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The Benefits of Playing Video Games

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Video games are a ubiquitous part of almost all children's and adolescents' lives, with 97% playing for at least one hour per day in the United States. The vast majority of research by psychologists on the effects of "gaming" has been on its negative impact: the potential harm related to violence, addiction, and depression. We recognize the value of that research; however, we argue that a more balanced perspective is needed, one that considers not only the possible negative effects but also the benefits of playing these games. Considering these potential benefits is important, in part, because the nature of these games has changed dramatically in the last decade, becoming increasingly complex, diverse, realistic, and social in nature. A small but significant body of research has begun to emerge, mostly in the last five years, documenting these benefits. In this article, we summarize the research on the positive effects of playing video games, focusing on four main domains: cognitive, motivational, emotional, and social. By integrating insights from developmental, positive, and social psychology, as well as media psychology, we propose some candidate mechanisms by which playing video games may foster real-world psychosocial benefits. Our aim is to provide strong enough evidence and a theoretical rationale to inspire new programs of research on the largely unexplored mental health benefits of gaming. Finally, we end with a call to intervention researchers and practitioners to test the positive uses of video games, and we suggest several promising directions for doing so.

Keywords: video games, mental health, adolescents, social, motivation

The game of Chess is not merely an idle amusement. Several very valuable qualities of the mind, useful in the course of human life, are to be acquired or strengthened by it, so as to become habits, ready on all occasions . . . we learn by Chess the habit of not being discouraged by present bad appearances in the state of our affairs, the habit of hoping for a favourable change, and that of persevering in the search of resources.

—Benjamin Franklin, “The Morals of Chess”

Today, in the United States, 91% of children between the ages of 2 and 17 play video games (NPD Group, 2011), and a nationally representative study of U.S. teenagers found that up to 99% of boys and 94% of girls play these games (Lenhart et al., 2008). In the United States alone, video games brought in over \$25 billion in 2010, more than doubling Hollywood's 2010 box office sales of \$10.8 billion in the United States and Canada (Motion Picture Association of America, 2011). Against this backdrop of nearly ubiquitous play, the popular press regularly

pulses out urgent warnings against the perils of addiction to these games and their inevitable link to violence and aggression, especially in children and adolescents. Indeed, the vast majority of psychological research on the effects of “gaming” has been focused on its negative impact: the potential harm related to aggression, addiction, and depression (e.g., Anderson et al., 2010; Ferguson, 2013; Lemola et al., 2011). It is likely that this focus will not diminish in the near future, in part because of the enormous media attention garnered when mass killings (e.g., the Columbine High School slayings in 1999) are associated with youth who play violent video games (Ferguson, 2007). Most recently (December 2012), the revelation that the Sandy Hook Elementary School gunman played shooter games directly resulted in President Obama requesting Congress to allocate \$10 million for research on the effects of violent media, especially video games (Obama & Biden, 2013).

Decades of valuable research on the effects of violent video games on children's and adolescents' aggressive behavior already exists, and this is indeed an important body of work to consider. However, we argue that in order to understand the impact of video games on children's and adolescents' development, a more balanced perspective is needed, one that considers not only the possible negative effects but also the benefits of playing these games. Considering these potential benefits is important, in part, because the nature of these games has changed dramatically in the last decade, becoming increasingly complex, diverse, realistic and social in nature (Ferguson & Olson, 2013). A small but significant body of research has begun to emerge, mostly in the last five years, documenting these benefits. We propose that, taken together, these findings suggest that video games provide youth with immersive and compelling social, cognitive, and emotional experiences. Further, these experiences may have the potential to enhance mental health and well-being in children and adolescents.

In this article, we summarize the research on the benefits of playing video games, focusing on four main domains: cognitive (e.g., attention), motivational (e.g., resilience in the face of failure), emotional (e.g., mood management), and social (e.g., prosocial behavior) benefits. By

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integrating insights from developmental, positive, and social psychology, as well as media psychology, we propose some candidate mechanisms by which playing video games fosters real-world benefits. Our hope is to provide strong enough evidence and a theoretical rationale to inspire new programs of research on the largely unexplored mental health benefits of gaming. Finally, we end with a call to intervention and prevention researchers to test the potential positive uses of video games, and we suggest several promising directions for doing so.

The Function of Play

Although relatively little research has focused on the benefits of playing video games specifically, the functions and benefits of play more generally have been studied for decades. Evolutionary psychology has long emphasized the adaptive functions of play (for a review, see Bjorklund & Pellegrini, 2010), and in developmental psychology, the positive function of play has been a running theme for some of the most respected scholars in the field (e.g., Erikson, 1977; Piaget, 1962; Vygotsky, 1978). Erikson (1977) proposed that play contexts allow children to experiment with social experiences and simulate alternative emotional consequences, which can then bring about feelings of resolution outside the play context. Similarly, Piaget (1962) theorized that make-believe play provides children opportunities to reproduce real-life conflicts, to work out ideal resolutions for their own pleasure, and to ameliorate negative feelings. Both Piaget (1962) and Vygotsky (1978) espoused strong theoretical links between play and a variety of elements that foster the development of social cognition.

Beyond social cognition, developmentalists have emphasized that play constitutes an emotionally significant

context through which themes of power and dominance, aggression, nurturance, anxiety, pain, loss, growth, and joy can be enacted productively (e.g., Gottman, 1986). For example, in his qualitative research on children's play conversations, Gottman (1986) showed how children use play for emotional mastery in their real lives. Whereas adolescents and adults often use self-disclosure and direct discussion with close friends to resolve emotional issues, children use play to work them out through pretend-based narratives enacted either alone or with others. Links between children's propensity to play and their development of cooperative skills, social competence, and peer acceptance have also been empirically established (e.g., Connolly & Doyle, 1984).

