DATE DUE	DATE DUE	DATE DUE
JUN 12 1995	MAY 17 2004	
	JUN 18 2007	
MAY 12 2006		
DEC 08 2008		

VIDEO GAMES: INTERACTION VS. OBSERVATION AS SOURCES OF SOCIAL LEARNING

By

Russell E. Alman

A THESIS

Submitted to

Michigan State University

in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

Department of Telecommunication

1992

ABSTRACT

VIDEO GAMES: INTERACTION VS. OBSERVATION AS SOURCES OF SOCIAL LEARNING

By

Russell E. Alman

Social learning theory suggests that playing violent video games may increase aggression in individual players. This effect is largely due to the interactive nature of the games; a video game allows players to participate in, as opposed to only observing, the learning process. This study suggests that individuals who play a video game will be more likely to agree with aggressive solutions and disagree with nonaggressive solutions than the those who watch a video game.

45 undergraduates at Michigan State University were divided into two test groups -- one group watched prerecorded segments of a boxing video game, while the other group played the same game. Each group was then administered a questionnaire designed to test agreement with aggressive and nonaggressive solutions of potentially aggressive scenarios.

While no support was found for the research hypotheses, there was evidence that frustration with the game was a salient difference between the two groups.

ACKNOWLEDGMENTS

I would like to thank my committee members, Dr. Robert LaRose and Dr. Carrie Heeter, for their valuable input and advice during the formulation and preparation of this thesis. In addition, I extend my gratitude to Michael Elasmar, Jeff Brand and Rick Bruselle, Ph.D. candidates in the Mass Media program at Michigan State, for their assistance with statistical analysis and general advice from "those who have already been there."

A number of other professors in the College of Communication Arts and Sciences were instrumental throughout the research and conceptualization process. These persons include Dr. Ronald Tamborini, Dr. James Dearing, Dr. Gretchen Barbastis, Dr. Frank Boster and Dr. Charles Atkin.

I must also thank my brother, Eric, for acting as my video game consultant throughout this process. It was extremely helpful to have access to the mind of a 13 year old video game addict.

Alas, the inner circle. Those who provided me with the moral support and expertise to struggle through this learning experience:

I express my thanks and love to my fiancée, Karen Champagnie, Mass Media Ph.D. candidate at Michigan State. Although Karen provided me with a considerable amount of assistance throughout the last year in the design and implementation of my thesis, I am most indebted to her for her moral support. May it be a sign of many happy years to come.

In addition, I must thank my father, Philip, for the midnight phone calls, pep talks and "swift kicks in the butt" that kept me on track through this experience, as well as the previous 22 years of my life.

Finally, I must express my deepest gratitude to my advisor and committee chairman, Dr. Bradley Greenberg. While I could list the many, many contributions he

has made to my thesis and my academic career, I feel it is a much greater tribute to encapsulate his guidance as follows: Dr. Greenberg has been like a second father to me.

TABLE OF CONTENTS

LIST OF TABLES vi

LIST OF FIGURES vii

Chapter Page

1. INTRODUCTION, THEORY AND HYPOTHESES 1

Literature Review 4

Previous Video Game Research 5

Conceptual Framework 8

Social Learning Theory 8

Interactivity as a Function in Social Learning Theory 9

Interactivity: A Conceptual Definition 11

Statement of Research Hypotheses 21

2. METHODS 23

Research Participants 23

Independent Variables: Video Game Play and Video Game Observation 24

Materials 24

Dependent Variable: Externalized Aggression 25

Control Measures 28

Pretest 29

Procedure 30

3. RESULTS 32

Pretest 33

Analysis of the Test Data 33

Physical Aggression Index 33

Verbal Aggression Index 33

Chapter Page

Leaving the Field Index....37

Positive Coping Index....37

4. SUMMARY & DISCUSSION....43

Aggression Due to Frustration from Insufficient Interaction: An Alternative Hypothesis....47

Control of Frustration....50

Study of Video Game Frustration....51

LIST OF TABLES

Table		Page
1.	Correlation Matrix for Physically Aggressive Items	34
2.	Mean Agreement with Physically Aggressive Solutions to Aggressive Scenarios	35
3.	Correlation Matrix for Verbally Aggressive Items	36
4.	Mean Agreement with Verbally Aggressive Solutions to Aggressive Scenarios	38
5.	Correlation Matrix for Leaving the Field Items	39
6.	Mean Agreement with Leaving the Field Solutions to Aggressive Scenarios	40
7.	Correlation Matrix for Positive Coping Items	41
8.	Mean Agreement with Positive Coping Solutions to Aggressive Scenarios	42
9.	Mean Agreement Index Summaries to Aggressive Scenarios	44
10.	Mean Levels of Frustration with Video Game Medium	46
11.	Mean Agreement Index Summaries to Aggressive Scenarios -- Frustration Group Only	48

LIST OF FIGURES

Figure		Page
1.	Annual Sales for the Home Video Game Industry	2
2.	Two Way Communication	19
3.	Reactive Communication	19
4.	Interactive Communication	20

CHAPTER I

INTRODUCTION, THEORY AND HYPOTHESES

Since its introduction in the 1940s, television has continued to take up an increasing amount of time in the American lifestyle. The average American spends two to four hours per day in front of the television (Kubey and Csikszentmihalyi, 1990), whether it be watching a program, or using the television as "background noise" while doing other activities.

One of the main elements of the traditional television research paradigm is that the audience is a passive receiver of information. Even in light of more current theoretical perspectives, such as the uses and gratifications perspective, which depicts the viewer as an active seeker of information, the television viewer nevertheless has little control over content passing through the monitor.

However, in 1972, this passive element of television drastically changed when Magnavox marketed Activision, the first home video game (Provenzo, 1991). Although this game was not a fully programmable system, it operated with a cartridge and could be played on home television sets (Jones, 1984).

In 1975, Atari introduced the home version of Pong, the extremely popular electronic table tennis game that revolutionized arcade games. Soon after, Fairchild Camera and Instrument introduced the first programmable video game system. It used electronic cartridges that plugged into a base unit, allowing the user to play as many games as there were cartridges. By the end of 1976, over 20 different companies were producing home video games (Provenzo, 1991).

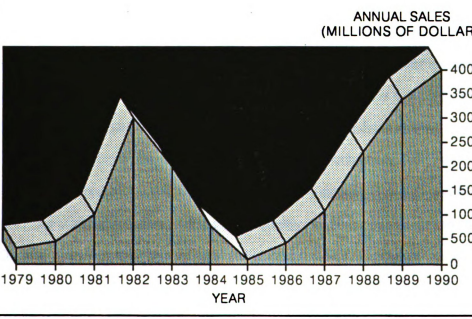
In 1977, the home video game market exploded. Within four years, consumers were spending $1 billion per year on home consoles and cartridges (Jones, 1984).

While sales skyrocketed during the early 80's, they plummeted to just $100 million in 1985. Market analysts suggest that video game sales dropped off so drastically during the mid-80's because almost all children between the ages of 6 to 16, the primary target group of video game companies, already owned systems. The market was saturated to the point that no new sales could be generated (Provenzo, 1991).

However, with the introduction of Nintendo in 1986, the home video game industry revitalized. By June 1988, Nintendo Corporation had sold 11 million game system units. In 1990 alone, Nintendo Corporation sold 7.2 million units producing $3.4 billion total sales. Total sales for the home video game industry as a whole in 1990 were $4 billion (Provenzo, 1991). (Please see Figure 1 for a graphic depiction of annual sales for the video game industry between 1979 and 1990.)

FIGURE 1

ANNUAL SALES FOR THE HOME VIDEO GAME INDUSTRY



The resurgence in the video game market was obviously due in large part to the release of Nintendo's new system in 1986. This likely resulted in many previous video game owners "trading up" from their old Atari and Magnavox systems to the more elaborate, sophisticated and lower-priced Nintendo systems (Provenzo, 1991). Market analysts also suggest that concurrently a new generation of children reached the market group's age (Provenzo, 1991).

Nintendo has become an enormously popular toy for both children and adults. According to one market analyst at Nintendo, boys age 8 to 15 were the original market target of their game system. After further demographic investigation, the company found that this age group was indeed the primary user group (36% of total users), but that adults (18 and over) were a very close second (35%). Children under six accounted for less than 2% of the market (Provenzo, 1991).

In February 1989, 16 of the 20 top selling toys in the United States were either video games or video game related merchandise. During the 1987, 1988 and 1989 Christmas seasons, Nintendo was the single largest selling toy (Provenzo, 1991). It seems, than, that while the home video game industry faltered during the mid-1980s, it has now become entrenched in the home as a new media alternative.

In response to the diffusion of video games into the home, there is concern among parents and educators that video games, particularly violent video games, are addictive and instigators of deviant behavior. Yet, video game research is in its infancy. Only a handful of empirical studies exist in psychological journals from the early 1980s, and only three studies from the same period exist in communications journals.

This in part may be due to, as Selnow (1987) states, "The Fall and Rise of Video Games." As discussed earlier, video games quickly became popular during the early 1980s, but then lost their appeal until about 1987, when Nintendo introduced their new generation of home video games. Since video games became a "sudden hit," then dropped off, and just reemerged during the last four years, they have not been seriously

considered as a topic of research by most social scientists. Evidently, if potential aggression due to violent video game play is to be seriously considered as a topic for research, empirical data must be generated to either confirm or disconfirm this relationship.

The limited research available suggests conflicting views and evidence as to whether violent video games have an effect on the modeling of aggressive behavior. Some research suggests that violent video games have an even stronger effect than an observed medium (such as television) on aggression (Condry & Keith, 1983), while others contend that video games may serve as a healthy social outlet for frustrations (Graybill *et al.*, 1985). The majority of research done thus far, however, indicates a significant relationship between aggressive behavior on the part of the subjects and the playing of video games (Provenzo, 1991).

This thesis will use social learning theory as a framework to test how violent video games produce modeling of aggression. More specifically, it will investigate the possibility that video game play elicits stronger modeling effects than observing a video game: the interactive process of video game play resembles direct learning, while watching a video game only allows the viewer to learn through observation.

The main hypothesis of this study states that *playing a violent video game will produce higher levels of short-term modeling of aggression than watching a violent video game.*

LITERATURE REVIEW

As was already noted, there is little available research pertaining to video games. This chapter will first summarize the results of some studies pertaining to aggression resulting from video game play. Next, it will outline the underlying concepts of social learning theory and how they relate to video games. Interactivity, a key concept to

learning from video game play, will then be defined. Finally, interactivity will be identified function of social learning theory.

PREVIOUS VIDEO GAME RESEARCH

Graybill *et al.* (1985) took 2nd, 4th and 6th grade children and divided them into groups based on peer's ratings of their aggressive nature. The researchers then had them play either a violent or nonviolent video game. The children were administered the Rosenweig Picture-Frustration (PF) Study and open-ended posttest interviews to determine post-exposure aggression.

