The increasing time devoted to video gaming by both adolescents and young adults during the past 2 decades has led to a spirited debate about the effect of this pastime on both individuals and societies. Stakeholders in this conversation include the burgeoning electronic gaming industry, video gamers, parents, educators, health care professionals, and governments. China has recently imposed a nationwide rule limiting online video gaming to 3 hours a week to protect youth. In contrast, proponents of video games around the world have claimed both educational and cognitive benefits for participants.

To clarify the impact of video games on personal and societal health, neuroscientists have researched the effects of video gaming on the human brain, an effort that has included many functional magnetic resonance imaging (fMRI) studies. As part of this widening investigation, Chaarani and colleagues studied the neurocognitive ramifications of playing video games by analyzing publicly available fMRI data from the National Institutes of Health–sponsored Adolescent Brain Cognitive Development (ABCD) study cohort. In their analysis, published in this issue of *JAMA Network Open*, the authors discovered that 9- and 10-year-old children who played at least 21 hours of video games per week demonstrated higher levels of performance on fMRI emotional working memory (n = 679) and response inhibition tasks (n = 800) compared with a group of similarly aged control individuals who did not routinely play video games. Moreover, the patterns of cerebral cortical blood oxygenation level–dependent fMRI activation exhibited during these tasks statistically differed between groups when assessed with a false discovery rate–corrected *P* value of .05, suggesting differing methods of cerebral function.

This analysis, among the largest reported in the literature, adds to a heterogeneous body of data suggesting that regular video game participation alters cerebral cortical responses to some types of stimuli and may confer certain cognitive advantages. In other fMRI studies of video gamers, improved performance was found in the gamer group in such diverse cognitive domains as visual responsiveness, executive function, and reward system stamina. However, the results of some fMRI studies have been less favorable for video gamers. For example, some fMRI evidence indicates that players of first-person shooter games experience blunted emotional responses to violent stimuli. Despite often conflicting conclusions, the body of evidence that the brains of video gamers may exhibit certain functional variances compared with the brains of non–videogamers, at least when assessed by fMRI, is increasing.

Making any recommendations based on fMRI studies of video gaming is challenging. By the nature of their design, most fMRI studies on this topic fail to establish causality between video gaming and purported brain functional alterations. Some studies may simply be uncovering inherent brain characteristics that lead certain individuals to gravitate toward video gaming. If, in fact, video games are altering neurocognition, the longevity of any cerebral changes induced by this activity remains largely unknown.

An additional concern is that the umbrella term video games includes a wide variety of individual game styles, including abstract tests of visuospatial coordination, fantasy community building, role-playing, virtual vehicular races, and military-style first-person shooter games. Consequently, one must also ask to what degree the specific variety of video games pursued by participants influences cognitive changes. To this point, Chaarani and colleagues reported the number of hours their research participants devoted to video games on a weekly basis; however, the specific makeup of those games remains unknown. Although much research has been directed at
the effects of violent video games on the limbic system, other styles of video games have garnered much less interest among researchers.

Another important question that remains unanswered is whether task-based fMRI is a neutral testing mechanism for assessing the cerebral consequences of video games. In many ways, undergoing a task-based fMRI examination is much like playing a video game. Within the confines of the scanner, fMRI participants commonly view various forms of visual stimuli by means of a liquid-crystal display screen or video goggles. Many fMRI tasks require the examinee to respond to these stimuli by pushing buttons on a small handheld device. This testing format may favor video gamers who have spent many hours using a game controller to respond to a variety of stimuli presented on a television screen. Beyond fMRI, many neurocognitive tests are likewise administered using a video-style format. Much more testing certainly needs to be performed on the brains of video gamers without the use of video screens. By doing so, we may come to understand whether the positive or negative cognitive effects of these games have implications beyond the realm of interacting with gaming consoles.

In conclusion, through their analysis of an fMRI data set from large ABCD cohort, Chaarani and colleagues1 have contributed yet another piece to the puzzle regarding the influence of video gaming on cognitive function and health. Their results suggest a possible benefit to video gaming in the realm of working memory and executive response inhibition. However, large gaps in our knowledge on this topic persist, including such issues as causality, the influence of video game styles, and the impact of any bias introduced by a video-based testing environment. Much future research will be required to address such knowledge deficits before scientific evidence can guide health recommendations or societal policy.

ARTICLE INFORMATION
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