More recently, neuroscientific research with rats suggests specific brain mechanisms that help explain how play fighting in particular leads to the development of social competence (for a review, see Pellis & Pellis, 2007). Experimental laboratory studies indicate that play fighting results in the release of chemical growth factors in the parts of the brain that are coordinated for highly social activities (e.g., the orbital frontal cortex), thus promoting the growth and development of these areas. Given how similar human and nonhuman animals are in terms of several forms of play, there may be a similar mechanism by which play experiences improve social competence in children (Pellis & Pellis, 2007). We propose that, in addition to several unique factors, the same emotional themes identified in children's play experiences in general (e.g., dominance, nurturance, anxiety, and growth) are also explored in video games, allowing for important cognitive, emotional, and social competencies to be acquired.

Defining Our Terms

Before we go further, it is essential to specify what we mean by the term *video games* and how they differ from other media (e.g., books, television, movies). The most essential distinguishing feature of video games is that they are interactive; players cannot passively surrender to a game's storyline. Instead, video games are designed for players to actively engage with their systems and for these systems to, in turn, react to players' agentive behaviors. There are millions of video games, with vastly different themes and goals. These games can be played cooperatively or competitively, alone, with other physically present players, or with thousands of other online players, and they are played on various devices from consoles (e.g., Nintendo Wii, Playstation) to computers to cell phones. Because of their diversity in terms of genres and the vast array of dimensions on which video games can vary, a comprehensive taxonomy of contemporary games is exceedingly difficult to develop (many have tried). However, to provide a glimpse into this diversity, Figure 1 depicts most of the genres (with examples) along two dimensions: the level of complexity and the extent of social interaction. This taxonomy is a necessary simplification; many games also differ on other important dimensions, and increasingly, commercial games can be played both socially and nonso-



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cially, cooperatively and competitively, and the complexity of games often depends on the manner in which the player engages in these various gaming contexts.

To describe only a small cross-section of 2011's most popular games (Entertainment Software Association, 2012): In *World of Warcraft*, 12 million players regularly log on to customize their fantasy personae, explore complex and ever-changing vistas, and collaboratively battle human and computer opponents. In *Starcraft 2*, millions worldwide play a complex chess-like strategy game that demands perpetual multitasking between procuring resources, amassing an army, and penetrating opponents' defenses. In *The Sims 3*, players cultivate a virtual existence where their character(s) socialize, learn new skills, work steady jobs, and develop complex relationships. In *Halo 4*, players take on the first-person perspective of a highly equipped supersoldier, violently killing alien races over the course of a narrative and, when online, competing and cooperating with peers. In *FIFA 13*, players take control of their favorite soccer teams, competing in realistic simulations against computer- or human-controlled teams. Finally, in *Minecraft*, millions of players use Lego-like elements to construct their own unique structures and mechanisms, sharing their creations with others in immense virtual worlds.

Given this vast diversity in video games, a single definition may not be useful. In fact, top scholars in the field have declared, "One can no more say what the effects of video games are, than one can say what the effects of food are" (Bavelier et al., 2011, p. 763). Thus, rather than define video games according to a convenient generality, we will be specific in defining the genre of games to which we are referring when we can and whether they are single- or multiplayer games, played cooperatively or competi-

tively, and so on. When we refer to *gamers*, we mean individuals who play video games regularly, more than one hour every day. We now turn to the literature on the benefits of gaming.

Cognitive Benefits of Gaming

Contrary to conventional beliefs that playing video games is intellectually lazy and sedating, it turns out that playing these games promotes a wide range of cognitive skills. This is particularly true for *shooter* video games (often called "action" games by researchers), many of which are violent in nature (e.g., *Halo 4*, *Grand Theft Auto IV*). The most convincing evidence comes from the numerous training studies that recruit naive gamers (those who have hardly or never played *shooter* video games) and randomly assign them to play either a shooter video game or another type of video game for the same period of time. Compared to control participants, those in the shooter video game condition show faster and more accurate attention allocation, higher spatial resolution in visual processing, and enhanced mental rotation abilities (for a review, see C. S. Green & Bavelier, 2012). A recently published meta-analysis (Uttal et al., 2013) concluded that the spatial skills improvements derived from playing commercially available shooter video games are comparable to the effects of formal (high school and university-level) courses aimed at enhancing these same skills. Further, this recent meta-analysis showed that spatial skills can be trained with video games in a relatively brief period, that these training benefits last over an extended period of time, and crucially, that these skills transfer to other spatial tasks outside the video game context.

These training studies have critical implications for education and career development. A 25-year longitudinal study with a U.S. representative sample (for a review, see Wai, Lubinski, Benbow, & Steiger, 2010) established the power of spatial skills in predicting achievement in science, technology, engineering, and mathematics (STEM). STEM areas of expertise have been repeatedly linked to long-term career success and are predicted to be especially critical in the next century (Wai et al., 2010).

Preliminary research has also demonstrated that these cognitive advantages manifest in measurable changes in neural processing and efficiency. For example, a recent functional magnetic resonance imaging (fMRI) study found that the mechanisms that control attention allocation (e.g., the fronto-parietal network) were less active during a challenging pattern-detection task in regular gamers than in nongamers, leading the researchers to suggest that shooter game players allocate their attentional resources more efficiently and filter out irrelevant information more effectively (Bavelier, Achtman, Mani, & Föcker, 2012). As summarized recently in *Nature Reviews Neuroscience*: "Video games are controlled training regimens delivered in highly motivating behavioral contexts . . . because behavioral changes arise from brain changes, it is also no surprise that performance improvements are paralleled by enduring physical and functional neurological remodeling" (Bavelier et al., 2011, p. 763). These changes in neural functioning



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may be one means by which the cognitive skills gained through video games generalize to contexts outside games.