The design of the PF Study is to investigate how people consciously or unconsciously identify themselves with a frustrated cartoon character. In the Graybill PF Study, cartoons were presented as frustrating to one of the characters in the cartoon. On the right, there was a continuation of the situation with a blank balloon for the participants to fill in their suggested reaction for the character.

The PF Study design identifies three directions of aggression and three types of aggression. The three directions of aggression are: (1) extra-aggression, or aggression directed toward the environment; (2) intra-aggression, or aggression directed towards oneself; and (3) imaggression, or evaded aggression. The three types of aggression are: (1) obstacle-dominance, or attending to the frustrating barrier; (2) ego-defense, or defending the organization or personality; and (3) need-persistence, or finding solutions to the situation.

As indicated by the results of the Rosenweig PF Study and open-ended posttest interviews, there was significant evidence that the children who played the nonviolent games showed a higher level of ego-defense aggression. Also, the children who played the violent games showed more need-persistent fantasies, demonstrating that these children sought solutions when confronted with frustration. However, there were no statistically significant main effects or interaction effects involving the violent or nonviolent

variable. The authors suggest these findings may be due to the nonviolent game being more difficult than the violent game: The nonaggressive game may have been more frustrating, and possibly confounded the aggression measurement.

After administering the PF study, evaluators asked two questions of the subjects:

1. Tell me what happened in the video game you played.

2. What did you like about the video game you played?

For the first question, there was aggressive content in 48 of the 59 children's responses who played the violent game, and none in the responses from the children who played the nonviolent game. For the second question, there was aggressive content in 24 of the 59 children's responses who played the violent game, and none in the responses from the children who played the nonviolent game. This indicated that the violent/nonviolent variable was salient.

The authors suggest that if increasing need-persistent fantasies are viewed as a positive trait, then the violent game was better for the children than the nonviolent game. These results are more in line with psychoanalytic theory, as opposed to social learning theory. In others words, video games appeared to have a cathartic effect in this study:

> They can be interpreted as illustrating that aggression in the context of a video game discharges children's aggressive impulses in a socially acceptable way, leaving the children less defensive and more assertive. (p. 204)

Graybill *et al.* (1985) discuss the study's primary limitation as only studying a very short term effect, so generalizability to long term effects is questionable. However, the authors were surprised at the effect they found with such a short trial.

In a later study, Graybill (1987) attempted to either confirm or disconfirm the validity of the Picture-Frustration Study using video games as a stimulus. This study had children from grades two to six play video games and then individually take the PF test.

Overall, the study found that extra-aggression was higher than imaggression, which in turn was higher than intra-aggression. Ego-defense was more frequent than need-persistence, which was more frequent than obstacle-dominance.

It is important to note that this study assumed video games to be frustrating to the player. Considering this, the present study will attempt to control the level of frustration through experimental design.

In a recent study by Kubey and Larson (1990) 483 children were outfitted with pagers to study their media activities and their subjective state of being in these media environments.

The authors found that video game play was related to significantly higher arousal, attention and motivation than traditional television viewing. Even after statistically controlling for the social context (i.e., whether the game was played alone, with other family members or with others), there was still a significant increase in arousal for video game play.

These findings suggest that video games are highly arousing and require a great deal attention from the player.

There are also a number of articles which, although lacking empirical backing, suggest avenues for video game research. For example, Condry and Keith (1983) suggest that:

> The predictions of influence for violent video games would be similar to those made for television, and one would have to expect that the mechanisms for these effects would be similar as well. Thus, it is not unreasonable to assume that video games with violent and aggressive content may lead to an increased likelihood of such behavior on the part of those that play them. (p. 104)

The authors note that a primary difference between television and video games is the active and ego-involving nature of video games. Although the authors cite no empirical studies, they suggest that these elements may enhance video game effects on aggression.

Long and Long (1984) suggest that video games possess powerful learning components. They contend that the games "are based on the same principles--challenge, fantasy and curiosity--that motivate learning" (p. 36). This idea, combined with Condry and Keith's suggestion of the effects of aggressive video games, may indicate that individuals may be motivated to learn aggressive behavior from video game play.

In summary, the limited video game research related to subsequent aggressive behavior suggests two primary points: video game play is (1) highly arousing and requires high levels of attention, and (2) potentially a source of frustration.

CONCEPTUAL FRAMEWORK

A number of schools of thought have attempted to explain human behavior. For example, psychodynamic theories suggest that human behavior can be attributed to drives and impulses operating at a subconscious level. Radical behaviorist theories assume that human behavior is automatically controlled by external stimuli (Bandura, 1986).

Social learning theory, on the other hand, explains human functioning in terms of, "a model of triadic reciprocality in which behavior, cognitive and other personal factors, and environmental events all operate as interacting determinants of each other" (Bandura, 1986, p. 18). Thus, while social learning theory acknowledges that instinctual drives and external stimuli affect human behavior, it also suggests that these elements interact with cognitive and other personal factors.

SOCIAL LEARNING THEORY

Social learning theory is based on the premise that the individual learns from his/her environment. Once a behavior is learned, the individual will either incorporate it into his/her behavioral repetoire or dismiss it as unacceptable. Simply put, learned behaviors that are reinforced will be added to the person's repertoire of behaviors,

while those which are punished will be dismissed as socially unacceptable and therefore detrimental to the self (Tan, 1986).

Social learning may occur through *observing* an act being performed. Bandura (1973, 1977, 1986) describes four assemblies of fundamental processes which maximize this process. The first are *attentional process* factors which affect the observance to modeled events. The second are *retention processes*, which affect cognitive and motor rehearsal. The third are *motor reproduction processes*, which influence ability to reproduce the modeled events. The last are *motivational processes*, which incite varying levels of reinforcement for the modeled behavior.

Social learning theory is more than just a model for observational learning, however. While observational learning is undeniably a major contributor to social learning, *enactive* learning, or learning by doing, is also a major contributor. As Bandura (1986) states, "Some cognitive and behavioral structures are largely developed in this way, and many of those acquired through modeling are refined and perfected experimentally" (p. 106).

While Bandura discusses observational and enactive learning in considerable depth, the present discussion will concentrate on how interactivity fits into the conceptual framework of social learning theory, and how this relationship enhances learning through video game play.

INTERACTIVITY AS A FUNCTION IN SOCIAL LEARNING THEORY

Mass communication research, particularly television studies, uses social learning theory as a conceptual framework because it stresses that behaviors can be learned through observation. Loftus and Loftus (1983), for example, suggest that observational learning is a relevant perspective for investigating television violence. Tan (1986) suggests that tendencies toward aggression, aside from biological determinants, may originate from observational learning through television. Likewise,

Geen (1990) indicates that the mass media may influence aggression through observational learning. There seems to be a general consensus among mass communication scholars that observational learning is a contributor to the learning of aggression.

Video games, however, represent a new type of learning environment. Like television, video games provide a *viewer* (a person watching, but not playing the game) with an environment to *observe* behaviors. However, they also give the video game *player* the opportunity to participate in and *interact* with the environment. In addition, the player, while participating in the action, is not truly *a part of* the environment.

Thus, the games incorporate properties of both observational and enactive learning in one medium. For example, a video game boxing match provides the viewer with an observed demonstration of socially acceptable violent behavior. By the same token, a boxing video game also allows the player, by controlling one of the boxers, to indirectly participate in the behavior.

Video games are not enactive. For example, in a boxing game, the player is not actually punching an opponent. On the other hand, video game play is more than observation. It seems, then, that video games represent a unique learning dimension possessing qualities of both observational and enactive environments. This dimension, which will be defined here as *indirect enaction* would logically provide a stronger reinforcement to the media user than observational learning through a television model.

The task remains, then, to identify the primary difference between an observational setting, such as viewing a video game, and an indirectly enactive setting, such playing a video game. A number of studies confirm that *interactivity* is perhaps the most important distinction between watching television and playing video games. Selnow (1984, 1987) points out that interactivity is the salient feature of video game play, and postulates that the individual who is normally a subject of the passive television environment may seek out video games to more actively participate in the television

environment. Since the player desires a more active role, s/he will likely learn more from the video game than from television.

Greenfield (1984) also touches on this theme. Basing her premise on general studies showing that children prefer activities in which they can become personally involved, she lists a number of reasons why video games are attractive to children, including: (1) visual dynamism, (2) goal-orientation and (3) interactivity. The games, then, have a bigger impact because children find them more attractive than television. Condry and Keith (1983) state that video games are more active and ego-involving than television, and suggest that this may either enhance the effect of television or create an entirely new effect. Long and Long (1984) found that video games allow the user considerable control over and flexibility with the game environment, allowing the user to participate more than with television.

Although watching a video game may not be equivalent to watching a television segment, both stress observational learning. Thus, while the present study may not be generalizable to television viewing, it will demonstrate if an indirectly enactive environment enhances social learning more than an observational environment.

INTERACTIVITY: A CONCEPTUAL DEFINITION

Two communication scholars in particular have attempted to define the highly elusive concept of interactivity. While Heeter (1989) suggests a definition of interactivity which concentrates on the *use and application* of media, Rafaeli (1987) has developed a model which emphasizes the *psychological interface* between the media and the user.

Heeter's definition consists of six dimensions: (1) complexity of choice available; (2) effort users must exert; (3) responsiveness to the user; (4) monitoring information use; (5) ease of adding information; and (6) facilitation of interpersonal communication. For clarity, each of these definitions is more fully described below,

followed by comparative media examples. Finally, each dimension is discussed in terms of video game play and observation.

1. COMPLEXITY OF CHOICE AVAILABLE. This is the amount of choice provided to the user, and is also referred to as "selectivity." It is defined as "the extent to which users are provided with a choice of available information" (p. 222).

For example, a television without cable has relatively low selectivity because it can only receive a few channels. A television with cable has slightly more selectivity since it can receive perhaps forty or fifty channels. A television equipped with a videocassette recorder, on the other hand, relays a much higher level of selectivity. Not only can the user record programs for later viewing, but s/he can rent any number of thousands of available titles from the local video store. In addition, the user can buy tapes through a variety of sources.

Video game selectivity exists on two tiers, which will be defined here as *content selectivity* and *action selectivity.* Content selectivity refers to the available number of game cartridges, games systems and input devices available to the video game player. Action selectivity, on the other hand, indicates the level of user choice within the video game environment.

The content selectivity of video games is quite similar to videocassette technology. While the supply of programs for video game consoles is slightly more limited than videocassettes, there are numerous possible combinations within the limitations of the software and hardware for each program.

Content selectivity is variable among different game systems, but in general, the newer generation of games affords greater selectivity than the last. For example, Nintendo has higher selectivity than the Atari 2600 for a variety of reasons, including better graphics, greater memory per game cartridge, and more versatile input devices.

Since content selectivity in video games is limited by the possible hardware and software combinations, video game play and video game observation afford similar levels

of content selectivity. Whether a user wishes to watch or play a video game, that person must select a particular game system, game cartridge and input device.

