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Aggression, competition and computer games: computer and human opponents

Russell B. Williams[a,*], Caryl A. Clippinger[b]

[a]*Digital Graphic Communications, Department of Communication Studies, School of Communications, Hong Kong Baptist University, 625 Sir Run Run Shaw Building, Kowloon Tong, Hong Kong*

[b]*College of Communications, The Pennsylvania State University, University Park, PA 16803, USA*

Abstract

Violence and aggression in computer games has been a concern of social commentators and an interest of media researchers for more than 10 years. Violent content has been at the top of the agenda even though aggression and hostility have been identified as a part of competitive gaming situations. The role of the opponent in this process has been largely overlooked. We examined the difference in frustration and aggression in game play after users encountered the computer as opponent and a proximate person as opponent using the same CD-ROM version of *Monopoly*. We found that users experienced higher levels of aggressive feelings after playing the computer than after playing a stranger face-to-face. It appears that aggression related to computer gaming may be reduced through the humanization of computer opponents.
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1. Introduction

Violence, aggression and computer games have become a serious issue in society. Games such as *Quake*, *Doom* and *Tomb Raider* invite users to destroy anyone and anything that stands in the path to glory. Dietz (1998) sampled 33 Nintendo and Sega games and found that 80% included aggression or violence as a means to win the game or as the object of the game, almost half of the games in this study included violence directed at another person.

The content of computer games may have a more powerful influence on people than television and film because viewers become users. They don't just see violence

* Corresponding author. Tel.: +852-2339-7890; fax: +852-2794-2476.
E-mail address: williams@hkbu.edu.hk (R.B. Williams).

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played out on the screen, they become active participants (e.g. Fleming & Rickwood, 2001; Sherry, 2001). The competition which is a foundational element in games may also lead to feelings of aggression and hostility which then become the basis for violent attitudes and behaviors (e.g. Anderson & Morrow, 1995; Anderson & Dill, 2000). Researchers have begun to ask questions about the relationship between the content of computer games, feelings of aggression and aggressive behavior (e.g. Anderson & Dill, 2000; Sherry 2001). There is also a substantial line of research which has explored the relationship between competition and feelings of aggression and hostility. One area of media effects research which is missing from the literature is the study of computer games, competition, the identity of the opponent and aggression.

The purpose of this study is to examine the feelings of aggression and hostility generated by computer game play with the computer as opponent and with a person as opponent. The game that will be played in this study is *Monopoly*, a computer game which has a rich history as a board game and is not particularly aggressive or violent. Using passive content will make it possible to isolate the aggression that is a function of game play, competition, and the identity of the opponent.

2. Literature review

2.1. Video games

Numerous studies have examined the possible relationship between computer-based games, violence, and aggression because many popular computer-based games involve simulated acts of aggression and violence.

Graybill, Kirsch, and Esselman (1985) found that children who played aggressive video games tended to act more aggressively than children who played non-aggressive video games. Cooper and Mackie (1986) found that girls increased their aggressive play after an aggressive game and increased non-aggressive play after playing a non-aggressive video game. Subsequent play by boys seemed to be unaffected by the type of game they played. Most chose an aggressive toy regardless of the experimental condition. Chambers and Ascione (1986) looked at the effects of pro-social and aggressive video games on children's donating and helping. They found that the children who played the aggressive video games donated less than those who played pro-social games and concluded that playing the aggressive video game tended to suppress pro-social response. Finally, in an examination of video games, television violence and aggression among teenagers, Dominick (1984) found that heavy teenage video game players were not necessarily more aggressive, but did have lower self-esteem.

Anderson and Ford (1986) compared the short-term effects of highly aggressive and mildly aggressive video games on college students. Sixty respondents were randomly assigned to one of three experimental conditions: playing a highly aggressive video game, a mildly aggressive video game, or no video game prior to completing an inventory devised for measuring aggression, anxiety, and depression. The authors

found that the highly aggressive game led to increased levels of aggression and anxiety compared to the no-game control, and the mildly aggressive game led to increased aggression in respondents.

