RESEARCH ARTICLE

Virtual Cultivation: Online Worlds, Offline Perceptions

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The first longitudinal, controlled experiment of a video game explored the presence of cultivation effects due to play. Over the course of 1 month, participants in an online game changed their perceptions of real-world dangers. However, these dangers only corresponded to events and situations found in the game world, not other real-world crimes. This targeted finding is at odds with the broader spreading activation postulated by some cultivation researchers. The results, their implications for theory, and the study of games are discussed.

As more and more people gravitate from traditional media to customizable digital ones, it is important that we understand their new uses and effects. Video games are one of the most popular yet least studied of these new media. Previously considered as a youth-oriented activity, games are now played by a majority of Americans (Ipsos-Insight, 2005), with 32% of players older than 35 (Engle, 2001). Financially, games have passed the motion picture box office in sales (Williams, 2002). In particular, online "networked" video games on both console and PC systems represent an increasingly popular space within the medium and one that has received little study. In the United States, more than 1 million people now regularly play the most popular online PC game, *World of Warcraft*. In this and other virtual worlds, players from around the globe interact in a shared fantasy that can involve competition, collaboration, and socializing. This takes place inside increasingly realistic-looking fantasy spaces. This paper is concerned with the possibility of cultivation effects (Gerbner, Gross, Morgan, & Signorielli, 1980) within these spaces.

Cultivation theory has become a popular and contested segment of media research (Gunter, 1994; Morgan & Shanahan, 1997; Potter, 1994). Under a barrage of criticism, researchers have pushed forward to establish the presence of cultivation effects even as others have suggested serious flaws in their work (Hirsch, 1980; Newcomb, 1978; Potter). Recognizing this, this paper is concerned with two things. First, it briefly considers the major criticisms in order to devise a methodology that will account for plausible alternative explanations. Second, it tests the theory with

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a substantial exposure to a new medium, one more immersive, involved, and therefore theoretically more affecting than television use—online video game space.

This exposure comes in the form of one game rather than a wide exposure to a sample of games. Thus, unlike much cultivation work, it is not a test of global influences and large sociocultural effects. Instead, it is a more targeted test of the mechanisms purported to drive cultivation carried out by focusing on one sustained piece of content. By displacing media diets with one large and impactful stimulus, the study is able to focus on whether cultivation works via a more Gerbnerian generalized mechanism of spreading activation or some form of priming, recall, and heuristic processing. This test is possible because the particular stimulus used here does have an overarching metamessage of violence and because it displaces other media.

Immersive video games and cultivation theory

In making the case for cultivation theory, Gerbner, Gross, Morgan, and Signorielli (1994) laid out the reasons why television is thought to be so influential: "Its drama, commercials, news, and other programs bring a relatively coherent system of images and messages into every home .… Transcending historic barriers of literacy and mobility, television has become the primary common source of socialization and everyday information (mostly in the form of entertainment) of otherwise heterogeneous populations" (p. 18). To what extent do these assumptions hold up in an increasingly selective and diverse digital media environment? Few media disrupt them more than online video games. For example, playing decisions are made independent of the producer's timetables. Online games are not on only during particular time periods—they are always on and available to anyone worldwide. They are also becoming increasingly popular. Data from the 2004 Pew Internet and American Life Project show that 75% of all Internet users play games and that half of them do so online. Twenty percent play only online (Fallows, 2004).

A further challenge for researchers is in the generalizability of game content. Because many researchers have taken issue with Gerbner and colleagues' collapsing of different content into single TV consumption variables, how consistent is the content of games from title to title? Although there are now studies of violent or sexist imagery in the most popular games (Knowlee et al., 2001; Smith, Lachlan, & Tamborini, 2003), generalizability is still an issue for game research. Indeed, the wide variety of video game content and play experiences would likely surprise most first-time investigators. The online database www.allgame.com lists descriptions of 35,400 different games across 93 different game machines plus computers. To collapse this wide variety of content and context into a variable labeled "game play" is the equivalent of assuming that all television, radio, or motion picture use is the same. If this assumption is problematic for television, it remains so for video games. As Dill and Dill (1998) have noted, "This is akin to lumping films like *The Little Mermaid* with *Pulp Fiction*, and expecting this combined 'movie viewing' variable to predict [something]" (p. 423). In parallel to Potter's (1991) criticisms of

television-based cultivation, this is being careful with the link between the type of content and the exposure. For this reason, it is essential to be precise with the content of a given game and to explicate how it does or does not generalize to other titles.