It is important to stress that enhanced cognitive performance is not documented for all video game genres. The most robust effects on cognitive performance come from playing shooter video games and not from, for example, *puzzle* or *role-playing* games (C. S. Green & Bavelier 2012). These cognitive enhancements are likely a product of the visually rich three-dimensional navigational spaces and the fast-paced demands that require split-second decision making and acute attention to unpredictable changes in context. These assumptions, however, remain somewhat speculative because the vast majority of video games include an enormous number of game mechanics intertwined, rendering specific hypothesis testing about these mechanisms extremely difficult. Moreover, it is virtually impossible to choose an appropriate control condition wherein all aspects of a game (e.g., visual stimulation, arousal induction, gameplay) are kept constant across conditions and only one cognitive challenge is manipulated (e.g., navigating three-dimensional space efficiently vs. inhibiting prepotent responses). Cognitive neuroscientists have just recently put out a call to game developers to design new games for testing hypotheses about the specificity of cognitive advances and the particular mechanisms on which they are based (Bavelier & Davidson, 2013).

In addition to spatial skills, scholars have also speculated that video games are an excellent means for developing problem-solving skills (Prensky, 2012). Indeed, problem solving seems central to all genres of video games (including those with violent content). In-game puzzles range in complexity from finding the quickest route from A to B, to discovering complex action sequences based on memorization and analytical skills. Further, game designers

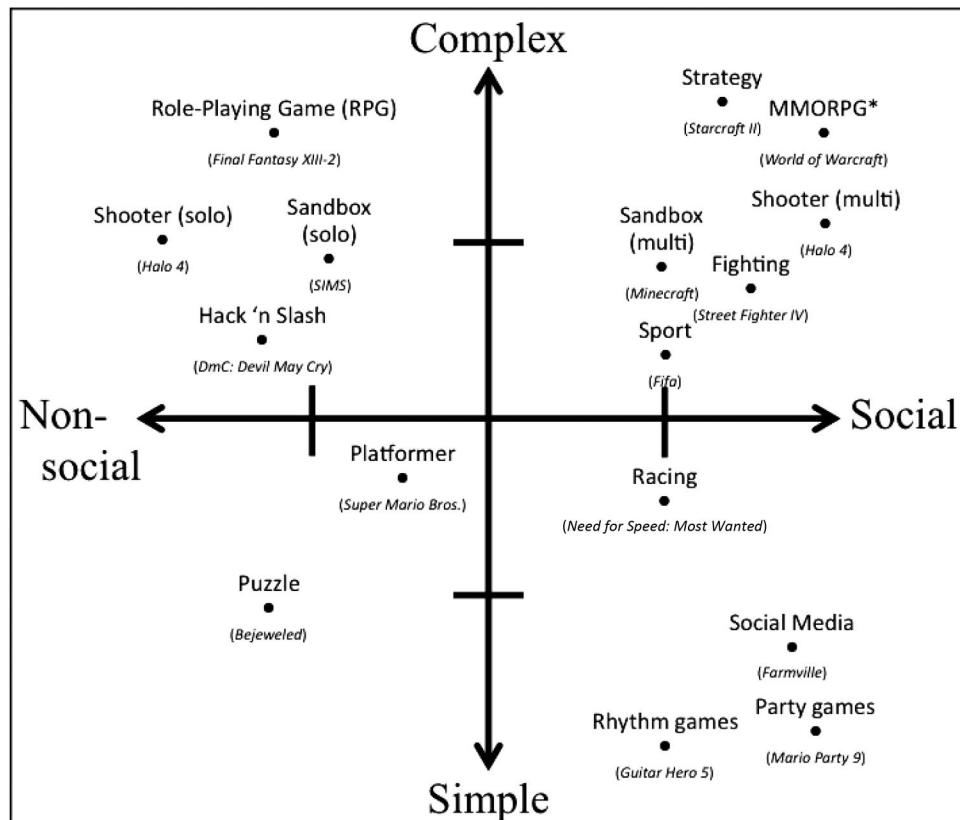
often provide very little instruction about how to solve in-game problems, providing players with a nearly blank palette from which to explore a huge range of possible solutions based on past experience and intuitions. Prensky (2012) has argued that exposure to these sorts of games with open-ended problems (and other learning experiences on the Internet) has influenced a generation of children and adolescents growing up as “digital natives.” Instead of learning through explicit linear instruction (e.g., by reading a manual first), many children and youth problem-solve through trial and error, recursively collecting evidence which they test through experimentation. Only two studies have explicitly tested the relation between playing video games and problem-solving abilities; in both, problem-solving was defined in the reflective sense (e.g., taking time to gather information, evaluate various options, formulate a plan, and consider changing strategies and/or goals before proceeding further). One study, with *World of Warcraft* players, was correlational (Steinkuehler & Duncan, 2008), making it impossible to discern whether playing the game improved problem solving or people with better skills in the first place were drawn toward this type of open-ended role-playing game. The other study (Adachi & Willoughby, 2013) was longitudinal and showed that the more adolescents reported playing strategic video games (e.g., role-playing games), the more improvements were evident in self-reported problem-solving skills the next year. The same positive predictive association was not found for fast-paced games such as *racing* and *fighting* games. Moreover, this latter study showed an indirect mediation effect such that playing strategic games predicted higher self-reported problem-solving skills, which, in turn, predicted better academic grades. More research is needed to tackle the causal question of whether and to what extent video games teach problem-solving skills and whether these skills generalize to real-world contexts.

Finally, video games seem to be associated with an additional cognitive benefit: enhanced creativity. New evidence is emerging that playing any kind of video game, regardless of whether or not it is violent, enhances children’s creative capacities. For example, among a sample of almost 500 12-year-old students, video game playing was positively associated with creativity (Jackson et al., 2012). Critically, children’s use of other forms of technology (e.g., computer, Internet, cell phone) did not relate to enhanced creativity. However, this study’s cross-sectional design made it unclear whether playing video games develops creative skills or creative people prefer video games (or both).

