

Video Games Boost Visual Skills, Study Finds

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Spending hours in front of the computer trying to single-handedly win World War II in the shoot-'em-up action video game *Medal of Honor* may serve more purpose than killing time.

According to a pair of researchers at the University of Rochester in New York, such action video games train the brain to better process certain visual information.

Action video gamers tend to be more attune to their surroundings while performing tasks like driving down a residential street, where they may be more likely to pick out a child running after a ball than a non-video gamer.

The research also suggests that action game playing might be a useful tool to rehabilitate visually impaired patients or to train soldiers for combat.

"It is certainly good training for people in situations where they need to detect things in their visual environment at any time in any location, like ground troops going through uncharted territory," said Daphne Bavelier, an associate professor of brain and cognitive sciences at the University of Rochester.

Bavelier and her graduate student Shawn Green stumbled upon this field of research while testing the visual-attention skills of deaf people as part of their on-going studies into how experiences shape the organization of the visual system.

"Shawn realized that his own visual attentional skills were abnormally good," said Bavelier. "As Shawn is an avid video game player, and definitely the only video game player of the two of us, we decided to test the hypothesis that this video game experience was the origin of the observed differences."

According to the experiments, which are reported in the May 29 issue of *Nature*, people who play action video games can process visual information more quickly and can track 30 percent more objects than non video game players.

"[Bavelier and Green] showed that playing action games can increase attention ability to a certain extent and that looks promising," said Alan Pope, an engineering psychologist at NASA's Langley Research Center in Hampton, Virginia.

Pope and his colleague Olafur Palsson, a clinical psychologist at the Eastern Virginia Medical School in Norfolk, have designed custom-made video games that help children with attention deficit disorder by teaching them how to control their brainwave patterns.

Collectively, said Pope, his and Palsson's research and that of Bavelier and Green shows that video

games are good for something and thus should not always get a "bad rap."

Bavelier says that while her and Green's research suggests playing off-the-shelf action video games has some positive benefits, she cautions against foregoing the more traditional brain exercises of reading, writing, and arithmetic to play shoot-'em-ups on the computer.

"Balance is the essence of everything and if you spend your whole life playing [video games] you will have amazing visual skills for sure, but that will only help you if you do things in life that require visual skills," she said.

Testing Gamers

Bavelier and Green tested a group of *Medal of Honor*, *Grand Theft Auto3*, and *Half-Life* aficionados from the University of Rochester campus to determine if action video games enhance visual attention.

The tests, described as boring, dull, and unlike gaming itself, required that the subjects perform the same highly specialized task over and over on displays using geometrical shapes or letters.

The tests were given to gamers and non-gamers. All of the subjects were male since no qualified female game players could be located on the university campus, said Bavelier.

The first test flashed a small object on a screen for 1/160 of a second and the participant would indicate where it flashed. Inattention to the screen would cause the brain to miss the appearance of the object. Gamers tended to notice the object far more often than non gamers.

The second test presented 1 to 12 small objects on a screen at once and the subject had to type how many objects they had seen. Gamers saw the correct number of objects more often than non-gamers.

The final test flashed black letters on a screen in fast succession. One letter was white, and it may or may not have been followed by a black "X." Gamers again picked out which letter was white and whether or not an "X" followed it better than non-gamers.

"These results indicate an enhanced allocation of spatial attention over the visual field, even at untrained locations, in [video game players]," the researchers write in *Nature*.

Video Game Homework

Next, to find out if visually attentive people naturally gravitate towards action video games or if game playing itself increases certain visual attention skills, Bavelier and Green trained a selection of male and female non-game players on one of two video games.

One group was asked to play the action video game *Medal of Honor* for at least one hour per day for two weeks. In the game, the player is a U.S. soldier fighting against German Nazis in World War II.

"It boils down to killing as many enemy soldiers as you can and going on different missions and fulfilling missions by taking over some buildings," said Bavelier. "In the process there are a lot of one-to-one fights. You have to determine the enemy, aim at it, and shoot."

Once the test subjects got the hang of the game, Bavelier said that they enjoyed playing it quite a bit. Some trainees even reported that it was the part of the day they most looked forward to.

As a control, the other group was asked to play the puzzle-oriented game *Tetris* in which players have to rotate and organize blocks into lines.

To the researchers' surprise, after just two weeks the group trained on *Medal of Honor* showed a

marked increase in their test performances, whereas the *Tetris* players did not.

"Action video games require effective monitoring of a large portion of the visual field in order to effectively detect multiple fast moving peripheral targets," said Bavelier. "*Tetris* on the other hand requires rather focused attention on the current piece as well as other higher-level processes such as mental rotation."

The researchers point out that the individuals trained on *Medal of Honor* did not perform nearly as well on the tests as the action video game aficionados, who reported playing at least four times per week for six months.

The amount of time needed to achieve the test scores of the aficionados is not known, but Bavelier and Green speculate that it requires significant dedication.

Anecdotal evidence from the trained gamers also suggests that the beneficial effects of gaming diminish after a month of non-gaming. Some of the trainees, however, have kept their skills honed by regularly playing action video games since they were hooked by the study.

A similar study was published in the *Journal of Applied Developmental Psychology* in 1994 by Patricia Greenfield, a professor of psychology and director of the University of California at Los Angeles Children's Digital Media Center, and colleagues Patricia DeWinstanley, Heidi Kilpatrick, and Daniel Kaye.

Their study demonstrates that expert video game players had better strategies for attending to two visual targets appearing simultaneously at two locations on a screen than novice players. As well, practice playing a game helped the non players improve their visual attention skills relative to a control group that did not play the game.

Greenfield said she is surprised that Bavelier and Green did not cite the research by her and her colleagues. "We were using less visually sophisticated video games. I wonder whether the strength of the effect has gotten larger," she said.

Research Applications

Bavelier and Green suggest their research may have practical applications for helping people with visual impairments to see more normally.

In stroke patients, for example, a kind of blindness occurs in part of the visual field as a result of the brain's inattentiveness to that area. The researchers suggest that action video games may be an effective way of bringing the brain's attentiveness back.

Bavelier said that if she and Green can determine what it is about the action video games sensory overload, sense of danger, sense of reward that allows the learning they induce to be so rapid, they would like to design a video game for patients.

Greenfield agrees that video games could be an effective learning tool, but that parents and designers should pay attention to the content of the games. As an example, she says that both a violent and a non-violent game could have all the benefits outlined by Bavelier and Green.

"In the former, the player would be gaining visual skills, but also could be stimulated to be more hostile or aggressive. In the latter, the game might have its cognitive effects without any negative social impact," said Greenfield.