Last, the level of activity in gaming is plainly different from that in television viewing. Some researchers have claimed that this higher degree of activity will make any effects stronger than for the relatively passive experience of television viewing (Anderson & Bushman, 2001; Anderson & Dill, 2000), an assumption disputed by others in what has become a hotly contested research area (Dill & Dill, 1998; Freedman, 2002; Griffiths, 1999, 2000; Sherry, 2001; Sherry & Lucas, 2003). Higher activity might also make the resulting cognitions more likely to be central rather than heuristic (Chaiken, 1987), making spreading activations less likely.

Does cultivation apply to video game worlds? Only Mierlo and Bulck (2004) have investigated this possibility, with a correlational study of Flemish school children. The authors argued that video games have become so realistic that they have begun to resemble reality, making cultivation possible. Their main conclusion was that the connection between cultivation and games is probably smaller than with television, but that the issues of genre and game content must be considered much more carefully than for television.

Yet content in the traditional, scripted television sense only partially applies in online gaming. Not only are these games sites of social interaction, they are also highly varied media content driven as much by the viewer/player as by the producer. This places large online games in a new space astride both mass and interpersonal communication. The game content is driven in part by the coding of the programmer/creators and in part by the actions of the other players. Although online games vary in the linearity of their plots and the parameters placed on player's actions, no game maker ever predicts the full range of interpersonal behaviors that will take place. In some sense, then, the other players often *are* the content in network-based games, and the influence of the programmers becomes a variable rather than a fixed quantity as in television programming. Game programmers create worlds that range from scripted and controlled to completely free and open. Thus, the content of some games is influenced by gamers and their fellows.

Addressing criticisms of cultivation theory

But is cultivation a worthwhile theory to use, regardless of medium? A brief review of the cultivation's appeals and pitfalls is important before any test of the theory. Despite heated exchanges over its validity (Gerbner, Gross, Morgan, & Signorielli, 1981; Hirsch, 1980, 1981a, 1981b), the theory continues to be popular. Recent uses of the theory have included using news exposure to explain perceptions of local violence (Romer, Jamieson, & Aday, 2003) and soap opera exposure to explain perceptions of human relationships (Woo & Dominick, 2003). But despite its popularity, the theory continues to come under fire. Any new investigation, including this one,

should address as many of these criticisms as possible. There have been six major objections made by critics outlined in brief here.

Nonfalsifiability. Hirsch (1981b) charges that cultivation can explain anything and is therefore irrefutable. Such claims are an easy mark for falsifiability assaults if the theory can explain both the presence and the absence of a phenomenon (Popper, 1959).

Imprecise content measures. Unless the content is wholly uniform, the content in question should be program specific, rather than simply total time with the medium (Gunter, 1994; Potter & Chang, 1990). In the case of television, this has meant a content analysis. In the case of an online game where a content analysis is far thornier, it would mean some rigorous study of the game content, including how social and contextual variables might impact perceptions.

Imprecise exposure measures. Exposure has sometimes been measured in inconsistent and imperfect ways, including arbitrary cut points rather than continuous variables (Potter, 1991). Continuous data can be given or shown on plots to shed light on the functional form of any effects, which may well be nonlinear.

Ambiguity between "media" and "real" answers. Researchers have given respondents choices between "television-world" answers and "real-world" answers without a clear assessment of how and why their choices match respondents' conceptualizations (Potter, 1991). These choices often ignore the contexts of the events or actions within the media world (Newcomb, 1978). Furthermore, if there is ambiguity about whether the answers stem from the real or media worlds, the data are useless within the theory.

Spurious causation. A link between exposure and attitudes is not necessarily causal. Without also establishing a clear time order and ruling out plausible alternative explanations, correlational data are always limited (Cook & Campbell, 1979).

Ignoring variation in viewers. Cohen and Weimann (2000) noted that many studies have ignored the differences between those consuming the medium. Gerbner's team responds that the theory is not intended to make specific predictions but is more of an overall "gravitational" level effect (Gerbner et al., 1994). Nevertheless, it seems valid to actually measure the phenomenon within some group of some size.

Understanding the game world

In order to address the concern about the medium's content, a 2-month participant observation of the game *Asheron's Call 2* (AC2) was undertaken prior to the main field experiment. This study allowed for an understanding of the title and the ability to qualify it by its genre, social context, access, and duration. AC2 is not generalizable to all games. Instead, it is representative of a class of games played over the Internet via home computers. Furthermore, there are many different genres of games (e.g., sports, puzzles, first-person shooters). AC2's genre is "role-playing," the most popular genre for PCs (Ow, 2003). In a role-playing game, the player creates, grows, alters, and maintains a character through a series of adventures. Role-playing games can be played alone on a dedicated machine or with others via the Internet, but AC2 is only played online. Although the nomenclature of role-playing suggests a social

learning model, players of these games rarely "role-play" in that sense. The participant observation phase of the research confirmed what has been suggested anecdotally in prior work (Stromer-Galley & Martey, 2003): players are not "in character" at all.