The story behind a recent breakthrough in biology research provides a nice illustration of how gamers’ superior spatial and problem-solving skills, as well as their creativity, all came together to solve a real-world, previously insoluble problem. In 2008, researchers at the University of Washington created an online game called *Foldit* (Cooper et al., 2010), allowing the public to play games in which they model the genetic makeup of proteins. At the end of a three-week competition in 2010, top-scoring players had generated phase estimates that allowed researchers

Figure 1

Conceptual Map of the Main Genres of Video Games (With Examples) Organized According to Two Important Dimensions: Level of Complexity and the Extent of Social Interaction Required



Note. The figure is not empirical but conceptual and is intended to demonstrate the variety of ways video games engage their users. Some genres have been necessarily excluded. The same game (*Halo 4*) was intentionally repeated to illustrate that many games have the option of being played in either a single- or a multiplayer mode. *MMORPG = massive multiplayer online role-playing game.

to identify a rapid solution of the crystal structure for a monkey virus related to AIDS. The structure had eluded researchers for over 10 years; however, the nonlinear, cooperative, and creative problem-solving techniques used by these gamers seemed to be precisely the skills needed to finally solve this elusive problem.

In summary, specific types of video games seem to enhance a suite of cognitive functions, some of which appear to generalize to real-world contexts. These data suggest that agendas to ban shooter games may be too simplistic. At the very least, the research on the negative impact of these games needs to be balanced with evidence for the cognitive benefits of these same games.

We now turn to the motivational, emotional, and social benefits of playing video games. It is important to highlight an across-the-board difference in the amount, breadth, and quality of research that can be found on these topics. Whereas cognitive mechanisms may be more easily isolated and tested, the motivational, emotional, and social effects of gaming are more complex and harder to disen-

tangle. Thus, research programs in these latter areas are only now beginning to gather steam. As a result, our claims about these latter benefits are more speculative, but the nascent research suggests immense promise for both theory development and practice.

Motivational Benefits of Gaming

Game designers are wizards of engagement. They have mastered the art of pulling people of all ages into virtual environments, having them work toward meaningful goals, persevere in the face of multiple failures, and celebrate the rare moments of triumph after successfully completing challenging tasks. In this section, we do not focus on the motivations children and youth have for playing video games (see Ferguson & Olson, 2013). Instead, we aim to identify several characteristics of video games that seem to promote an effective motivational style both in and outside gaming contexts. Specifically, decades of research in developmental and educational psychology suggest that mo-

tivational styles characterized by persistence and continuous effortful engagement are key contributors to success and achievement (for a review, see Dweck & Molden, 2005).

According to Dweck and her colleagues (Dweck & Molden, 2005), children develop beliefs about their intelligence and abilities, beliefs that underlie specific motivational styles and directly affect achievement. Children who are praised for their traits rather than their efforts (e.g., "Wow, you're such a smart boy") develop an *entity* theory of intelligence, which maintains that intelligence is an innate trait, something that is fixed and cannot be improved. In contrast, children who are praised for their effort (e.g., "You worked so hard on that puzzle!") develop an *incremental* theory of intelligence; they believe intelligence is malleable, something that can be cultivated through effort and time. We propose that video games are an ideal training ground for acquiring an incremental theory of intelligence because they provide players concrete, immediate feedback regarding specific *efforts* players have made.

Immediate and concrete feedback in video games (e.g., through points, coins, dead ends in puzzles) serves to reward continual effort and keep players within what Vygotsky (1978, p. 86) coined the "zone of proximal development." This motivational "sweet spot" balances optimal levels of challenge and frustration with sufficient experiences of success and accomplishment (Sweetser & Wyeth, 2005). Importantly, in the best games available on the market, this "sweet spot" is so effective because it adjusts itself dynamically; the difficulty level is continuously being calibrated to players' abilities through increasingly more difficult puzzles demanding more dexterity, quicker reaction times, and more clever and complex solutions.

Further, research has shown that the extent to which individuals endorse an incremental versus entity theory of intelligence reliably predicts whether individuals in challenging circumstances will persist or give up, respectively (Dweck & Molden, 2005). Thus, these implicit theories of intelligence have implications for how failure is processed and dealt with. If one believes that intelligence or ability is fixed, failure induces feelings of worthlessness. But if intelligence or ability is presumed to be a mark of effortful engagement, failure signals the need to remain engaged and bolster one's efforts. In turn, this positive attitude toward failure predicts better academic performance (e.g., Blackwell, Trzesniewski, & Dweck, 2007).

Notably, video games use failure as motivational tools and provide only intermittent chances for large-scale success. As behaviorists have documented for decades (e.g., S. B. Kendall, 1974), the kinds of intermittent reinforcement schedules that are doled out to video game players are the most effective for "training" new behaviors. We propose that being immersed in these gaming environments teaches players an essential basic lesson: Persistence in the face of failure reaps valued rewards (Ventura, Shute, & Zhao, 2013). Moreover, contrary to what we might expect, these experiences of failure do not lead to anger, frustration, or sadness, although players often do feel these neg-

ative emotions intermittently. Instead, or as well, players respond to failures with excitement, interest, and joy (Salminen & Ravaja, 2008). When faced with failure, players are highly motivated to return to the task of winning, and they are "relentlessly optimistic" about reaching their goals (McGonigal, 2011). The development of a persistent motivational style charged with positive affect may, in turn, lead to lasting educational success (Ventura et al., 2013).

Almost no empirical studies have directly tested the relation between playing video games, persistence in the face of failure, and subsequent "real-world" success. However, one recent study indicates that these relations may indeed exist. Ventura and colleagues (2013) used an anagram-riddle task and demonstrated that the extent of video game use predicted how long participants would (outside of a gaming context) persistently attempt to solve difficult anagrams. Of course, a great deal more research is required to establish causal relations between regular gaming and persistence in the face of failure. It may be particularly fruitful to examine, longitudinally, whether gaming predicts school achievement and whether this effect is mediated by increases in persistence.