Scott (1995) studied the effects of video games on feelings of aggression on a total of one hundred and seventeen university students. He controlled the respondents interaction with aggressive game content and used a hostility inventory and a personality questionnaire to measure the affect. There was no linear pattern in aggressive feeling as a result of encountering the varying levels of violence in the three games used. Anderson, Anderson, and Deuser (1996) and Anderson, Deuser, and DeNeve (1995) found that hot and cold temperatures increased subjects aggression while using video games. The authors theorized that independent variables such as cognitive cues and physical discomfort created frustration and resulted in higher levels of subsequent aggression.

Fleming and Rickwood (2001) studied the affective impact of violent and non-violent video games on children. They found that arousal was higher after playing the violent video game but did not find a positive correlation between this arousal and an aggressive mood for boys or girls. They suggest that difficulty level and interest should be measured in future studies and that there needs to be some consideration of the level of identification between respondents and the character they play in the game.

Anderson and Dill (2000) used the General Affective Aggression Model to study the impact of video game play on aggressive behaviors and aggressive feelings. They used both survey and experiment to generate their findings. They proposed that *personological* and situational variables can influence the individual's cognitive, affective and arousal state can influence the impact of the video game experience. They found that college students who played a violent videogame acted more aggressively toward an opponent than those who played a non-violent video game. They also found that women in the experimental component of their study showed higher levels of state hostility than men. They reasoned that this hostility was a function of less familiarity with video games or aggravation at the need to play the game for the study. They concluded that violent video games effect players through their cognitions rather than their affective state, "...violent video games provide a complete learning environment for aggression, with simultaneous exposure to modeling, reinforcement, and rehearsal of behaviors. This combination of learning strategies has been shown to be more powerful than any of these methods used singly" (Anderson & Dill, 2000, p. 788).

It is reasonable then to assume that the situation, or context, in which a game is played can contribute to subsequent aggressive feelings and behaviors as well as the level of aggression and violence within the game itself.

2.2. Frustration-aggression and competition

Aggression originates primarily as a response to frustration (Berkowitz, 1962). This is the primary tenet of the Frustration-Aggression Hypothesis. Frustration within this conceptual structure is "an interference with the occurrence of an instigated

goal-response at its proper time in the behavior sequence" (Berkowitz, 1962, p. 26). Video games can therefore lead to frustration and subsequent aggression on the basis of goal interference within play. This interference and frustration can be a function of game play, the identity of an opponent and the context of competition.

Games are competitive encounters that can be frustrating as participants try to block one another's attempts to ultimately win while achieving sub-goals along the way. There are two factors that are essential in a competitive situation (Berkowitz, 1962). First, there must be two or more units (individuals or groups), vying for the same reward. Second, the attainment of the reward by one unit will diminish the chances of the other unit to attain any part of the reward. The fluctuating process of winning and losing within a game and the final result will lead to varying levels of frustration and aggression during play and after the game is completed.

Deutsch (1993) analyzed competition as a determinant of anger and aggression in learning situations. He theorized that competitive circumstances act as a precursor to aggression: competitive situations are seen as leading to interpersonal conflict and aggression by means of the cognitive, affective, and behavioral exchanges that take place between actors (Anderson & Morrow, 1995, p. 1021). It is the interpersonal exchange between two people or between groups that can affect aggression and aggressive tendencies. Conversely, cooperative situations in learning are the key element in creating a peaceful society (Deutsch, 1993).

A game presents a situation in which competition and aggression can be studied and measured. By definition, a game is an exercise of voluntary control systems, in which there is a contest between powers, confined by rules in order to produce a disequilibrial outcome (Avedon & Sutton-Smith, 1971). In other words, a game is an interdependent decision situation and the outcome of the game depends on what all of the players do. One use of games in the social sciences is as a mirror of the social processes related to achievement, anxiety and aggression.