Online games are played by large and small groups of players and last for very different time periods. As a group, online games have revenues of $1.4 billion worldwide, a number that is expected to rise to $4.1 billion by 2008 (Barlow & Macris, 2004). The smallest games—for example, online chess—have only two players and are relatively short. Medium-sized games, such as *Counterstrike* or *Quake*, may last about the same time period but have from 2 to 40 players. The largest games of all have hundreds of thousands of players and continue indefinitely.

This last kind of game is known as a "massively multiplayer online role-playing game," more commonly referred to as an MMRPG. In an MMRPG, such as AC2, players log into and out of a virtual environment that is "persistent" or always on. Players access this shared virtual space and see a representation of themselves on the screen—their avatar—along with other players'. This avatar is created and directed by the player and maintained indefinitely rather than for a single play session. In AC2, players create human characters and endow them with skills, abilities, and a customizable appearance, including height, build, skin and hair color, and gender. Players also choose weapons and control the avatar's actions within the game world, most of which consists of battling with monsters.

AC2 is well suited for a test of cultivation because of its accessibility, setting, and content. AC2 is considered in the game community to be one of the more accessible MMRPGs available ("2003 State of the online union," 2003). Its game manual is short and simple, and the user interface has few options compared to some of the more complex MMRPGs. This relative simplicity makes it better suited to first-time players, especially ones not previously interested in or aware of such games who might be solicited for a study. AC2's setting is the fantasy world of Dereth. In the vein of Tolkien and *Dungeons and Dragons*, Dereth is filled with the expected assortment of evil monsters, virtuous heroes (and heroines), and panoramic environments. Unlike many television programs chosen for cultivation tests in the past, AC2 bears little relation to the real world. Rather than urban or suburban streets and neighborhoods, the game world is mostly vast wilderness, with the occasional dungeon, castle, or outpost. And, rather than being populated by mail carriers, family members, coworkers, and the like, it features wizards, dragons, and a variety of fantastic creatures. With few similarities between the game world and the real one, setting-based cultivation is unlikely. However, violence is omnipresent and could potentially be a source of cultivation effects.

Interpersonal communication creates some of the game's content. What is the influence of their interactions on the overarching message? In AC2, the impact of other gamers can be found on social dimensions such as teamwork and in observational learning. Players do not fight each other and, instead, work together to fight monsters. Thus, while interacting with others, players will be exposed to more of the same kind of violence that they would experience if playing alone. The only

difference is that the perpetrators and victims of the violence are sometimes the player and sometimes the teammate. Regardless, the metamessage continues to be the same form of violence, alternately carried out and observed by the player.

Potential cultivation within the game world

With an understanding of the content in hand, it was appropriate to proceed with hypotheses and research questions. The study's first hypothesis addressed the possibility that an immersive online game such as AC2 would change players' perceptions of the real world around them chiefly because it contains human characters and repetitive violence:

> H1: Exposure to an MMRPG leads to cultivation effects.

A more complex question involves the particular kind of cultivation effects that may occur. According to its creators, cultivation theory is concerned with the aggregate effects of "massive, long-term and common exposure of large and hetero-geneous publics to centrally produced, mass-distributed, and repetitive systems of stories" (Gerbner et al., 1994, p. 20). They stress that the cultivation effect is not a precise one but one more akin to a complex gravitational pull. Those exposed to more of the content will experience more cultivation; "heavy" viewers of television are conceptualized to be more prone to the "television view of the world." Neverthe-less, if the content is more limited, cultivation predicts that the effects ought to follow suit. For example, if a television viewer were to somehow be constrained to watch only a very narrow slice of content for a long period of time, then this par-ticular type of content would play a larger role. Although this is impractical to meas-ure with television, it is possible to measure with an immersive video game.