In summary, although playing games is often considered a frivolous pastime, gaming environments may actually cultivate a persistent, optimistic motivational style. This motivational style, in turn, may generalize to school and work contexts. It is also probably the case that certain types of games will more likely foster these healthy motivational styles, while others may not. Moreover, individual differences in players' personalities and preferences for game genres may also have a differential impact on motivational outcomes. New studies that are designed to take these complexities into consideration are necessary to move the field forward significantly.

Emotional Benefits of Gaming

Based on the uses and gratifications theory, one of the oldest and most well-validated theories in communications research (Ruggiero, 2000), among the top reasons individuals cite for using diverse forms of media are to manage their moods and to enhance their emotional states. Gaming may be among the most efficient and effective means by which children and youth generate positive feelings. Several studies have shown a causal relation between playing preferred video games and improved mood or increases in positive emotion (e.g., Russoniello, O'Brien, & Parks, 2009; Ryan, Rigby, & Przybylski, 2006). For example, studies suggest that playing *puzzle* video games—games with minimal interfaces, short-term commitments, and a high degree of accessibility (e.g., *Angry Birds*, *Bejeweled II*)—can improve players' moods, promote relaxation, and ward off anxiety (Russoniello et al., 2009).

It has further been suggested that some of the most intense positive emotional experiences are triggered in the context of playing video games (McGonigal, 2011). For instance, *fiero*, the Italian word for intense pride after succeeding against great adversity, is a feeling that gamers often report seeking and experiencing. *Flow* or *transpor-*

tation is another positive emotional experience described by gamers, during which they are immersed in an intrinsically rewarding activity that elicits a high sense of control while simultaneously evoking a loss of self-consciousness (Sherry, 2004). In psychology, flow experiences have repeatedly been linked to a host of positive outcomes for adolescents, including commitment and achievement in high school (e.g., Nakamura & Csikszentmihalyi, 2002), higher self-esteem, and less anxiety (Csikszentmihalyi, Rathunde, & Whalen, 1993). Experiencing flow or transportation in games may lead to similar positive real-world outcomes; however, this hypothesis remains untested.

Although not specific to game playing, the importance of experiencing positive emotions on a daily basis has been elaborated in Fredrickson's (2001) broaden-and-build theory of positive emotions. She demonstrates that experiencing positive emotions may help *broaden* the number of behaviors one perceives as both possible and motivating and may *build* social relationships that provide support for goal pursuit and coping with failure. Further, Fredrickson and colleagues propose that positive emotions help undo the detrimental and de-motivating results of negative emotions. Positive emotions are thus the bedrock for well-being, crucial not only as end states but as sources of inspiration and connectivity. If playing games simply makes people happier, this seems to be a fundamental emotional benefit to consider.

Although it is clear that games are fun and that they elicit positive emotions, there remain unanswered questions regarding the consequences of positive emotional experiences during video game play. For instance, puzzle games have been empirically shown to trigger positive emotions, but these games are designed for brief, intermittent play. The extent to which games designed for long-term engagement also foster positive changes in mood is unclear. Further, although correlational studies suggest that individuals consciously *turn to* these games to regulate their emotions (Olson, 2010), it may simply be that positive moods and game playing co-occur, and players report retrospectively that experiencing positive emotions was a conscious motivation that preceded play. We therefore need temporally sensitive designs (e.g., diary studies) to more rigorously assess whether youth in negative moods play games because they want to stop feeling badly and, crucially, the extent to which playing these games predicts their mood improvements at subsequent time points. Finally, it is important to study the extent to which turning to video games to feel better is adaptive and at what point using games becomes an avoidant strategy that leads to more negative outcomes.

Evaluating the emotional benefits of video games leads to the study of emotion regulation in these contexts. Simple up-regulation of positive emotions is one emotion-regulation strategy that has been linked to beneficial outcomes (e.g., Fredrickson, 2001), but there may be additional emotion-regulation benefits of playing video games. Games do not elicit only positive emotions; video games also trigger a range of negative ones, including frustration, anger, anxiety, and sadness. But similar to what Gottman's

(1986) research has shown on the function of traditional play, the pretend context of video games may be real enough to make the accomplishment of goals matter but also safe enough to practice controlling, or modulating, negative emotions in the service of those goals. Adaptive regulation strategies such as acceptance, problem solving, and reappraisal have repeatedly been linked to less negative affect, more social support, and lower levels of depressive symptoms (Aldao, Nolen-Hoeksema, & Schweizer, 2010). These same adaptive regulation strategies seem to be rewarded in gaming contexts because their use is concretely and clearly linked to goal achievement. For example, reappraisal (a cognitive "habit" involving reevaluations of a situation or of one's ability to cope with that situation) is a well-established emotion-regulation strategy (Gross & John, 2003) that appears to be fundamental for many video games. Games continuously provide novel challenges, demanding players to shift already established appraisals to new ones in order to most efficiently reach goals. For example, *Portal 2*, an immensely popular first-person puzzle game, challenges the player to solve intricate maze-like problems by exploiting physics-based rule structures. As soon as a player masters one type of puzzle, however, the rules change drastically, frustrating players and often triggering anxiety while also forcing players to "unlearn" their previous strategies and flexibly switch their appraisal systems to uncover the new rule structure. Without applying reappraisal strategies, anxiety and frustration would likely be amplified. This continual switching of whole systems of rules is also evident in certain role-playing games (e.g., *World of Warcraft*, *Pokémon*, *Final Fantasy*) in which players cultivate an array of avatars, each with its own unique skill set (e.g., healers, warriors, sorcerers), allegiances, associated social behaviors, advantages, and vulnerabilities. Many players switch among these avatars, forcing themselves to fluidly adjust to unique social and emotional goals. Thus, game playing may promote the ability to flexibly and efficiently reappraise emotional experiences, teaching players the benefits of dealing with frustration and anxiety in adaptive ways. In contrast, less adaptive strategies, such as rumination (Aldao et al., 2010), are less likely to be rewarded by video games because they impede players from reacting quickly and flexibly to constantly changing, often frustrating, challenges.

