Not Just Fun and Games

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You're on a sensitive mission and your objectives are clear: Kill enemy combatants, capture territory, reach your target, and, above all, stay alive.

This sort of scenario — eliminate the bad guy while avoiding major harm to achieve a particular goal — serves as the basic premise for video games played by millions of people around the world. These action-based games have received considerable scrutiny for their portrayal, even glorification, of violence. And yet, researchers are finding that the unique affordances of these games may shed new light on interactions among the mind, the brain, and technology.

Psychological scientists Daphne Bavelier (University of Rochester and Université de Genève, Switzerland) and Jeffrey Lin (Riot Games) explored these interactions as part of the Psychonomic Society–APS W.K. & K.W. Estes Symposium.

Action-based video games may be seen as entertaining and engaging, yet they have a very different feel and style of play than other kinds of video games. It is this difference that seems to yield transferrable benefits across perceptual and cognitive domains, says Bavelier.

In a 2009 study, for example, Bavelier and colleagues showed that first-person-shooter (FPS) video-game training enhanced participants' ability to detect subtle differences in visual contrast, or "contrast sensitivity." In the study, the researchers randomly assigned participants to play an FPS game (*Unreal Tournament 2004* or *Call of Duty 2*) or a control game (e.g., *The Sims 2*) for a total of 50 hours spread over 9 weeks. Participants who trained on FPS games showed marked improvements to contrast sensitivity several days after completing training compared with those who trained on control games.

Additional studies have shown action-game-related improvements to an array of perceptual and cognitive abilities, including perceptual decision-making, object tracking, visual memory, and task switching. And accumulating research indicates that these improvements extend to abilities that aren't even tapped in the games. Feng, Spence, and Pratt (2009) found, for example, that 10 hours of action-game training nearly eliminated the gender difference typically observed in mental rotation of geometric shapes, a task not typically featured in action-based games.

"If you stand back and look at the literature on intervention and transfer, it's actually relatively rare to have a learning task transfer to different domains," says Bavelier. She and her colleagues believe that the transfer effects may come down to cognitive abilities related to attentional control: "We think we're actually getting those people to train to be better focused on the task at hand and, as a result, better at excluding sources of distraction, interruption, or noise in their environment."

A 2011 neuroimaging study conducted by Mishra, Zinni, Bavelier, and Hillyard provides some evidence suggesting how this might work on a neural level. FPS players and nonplayers were presented with four

different streams of visual stimuli simultaneously while their brain activity was recorded with EEG. Importantly, the four streams flickered at different frequencies, each of which was identifiable by a specific neural signal. The participants were told to focus on a specific stream at a time, while ignoring the other three streams, and to indicate when they saw a specific target.

The EEG data revealed an interesting pattern. FPS players did not show changes in attentional enhancement per se — that is, they did not show greater elicitation of activation for the stream they were told to attend to compared to nonplayers. Rather, they showed a smaller elicitation of activation for the unattended streams. That is, they seemed to be better able to tune out the distracting stimuli. The FPS players also were faster than nonplayers at detecting the target stimuli without sacrificing accuracy.

According to Bavelier, these benefits may come with certain costs:

“If you’re a good learner in certain contexts, it means you come with prior knowledge that may actually be counterproductive in other contexts,” she explained.

Bavelier and her colleagues are conducting further studies to determine where the boundaries of video-game learning might lie in order to establish the conditions under which video-game trained individuals may fail or find learning difficult. They also want to drill down further to identify specific aspects of action-based game play that lead to training effects.

For most researchers, trying to isolate the effects of specific game mechanics might seem impossible simply because the features of the game aren’t readily manipulable. But for scientists like Jeffrey “Lyte” Lin, it’s simply a matter of figuring out which research questions you want to answer.

Lin is Lead Game Designer of Social Systems at Riot Games, maker of the extraordinarily popular multiplayer online-battle-arena (MOBA) video game *League of Legends*. While Bavelier and others are investigating how aspects of video-game play affect behavior in the real world, Lin’s research team is looking through the other end of the microscope to investigate how behavior unfolds within the context of a virtual society.

According to data collected by Riot Games, *League of Legends* has an average of about 67 million active players in a given month, and at peak times there are more than 7.5 million people playing the game simultaneously. For reference, that’s more people than the population of countries like El Salvador, New Zealand, and Denmark.

Social interaction data generated by the millions of *League of Legends* players provides a new avenue for investigating important questions that are otherwise difficult to examine:

“Online games are a microcosm of the real world, but the only difference is for the first time everything is recorded: Every piece of game data, every chat log, every interaction, every click, everything you do online, we have a data point for,” says Lin.

The granularity of this data allows Lin and his team to examine the impact of any number of variables on the evolution of the online society created by *League of Legends*. And one aspect of societal evolution that particularly interests Lin is the emergence of deviant behaviors like harassment.

Using social network analysis to look at interactions among *League of Legends* players, Lin and his team found evidence for "trigger toxicity," in which a negative interaction ripples through the social network, breeding further negative behavior. The research team wanted to see if they could attack these toxic pockets through a simple intervention.

The researchers developed and tested an in-game judicial system that allows players to report each other for negative behavior, including verbal abuse and spamming. Initially, the system was built around a tribunal that reviewed the worst cases and presented them back to community members, who could then vote on the case.

While the system seemed to produce appropriate outcomes — with high inter-rater reliability between Riot staffers and the larger community — the process was slow, taking days, or sometimes weeks, to send players a verdict.

"As every scientist knows, clarity and speed are super critical to feedback," says Lin.

The researchers now are taking advantage of advances in machine learning to embed more responsive feedback systems within the game. Using players' reports of offensive behavior, the machine-learning program is able to learn local language context, classify behaviors according to cultural norms and accepted practices, and send offending players detailed warning notices for negative behavior.

The program isn't perfect — it still has trouble classifying self-deprecating remarks, for example — but Lin notes that initial results suggest that rapid feedback leads to a dramatic drop in toxicity.

Lin and his team have many more questions they're hoping to answer, but they have no intention of keeping their trove of data to themselves:

"We do want to open our doors to all labs in psychology and many other fields as well," Lin said. He hopes interested readers will contact him with proposals at jlin@riotgames.com or on Twitter at @RiotLyte.

References

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