When substituting a game for television, that game would need to effectively displace television in the media diet, and to do so to the exclusion of other games as well. Based on the time spent on them, and their displacement of other media, MMRPGs typically fulfill this requirement. Like most MMRPGs, AC2 has a cultish following and the most hard-core players in the participant observation phase of the study reported that they played upward of 60–80 hours per week. These hour totals are consistent with prior survey data (Griffiths, Davies, & Chappell, 2003; Yee, 2001, in press). In the study presented here, users dramatically dropped their TV use to make time for the game. This point is crucial. Cultivation requires there to be a consistent metamessage, requiring both a large amount of the content in question and little else in the media diet. AC2 players experienced a constant stream of violence, and they simultaneously ceased consuming prior media. Thus, their AC2 playtime became the dominant portion of their media diet. This consistent and overwhelming metamessage of violence was more controlled and displacing than traditional cultivation studies, which meant a large reduction in the noise in the design compared to studies of broader stimuli such as television.

Furthermore, the theory predicts that the more time a player spends in the game, the more they would come to see the real world through its imagery. To paraphrase

the original theory, heavy game players would come to see a "game version of the world." If the game is violent, as AC2 is, players should perceive the real world as generally violent as well. For the first hypothesis, the particular type of violence would be less important than its overall presence.

However, because of the nature of this particular game, there was an opportunity to test the likelihood of general versus specific cultivation. With more precise content exposure, will cultivation produce spreading activation effects or more targeted outcomes? Shrum's (1995) model elaborates on the original approach to predict *when* related constructs ought to be activated. In this model, cultivation essentially becomes an extension of well-established models of cognitive processing dealing with memory recall. Cultivation effects occur through memory recall when someone uses heuristic processing (Chaiken, 1987) rather than central processing of information (Chaiken, Liberman, & Eagly, 1989; Petty & Cacioppo, 1981). These heuristic shortcuts can lead to a distortion of reality because they emphasize accessible information that may be incorrect rather than harder-to-recall correct information (Shrum, 2001), a process known as spreading activation (Berkowitz & Rogers, 1986). The likelihood of such a shortcut over the central route can in part be predicted by the decision rule (Tversky & Kahneman, 1973), which "posits that people infer the prevalence of a construct from the ease with which an example is retrieved (i.e., its accessibility from memory). That is, they infer that because something is easy to remember, it must occur frequently" (Shrum, 1999, p. 126). Participants paying careful attention to questions are less likely to experience such spreading activations. Participants answering a typical survey without special instruction (as is the case here) are more likely to experience spreading activations.

To test this, the game must have violent situations that have direct real-world parallels and must also have a different set of violent *non* real-world situations, two conditions that AC2 fulfills. In AC2, the situation that does parallel the real world is the preponderance of attacks with weapons. Monsters in the game attack the player with swords, bows, knives, staffs, and the like. In contrast, the game does not have hand-to-hand physical combat, rape, or murder. Therefore, if there are changes in the perceived likelihood of these latter three situations, the effect must be the result of spreading activation, that is, the participants will recall that the world is violent and are less focused on the particular kind of violent act.

> H2: Cultivation effects will work through spreading activation rather than remain
>   constrained to a particular present construct (assault with weapons).

Next, there is an opportunity to test the general question of for whom effects will be most prevalent:

> RQ1: For which groups will cultivation effects be strongest?

Last is the question of exposure. Potter's critique of cultivation theory posits that it is the type of content rather than the amount that is most salient and that thinking guides the first two hypotheses. Still, it is fair to ask whether or not

a little or a lot of exposure makes a difference. How long do the effects take to occur? Over time, will the effects continue in a linear fashion or exhibit some curvilinear trend? In short, what is the functional form of effects and when do they start?

RQ2: What is the functional form and threshold of cultivation effects?

Method

Although the criticisms of cultivation cited above are strong, they are not by any means insurmountable. To begin, the content was studied through the participant observation phase of the study, allowing for a precise understanding of the particular game. The remainder of the criticisms was addressed via a carefully planned field experiment. This method offers falsifiability through a test that can fail, precise exposure measures through time diaries and the use of continuous data, a clear separation between the media answers and the real ones due to the quite unreal fantasy-based content of the game, a more direct test of causation through an experiment with random assignment and a control condition, and an allowance for variation in game players through control variables in within-group treatment condition tests. Many other potential threats to validity—for example, the real-world neighborhood violence of the participants (Doob & Macdonald, 1979)—are controlled by random assignment to condition.

Design and procedures
A two-wave, field-based panel study with a control group was used to test the hypotheses and research questions. Participants were first-time MMRPG players. They were recruited and assigned randomly to a treatment group that received the game or to a control group that did not. Participants in the treatment condition were mailed a copy of the game, along with instructions and time diaries to record their playing time. Game play then lasted for 1 month. The number of hours played by participants in the treatment condition ranged from 5 to 275, with a mean of 56 or about 14 hours per week. Even for the participants who dropped out early, this was by far the longest exposure to a video game in any experiment to date. The same measures in the pre- and posttests were repeated 1 month apart. All pre- and posttest measures were collected within 1 week of the beginning and end of the stimulus period.