The action selectivity of video games, however is more similar to a computer environment. Both the computer user and the video game user are presented with a finite number of choices within the programmed environment. The greater the available number of choices, the higher the level of action selectivity.

It is this active element of selectivity which differentiates video game play and observation. Once the video game has begun, the observer has no control over the images appearing on the monitor. The video game player, however, with the ability to manipulate the environment, has significantly greater choice available.

2. EFFORT THE USER MUST EXERT TO ACCESS INFORMATION. Different media require varying levels of effort on the part of the user for information access. For example, a person who wishes to watch a movie has a number of different choices, each with different levels of involvement. The person could watch a movie on television. This might require looking in the newspaper or *TV Guide* to see if and when a suitable movie will be broadcast, and then tuning the television to the appropriate channel at the listed time. If, by chance, the person has access to a pay-per-view channel, s/he can call the cable station and request the movie. In either case, very little effort is required from the user.

The person, on the other hand may decide to rent or purchase a prerecorded videocassette of a movie. In this case, one must visit a videocassette vendor or rental outlet, or perhaps mail order the cassette. This process includes the amount of effort it takes to select a specific title. Once the cassette has been rented or purchased, one must put the tape in the machine and start the machine. Thus, watching a videocassette requires more effort than watching a movie on television.

As with the complexity of choice available, the amount of effort required to watch or play a video game can be broken down into *content-related effort* and *action effort*. Content-related effort suggests the amount of effort involved in choosing a specific game, game system and input device, while action effort refers to the amount of effort exerted while either playing or watching the game.

Content-related effort is equivalent for both viewing and playing a video game. That is, the same amount of effort is required for choosing the equipment. On the other hand, a great deal of effort is required for playing a video game.

3. RESPONSIVENESS TO THE USER. Heeter defines responsiveness as "the degree to which a medium can react responsively to a user" (p. 223).

Heeter cites Rafaeli (1985), who defines responsiveness as "conversationality," or the degree to which communication exchange resembles human discourse" (p. 223). Rafaeli considers humanlike responsiveness to be the highest level of communication.

For example, television only requires the viewer to passively watch an illuminated screen; it has little resemblance to human discourse. On the other hand, programming a VCR to record one's favorite program involves the input of information (what time to turn on and off, tape speed, etc.) through a communication device (a remote control or buttons on the VCR). As Heeter states, in terms of a computer-like device, "Intelligence might reside in a computer processor. . . that is capable of recognizing and responding to information" (p. 223). In fact, the process of inputting information into a programmable communication device is often referred to as "telling it what to do."

In this sense, video game play is, compared with most media, highly responsive to the user. While video games are at present rather primitive in their resemblance to human discourse, the games have become considerably more responsive and lifelike since their introduction nearly two decades ago. Instead of meeting a crude, square "ball"

with a bar to bounce it back to an opponent in games like "Pong," or shooting at a crude abstraction of an alien, video game players can now manipulate characters that kick, punch and annihilate others characters in a detailed video environment.

Observing a video game, however, requires little more than plugging in the game console program cartridge and hitting the start button. It is apparent then that video game play is more like human discourse than video game observation.

4. MONITORING INFORMATION USE. Heeter suggests that this dimension centers on the *potential* for monitoring information use, or the degree to which feedback is facilitated. A traditional mass medium gives the source of the message, such as a television station, little means to assess who is watching their station.

Newer media give the message source more control over the monitoring of information use. For example, some on-line computer services bill customers by the minute. Videocassette rental outlets keep track of who has one of their cassettes at any given moment (Heeter, 1989).

Because video games contain computer-mediated, programmed environments, they have the potential for a high degree of user monitoring. This dimension is particularly useful for social science behavioral research (Toole *et al., 1983*; Jones, 1984), in both observation and play modes. Unfortunately, programs of commercial video games are inaccessible because of proprietary reasons, making modification for testing procedures impossible (Jones, 1984).

Perhaps in the future, video games for game systems such as Nintendo will be developed specifically for use as testing devices. Computer games have already been tested as a therapy for brain-damaged patients, and specially designed video games have been developed to sustain attention and motivation, exercise memory, reaction time, verbal and visual recall and perception (Long and Long, 1984).

5. EASE OF ADDING INFORMATION. Heeter defines this dimension as "the degree to which users can add information to the system that a mass, undifferentiated audience can access." (p. 224)

Of course, a passive, "one to many" medium such as television allows virtually no opportunity for user input, unless one includes viewer mail and audience polls as indirect sources of added information. However, new "many to many" media systems, such as Compuserve and America OnLine, give users an environment in which they can add to a large database of information that thousands of others can access. Computer on-line services also give subscribers the opportunity to convey messages to individuals and companies through forums and electronic mail.

While current video games such as Nintendo only allow input into the individual game situation (which can at most be accessed by four total players in the Nintendo system), future games will likely incorporate multi-user systems into their repertoire. On-line services such as America On-Line already promote multi-user, interactive games which are played in real-time. With Nintendo's interest in expanding into information services (Provenzo, 1991), it is likely that video games will soon have the capability of operating in this manner.

Current video games, while incapable of the ease of adding information that Heeter defines, do afford the user with a varying degree of input capability into the system. Many video games, for example, allow the player to choose among a specified number of screen characters and difficulty levels. Also, in a sense, every time a player pushes a button on the control pad or moves a joystick, that person is adding information to the system.

6. FACILITATION OF INTERPERSONAL COMMUNICATION. Heeter defines this sixth dimension of interactivity as "the degree to which a media system facilitates interpersonal communication between specific users" (p. 224).

In terms of current video games, it is not useful to consider this dimension. The vast majority of video games are one-player games which stress individuality (Provenzo, 1991). This sixth dimension Heeter defines will likely become more important concerning future video games if they stress two-player interaction mediated by the video game.

According to Heeter's six dimensions of interactivity then, video game play exhibits a higher degree of the first three dimensions -- complexity of choice available, effort the user must exert to access information, and responsiveness to the user -- than video game observation. These fundamental differences provide conceptual support for the notion that video game play is more interactive than video game observation. In terms of social learning theory, this higher level of interactivity contributes to the notion that video games present an indirectly enactive environment, an environment in which modeling effects are enhanced compared to the observational environment.

While the Heeter model identifies six primary components which contribute to varying levels of interactivity in media, Rafaeli (1987) takes a more holistic approach to defining the concept.

According to Rafaeli, many people consider interactivity an intuitive concept. After all, we engage in interaction every day in interpersonal communication, so we do not give it much thought. However, this is no excuse to not more fully explicate the process.

Rafaeli defines interactivity as, ". . . an expression of the extent that, in a given series of communication exchanges, any third (or later) transmission (or message) is related to the degree to which previous exchanges refer to even earlier transmissions" (p. 111). This definition emphasizes two important aspects of interactivity. First, interactivity is an ongoing process, not a static feature of communication. Secondly, interaction is a variable outcome of communication, rather than separate from

communication. Thus, any model including an interactive element should consider interaction as an integral part of the communication process.

Previous models of interactivity, according to Rafaeli, mistakenly identify other aspects of communication for interactivity, such as (1) bidirectionality; (2) quickness of response; (3) bandwidth; (4) user control; (5) amount of user activity; (6) feedback; (7) transparency (the extent to which the user is aware of the existence of the mediating entity); (8) social presence; and (9) artificial intelligence. The main distinction of the interrelationship of these dimensions, however, is the difference between two-way communication, reaction, and interaction.

Rafaeli has developed a three-tier model of interactivity based on these distinctions. Before delving into the model itself, it is important to emphasize its stated premises:

1. First, not all communication is interactive, and even noninteractive communication may contain coherent responses.

2. We are made aware that interactivity is not a medium characteristic. Media and channels may set upper bounds, remove barriers, or provide necessary conditions for interactivity. But potential does not compel actuality.

3. Following from this is the overdue realization that much use of new communication technologies is noninteractive. Potential interactivity is a quality of the situation or setting.

4. Last, this model distinguishes between interactivity and feedback, of which is it a subset. Interactivity is feedback that relates both to previous messages and to the way previous messages related to those preceding them. (p. 119)

In <u>two way communication</u>, each message transaction is independent of all previous and subsequent messages. A good example of this type of transaction is an "electronic decision maker." The computer user, or operator, inputs a question which can be responded to with a yes or no answer. The computer then returns a random answer of "yes", "no", "maybe" or "ask again" to the operator. The computer is not actually responding to the inputted question, i.e., the previous message; it is returning a message independent (and functionally irrelevant) to the previous message.

Furthermore, any subsequent answers the computer emits have no association with the current question (See Figure 2).

Reactive communication is slightly more complex than two way communication in that each message is based on the previous transaction (See Figure 3). When the computer receives Message 1, for example (M1), it transmits Message 2 (M2) based on the content of Message 1.