A few studies have analyzed human competition while playing video games. Anderson and Morrow (1995) tested the effects of competitive versus cooperative instructions on aggressive behavior during video game play. They found that people think of competitive situations in more aggressive terms than cooperative situations. They also found that the subjects who were primed for a more competitive situation acted more aggressively in the game play than those who were primed cooperatively. Video tapes were used to analyze aggressive behavior during play, an interpersonal liking scale was used to rate how much each subject liked his or her partner, and a hostility scale assessed mood states, aggression, and hostility after play. The authors found an increase in aggression and hostility as a function of competition and competitive situations between human competitors using video games. Additionally, video game competition creates dynamic interpersonal situations where argument, anger, and aggression are displayed.

The majority of the findings from the studies on aggression and video games suggest that there is, in fact, a correlation between the two. Indeed, Anderson and Ford (1986) found that even mildly aggressive video games led to increased levels of aggression. Furthermore, the Frustration-Aggression Hypothesis—which theorizes

that frustration leads to aggression—incorporates competition as a factor which ultimately can lead to frustration and aggression. Anderson et al. (1995, 1996) found that extreme temperature changes—factors that are in the same category as frustration in the Framework for Affective Aggression—led to increased levels of aggression in subjects playing video games. Fleming and Rickwood (2001) discovered increased levels of arousal in children playing violent versus non-violent video games but did not find this arousal connected to aggressive feelings. They did, however, suggest that research needs to consider respondent interest in the game, perceived difficulty and character identification which can all serve as sources of frustration in computer-game play.

Furthermore, according to Deutsch (1993) competition results in aggression. Competitive situations are seen as leading to interpersonal conflict and aggression in the cognitive, affective, and behavioral exchanges that take place between actors. Indeed, competitive situations between two or more actors allow for a great range of interpersonal exchange. Anderson and Morrow (1995) tested Deutsch's theory and found that subjects thought of competitive situations between two or more people or groups in aggressive terms and therefore, acted more aggressively in competitive situations.

3. Hypothesis

Video games make it possible to play against a machine as easily as against another human competitor. These variant forms of competition may have a differential effect on feelings of frustration, aggression and hostility associated with game play. People may compete with a computer more passively, or aggressively, than they compete with another person. It depends how they perceive their interaction with computers and video game content.

Although there have been numerous studies that have attempted to assess and understand the relationship between video games and aggression, none have looked primarily at the differential nature of competition between people and competition between people and a machine. This study examines the relationship between competition, hostility and aggression in the unique environment made possible by the computer. Here we used a non-violent computer game to compare aggression and hostility as a subject plays against the computer versus the aggression and hostility of a subject as he or she plays the computer game against another person. This allows us to separate the aggression caused by the situation from the aggression caused by the video game content (Fleming & Rickwood, 2001).

How aggressively will people react to the computer as compared to another person in the exact same competitive situation? The existing literature only suggests that a positive relationship exists between competition, computer game play and aggression. The direction of increased hostility from interpersonal play to computer play is not apparent. Therefore, it is hypothesized that: There will be a significant difference in mean aggression demonstrated by people when they are playing against each other and when they are playing against the computer.

4. Methodology

4.1. Participants and equipment

A total of 54 students from the Pennsylvania State University participated in the study. Of the 54, 26 were women and 28 were men. They were all enrolled in classes from the College of Communications and received class credit for participation.

The study took place in a small university computer lab. The lab is an open room equipped with nine Power Macs, each with 21 inch monitors. The video game used was Hasbro's *Monopoly*—an interactive CD-ROM.[1] Monopoly is a non-violent, flexible computer game that has controllable features such as sound, animations and computer opponents. The game play in the CD-ROM version is exactly the same as the board game. The computer version, however, automatically keeps an accurate record of all money, moves pieces around the game, and rolls the dice. The CD-ROM version performs the more tedious, time consuming tasks of the game and allows players to concentrate on situations and strategy. If a person is able to click a computer mouse and is even somewhat familiar with the board game version, he or she would have no substantial problem understanding the CD-ROM version of *Monopoly*.