Participants
Participants were solicited via online message boards on both game and general interest Web sites, with language that asked for first-time players. As incentives, members of the treatment group were given a free copy of the game (retail value $50), and members of the control group were promised entry into a generous raffle for other free copies and prizes. Because the control group members did not have

perfectly equivalent incentives, it was assumed that they would have a lower retention rate and were therefore oversampled. Furthermore, there was no guarantee that those in the treatment condition would play the game. The posttest time diaries showed that 11 participants never played the game, and they were dropped from the group. In addition, minor data errors resulted in the loss of eight other participants. None of the control group participants reported playing the game. In the final analysis, 213 participants (167 male, 45 female, 1 unstated) completed both waves of the study. Study-wide, the mean age was 27.7 years, ranging from a low of 14 to a high of 68 years. The participants in the sample were also predominantly White (85%), male (84%), educated, and middle class; their median educational level was an associate's degree/specialized technical training; and their median annual income was near the top of the $30,000–$40,000 bracket. According to data supplied to the author from Microsoft (the game's publisher) and two MMRPG player surveys (Griffiths et al., 2003; Yee, in press), these demographics are consistent with the typical player profile.

The treatment group contained 75 final participants and the control group, 138. Retention rates were 78.8% and 72.6%, respectively. This difference is a product of the relative lack of control common to field settings. A key issue is whether the two groups ultimately were different enough to violate the group equivalence gained by the random assignment. To ensure that they were equivalent, independent samples *t* tests were used to compare the two groups on all the Wave 1 dependent measures and demographics. Despite the slightly different retention rates, the treatment and control groups did not differ significantly in *t* tests on any of the demographic measures (with alpha set conservatively at .1), nor did the participants who dropped out. The exception was gender, in that there was a higher percentage of female players in the treatment group (26.7%) than in the control group (18.1%). For this reason, the analyses were all performed with and without the female players.

Measures

The cultivation hypotheses were tested with four separate crime measures taken from Anderson and Dill's (2000) video game study, rather than a single crime variable found in some prior studies (Romer et al., 2003) or broad categories such as "violent crime" versus "property crime" (Gross & Aday, 2003). These four items fulfill Potter's (1991) charge that they should not be scaled together needlessly and should not introduce elements that might overlap both the media and the real worlds. Crime likelihood was therefore measured with questions that asked participants to estimate the percentage chances (0–100%) of four crime events, only the first of which occurs in the game: "What do you think the chances are that any one person will be robbed by someone with a weapon in their lifetime?" and three of which do not occur in the game: "… physically assaulted by a stranger in their lifetime?", "… any one woman will be raped in her lifetime?", and "… that any one person will be murdered?" In addition, personality-based measures, such as the Pittsburg Scales of Introversion/Extroversion (Bendig, 1962) and the UCLA

Table 1 Pearson Correlations for Study Variables

	Age	Education	Total Hours Played	Black	Hispanic	Weapon	Crime Physical Assault	Rape	Murder
Gender	.26**	.18**	−.03	.19*	.23**	−.11	−.08	.07	−.10
Age		.50**	−.01	.15*	.07	−.08	.02	.02	−.02
Education			−.11	.15*	.18**	−.20**	−.10	−.10	−.21**
Total hours played				−.05	−.01	−.13	−.04	−.05	−.06
Black					.53**	.06	.07	.20**	−.04
Hispanic						.09	.06	.07	.04
Crime									
Weapon							.81**	.64**	.64**
Physical assault								.62**	.55**
Rape									.70**
Murder									

Note: Gender is a dummy variable for which *female* = 1. Age was measured as a continuous variable. Education was measured with a 7-point Likert scale ranging from *no education* to *a graduate or professional degree*. The four crime variables are reported with their Time 1 scores. Each was a 100-point scale.

* $p < .05$. ** $p < .01$.

Loneliness Scale (Russell, Peplau, & Cutrona, 1980), were used as control variables for a within-subjects test.

Results

Correlations for all the variables reported in the study are given in Table 1. Education was negatively correlated with the perceived likelihood of two of the violent acts as measured at Time 1. In contrast, being African American was positively correlated with the perceived likelihood of rape at Time 1. However, these predispositions were controlled through random assignment in the main experiment.