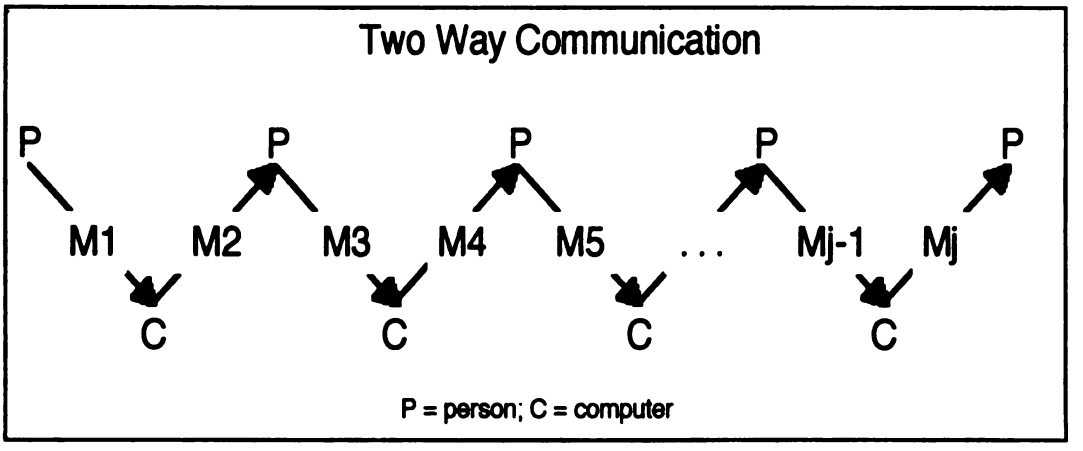


Figure 2

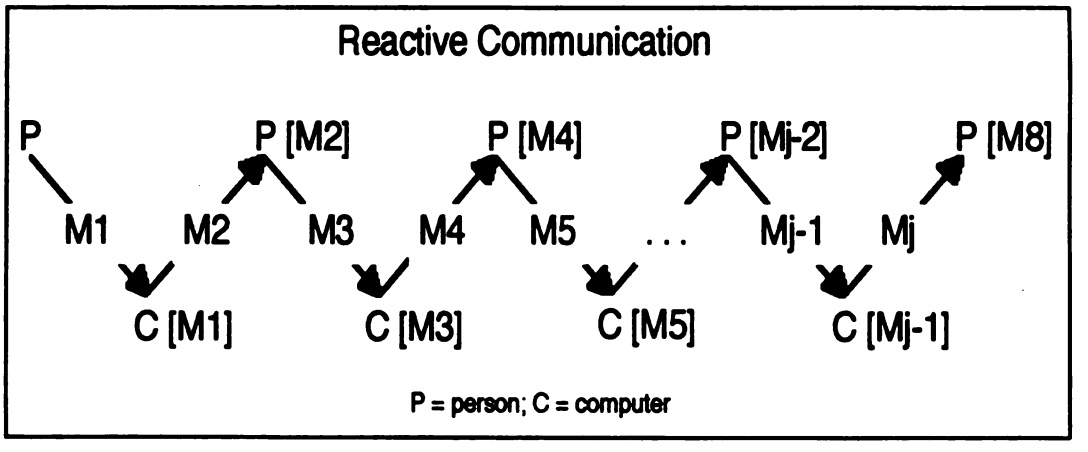


Figure 3

Fully interactive communication incorporates an additional element over reactive communication, in that each message transmitted is based on new information and all information from previous transactions. Figure 4 illustrates this concept. Message 5, for example, is based on communication from messages 1 through 4. Of course, all information from these prior transactions need not be incorporated, but it is important to note that the message sender, whether it be a person or a computer, has the ability to send a message based on all available prior information.

Although Rafaeli developed this three-tier model as three distinct examples of interactivity, he emphasizes that definition of interactivity is not a "normative prescription," but rather a highly variable concept. So, even though these models serve as a useful framework, they should be considered as a continuum, rather than three separate models.

Most video games function at a level somewhere between reactive and fully interactive communication. Home video game systems (and arcade games for that matter) react in part to messages as they are inputted into the game system by the user by means of a joystick, button, trackball or keyboard. At the same time, most of the games incorporate previous indications of user skill as means of calculating scores and increasing difficulty.

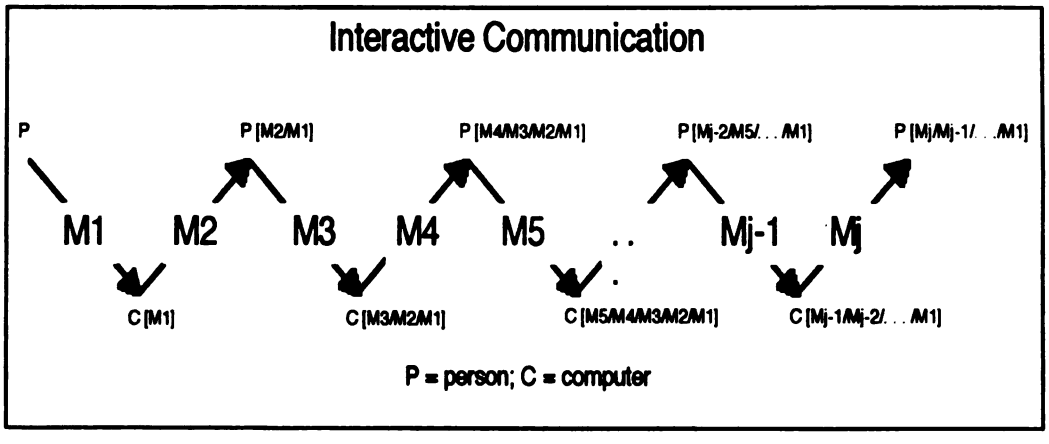


Figure 4

While the social learning model does not include interactivity as a factor in the modeling process, the concept of interactivity is the key difference between an observational learning environment and an indirectly enactive environment. Highly interactive media provide an environment in which the user participates in the learning process, while media with little or no interactive component lack a channel for user involvement.

In terms of tendencies towards aggression, Bandura (1973) states that:

> The social learning theory of human aggression adopts the position that man is endowed with neurophysiological mechanisms that enable him to behave aggressively, *but the activation of the mechanisms depends on appropriate stimulation and is subject to cortical control.* [italics added] (p. 29)

In other words, there is a physiological component to aggression, but aggressive behavior is largely determined by social experience. In terms of a video game, this suggests that mechanisms for aggressive behavior are triggered by the interactive properties of the video game environment.

STATEMENT OF RESEARCH HYPOTHESES

Based on the conceptual framework and research findings set forth in this chapter, the primary hypothesis of the study can now be stated: *playing a violent video game will produce higher levels of short-term modeling of aggression indicated through individual's attitudes than watching a violent video game.*

To more fully explicate the difference in effects between playing and observing a violent video game, the following research hypotheses will be tested:

H_1: Individuals who play a violent video game will be more likely to agree with aggressive solutions to aggressive scenarios than individuals who watch a video game.

$H_{1.1}$: Individuals who play a violent video game will be more likely to agree with *physically aggressive solutions* to aggressive scenarios than individuals who watch a video game.

$H_{1.2}$: Individuals who play a violent video game will be more likely to agree with *verbally aggressive solutions* to aggressive scenarios than individuals who watch a video game.

H_2: Individuals who play a violent video game will be less likely to agree with non-aggressive solutions to aggressive scenarios than individuals who watch a video game.

$H_{2.1}$: Individuals who play a violent video game will be more likely to disagree with solutions to aggressive scenarios that suggest *leaving the scene of the incident* than individuals who watch a video game.

$H_{2.2}$: Individuals who play a violent video game will be more likely to disagree with solutions to aggressive scenarios that suggest *positively coping with the situation* than individuals who watch a video game.

CHAPTER II

METHODS

An experiment was conducted using two test groups. The first group watched a boxing video game, while the second group played the same game. After exposure, each participant was administered a questionnaire designed to measure agreement and disagreement with both aggressive and nonaggressive solutions to potentially aggressive situations.

RESEARCH PARTICIPANTS

Participants were recruited from undergraduate advertising and telecommunication courses in the College of Communication Arts and Sciences at Michigan State University. Sixty-four individuals volunteered to participate in the experiment. Four of the volunteers, one female and three males, were recruited for pretesting. For the actual testing, fourteen did not show up for their assigned time. All other recruits chose to participate in the study. One of the tests was terminated due to a lost contact lens. The remaining participants consisted of 21 males and 24 females.

All participants reported having some experience playing video games. By including only experienced game players in the experiment, it was expected that the participants would need less instruction on the use of the game, and were less likely to become frustrated by lack of expertise.

INDEPENDENT VARIABLES: VIDEO GAME PLAY AND VIDEO GAME OBSERVATION

A large body of research suggests that individuals may learn aggressive behavior through violent television viewing (see, for example, Singer *et al.*, 1984). Since video games use a television monitor as an output device, it is likely that the effects resulting from violent video game viewing are similar or parallel to television effects. This research suggests that while video game *viewing* serves as an instrument of observational learning, violent video game *play* provides a means for indirect enactive learning, resulting in stronger modeling effects.

The present study concentrated on the difference between observation and interaction. An observed violent video game segment, i.e., a videotaped segment of video game play, served as the observation treatment, while the same video game in a player versus computer mode served as the interactive treatment. This procedure provided both test groups with parallel content.

MATERIALS

"Ring King," a boxing video game produced by Data East, Inc. for the Nintendo Entertainment System, was used as the treatment. This game was selected because it portrays violent acts (punching an opponent) in a socially sanctioned setting. According to social learning theory, justifying the aggressive act will reinforce the behavior in the player/viewer.

The game consists of one-minute rounds, with an eight second rest period in between rounds. Therefore, the number of rounds watched or played controls the duration of exposure to the game. Game output continually displays the number times each boxer swings at his opponent. Thus, the number of violent acts to which each participant is exposed can be accurately measured.

If an opponent is knocked out, the match ends, even though the round has not been completed. It is possible, then, for a six-round exposure to the game to be of varying lengths of time.

The game can be set in both a one-player mode, in which one player competes against a computer-controlled opponent, and in a "watch mode" in which the video game controls both boxers. In addition, the relative punch power, punch speed and stamina of the boxers can be controlled for both the player's boxer and the computer-controlled boxer.

For this experiment, the game was set at the easiest level. In this mode, players have a total of 9 points to distribute between punch power, punch speed and stamina. After practicing with the game for a number of rounds, the researcher determined that the player's boxer was easiest to control with the following settings: punch power = 5, punch speed = 1, and stamina = 3. These were the settings used during the test procedure.

Finally, the game is not complicated to play. The player manipulates the boxer's movements with a four-direction keypad, punches the opponent with a second button and blocks punches with a third. It was hoped that the simplicity of the game controls would prevent frustration by inability to control the boxer, even if the participant had never played the game before.

An RCA 20" color television was used for monitoring both the videotaped and "live" segments. The videotaped segments were recorded and played back on a Sharp 4-head VHS videocassette recorder with an HQ (high quality) picture circuit. All interactive group participation was recorded for further analysis.

DEPENDENT VARIABLE: EXTERNALIZED AGGRESSION

Externalized aggression, that is, aggression directed towards the environment (Graybill, 1987), was the measure of aggressive intention used in this study. This

includes aggression aimed at other people and objects. The experiment did not give participants an opportunity to *behave* aggressively; rather, it relied on measurement of *attitudes and tendencies* through administration of a questionnaire.

In social learning terms, the behavior being taught in the game is punching the opponent. The behavior is reinforced by a number of factors. As already mentioned, boxing is a socially acceptable arena for hitting others. In addition, the goal of the game is to punch the opponent as many times as possible and win the match, asserting the aggression as a justifiable means to an end. Finally, the modeled effect, i.e. punching an opponent, is measured by the study's questionnaire items.

Leifer *et al.* (1972) suggest four possible responses to an aggressive scenario which can be measured via questionnaire subsequent to television viewing: (1) physical aggression, (2) verbal aggression, (3) leaving the field (avoiding the situation by removing one's self from the scene), and (4) positive coping (attempting to find a peaceful solution). These four categories were used to design the questionnaire for the present study.

The questionnaire presented a total of twenty scenarios -- five of each of the above types in random order -- in which a person was presented with a potentially aggressive situation and then given a potential solution. Each scenario was followed by a seven-point, bipolar, agree/disagree scale. Respondents were instructed to mark an "X" to indicate the extent to which they either agreed or disagreed with the solution presented for the scenario. Items were coded from "1" for highly disagree, to "7" for highly agree for analysis.