The extent to which adaptive emotion-regulation skills are learned through gaming remains speculative at this point, but testing these ideas seems like an exciting new area for future programs of research. Importantly, the type of contexts that most often pull for effective emotion-regulation strategies—such as reappraisal—are social in nature.

Social Benefits of Gaming

Perhaps the biggest difference in the characteristics of video games today, compared to their predecessors of 10 to 20 years ago, is their pervasive social nature. Contrary to stereotypes, the average gamer is not a socially isolated, inept nerd who spends most of his (or her) time alone

loafing on the couch (Lenhart et al., 2008). Over 70% of gamers play their games with a friend, either cooperatively or competitively (Entertainment Software Association, 2012). For example, *World of Warcraft*—a multiplayer fantasy game set in a massive virtual world—boasts 12 million regular players, and *Farmville*—one of the most popular social networking games on Facebook—hosted over 5 million daily users in 2012 (Gill, 2012). In these virtual social communities, decisions need to be made on the fly about whom to trust, whom to reject, and how to most effectively lead a group. Given these immersive social contexts, we propose that gamers are rapidly learning social skills and prosocial behavior that might generalize to their peer and family relations outside the gaming environment (Gentile & Gentile, 2008; Gentile et al., 2009).

Players seem to acquire important prosocial skills when they play games that are specifically designed to reward effective cooperation, support, and helping behaviors (Ewoldsen et al., 2012). One study that summarized international evidence from correlational, longitudinal, and experimental studies found that playing prosocial video games consistently related to, or predicted, prosocial behaviors (Gentile et al., 2009). More specifically, playing prosocial games led to causal, short-term effects on “helping” behaviors, and longitudinal effects were also found, in that children who played more prosocial games at the beginning of the school year were more likely to exhibit helpful behaviors later that year. It may be tempting to conclude from this work that games with exclusively non-violent, prosocial content lead to prosocial behavior. But compelling work is just emerging that seems to refute this simple interpretation, suggesting that violent games are just as likely to promote prosocial behavior. The critical dimension that seems to determine whether violent games are associated with helping, prosocial behavior versus malevolent, antisocial behavior is the extent to which they are played cooperatively versus competitively. For example, players who play violent games that encourage cooperative play are more likely to exhibit helpful gaming behaviors online and offline than those who play nonviolent games (Ferguson & Garza, 2011), and playing violent video games socially (in groups) reduces feelings of hostility compared with playing alone (Eastin, 2007). Likewise, violent video games played cooperatively seem to decrease players’ access to aggressive cognitions (Schmierbach, 2010; Velez, Mahood, Ewoldsen, & Moyer-Gusé, 2012). Two recent studies have also shown that playing a violent video game cooperatively, compared with competitively, increases subsequent prosocial, cooperative behavior outside of the game context (Ewoldsen et al., 2012) and can even overcome the effects of outgroup membership status (making players more cooperative with outgroup members than if they had played competitively; Velez et al., 2012). Conversely, recently published experimental studies (Tear & Nielsen, 2013) suggest that even the most violent video games on the market (*Grand Theft Auto IV*, *Call of Duty*) fail to diminish subsequent prosocial behavior. All of these studies examined immediate, short-term effects of cooperative play, but they point to potential long-term benefits as

well. The social benefits of cooperative versus competitive game play need to be studied longitudinally, with repeated assessments, to have clearer implications for policy and practice.

Social skills are also manifested in forms of civic engagement: the ability to organize groups and lead like-minded people in social causes. A number of studies have focused on the link between civic engagement and gaming. For example, one large-scale, representative U.S. study (Lenhart et al., 2008) showed that adolescents who played games with civic experiences (e.g., *Guild Wars 2*, an MMORPG, or massive multiplayer online role-playing game) were more likely to be engaged in social and civic movements in their everyday lives (e.g., raising money for charity, volunteering, and persuading others to vote). Unfortunately, as is the case with most survey studies in the field, this study did not differentiate the causal direction of effects.

“Serious” Games in Health and Education

Up to this point, we have reviewed a diverse set of potential benefits of gaming relevant to children’s cognitive, motivational, social, and emotional development. The medical field has picked up on these positive effects and become increasingly interested in “gamifying” medical interventions (Ritterfeld, Cody, & Vorderer, 2009), as evidenced by the emergence of a new journal (*Games for Health Journal*), calls for proposals from major granting agencies (e.g., the National Science Foundation, the European Research Council), and some highly successful “serious games” that have made international headlines for their promising outcomes. Researchers and practitioners alike in the medical field have begun to harness the power of video games to motivate patients and, ultimately, to improve their health outcomes (for a review, see Kato, 2010).

Perhaps the most celebrated success story of a game that had a significant impact on health-related behaviors is the case of *Re-Mission* (Kato, Cole, Bradlyn, & Pollock, 2008), a video game designed for child cancer patients. By allowing the player to control a nanobot who shoots cancer cells, overcomes bacterial infections, and manages signs of nausea and constipation (common barriers to cancer patients’ treatment adherence), the game aimed to teach children how best to adhere to their cancer treatments. A randomized controlled study conducted internationally in 34 medical centers compared children assigned to play *Re-Mission* to a control group of children playing another computer game (Kato et al., 2008). Adherence to treatment protocol, self-efficacy, and cancer-related knowledge were all significantly greater in the intervention group. The game has now been distributed to over 200,000 patients and continues to be viewed as a successful treatment approach.

The promise of video games has also made a great stir in the field of education. Space limitations preclude a review of the myriad games developed to improve educational outcomes in almost every subject taught in schools. Several reviews already exist on the learning outcomes

associated with educational games (e.g., O’Neil, Wainess, & Baker, 2005), and a meta-analysis concluded that games can make important advances in the educational reform necessary to deal with the learning challenges of the next century (Vogel et al., 2006).