Table 2 shows a test of the major hypotheses by reporting the differences between the treatment and the control groups on their change scores from Time 1 to Time 2 for the four violence variables, along with an associated t test of significance. The central finding is that there is a significant cultivation effect due to game play. After playing the game, the participants in the treatment condition were more likely than those in the control group to say that people would experience robbery with weapons in the real world. This finding was substantively very large (more than 10 points on a 100-point scale) and significantly powerful and was strongest among the male participants. There was also a finding approaching significance for the males in the sample for the likelihood of rape. The female participants were checked for ceiling effects, but their baseline scores were low and were comparable to the males'. To account for any noise that may have remained from hours of television watched, the effects were also tested with ordinary least squares (OLS) regressions that included television-viewing time as an independent variable. These variables were not significant and did not substantively change the size or significance of the four crime variables. For the test of spreading activation versus a contained precise effect, the data offer clear support for the latter. Had the general effect been present, there would have been effects on all the variables, indicating the sort of gravitational spreading activation finding that Gerbner and colleagues postulate. Instead, there was only the targeted finding for robbery with a weapon, the only situation with both in-game and real-world parallels. Notably, the variables without in-game parallels (physical assault, rape, and murder) did *not* yield effects. The lack of significant effects on these three variables is not likely to be

Table 2 Treatment Versus Control: Mean Differences on Change Scores

Variable	Whole Sample	Males	Females
Robbery with a weapon	10.63**	12.47**	4.00
Physical assault	−1.78	−1.36	−5.31
Rape	4.02	5.54*	−2.93
Murder	3.48	4.02	0.65

Note: The crime variables were 100-point scales.
* $p < .10.$ ** $p < .001.$

a result of low statistical power; with a two-tailed test and .05 alpha, the power of the design for detecting medium effects ($d = .50$) was .92 and the power for detecting very large effects ($d = .80$) was in excess of .995 (Cohen, 1988).

The research questions asked about within-group differences for different demographic groups and over different lengths of exposure. No group-oriented effects were found for the weapon-based cultivation effect. Using OLS regression and trying a variety of models, no particular group was more likely to experience the effect than another. The Pittsburg Scales of Introversion/Extroversion and the UCLA Loneliness Scale were tested as independent variables but added no value to the models. Last, each demographic group was also tested with interactions combining the group variable and hours of game time to test whether or not more game play would lead to more of an effect. These effects also did not materialize. In other words, no single group experienced more of an effect due to extensive play. The lone exception was an effect among Hispanic players. However, because there were only seven Hispanics in the sample, this may well have been an artifactual finding. Regression results for the simplest model with the best fit and the least error are shown in Table 3.

As the table suggests, the one variable that did consistently and strongly emerge in the analysis was hours of play. The more time participants played, the stronger the effect. This leads to the study's final research question, which asked about the functional form of effects and whether or not there is some threshold to acquire them.

In keeping with Potter's (1991) recommendation to present such findings in a visual form, these data are presented in Figure 1. The line of best fit presented in the figure shows that more game play leads to a larger cultivation effect. In order to test the influence of outliers, the analysis was redone after excluding those participants who had played more than 150 hours. This lowered the line of best fit slightly,

Table 3 Within-Group Ordinary Least Squares Regression Results: Change Score for the Likelihood of Assault with a Weapon

Variable	β
Constant	7.91 (5.73)
Gender (female = 1)	−3.72 (3.98)
Age	−0.06 (.22)
Education	−0.56 (1.14)
Race, Black	−16.72 (19.50)
Race, Hispanic	27.70 (11.35)*
Total hours played	0.14 (.04)**
Model: $F = 3.48$, $p < .005$, $R^2 = .094$	

Note: The dependent variable is the change score for the treatment group for the likelihood of robbery with a weapon. The table entries are unstandardized ordinary least squares regression coefficients with standard errors in parentheses.
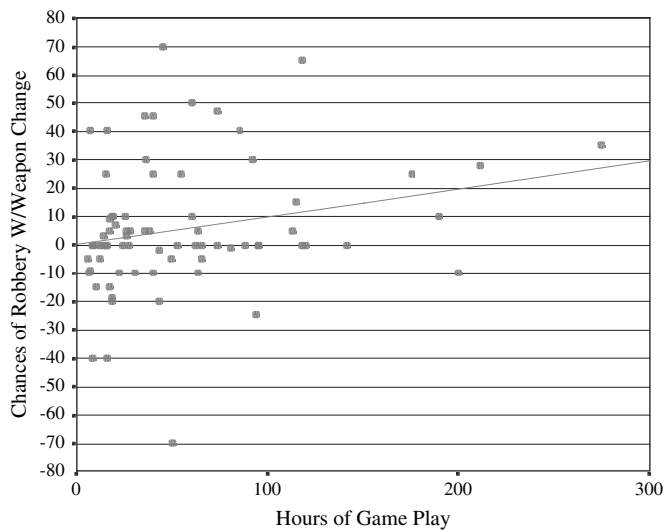* $p < .05$. ** $p < .001$.