The items for each category are listed below with their corresponding item numbers from the questionnaire:

PHYSICAL AGGRESSION

1. If I am in line at the movies and a person shoves me, I will shove them back.

3. If I get a bad grade on a test, I feel like finding my professor's car and slashing his tires.

5. When a bully starts pushing me around, I'd like to give them a taste of their own medicine and push them around.

8. When a person says bad things about me, I feel like going after them and giving them a good punch in the nose.

14. My neighbors' dog digs up my flowerbed that I just spent the entire afternoon planting. I feel like swatting their dog with my rake.

VERBAL AGGRESSION

6. While trying to lock up their bicycle on a bike rack, someone purposely knocks over my bicycle. I scream at them to pick up my bicycle and then chew them out.

10. When someone pulls out in front of me when I'm driving, I want to cuss them out.

11. One of my friends plays a practical joke on me and embarrasses me. I will get back at that person by embarrassing them even more.

16. If my best friend yells at me for no reason I will yell back.

18. A classmate gets a good grade on a test by copying off my paper. I feel like telling that person to go to hell.

LEAVING THE FIELD

2. If a bully tries to provoke me into a fight, I just walk away and hope that the person won't pursue me.

7. If I am at a party and a person who has had too much too drink calls me a name, I will just walk away.

13. If someone cuts in front of me in the checkout line at the supermarket, I will move to another line without saying anything.

15. If my "significant other" has a bad day and starts to take it out on me, I will ignore them.

20. If I am at a football game and a fan cheering for the opposing team makes an obscene gesture at me, I will just ignore it.

POSITIVE COPING

4. I find out that the person I thought was my best friend has been telling lies about me behind my back. I will calmly talk to this person and try to find out why they have been spreading these lies.

9. If my friend yells at me and I don't know why, I will try to find out what is wrong.

12. I have a minor car accident with another driver in a parking lot. That driver jumps out of their vehicle very angry and accuses me of causing the accident. I will try to calm the person down and then reach a peaceful solution.

17. My roommate gets home after a long day at work and starts cursing and throwing things around the house, including breaking my favorite coffee mug. Even though I am very angry about my mug, I try to calm my roommate down and find out what has been so upsetting.

19. I accidentally spill my drink on a person at the movies. The person is very angry and shoves me. Instead of shoving back, I volunteer to pay for their cleaning bill.

Questionnaire responses were correlated by index (i.e., physical aggression, verbal aggression, leaving the field and positive coping) to determine which items most closely measured each construct. (The results of these matrices are discussed in Chapter 3.) The sum of the highly correlated items for each raw index was then used as the adjusted index for that response type. For example, of the five physical aggression items, four were correlated highly and used for subsequent analysis. Results listed in the following tables relate only the data from the selected items and adjusted indices. Pooled variance estimates by test group were then calculated for all selected items and indices. All statistical analysis was conducted in S.P.S.S. for the Macintosh, version 4.0.

CONTROL MEASURES

Three items were also included at the end of the questionnaire which asked the participant the extent to which they felt frustrated by the video game. These were included to determine if there is a confounding effect from frustration-induced aggression. The interaction and observation groups were given identical versions of the questionnaire, except for the last three questions. (See Appendix A for a reproduction of these items.)

PRETEST

A pretest was conducted to determine an average number of punches per five minute segment and six round segment. Four undergraduates (three males and one female) participated in the pretest.

The pretest participants were run through the same procedure as the actual test group. Each was required to rest for 10 minutes before playing the game. During the rest period, the participants filled out a consent form and read through the instructions for the video game (see Appendix C).

Following the rest period, the researcher set up the video game and explained to each participant that they would now play a five minute segment of the video game, during which time they could ask any questions concerning the game. The researcher reminded the player to immediately begin a new match if either their boxer or the computer's boxer was knocked out. The researcher pressed "record" on the VCR and set up the game so that the participant could press the "start" button to begin. The researcher then instructed the participant to begin when ready. The five minute segment was included to give the person an opportunity to become acquainted with the game. This "practice" segment was included particularly to control for frustration in the interaction group.

After five minutes expired, the researcher instructed the participant to stop play. The researcher then reset the video game and explained to the participant that he or she would now play six rounds of boxing. Again, the participant was instructed to immediately begin a new round if the match ended prematurely. The participant was told that there could be no communication with the researcher during the six rounds. As before, the researcher set up the game so that the player would only need to press the "start" button, and then instructed the participant to begin when ready.

Following the six round segment, the researcher stopped the VCR and then gave the participant a debriefing statement explaining the goals of the experiment. The researcher thanked the student for their help and dismissed them.

The pretest videotape was then coded for a total number of punches (sum of hits and misses) administered by each player and his or her computer opponent for both the five minute and six round segments. It was found that the average number of punches for the five minutes segment was 230, and the average number of punches for the six round segment was 303.

A videotape was designed for the observation test group using these parameters: The researcher played the video game and recorded sessions on videotape that roughly matched the average punches from the pretest. The tapes used for testing of the observation group contained 230 punches for the five minute segment, and 304 punches for the six round segment.

The original intention was to videotape a five minute segment and a six-round game segment in the "watch" mode (two computer opponents playing against each other) to be used as the treatment for the observation group. However, it was apparent after coding the total punches for a number of rounds that the watch mode produced significantly more punches than a person playing against a computer opponent. It was subsequently decided that, to provide both test groups with similar content, videotaped segments of play between the researcher and the computer would be substituted.

PROCEDURE

The sixty participants were randomly assigned to one of two groups:

- an *Observation Group,* which would watch a violent video game for five minutes and six rounds, respectively; and
- *an Interaction Group,* which would play a violent video game for five minutes and six rounds, respectively.

As with the pretest group, all participants were required to rest in a waiting room for 10 minutes before the treatment to control for the possible effect of pre-treatment aggressive tendencies from recent frustration. During the rest period, all participants were given written instructions for the video game (see Appendix C) and a game controller. In addition, each participant received a consent form explaining the experimental procedure (see Appendix B).

After the rest period, the researcher told the participant whether they would play or watch the video game. Those assigned to the interactive group were then run through the same exposure procedure as those in the pretest.

The observation group participants were individually exposed to the five-minute, prerecorded segment of the game. Participants were told that they could ask any questions concerning the game during this period. Similarly, this group then individually viewed the prerecorded six round segment.

Immediately following the respective treatments, all participants were administered the aggressive tendency questionnaire. After completing the questionnaire, the researcher supplied the participant with a debriefing statement and thanked the participant for their contribution.

CHAPTER III

RESULTS

The main hypothesis of the study posits that individuals who *play* violent video games will demonstrate higher levels of modeling of that aggression than those who *watch* a violent video game. To confirm this, the group that played the violent video game should agree more with statements in the questionnaire that suggest violent solutions, and disagree a more with statements in the questionnaire that suggest nonviolent solutions. Analysis will be conducted according to the following research hypotheses:

H_1: Individuals who play a violent video game will be more likely to agree with aggressive solutions to aggressive scenarios than individuals who watch a video game.

- $H_{1.1}$: Individuals who play a violent video game will be more likely to agree with physically aggressive solutions to aggressive scenarios than individuals who watch a video game.
- $H_{1.2}$: Individuals who play a violent video game will be more likely to agree with verbally aggressive solutions to aggressive scenarios than individuals who watch a video game.

H_2: Individuals who play a violent video game will be less likely to agree with non-aggressive solutions to aggressive scenarios than individuals who watch a video game.

- $H_{2.1}$: Individuals who play a violent video game will be more likely to disagree with solutions to aggressive scenarios that suggest leaving the scene of the incident than individuals who watch a video game.
- $H_{2.2}$: Individuals who play a violent video game will be more likely to disagree with solutions to aggressive scenarios that suggest positively coping with the situation than individuals who watch a video game.

PRETEST

As discussed in the methods section, a pretest was conducted to find the average number of punches thrown in both the five minute and six round segments. These average scores were then used to develop the videotape used for the observation group treatment.

To determine content similarity between the observation and interaction groups, interaction group treatments were recorded on videotape and an average number of punches tabulated for each segment.

While the observation tape contained 230 punches for the five minute segment and 303 punches for the six round segment, the interaction group averaged significantly fewer punches (186 in the five minute segment, 252 in the six round segment).

ANALYSIS OF TEST DATA

PHYSICAL AGGRESSION INDEX

Of the five items on the questionnaire intended to measure physical aggression, items 1, 5, 8 and 14 were selected for the physical aggression index based on correlation matrix analysis (see Table 1). Pooled variance estimates for the individual item means and the index means are not significant at the .05 level. However, the mean of the interaction group is greater than the observation group for all selected physical aggression items and the physical aggression index. In support of $H_{1.1}$, these results indicate that the interaction group agreed more with physically aggressive solutions. The results of this analysis are in Table 2.

VERBAL AGGRESSION INDEX

Only two of the five verbal aggression items, items 6 and 10 reveal a sufficient correlation to use in an index (see page 36). Pooled variance estimates for both individual item means and the index means are not significant at the .05 level.

TABLE 1

CORRELATION MATRIX FOR PHYSICALLY AGGRESSIVE ITEMS

	ITEM 03	ITEM 05	ITEM 08	ITEM 14
ITEM 01	.2904	.6001**	.4134**	.3099*
ITEM 03		.2422	.4446**	.1558
ITEM 05			.5953**	.3987**
ITEM 08				.4012**

n = 45

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

Items selected for Physical Aggression Index: 1, 5, 8 14

TABLE 2

MEAN AGREEMENT WITH PHYSICALLY AGGRESSIVE SOLUTIONS TO AGGRESSIVE SCENARIOS

	Item	Interaction Condition (n = 24)	Observation Condition (n = 21)	t	p
1.	If I am in line at the movies and a person shoves me, I will shove them back.	2.92	2.71	0.39	n.s.
5.	When a bully starts pushing me around, I'd like to give them a taste of their own medicine and push them around.	3.79	3.67	0.22	n.s.
8.	When a person says bad things about me, I feel like going after them and giving them a good punch in the nose.	2.86	2.76	0.20	n.s.
14.	My neighbor's dog digs up my flowerbed that I just spent the entire afternoon planting. I feel like swatting their dog with my rake.	4.38	3.81	0.89	n.s.
Physical Aggression Index:		13.96	12.95	0.58	n.s.

* The higher the score, the more agreement with the physically aggressive solution.

TABLE 3

CORRELATION MATRIX FOR VERBALLY AGGRESSIVE ITEMS

	ITEM 10	ITEM 11	ITEM 16	ITEM 18
ITEM 06	.4915**	.2629	.1789	-.0065
ITEM 10		.3300*	.3986**	.1857
ITEM 11			.2745	.0897
ITEM 16				.2649

n = 45

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

Items selected for Verbal Aggression Index: 6, 10

Furthermore, there is insufficient evidence to suggest any difference between the means of the two groups. Thus, there is no support for $H_{1.2}$, which suggested that the interaction group would agree more than the observation group with verbally aggressively solutions. Table 4 contains these results.