4.2. Procedure

The study took place over the span of 2 weeks. The first week tested aggression levels of the participants playing against the computer. The second week tested aggression levels of the participants playing against another person. Each participant was required to attend a testing session during each of the 2 weeks.

During the first session, where measurements of aggression while playing solely against the computer were assessed, the students first signed consent forms and were told only that the study involved computer games. Then, in order to calm the respondents and to neutralize any existent aggressive tendencies resulting from their day (the sessions took place during the evening), an episode of the sitcom *Seinfeld* was shown to the respondents. *Seinfeld* was chosen because of its humor and popularity, especially among young adults. All commercials were edited out and the entire episode took approximately 20 min to show.

Immediately following the sitcom, the respondents were given a CD-ROM copy of *Monopoly*. As a group, the respondents were directed through a list of game preferences in order to make sure that everyone had the exact same settings (Fig. 1). They then entered themselves as the first player and were able to choose a *Monopoly* game piece of their choice. They added the computer as the second player and chose a game piece for the computer. Although there are several computer personalities to choose from, they were instructed to choose the same one—a computer personality named "Dana" who could ultimately be either male or female.

[1] Hasbro Interactive provided the researchers with 10 copies of the game for use in this study.

Monopoly Game Preferences

Categories	Set Preferences
Rules:	Landing on GO doubles salary
	Transactions allowed from jail
	Free Parking collects $
	Even-Building Rule for buildings
Board Options:	Active token spins on board
	Draw deed on Mortgaged Properties
	Active token spins in player area
	Play sound when it is your turn
Sound/Music:	Digital sound effects enabled
Movies/Backdrop:	Movies enabled
	-Uncle Money Bags rolls dice
	-Uncle Money Bags presents cards
	-Travel view
	-Player collects money
	-Player pays money
	Movie Backdrop = City
Computer:	Computer rolls for itself
	Computer has thinking delay

Fig. 1. Monopoly game preference settings.

The respondents were briefed on the rules and functions of the interactive game. They were shown how to maneuver, how to buy property, how to propose trades, how to buy houses and hotels, and how to mortgage property. They were also shown how to access the internal "HELP" from within the game itself.

The selected preferences made it nearly impossible to complete an entire game of *Monopoly* in the available time. Respondents were told that if they were winning when time ran out then they would receive more class points than if they were losing

(all students received the same amount of points for participation and were told this at the conclusion of their two sessions with the game). This underlined the competitive nature of the game and created the desire to win to receive the reward.

The participants played the *Monopoly* game against the computer for approximately 20 min. They were then asked to stop and were given an aggression and hostility questionnaire to complete. The respondents were then dismissed.

A week later, the respondents returned for a second session of game play. They were first shown a different episode of *Seinfeld*. The participants were then randomly paired within the same gender. Additionally, every effort was made to ensure that the pairs playing competitively against one another did not know each other.

Again, the respondents were told to do their best while playing the game and that if they won they would receive more class credit points than if they lost. They were asked to stop after 20 min of play and then given an aggression and hostility questionnaire to complete. Upon completion of the aggression and hostility questionnaire, the participants were debriefed about the study and told that they would all receive equal credit for participation and excused.

4.3. Aggression scale

The scale used to measure aggression and hostility was adapted from the State Hostility Scale, developed by Anderson et al. (1995). The scale, based on the Multiple Affect Adjective Check list by Zuckerman, Lubin, Vogel, and Valerius (1964), assesses current mood states. Through statements such as *"I feel irritated*," the participants were told to respond to a five-point Likert-type scale (Strongly Agree, Agree, Neither Agree nor Disagree, Disagree, or Strongly Disagree) as to how they feel "right now." The scale contains 11 statements representing aggression and hostility, and nine statements that represent a lack of aggression and hostility. The statements representing a lack of hostility and aggression were reverse scored.

5. Results

The aggression and hostility results were scored and the means calculated for each session. The differences in the means were then tested using a two-tailed t-test for related measures (Brunning & Kintz, 1968). The scores were grouped and analyzed in three ways: total respondent scores, female respondent scores, and male scores.

