Video game based learning: there is more than meets the eye

BAVELIER, Daphné, GREEN, C. Shawn


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Over the past three decades the prevalence of video games in our society has increased exponentially. While for most of that time the predominant societal attitude was that video games were something for ‘kids,’ or more accurately boys, the current reality is that video game use cuts widely across both gender and age groups. In fact, according to the Entertainment Software Association, in the United States the average video game player’s age is 35 and 40% of all game players are women. The number of gamers is likely to continue to grow as game designers strive to capture a larger market share. Extensive video game play, in some respect, constitutes a natural experiment in which individuals expose themselves to an abnormal sensory and cognitive environment. In our research we seek to evaluate exactly how gaming alters perceptual and cognitive processing as well as the neural mechanisms underlying these behavioral changes.

The first notable finding from our work is that the nature of the perceptual and/or cognitive changes that occur as a result of video game experience is highly dependent on the type of games that are played. The largest observed effects on perception, attention, and processing speed arise specifically from ‘action’ video game play. Action video games are a particular subset of games in which many quickly moving or highly transient objects are present. They require flexible allocation of resources to efficiently monitor the entire visual scene for unexpected events, and demand extremely fast action selection. While games from a variety of genres may be considered action games, the primary examples are first- and third-person shooters, such as Halo or Gears of War. Our research shows that individuals trained on such games perform better in a variety of perceptual, attentional, and cognitive tasks than individuals trained on other types of similarly engrossing, but ‘non-action’ games. More explicitly, the skills enhanced by action video game training include low-level vision (enhanced contrast sensitivity function), various aspects of attention (ability to monitor several objects at once, to search through a cluttered scene, to detect an event of interest in a fast-forwarding video), more complex task constructs (multi-tasking, task-switching) and finally a general speeding of perceptual processing. Our work illustrates how skilled performance in a variety of processing domains can be enhanced by a single training regimen, a finding that has direct practical implications for job-related training (e.g., laparoscopic surgeons and clinical rehabilitation).

Significantly, skills improved by the regimen extend well beyond specific tasks required in the games. A training regimen whose benefits are so broad is unprecedented and provides a unique opportunity to identify factors that underlie learning in general, and more specifically, factors that promote the transfer of skills to new tasks or new domains. A multi-disciplinary and multi-university effort is under way investigating just these factors (see www.bcs.rochester.edu/muri/index.html). Our core hypothesis is that broad learning requires a training regimen that (i) increases processing speed, (ii) enhances the flexibility with which executive resources are allocated and (iii) has a high degree of flow or sense of enjoyment, engagement, and task mastery from gaining expertise in a given task. On-going work is investigating the neural basis of changes induced by action video game training, and will compare these changes with any that occur as a result of experience with games specifically designed to augment cognitive functioning.

An important direction for future research is to address how video games can best be used to foster content-based learning. Our results show that there is more than meets the eye when designing a training game. While there is obviously virtue in applying principles derived from classroom teaching, it should not preclude the exploitation of gaming technology for the unique experience it offers.