LEAVING THE FIELD INDEX

Three of the five leaving the field items (2, 7 and 20) were used in the related indices (see Table 5). All three items do not correlate together; rather, one item correlates with two other items independently. As a result, two indices have been developed, which will be referred to here as Leaving the Field Index 1 (items 2 and 7) and Leaving the Field Index 2 (items 2 and 20). Although none of the individual item means or the index means are significant at the .05 level, in all cases, the mean scores in the interaction group are lower than those of the observation group, lending some support to $H_{2.1}$: the interaction group agreed less with the nonaggressive solution of leaving the field than the observation group. The results of the two indices are listed in Table 6.

POSITIVE COPING INDEX

Three items (4, 9 and 17) were selected for the positive coping index (see Table 7). Pooled variance estimates of group mean scores revealed no statistically significant relationships at the .05 level, but the interaction group did score higher on all individual items (and the index). Interestingly, this suggests the reverse of H2.2: The interaction group agreed *more* with positive coping solutions than the observation group. Table 8 summarizes this index.

TABLE 4

MEAN AGREEMENT WITH VERBALLY AGGRESSIVE SOLUTIONS TO AGGRESSIVE SCENARIOS

	Item	Interaction Condition (n = 24)	Observation Condition (n = 21)	t	p
6.	While trying to lock up their bicycle on a bike rack, someone purposely knocks over my bicycle. I scream at them to pick up my bicycle and then chew them out.	3.71	3.71	0.01	n.s.
10.	When someone pulls out in front of me when I'm driving, I want to cuss them out.	5.25	5.57	0.61	n.s.
Verbal Aggression Index:		8.96	9.23	0.35	n.s.

* The higher the score, the more agreement with the verbally aggressive solution.

TABLE 5

CORRELATION MATRIX FOR LEAVING THE FIELD ITEMS

	ITEM 07	ITEM 13	ITEM 15	ITEM 20
ITEM 02	.5307**	.0305	.0915	.3813**
ITEM 07		.0622	.0314	.1188
ITEM 13			.1109	.2771
ITEM 15				.1559

n = 45

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

Items selected for Leaving the Field Index 1: 2, 7

Items selected for Leaving the Field Index 2: 2, 20

TABLE 6

MEAN AGREEMENT WITH LEAVING THE FIELD SOLUTIONS TO AGGRESSIVE SCENARIOS

Item		Interaction Condition (n = 24)	Observation Condition (n = 21)	t	p
2.	If a bully tries to provoke me into a fight, I just walk away and hope that the person won't pursue me.	4.54	4.62	0.15	n.s.
7.	If I am at a party and a person who has had too much too drink calls me a name, I will just walk away.	4.58	4.86	0.45	n.s.
20.	If I am at a football game and a fan cheering for the opposing team makes an obscene gesture at me, I will just ignore it.	4.08	4.57	0.75	n.s.
Leaving the Field Index 1 (Items 2 and 7):		9.13	9.48	0.36	n.s.
Leaving the Field Index 2 (Items 2 and 20)		8.62	9.19	0.58	n.s.

* The higher the score, the more agreement with the leaving the field solution.

TABLE 7

CORRELATION MATRIX FOR POSITIVE COPING ITEMS

	ITEM 09	ITEM 12	ITEM 17	ITEM 19
ITEM 04	.3322*	.0975	.3642*	.2346
ITEM 09		-.1736	.4259**	.2901
ITEM 12			.2176	.5838**
ITEM 17				.4674**

n = 45

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

Items selected for Positive Coping Index: 4, 9, 17

TABLE 8

MEAN AGREEMENT WITH POSITIVE COPING SOLUTIONS TO AGGRESSIVE SCENARIOS

	Item	Interaction Condition (n = 24)	Observation Condition (n = 21)	t	p
4.	I find out that the person I thought was my best friend has been telling lies about me behind my back. I will calmly talk to this person and try to find out why they have been spreading these lies.	4.67	4.38	0.55	n.s.
9.	If my friend yells at me and I don't know why, I will try to find out what is wrong.	6.63	6.52	0.34	n.s.
17.	My roommate gets home after a long day at work and starts cursing and throwing things around the house, including breaking my favorite coffee mug. Even though I am very angry about my mug, I try to calm my roommate down and find out what has been so upsetting.	4.54	4.47	0.15	n.s.
Positive Coping Index		15.83	15.38	0.45	n.s.

* The higher the score, the more agreement with the positive coping solution.

CHAPTER IV

SUMMARY & DISCUSSION

The analysis gives no statistically significant support for any of the research hypotheses. A summary of the mean indices is presented in Table 9.

There are two possible factors which may have affected the findings. First, the discrepancy between the number of punches to which the interaction and observation groups were exposed may have affected the test results. Second, frustration due to lack of game interactivity may have interfered with learning the behavior.

As noted in the previous chapter the observation tape contained 230 punches for the five minute segment and 303 punches for the six round segment, while the interaction group averaged significantly fewer punches (186 in the five minute segment, 252 in the six round segment). This was likely a systematic error. The pretest recruits were asked to participate on much shorter notice than the test recruits. In addition, conversations with these students after the pretest indicated that they were all highly skilled with video games. Even though none of them had played "Ring King" before, it is likely that their prior video game skill improved their ability to manipulate the controller, subsequently inflating their punch frequency.

While it is not possible to discern from the collected data, the greater number of punches on the observation tape may have attenuated the sought after effects. More care should be taken in future studies to select pretest participants from the total pool of recruits.

TABLE 9

MEAN AGREEMENT INDEX SUMMARIES TO AGGRESSIVE SCENARIOS

Hypothesis/Item	Interaction Condition (n = 24)	Observation Condition (n = 21)	t	p
1.1 Physical Aggression Index	13.96*	12.95	0.58	n.s.
1.2 Verbal Aggression Index	8.96**	9.29	0.35	n.s.
2.1 Leaving the Field Index 1 (Items 2 & 7)	9.13***	9.48	0.36	n.s.
2.1 Leaving the Field Index 2 (Items 2 & 20)	8.63	9.19	0.58	n.s.
2.2 Positive Coping Index	15.83****	15.38	0.45	n.s.

* The higher the score, the more agreement with the physically aggressive solution.

** The higher the score, the more agreement with the verbally aggressive solution.

*** The higher the score, the more agreement with the leaving the field solution.

**** The higher the score, the more agreement with the positive coping solution.

A more likely alternative explanation for the group differences, however, is revealed by analysis of the frustration questions added to the end of the questionnaire. They suggest that frustration with the game among the interaction group confounded any learning effect.

Of all the item responses, group differences were by far greatest among the frustration questions. The first question in this subset, for example, asked respondents how frustrated they were by playing or watching (depending on the group) the video game. The pooled variance estimate between groups was highly significant ($t = 4.38$, $p<.001$). Table 10 lists the frustration items, their group means and pooled variance estimates between groups.

Because the difference of frustration between groups was so great, further analysis was performed within the interaction group to measure pooled variance estimates between the highly frustrated and lowly frustrated video game players. The following alternative hypotheses were tested:

> H_{A1}: Individuals who become highly frustrated playing a video game will agree more with aggressive solutions to aggressive scenarios than lowly frustrated players.
>
> H_{A2}: Individuals who become highly frustrated playing a video game will disagree more with non-aggressive solutions to aggressive scenarios than lowly frustrated players.

To investigate these relationships, pooled variance estimates were performed for the identical items and indices as the research hypotheses analysis. In this case, however, instead of comparing the means of the interaction and observation groups, the interaction group was divided into high frustration and low frustration groups based on frustration item 1 (see Table 10). Respondents who indicated frustration levels of "not frustrated at all" and "a little frustrated" were recoded as the low frustration group ($n = 11$), while those who replied that they were "somewhat frustrated" and "very frustrated" were recoded as the high frustration group ($n = 13$). (No one in the interaction group reported being "extremely frustrated".)

TABLE 10

MEAN LEVELS OF FRUSTRATION WITH VIDEO GAME MEDIUM

	Item	Interaction Condition (n = 24)	Observation Condition (n = 21)	t	p
1.	How frustrated were you by the video game you just played? *(How frustrated were you by the video game you just watched?)**	2.54**	1.43	4.38	<.001
2.	To what extent do you think the practice session made the playing session less frustrating? *(To what extent do you think the first viewing session made the second viewing session less frustrating?)*	2.79***	1.52	3.75	<.001
3.	Do you think the video game you played would have been less frustrating if you could have had more time to practice? *(If you had more time to watch the video game during the first period, do you think the second period would have been less frustrating?)*	2.17****	1.29	3.15	<.01

* Items in italics are the equivalent items presented to the observation group

** 1 = "not frustrated at all" ; 5 = "extremely frustrated"

*** 1 = "not at all"; 5 = "a great deal"

**** 1 = "it wouldn't have made a difference"; 5 = "much less frustrating"

Table 11 lists the indices, means and pooled variance estimates for the high and low frustration groups. This analysis did not reveal any statistically significant findings. However, group means of each index were more representative of the hypothesized aggression and nonaggression relationships than the group means of the respective indices of the two test groups. The difference between the means of the high and low frustration groups for the physical aggression index was twice as large as the similar measure for the test groups. The high frustration group also scored higher on the verbal aggression index than the low frustration group, in agreement with H_{A1}. As was noted in Table 4, no relationship was found for the test groups and the verbal aggression index. There is insufficient evidence to support any relationship with the leaving the field indices.

The positive coping index, however, matches the hypothesized relationship: the high frustration group was less likely to agree with positive coping (non-aggressive) solutions. As with the verbal aggression index, the results of this positive coping indicate a reverse relationship from that of the test groups.

There is some support then for the notion that frustration with the game is a strong confounding factor in questionnaire responses to learning aggression from the game. The stability of these measures is questionable, however, since these estimates were created from such small n values. The high frustration group only contains 11 participants and the low frustration group only 13.

AGGRESSION DUE TO FRUSTRATION FROM INSUFFICIENT INTERACTION: AN ALTERNATIVE HYPOTHESIS

Rafaeli (1987) offers a possible explanation for the confounding of interactive social learning with frustration. As discussed in Chapter II, Rafaeli considers interactivity to be a continuum, from reactive communication to fully interactive communication.

TABLE 11

MEAN AGREEMENT INDEX SUMMARIES TO AGGRESSIVE SCENARIOS

FRUSTRATION GROUP ONLY

Hypothesis/Item	High Frustration Condition (n = 13)	Low Frustration Condition (n = 11)	t	p
A.1 Physical Aggression Index	15.09*	13.00	0.97	n.s.
A.1 Verbal Aggression Index	10.09**	8.00	1.77	n.s.
A.2 Leaving the Field Index 1 (Items 2 & 7)	9.64***	8.69	0.73	n.s.
A.2 Leaving the Field Index 2 (Items 2 & 20)	8.27	8.92	0.55	n.s.
A.2 Positive Coping Index	15.09****	16.46	1.16	n.s.

* The higher the score, the more agreement with the physically aggressive solution.