For the total sample, participants playing against the computer reported more feelings of aggression than they did when playing against each other. The mean aggression/hostility score for the total sample when playing against the computer was 49.11. The mean aggression score for the total sample when playing against another person was 42.35 ($t = 3.75$, df = 40, $P < 0.05$).

The results for female respondents showed similar results. The mean aggression/hostility score for females when playing against the computer was 51.12. The mean score for females when playing another woman was 42.58 ($t = 3.49$, df = 25, $P < .05$).

The women felt more aggression when playing the machine than when playing another woman face to face.

The difference in aggression scores for the men appears to be substantial but it only approaches statistical significance. When playing the computer men had a mean hostility/aggression score of 47.25. When playing each other the aggression score dropped to 42.14 ($t = 1.98$, df = 27, $P < 0.10$). Men felt substantially more aggressive when playing the computer than when playing another man (Fig. 2).

6. Discussion

We had hypothesized that there would be a significant difference in mean aggression shown by the players when playing against each other and when playing against the computer. The study indicates that there was a significant difference in mean aggression shown by the participants in the two different game scenarios. More specifically, the results show that playing against the computer generated significantly more aggression in the participants than playing against another person. The null hypothesis is therefore rejected in this study and we can conclude that playing a computer game with a computer as an opponent creates a more aggressive affective state in people than playing a computer game with an immediately present

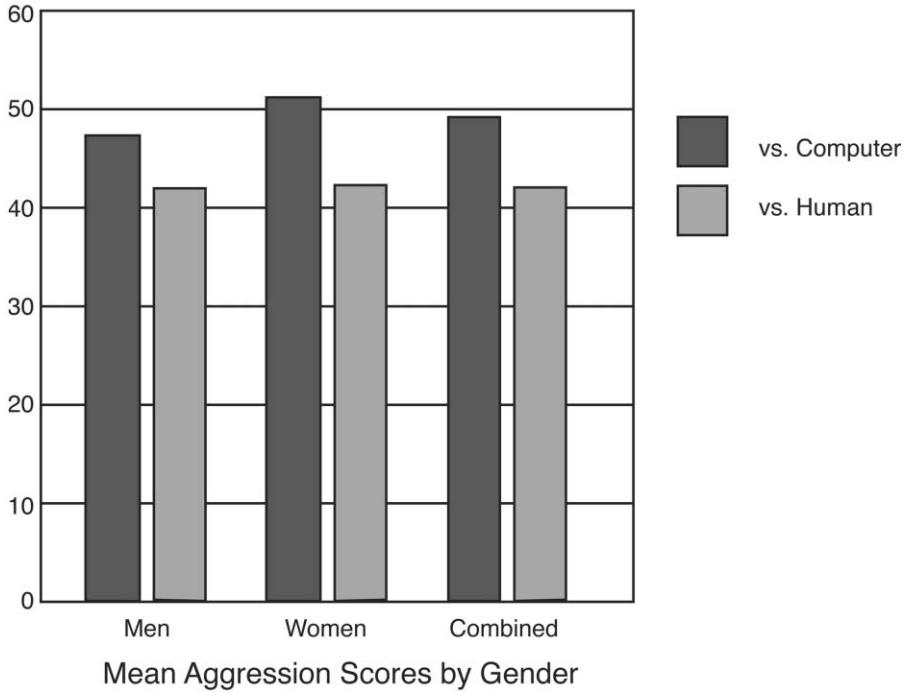

Fig. 2. Mean aggression scores by gender.

person as an opponent. This provides clear support for the importance of situational variables proposed by Anderson and Dill (2000).

One explanation for the direction of the players aggression levels is found in theories of social dynamics. Game Theory suggests that people operating in small groups are more likely to cooperate with one another than people operating in large groups. Cooperation also increases when participants are allowed to talk and communicate with one another openly as they compete (Glance and Huberman, 1994, pp. 76–77).