Figure 1 Change in real-world perceptions of robbery with a weapon versus hours of game play.

but the positive linear pattern persisted. There was no significant quadratic trend to the line. This may simply have been a result of the relatively short time span of the experiment. However, when examining a more detailed graph, there was some slight indication of a minimum effects threshold for time. The first effects appeared in a handful of participants who dropped out after only 5 hours of game play, and the first cluster of cases appeared just less than 20 hours of game play. Still, given the relatively small number of data points at this level, these threshold points should be regarded as a speculative finding.

Discussion

Cultivation hypotheses and research questions were tested with a methodology that addressed the major criticisms of the theory. The content was carefully identified, separated from the rest of the medium, and studied via participant observation for a thorough understanding. A field experiment addressed the remainder of the criticisms: falsifiability, precise and continuous exposure measures, a clear separation between the media answers and the real-world ones, and control over subject variation through random assignment. The study's central finding is that there is a cultivation effect from playing this particular online game. Contrary to expectation, this effect is the targeted and specific one predicted by central processing rather than the more heuristic-based spreading activation. The findings have implications for general cultivation theory—what theories and operationalizations work, what functional form is present, and what groups are impacted—and for the notion of mainstreaming.

The findings also have implications for the use and study of video games, including their social impacts and the right ways to study them.

In the test between the gravitational, generalized spreading effects and the more precise ones, the data clearly reject the former and support the latter. In the treatment versus control comparison, first-time players had a large and precise fear effect in which their perceptions of real-world events were directly impacted by their in-game experience. Tests of real-world perceptions that had no in-game parallels were insignificant, making the finding particularly robust. How can we explain this outcome? There are three possibilities. First, the theory could be incorrect or not nuanced enough to account for the findings. Second, the constructs might not have been related enough. However, this seems unlikely given that murder, rape, assault by weapon, and assault by hand are all violent criminal acts. Third, there may not have been enough activation, but there is no question that there was enough mental processing of some kind to generate the strong physical assault outcome. Without additional studies, it is not perfectly clear which explanation fits. But based solely on these data, it appears that cultivation works as a precise phenomenon in online games, rather than being the broad gravitational system that Gerbner and colleagues' original theory would suggest. Given that this interpretation contradicts much of prior cultivation work, further controlled longitudinal research is called for.

If cultivation is in fact precise and does not use spreading activation, other generalized cultivation studies may well have been conflating findings of various strengths and perhaps even of different directions. When Morgan and Shanahan (1997) concluded in their meta-analysis that there has been a small but significant pattern of positive effects across studies, they may have been interpreting data that were collected without the proper rigor. Or, to put it another way, the source studies may well have been measuring at too coarse a level of analysis, for example, general violence rather than type of violence. Perhaps, if the original studies had offered more precise measurements of exposure and perceptions, they would have revealed much larger, if much rarer, effects. This conclusion does not invalidate cultivation theory at all. Instead, it suggests that the theory be refined. As Shrum (2001) noted in his interpretation of cultivation's progress, Kuhn (1962) argued that the initial sparks and ideas in science are later refined into more precise and careful—and ultimately more accurate—versions.

But while this study offers clear evidence of the kind of cultivation that occurs, it is only somewhat useful in deciphering the functional form of those effects. The data presented in Figure 1 suggest a rough linearity to the effect. Previous research has found that curvilinear patterns are more likely (Hirsch, 1980, 1981b; Potter, 1991). Those findings, however, had enough data to identify patterns within subgroups and had a larger body of time. This experiment sacrificed the quantities (and duration) necessary for such an analysis in favor of a method that could more firmly establish causality. As a result, the data here only reveal effects that take place over a month. Nevertheless, the findings are real and powerful, suggesting that the effect certainly occurs over days and weeks. As Potter suggested, a continuous rather than a

categorical-use variable was a key to interpreting the raw data. Establishing the longer term persistence of the effect would require a longer longitudinal study. What we can say as of now is that—at least in the short term—the cultivation effect is fairly linear.