Despite the emerging hype regarding the “gamification” of interventions in the health and educational sciences, caution is also warranted. The most important reason is that very few of the games developed to improve health and learning outcomes are ever scientifically evaluated. As a result, it is still unknown how much more effective these games are in changing behavioral and health outcomes than are conventional approaches. The second shortcoming is that medical practitioners, teachers, and researchers are not game designers, and as a result, they often develop products that miss the most essential mechanism of engagement in games—the fun. In an effort to pull together a set of valid principles or lessons, games for health and education often end up with the “chocolate-covered broccoli” problem—the games look great, they are good for you, but they ultimately fail to work because the creative game dynamics that induce transportation and immersion are missing, making them simply not fun. We highlight these shortcomings in the domain of games for health in particular because the same cautionary notes should be taken seriously if (and when) psychologists consider developing games for *mental* health. We now turn to a discussion of more general limitations of the gaming literature and attempt to address these limitations with suggestions for novel research directions.

Challenges and Future Research Directions

By highlighting the positive effects of playing a wide range of video games, it is not our intention to gloss over their very real potential for harm. Indeed, important research has already been conducted for decades on the negative effects of gaming, including addiction, depression, and aggression (Anderson et al., 2010; Ferguson, 2007), and we are certainly not suggesting that this body of research should be ignored. For example, two large-scale survey studies have found that 3% of Dutch (van Rooij, Schoenmakers, Vermulst, van den Eijnden, & van de Mheen, 2011) and about 8% of U.S. youth (Gentile, 2009) who play video games exhibit pathological symptoms of addiction (i.e., damage to family, school, or psychological functioning). Also, two major meta-analyses have been published on the series of studies on aggressive behavior and violent video games (Anderson et al., 2010; Ferguson, 2007). Unfortunately, these meta-analyses, which dealt with almost the same data pool, reached very different conclusions. Ferguson and his group (see Ferguson, 2013) have argued that the effect sizes are so small, they provide little meaningful predictive power, and the methodological weaknesses in the field make it almost impossible to come to any conclusion. In stark contrast, Anderson, Bushman, and their colleagues (Anderson et al., 2010; Bushman & Anderson, 2002) counter that, although the effect sizes may be small, they are

reliable even after controlling for a variety of potential confounding factors, such as socioeconomic status, IQ, and previous aggressive behavior problems. Ultimately, both camps have valid points, and perhaps the most important lesson from these conflicting meta-analyses is that the picture is much more complex than popular press headlines suggest (Ferguson, 2013).

If the popular press simplifies the effects of video games, it is no less true for most psychological research. By dichotomizing video games into either “good” or “bad,” “violent” or “prosocial,” psychologists are largely (with the exception of media psychologists) overlooking the complex new playground of contemporary video games and the varied landscape of virtual interactions taking place in those games. Players are drawn toward different types of games based on individual differences on a variety of factors including personality differences, their own needs assessments, their mood, and so on (e.g., Tamborini, Bowman, Eden, Grizzard, & Organ, 2010). The games people choose to play, in turn, exert diverse influences on players’ motivations, emotional states, and social interactions. Moreover, most popularly played games today are complex and change dynamically (see the top half of Figure 1), which means that players’ in-game behaviors change how the game itself progresses, feeding back to, and constraining, how the player continues to adapt to these changes in subsequently updated game contexts (Klimmt, Vorderer, & Ritterfeld, 2007). Games that are fundamentally social and rely on varied social partners also provide a large amount of variability in game experiences, depending on who the player encounters each time she or he enters the gaming world. Ultimately, these dynamic features mean that there is a certain element of uniqueness to each player’s experience, each time she or he plays even the very same game. Thus, the question for psychological research on gaming is not what games are “good” or “bad” for us; rather, it seems important to start by acknowledging the growing complexity and interactivity and, from there, to develop equally complex models to explain how gaming influences players in relevant cognitive, social, and emotional domains.

Toward that aim, there are several methodological drawbacks to gaming research that, if addressed, provide novel concrete directions for future research. First, there are very few, if any, well-designed published studies that examine *both* the positive and negative effects of the same games and the conditions under which these effects are most likely manifested, whether they are violent in nature or otherwise. Second, the majority of studies on video games (on both the negative and positive effects) continue to depend on survey assessments. Although self-report and retrospective assessments are useful, relying exclusively on these data limits our understanding. Instead, a more multimethod approach seems to be warranted in which objective observations of in-game behaviors are associated with immediate and long-term “real-world” effects. These methods can also fruitfully incorporate psychophysiological and neural assessments that may be better able to identify the emotional, cognitive, and neural changes associated with playing video games (Bavelier et al., 2011).

Another limitation of past approaches is the almost exclusive focus on the short-term impact of games; very few longitudinal studies have been conducted in this area. Moreover, no studies have assessed the daily patterns of gaming and the function that these patterns of use may serve. Diary studies, combined with observational and survey methods that are repeated over months and years, would be immensely useful to clarify the details of daily playing and its long-term impact. These studies would be especially helpful if they began their baseline assessments in childhood, prior to children's exposure to games. These types of developmental designs can yield some substantive data about how much game playing is too much, information urgently sought after by parents, teachers, and clinicians alike. We also need information on whether different types of games are not only beneficial but also appropriate to play at specific developmental stages and whether there are specific benefits that are obtained during specific developmental windows and not others. As it stands, the suitability ratings ascribed to games by the entertainment industry (e.g., E for "everyone," M for "not appropriate for children under the age of 18") are based on little to no scientific evidence regarding potential harms or benefits. Finally, without longitudinal designs that are explicitly designed to disentangle selection from influence effects as much as possible, it is impossible to know whether games directly cause changes in emotions, cognitions, and social functioning or whether children with certain characteristics select particular games that match these characteristics.