** The higher the score, the more agreement with the verbally aggressive solution.

*** The higher the score, the more agreement with the leaving the field solution.

**** The higher the score, the more agreement with the positive coping solution.

Rafaeli (1987) produced interesting empirical data to test this conceptualization of interactivity. By developing a computer game which could be programmed to exhibit varying levels of interactivity, he was able to trace how varying levels of interaction affected such factors as user acceptance and satisfaction, and user cooperation and defection (decreased cooperation over time).

In his study, Rafaeli found the following:

1. The higher the level of interactivity the higher the levels of acceptance and satisfaction by the user.

2. Fully interactive games increased cooperation and decreased defection, while lower levels of interactivity resulted in decreased cooperation and increased defection.

Taking these results one step further, it seems possible that, since levels of interactivity lower in the continuum resulted in decreased cooperation and increased defection, higher levels of frustration and therefore, aggression, may have resulted as well.

Although no empirical data was collected in the present study to confirm a lack of interactivity in the video game, there was anecdotal evidence that the game was not fully responsive to the players. The player's boxer did not always punch when the punch button was pressed. As a result, players often pushed the button repeatedly, trying to make their boxer punch. In addition, the boxer does not punch while he is moving; it requires considerable practice and timing to learn to manipulate the boxer well. Some of those in the interaction group mentioned these difficulties while they were playing. Thus, while the boxing game seems fully interactive in its ability to relate current responses to all previous responses, some ease of manipulation is lacking, effectively reducing the level of interactivity.

Others suggest similar results in their video game research. Graybill (1985), testing for differences between players of violent and nonviolent video games, suggested that the nonviolent game was more difficult than the violent one, attenuating the variance between groups. Riddick *et al.* (1987) investigated how video games can be used to affect

positive changes in health of seniors. The experimental group experienced a decrease in pleasure, which the authors propose may be due to frustration.

As anecdotal evidence of this effect, Provenzo (1991) quotes from an interview he conducted with a first grade boy:

> When like I got up to Junior [King?] Koppa in Mario 3, I got up to this big guy and I had only a little knife and I was small, and I got hit because he was too fast, and I got frustrated because I didn't beat him. And then I got real hypered up, and then Mom said it was time to turn it off, and then Nicky started to have a fuss and I only cried a little bit. (p. 125)

Considering the apparent effect of frustration in the video game playing environment, future studies could follow two paths. One path should strive to more carefully *control* frustration among video game players. The other should *isolate* frustration and investigate its effects on video game play.

CONTROL OF FRUSTRATION

There is significant evidence that further practice among the interaction group would have reduced their level of frustration. The interaction group indicated that the five minute "practice" session made the six round "playing" session less frustrating, while the observation group noted little difference. In addition, the interaction group felt that further practice would have significantly reduced their frustration with the game. The observation group again noted no such relationship.

Riddick et al. (1987), in their study of how video games may affect positive health changes in seniors, suggest increased practice time as a method for controlling frustration. The authors suggest that if this study would have been conducted for a longer period of time, the decrease in pleasure found in their test group might have reversed over time.

Jones (1984) suggests that it takes time for the player to get used to the video game before the results of testing may be considered reliable. A subject's performance

is said to be stabilized, according to Jones, when they neither improve or worsen with additional play. While this is a "perfect" definition that cannot usually be achieved, the idea suggests that increased stabilization will decrease frustration.

One method for increasing practice time may be to allow participants to practice with the video game on days preceding the experiment. This would allow players to become well-acquainted with the game, reducing frustration.

User responsiveness and ease of adding information of the video game chosen must be carefully assessed. According to Rafaeli (1987), lack of these qualities increased frustration in his experiment. The fact that the game "Ring King" has been identified as lacking some user control suggests that more care must be taken in future studies to select video games that interface more easily with the player. In particular, the game should respond quickly and consistently to the player's controller input.

STUDY OF VIDEO GAME FRUSTRATION

While the intent of the present study was to control for frustration, the fact that frustration was still the prevailing effect suggests that video games may be an appropriate stimulus for studying this effect. Realizing this potential, Graybill's studies (1985, 1987) attempt to measure frustration resulting from video games through the Rosenweig Picture-Frustration Study. As discussed earlier, Rafaeli (1987) increased defection and frustration by purposely designing computer games with limited interactivity. Thus, it is plausible to manipulate frustration as an independent variable.

While no support was found for any of the research hypotheses of this study, social learning theory does appear to be a valuable framework for further research pertaining to interactive technologies such as video games. By allowing the user to participate in the learning process, these media provide an indirectly enactive

environment that may enhance modeling effects compared to observational media, such as television. In addition, this study identifies frustration as a factor with which to contend concerning interactive media.

APPENDIX A

QUESTIONNAIRE

Questionnaire

Please read the following statements and indicate to what extent you agree or disagree with them by putting an X in the appropriate box. For example:

Ex. 1: I am feeling well today.

agree |_____|__X_|_____|_____|_____|_____|_____|disagree

Ex. 2: I think I will do well on my exams this term.

disagree |_____|_____|_____|__X_|_____|_____|_____|agree

If you have any questions, please ask your test supervisor.

1. If I am in line at the movies and a person shoves me, I will shove them back.

agree |_____|_____|_____|_____|_____|_____|_____|disagree

2. If a bully tries to provoke me into a fight, I just walk away and hope that the person won't pursue me.

agree |_____|_____|_____|_____|_____|_____|_____|disagree

3. If I get a bad grade on a test, I feel like finding my professor's car and slashing his tires.

agree |_____|_____|_____|_____|_____|_____|_____|disagree

4. I find out that the person I thought was my best friend has been telling lies about me behind my back. I will calmly talk to this person and try to find out why they have been spreading these lies.

agree |_____|_____|_____|_____|_____|_____|_____|disagree

5. When a bully starts pushing me around, I'd like to give them a taste of their own medicine and push them around.

disagree |____|____|____|____|____|____|____|agree

6. While trying to lock up their bicycle on a bike rack, someone purposely knocks over my bicycle. I scream at them to pick up my bicycle and then chew them out.

disagree |____|____|____|____|____|____|____|agree

7. If I am at a party and a person who has had too much too drink calls me a name, I will just walk away.

disagree |____|____|____|____|____|____|____|agree

8. When a person says bad things about me, I feel like going after them and giving them a good punch in the nose.

disagree |____|____|____|____|____|____|____|agree

9. If my friend yells at me and I don't know why, I will try to find out what is wrong.

agree |____|____|____|____|____|____|____|disagree

10. When someone pulls out in front of me when I'm driving, I want to cuss them out.

agree |____|____|____|____|____|____|____|disagree

11. One of my friends plays a practical joke on me and embarrasses me. I will get back at that person by embarrassing them even more.

agree |____|____|____|____|____|____|____|disagree

12. I have a minor car accident with another driver in a parking lot. That driver jumps out of their vehicle very angry and accuses me of causing the accident. I will try to calm the person down and then reach a peaceful solution.

agree |____|____|____|____|____|____|____|disagree

13. If someone cuts in front of me in the checkout line at the supermarket, I will move to another line without saying anything.

disagree |____|____|____|____|____|____|____|agree

14. My neighbors' dog digs up my flowerbed that I just spent the entire afternoon planting. I feel like swatting their dog with my rake.

disagree |____|____|____|____|____|____|____|agree

15. If my "significant other" has a bad day and starts to take it out on me, I will ignore them.

disagree |____|____|____|____|____|____|____|agree

16. If my best friend yells at me for no reason I will yell back.

disagree |____|____|____|____|____|____|____|agree

17. My roommate gets home after a long day at work and starts cursing and throwing things around the house, including breaking my favorite coffee mug. Even though I am very angry about my mug, I try to calm my roommate down and find out what has been so upsetting.

agree |____|____|____|____|____|____|____|disagree

18. A classmate gets a good grade on a test by copying off my paper. I feel like telling that person to go to hell.

agree |____|____|____|____|____|____|____|disagree

19. I accidentally spill my drink on a person at the movies. The person is very angry and shoves me. Instead of shoving back, I volunteer to pay for their cleaning bill.

agree |____|____|____|____|____|____|____|disagree

20. If I am at a football game and a fan cheering for the opposing team makes an obscene gesture at me, I will just ignore it.

agree |____|____|____|____|____|____|____|disagree

FOR THE FOLLOWING QUESTIONS, PLEASE CHECK THE ANSWER WITH WHICH YOU MOST AGREE. [INTERACTION GROUP]

1. How frustrated were you by the video game you just played?

   _____ Extremely frustrated

   _____ Very frustrated

   _____ Somewhat frustrated

   _____ A little frustrated

   _____ Not frustrated at all

2. To what extent do you think the practice session made the playing session less frustrating?

   _____ A great deal

   _____ Quite a bit

   _____ Somewhat

   _____ A little

   _____ Not at all

3. Do you think the video game you played would have been less frustrating if you could have had more time to practice?

   _____ Much less frustrating

   _____ Quite a bit less frustrating

   _____ Somewhat less frustrating

   _____ A little less frustrating

   _____ It wouldn't have made a difference

FOR THE FOLLOWING QUESTIONS, PLEASE CHECK THE ANSWER WITH WHICH YOU MOST AGREE. [OBSERVATION GROUP]

1. How frustrated were you by the video game you just watched?

   _____ Extremely frustrated

   _____ Very frustrated

   _____ Somewhat frustrated

   _____ A little frustrated

   _____ Not frustrated at all

2. To what extent do you think the first viewing session made the second viewing session less frustrating?

   _____ A great deal

   _____ Quite a bit

   _____ Somewhat

   _____ A little

   _____ Not at all

3. If you had more time to watch the video game during the first period, do you think the second period would have been less frustrating?

   _____ Much less frustrating

   _____ Quite a bit less frustrating

   _____ Somewhat less frustrating

   _____ A little less frustrating

   _____ It wouldn't have made a difference

APPENDIX B

CONSENT FORM

CONSENT FORM

Hello!

You are about to participate in a study designed to test differences between playing and watching a video game. We have placed you in this room to relax for a few minutes before we begin testing. During this time, please read through the instructions for the video game to familiarize yourself with the game. We also have provided you with a controller so that you can get used to where the buttons are.

When the assistant returns, you will either play a video game or watch a video game. The assistant will give you further instructions.

Before you can participate in this study, you must check the box below stating that you have read the statement of consent. If you do not wish to participate in this study, please check the appropriate box. Give this form to the attendant when s/he returns so that s/he knows whether or not you want to participate. You will not be penalized in any way for refusing to participate, but we would really appreciate your help.

PLEASE READ THE FOLLOWING STATEMENT, AND THEN CHECK ONE OF THE BOXES BELOW:

I understand that I am about to either play or watch a video game, and that afterwards I will fill out a questionnaire. I understand that the proceedings of this study will be confidential and anonymous. I understand that I will receive extra credit in the class from which I was recruited. Furthermore, I understand that I can stop my participation at any time without penalty.