The effects were only significant among the males in the study; females had no increase in their perceptions of robbery with a weapon. This may have been a product of the small number of females in the cells (20 in the control and 24 in the treatment conditions), but the statistical significance was strong, suggesting that the gender difference is likely real. Was this a case of identification with the in-game avatars or is there something different about the way males and females experience cultivation? Further study on this issue is certainly warranted, especially as gender-based work on cultivation remains limited (but see Olson, 1994; Signorielli & Lears, 1992).

Similarly, what was the cause of the marginally significant rape likelihood finding for the men? One intriguing possibility was that the male players had assumed the role of female avatars and felt a degree of the risk that women experience in real life. Similarly, the female players could have assumed male avatars and experienced a sense of imperviousness. Unfortunately, although the study did capture the gender of the participants' avatars, few gender-bent. Only two women and two men in the sample swapped avatar gender, leaving room only for speculation. A future study might control for the gender of the avatar and test this idea of empowerment or risk. Such "walk a mile in my shoes" experiences are becoming common in virtual settings and might offer both learning experiences and pitfalls for players as they consciously or unconsciously transfer perceptions of the virtual world back to the real one.

Then, there is the question of the "mainstreaming" effect. Does mainstreaming occur in online virtual spaces? It is possible to the extent that game worlds are similar to one another. But if this point is questionable for television, it is even more so for gaming. Game worlds, less limited by the constraints of film and the physical world, range from violent fantasy worlds to outer space to tiki beach parties to the everyday. They are as malleable as their creators and users make them. In online spaces, what regulates the digital architecture is simply computer code. This code is the law of cyberspace (Lessig, 1999) and it is far too varied to make predictions of mainstreaming effects for something so broad as "games." In the end, the question of mainstreaming is simply an issue of the generalizability of content. The targeted findings here suggest that not only are cultivation effects not broad-based but also will vary from game to game. This is of course a frustrating obstacle for social scientists, who will seek to understand what effect games have. This impulse, however, is no excuse for a lack of rigor in researching such a varied and complex medium. A more realistic and fruitful goal is to measure and isolate common themes, occurrence, and patterns, identifying a game's "mix of attributes" (Eveland, 2003). But unlike television, the researchers are charged with the additional responsibility of understanding the social contexts of these online worlds. When the content is as much the fellow players as the plot or game mechanics, basic content analyses of incidents per hour will not suffice.

This study has shown distinct effects, but future work can extend and improve upon it. The social context mentioned above might be a moderating variable.

Perhaps gamers playing alongside a very large group of strangers begin to feel as if they are part of the same audience, bringing the mechanisms closer to the realm of mass communications. The sensibility of playing with many others could create a normative effect as players come to see their time in these fantasy spaces as more commonplace. Or perhaps in a smaller group, the mechanisms at work begin to take on the characteristics of models from interpersonal communication. As more and more people go online and interact with one another, these variables become important for our understanding. Another area of interest would be the use of a stimulus that more closely mirrored daily life. Such a stimulus would allow for even more precise testing of the phenomena in question. It was unrealistic to test racial or urban versus suburban cultivations in a fantasy setting. Also not tested here were the distinctions between first- and second-order effects or variation on different kinds of perpetrators and victims. And further control could be gained if researchers could find a pair of equivalent titles in which different kinds of violence occurred. A broader range of incidents would allow for more precise and generalizable hypotheses about real-world violence and cultivation.

Last, there is the important issue of the various types of cultivation that might occur in video games. As cultivation researchers have found, all effects need not be negative or solely concerned with violence and fear. When digital worlds can be anything, the effects could be negative or positive. Shrum's heuristic-recall model suggests that the frequent occurrence of an action or pattern could inform the player's perceptions of offline life. For example, a virtual world in which players continually see cheaters prosper might well cause a decrease in general trust because the player could begin to suspect real-world people of cheating. In contrast, one that stresses the importance of ethical behavior might well cause an increase in the perception of others as ethical in the real world. *Ultima Online*, for example, is well known in the gaming community as a title that preaches ethical behavior.

Perhaps virtual cultivation could improve human relations. Lai (2003) has shown how American MMRPGs stress racial diversity. Could spending time in diverse worlds improve real-world perceptions of other racial groups or lead to ethnic tolerance? Or could it foster stereotypes (Nakamura, 2001)? Can time spent in a prosocial environment featuring sharing, altruism, and generosity improve our perceptions of others offline? Many games make a point of rewarding virtuous behavior, although a handful, like the *Grand Theft Auto* series, glorify antisocial behavior. Despite the fact that media tend to emphasize only the sensational and negative titles, there is a wide range of content worth studying.

Acknowledgments

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