Finally, the vast majority of previous work has examined children's and adolescents' experiences with single-player games, ignoring the fact that more than 70% of individuals play games socially, online or in person, with friends and acquaintances (Entertainment Software Association, 2012). Although studies that track multiplayer social interactions on- and offline are vastly more complex than studies focusing on single-player experiences, they are also far more ecologically valid given that these are the games in which youth are increasingly immersed.

Implications for Mental Health Intervention

Given that video games have permeated almost all households, across almost all countries, it is striking how little attention has been paid to using this medium for purposes that go beyond entertainment and beyond demonstrated benefits for education and health care. Although we have chosen to avoid taking part in the debate regarding the harms versus benefits of gaming, there is one point that both sides are advocating with which we fervently agree: Video games hold immense potential to teach new forms of thought and behavior. We argue that this learning potential has been left largely untapped in the mental health arena, and addressing this gap holds a great deal of promise for a radical new approach to intervention.

Our expertise is in the area of developmental psychopathology, where we contend video games can have a particularly large impact. The vast majority of evidence-

based interventions in this field are based on cognitive-behavioral principles (see P. C. Kendall, 2011). Despite optimistic conclusions about the effectiveness of cognitive-behavioral therapy (CBT), overarching limitations have also been pointed out (see Kazdin, 2011, for a review). We propose that video games can uniquely and significantly address these limitations and, in turn, improve intervention effects across a broad spectrum of disorders.

The first limitation of a number of evidence-based approaches, particularly those oriented around CBT principles, is that they largely rely on imparting psychoeducational information, usually in some didactic style (albeit with efforts to make these lessons interactive). Learning about cognitive biases, the extent to which our feelings are intricately linked to our thoughts and how this interaction underpins behavior and effective problem-solving strategies, is, indeed, critical. However, children and adolescents, especially those who do not recognize that they have a mental health problem or are not motivated to change, often find these lessons boring. Engaging children and youth is one of the most challenging tasks faced by clinicians (Crenshaw, 2008). A video game that can impart this same knowledge but use elements of play and game mechanics that have proven immensely engaging may help to address this barrier. Indeed, a fantasy role-playing game based on CBT for depression was recently developed (SPARX) to explicitly increase engagement, and a randomized controlled trial showed it to be as effective in treating depression as a therapist-administered CBT program (Merry et al., 2012).

A second, related barrier to the majority of CBT approaches is that these programs do an adequate job of imparting new knowledge, but they leave a large gap between what youth actually *know* and what they *do* in their everyday lives. This gap between knowledge and behavior has long been recognized as a problem in the field, and thus many interventions incorporate role-playing, problem-solving exercises and homework assignments (e.g., P. C. Kendall, 2011). But these are mostly de-contextualized exercises that rarely involve the authentic emotional experiences during which most conflicts arise. Developing therapeutic video games can address this gap because they engage players in immersive emotional experiences (eliciting a range of emotions) and provide opportunities to *practice* new regulatory skills until they are automatized, canalizing new neural patterns that can lead to generalization outside the game.

A third challenge faced by many intervention programs is access to care. Many people, often those most in need of care, have a difficult time accessing treatment programs because they either live in hard-to-reach rural locations, work or go to school during treatment hours, or are physically or psychologically unable to commute. Adolescents, minority youth, and the elderly are particularly likely to face these challenges. Games designed for mental health interventions can reach these populations because they can be delivered to wherever clients reside, with little cost and effort. Moreover, it is likely that games are associated with less stigma than conventional therapy, address-

ing another barrier. Finally, the cost-effectiveness of delivering mental health interventions is often a barrier to treatment delivery. Many children and families cannot afford individual or group therapy, and schools worldwide are facing cuts in funding that have significantly decreased the number of programs that can be offered as part of the curriculum. Games are simply cheaper, given that they have no costs associated with therapists' time and training, renting facilities, and so on.

It bears emphasizing that we are by no means advocating the elimination or replacement of the many intervention practices already used. In fact, there is strong evidence for the effectiveness of particular qualities of conventional intervention approaches that are difficult to incorporate in a game, including the healing effects of a strong therapeutic alliance (e.g., *J. Green*, 2006) and the benefits of experiencing emotional and social support in group-based interventions (e.g., *Fine, Forth, Gilbert, & Haley*, 1991). It may be ideal to combine established intervention approaches with the use of video games to enhance motivation, increase engagement, and provide varied opportunities for practicing new skills in flexibly designed contexts.

Conclusion

We began this article by summarizing the rich and long history of the study of play. Video games share many similarities with traditional games and likely provide benefits similar to those provided by play more generally. Both traditional and video games are fundamentally voluntary in nature, they can include competitive and cooperative objectives, players immerse themselves in pretend worlds that are safe contexts in which negative emotions can be worked out, and games allow a sense of control with just enough unpredictability to feel deep satisfaction and intense pride when formidable goals are finally reached. Yet video games today and those on the radar for development in the near future are also unique forms of play. Video games are socially interactive in a way never before afforded. Increasingly, players are gaming online, with friends, family, and complete strangers, crossing vast geographical distances and blurring not only cultural boundaries but also age and generation gaps, socioeconomic differences, and language barriers. The large amount of time invested in playing video games may also mean that they provide qualitatively different experiences than conventional games. Although we may remember spending whole weekends playing Monopoly with siblings and neighbors, few traditional games can boast the weeks and months of game play that many video games provide. These differences in space and time likely hold wholly new benefits and risks that have yet to be conceptualized.

After pulling together the research findings on the benefits of video games, we have become particularly inspired by the potential that these games hold for interventions that promote well-being, including the prevention and treatment of mental health problems in youth. Remarkably, there are very few video games that

have been developed with these aims in mind. Given how enthralled most children and adolescents are with video games, we believe that a multidisciplinary team of psychologists, clinicians, and game designers can work together to develop genuinely innovative approaches to mental health interventions.

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