☐ I have read the above statement and WILL PARTICIPATE in the study.

☐ I have read the above statement and WILL NOT PARTICIPATE in the study.

_____

(Signature)

APPENDIX C

Video Game Instructions

You are about to watch or play a Nintendo game called Ring King. The game is a boxing simulation. The object of the game is to hit one's opponent as many times as possible and knock him out. The following are some basic instructions on how to play the game.

Rounds consist of 60 seconds, but if either boxer is knocked out, the round ends at that point.

The assistant will set the game up so that you only need to hit the start button on the controller to begin. Once you have started the game, a boxing ring will appear with two boxers.

Now, take a look at the controller. Here is a description of the buttons on the controller and what they do:

1. The cross-shaped button on the left of the controller is called the **control pad.** This is how you move your player around the ring. If you want to move your boxer to the left side of the ring, hold down the left side of the control pad. Similarly, move the pad right, up or down to move your boxer in these respective directions.

2. To punch your opponent, press the **"A" button,** which is located on the extreme right of the controller.

3. To block an opponent's punch, the **"B" button.** This is located just to the left of the "A" button.

4. In between rounds, repeatedly press both the "A" and "B" buttons. This will increase the strength of your player and restore some of his energy for the next round.

5. If you are knocked down during a round, repeatedly press both the "A" and "B" buttons. If your player is not too "tired," this will restore enough of his power to get up and fight again.

6. If you are knocked out (knocked down and cannot get up), the match will end. For this experiment, if the match ends, *immediately press the start button twice to begin a new match.*

If you have any further questions, please ask the attendant during the upcoming practice session.

APPENDIX D

DEBRIEFING STATEMENT

Dear Participant:

You have just participated in a study designed to look at the immediate effects of playing video games. There are many studies that link traditional mass media, such as television and movies, to aggressive attitudes and behaviors of the viewers. It seems reasonable to assume, then, that video games have some effect on the viewers' behaviors after exposure. However, because video games are interactive, they may have even stronger effects on aggressive attitudes and behaviors than non-interactive media.

This study suggests that playing a video game may result in more aggressive attitudes reported than just watching a video game.

There are three important points I would like you to remember:

1. Your answers on the questionnaire are completely anonymous. We do not know who you are once you put your questionnaire in the box.
2. If you would like to find out more about this study, please contact Russ Alman at 336-1333.
3. Please do not talk with anyone about this study until the end of the term, because we will be collecting data throughout this term. If someone asks you about the study, please do not tell them anything, except that you played/watched a video game and then completed a questionnaire.

Thank you for participating in my study.

Russell E. Alman
M.A. Student, Dept. of Telecommunication

LIST OF REFERENCES

LIST OF REFERENCES

Atkin C. (August, 1976). Effects of realistic vs. fictional television violence on aggression. Paper presented to Theory and Methodology Division, Association for Education in Journalism, College Park, Maryland.

Bandura, A. (1973). *Aggression: a social learning analysis.* Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1977). *Social learning theory.* Englewood Cliffs: Prentice-Hall.

Bandura, A. (1986). *Social foundations of thought and action: a social cognitive theory,* Englewood Cliffs, NJ: Prentice-Hall.

Berkowitz, L. (1962). *Aggression: a social psychological analysis.* New York: McGraw-Hill.

Berkowitz, L. (1989). Frustration-aggression hypothesis: examination and reformulation. *Psychological Bulletin, 106*(1), 59-73.

Buckalew, L. W., & Buckalew, P. B. (1983). Behavioral management of exceptional children using video games as reward. *Perceptual and Motor Skills, 56*(2), 580.

Condry, J., & Douglas, K. (1983). Educational and recreational uses of computer technology: computer instruction and video games. *Youth & Society, 15*(1), 87-112.

Creasey, G. L., & Myers, B. J. (1986). Video games and children: effects on leisure activities, schoolwork, and peer involvement. *Merrill-Palmer Quarterly, 32*(3), 251-262.

Crespi, P. (1983). Sorting out the video game controversy. *Parks & Recreation, 17*(5), 28-31, 58.

DeFleur, M. L., & Ball-Rokeach, S. (1989). Chapter 8: socialization and theories of indirect influence. In *Theories of mass communication* (pp. 202-227). New York: Longman.

Dominick, J. R. (1984). Videogames, television violence, and aggression in teenagers. *Journal of Communication, 34*(2), 136-147.

Ellis, D. (1984). Video arcades, youth, and trouble. *Youth & Society, 16*(1), 47-65.

Eron, L. D., & Huesmann, L. R. (1984). The control of aggressive behavior by changes in attitudes, values, and the conditions of learning. In R. Blanchard and C. Blanchard (Eds.), *Advances in the study of aggression* (pp. 139-171). Orlando: Academic Press.

Gagnon, D. (1985). Videogames and spatial skills: an exploratory study. *Educational Communications and Technology Journal, 33*(4), 263-275.

Geen, R. G. (1990). *Human aggression.* Pacific Grove: Brooks/Cole.

Gibb, G. D., Bailey, J. R., Lambirth, T. T., & Wilson, W. P. (1983). Personality differences between high and low electronic video games users. *Journal of Psychology, 114*, 159-165.

Graybill, D. (1987). Developmental changes in the Rosenzweig picture-frustration study, children's form. *Child Study Journal, 17*(2), 89-96.

Graybill, D., Kirsch, J., & Esselman, E. D. (1985). Effects of playing violent versus nonviolent video games on the aggressive ideation of aggressive and nonaggressive children. *Child Study Journal, 15*(3), 199-205.

Greenfield, P. M. (1984). *Mind and media: the effects of television, video games, and computers.* Cambridge: Harvard Univ. Press.

Gustafson, R. (1989). Frustration and successful vs. unsuccessful aggression: a test of Berkowitz' completion hypothesis. *Aggressive Behavior, 15*, 5-12.

Heeter, C. (1989). Implications of new interactive technologies for conceptualizing communication. In J. L. Salvaggio & J. Bryant (Eds.), *Media use in the information age: emerging patterns of adoption and consumer use* (pp. 217-235). Hillsdale: Lawrence Erlbaum Assoc.

Hoppes, S. (1987). Solitary and social play. *Journal of Physical Education, Recreation & Dance, 58*(1), 84-85.

Johnston, J., & Ettema, J. S. (1986). Using television to best advantage: Research for prosocial television. In Jennings Bryant and Dolf Zillman (Eds.), *Perspectives on media effects* (pp. 143-164). Hillsdale: Lawrence Erlbaum Assoc.

Jones, M. B. (1984). Video games as psychological tests. *Simulation & Games, 15*(2), 131-157.

Katz, E., Blumler, J. G., & Gurevitch, M. (1974). Utilization of mass communication by the individual. In J. G. Blumler & E. Katz (Eds.), *The uses of mass communications: current perspectives on gratifications research* (pp. 19-32). Beverly Hills: Sage.

Kubey, R., & Csikszentmihalyi, M. (1990). *Television and the quality of life: how viewing shapes everyday experience.,* Hillsdale: Lawrence Erlbaum.

Kubey, R., and Larson, R. (1990). The use and experience of the new video media among children and young adolescents. *Communication Research, 17*(1), 107-130.

Lewin, A. W. (1983). Down with green lambs: creating quality software for children. *Theory Into Practice, 22*(4), 272-280.

Leifer, A. D. & Roberts, D. F. (1972). Children's responses to television violence. In John P. Murray, Eli A. Rubenstein, and George A. Comstock (Eds.), *Television and social behavior: reports and papers, volume II: television and social learning* (pp. 181-196). Rockville, MD: National Institute of Mental Health:.

Loftus, G. R., & Loftus, E. F. (1983). *Mind at play: the psychology of video games*, New York: Basic Books, Inc.

Long, S. M., & Long, W. H. (1984). Rethinking video games: a new challenge. *The Futurist, 18*(6), 35-37.

Myers, D. (1990a). A q-study of game player aesthetics. *Simulation & Gaming, 21*(4), 375-396.

Myers, D. (1990b). Computer game genres. *Play & Culture, 3,* 286-301.

Needham, N. R. (1982-1983 Annual). Thirty billion quarters can't be wrong -- or can they? *Today's Education*, 53-55.

Panelas, T. (1983). Adolescents and video games: consumption of leisure and the social construction of the peer group. *Youth & Society, 15*(1), 51-65.

Provenzo, E. (1991). *Video kids: making sense of Nintendo.* Cambridge: Harvard Press.

Radencich, M. C. (1984). From Dick and Jane to Tron? *Reading World, 24*(2), 1-3.

Rafaeli, S. (1987). Interactivity: From new media to communication. In Robert P. Hawkins, John M. Wiemann, & Suzanne Pingree (Eds.), *Advancing communication science: Merging mass and interpersonal processes* (pp. 111-128). Newbury Park: Sage Publications.

Riddick, C. C., Drogin, E. B., & Spector, S. G. (1987). The impact of videogame play on the emotional states of senior center participants. *The Gerontologist, 27*(4), 425-427.

Rogers, E. M. (1986). *Communication technology: the new media in society.* New York: The Free Press.

Rubin, A. (1986). Uses, gratifications, and media effects research. In J. Bryant and D. Zillman (Eds.), *Perspectives on media effects* (pp. 281-301). Hillsdale: Lawrence Erlbaum.

Salomon, G. (1990). Cognitive effects with and of computer technology. *Communication Research, 17*(1), 26-44.

Selnow, G. W. (1984). Playing Videogames: the electronic friend. *Journal of Communication, 34*(2), 148-156.

Selnow, G. W. (1987). The fall and rise of video games. *Journal of Popular Culture, 21*, 53-60.

Silvern, S. B. (1985-86). Classroom use of video games. *Educational Research Quarterly, 10*(1), 10-16.

Singer, J. L., Singer, D. G., & Rapaczynski, W. S. (1984). Family patterns and television viewing as predictors of children's beliefs and aggression. *Journal of Communication, 34*(2), 73-89.

Soper, W. B., & Miller, M. J. (1983). Junk-time junkies: an emerging addiction among students. *The School Counselor, 31*(1), 40-43.

Tan, A. S. (1986). Social learning of aggression from television. In Jennings Bryant and Dolf Zillman (Eds.), *Perspectives on media effects* (pp. 41-55). Hillsdale: Lawrence Erlbaum Assoc.

Toole, T., Korienek, G. G., & Lucariello, G. (1983). Video games: a tool for research. *Journal of Physical Education, Recreation & Dance, 54*(9), 44-46.

Valzelli, L. (1981). *Psychobiology of aggression and violence.* New York: Raven Press.

Wilder, G., Mackie, D., & Cooper, J. (1985). Gender and computers: two surveys of computer-related attitudes. *Sex Roles, 13*(3,4), 215-228.

Williams, F. (1987). *Technology and communication behavior.* Belmont: Wadsworth.