Differences in the social interaction between respondents as they faced different opponents were observed. When respondents were playing against the computer, the room was relatively quiet and there was little, if any, interaction between the respondents. They were focused on their competition with the computer. When playing against each other, the majority of the participants engaged in friendly exchanges with their opponents. Opponents were essentially strangers but their competition was played out within a hand's reach of each other. Social facilitation theories suggest that the presence of others in situations leads people to anticipate evaluation and therefore causes them to adjust their behavior to a public standard or norm (Robinson-Staveley & Cooper, 1990, p. 180). The proximity of the other person in this computer game playing experience may have activated social norms which outweigh the aggression normally associated with competition.

The finding that respondents in this study were more aggressive playing the computer than when playing another person has implications for understanding of the effects of computer games. The playing situation and the identity, and perhaps the proximity, of the opponent has an impact on the feelings of aggression and hostility associated with playing the game. This could impact subsequent behaviors and attitudes. It appears to be true even when the game being played is essentially passive and definitely non-violent.

The findings for male respondents in this study may reinforce Cooper and Mackie's (1986), observation that males had a high tendency for aggression to begin with and playing or observing a highly aggressive video game did not change their aggression and hostility in play. Males may be more aggressive to begin with, and therefore their reaction to computer game competition against varying opponents may not be as highly affected as females. This finding is also consistent with Anderson and Dill (2000) who found that female college students had higher degrees of state hostility when playing violent video games than the men in their study. However, in this study, the impact of game familiarity was reduced by using a well known board game as the basis. Perhaps there is a degree to which women experience more frustration with using a computer for play. This is consistent with this study and work done by Anderson and Dill (2000).

Deutsch's theory of interpersonal dynamics in competitive situations (Deutsch, 1993)—where competition leads to interpersonal conflict and aggression—is undermined by this research. The participants were less aggressive when interacting among each other and more aggressive when interacting with the computer. The interpersonal dynamics of face-to-face game play were more positive and the participants had lower levels of aggression when competing with proximate people. The

interpersonal dynamics which occurred between person and machine were more negative and the respondents demonstrated higher levels of aggression and hostility.

6.1. Limitations

There are limitations to this study. For example, it does not measure each individual's aggression level before beginning each session of play. Although an attempt was made to neutralize any aggressive tendencies prior to each session by showing a humorous sitcom to the subjects, it cannot be confirmed that this did, in fact, lessen any prior aggression.

Additionally, because of time and space constraints, the group of subjects were not split in which one half would first play against the computer and the next week play against each other, and the other half would first play against each other and the following week play against the computer. Because all of the participants played against the computer first, the higher levels of aggression could be an order affect as their first experience with the game was more frustrating than their second. The influence of order would seem to be negligible in this case because of previous knowledge of the game, the specific instructions, the availability of help and the simplicity of the point and click interface.

Another possible confounding factor is the respondents performance in the allotted time. Individual game scores were not obtained in either of the two sessions. The degree to which the subjects may have been either winning or losing may have affected their levels of aggression and the computer may have been a more decisive and aggressive opponent than the human one. Theoretically, the act of competition involves aggression and hostility but the level of each may increase when an individual is on the less-desirable end of the score.

6.2. Future research

This study should be replicated to ensure validity while eliminating the limitations imposed by the time and space constraints. It can be expanded upon in several ways. First, the impact of a human opponent at a distance could be included. Network game play is becoming increasingly popular and the perception of the person at distance may produce aggression and hostility that is more closely related to computer opposition than face-to-face human competition. Second, computer games of differing levels of aggression and violence could be used to measure the extent to which these factors interact with the identity and proximity of the opponent.

In an era when many view a very negative side to computer technology and especially computer games—one which increases the "...detrimental effects of the quality of life, interpersonal relationships, and mental health... " (Waterworth, 1992, p. 175), the results of this study indicate the possibility that those "detrimental effects" can be changed by humanizing the identity of the opponent. A proximate human opponent leads to less aggressive and hostile thought as a product of competition than a computer opponent. This may in turn lead to less aggressive and hostile attitudes and behaviors.

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