THE EFFECTS OF INTERACTING WITH A COMPUTER-SIMULATED VIRTUAL PET DOG ON CHILDREN'S EMPATHY AND HUMANE ATTITUDES

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THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENT FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

In the
Faculty of Education

Curriculum Theory and Implementation

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SIMON FRASER UNIVERSITY

Summer 2008

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Degree: Doctor of Philosophy

Title of Thesis: The Effects of Interacting With a Computer-Simulated
Pet Dog on Children's Empathy and Humane
Attitudes

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ABSTRACT

Children's care for a real pet animal has been shown to be associated with higher levels of empathy and positive attitudes toward the humane treatment of animals. However, studies that examined whether a *virtual pet* animal would have similar associations are limited. With the sophistication of computer games such as *Nintendogs* it becomes important to determine the socio-emotional effects of virtual pets. The purpose of this research was to investigate whether playing with and caring for a virtual pet dog would improve empathy and humane attitudes, and whether these outcomes would be related to children's sex, play type and duration, and companion bonding. The sample comprised 51 students in grades 4 and 5 from a multicultural, working class, neighborhood school in Surrey, British Columbia. Although 78 percent were from a non-English culture, all communicated satisfactorily in English. A repeated measures design was used in this study and consisted of: (1) a first pretest followed by three weeks with no intervention, (2) a second pretest followed by a three week intervention with Nintendogs, and (3) a posttest. The students also completed a weekly log and were interviewed after the intervention. The instruments used were: (1) Bryant Index of Empathy, (2) Intermediate Attitude Scale, and (3) Companion Animal Bonding Revised Scale. Quantitative findings revealed that empathy and humane attitude posttest scores significantly increased, with females scoring higher on pretest and posttest. Also, students who developed stronger companion bonds tended to have higher empathy scores, and that play and care were positively correlated with humane attitude scores. Qualitative analysis

of semi-structured interviews revealed that most students formed an emotional bond with their virtual pet dog, believing it possessed emotions, needs and interests. Play type and duration by females and males were similar. The research results suggest that playing with and caring for a virtual pet dog may promote empathy and humane attitudes, and that children's sex and play type and duration are related to empathy and attitude. Further research should be conducted with an independent control group and a larger sample to better understand the socio-emotional effects of virtual pets on children.

DEDICATION

I would like to graciously dedicate this thesis to my dear parents,

Mrs. Hu Mei-Hui and Dr. Tsai Chiu-Lia,

Professor Emeritus of Chinese Culture University (Taiwan) and

Taipei Municipal Teachers' College,

and to my wonderful husband Philip Wong

for their faith, encouragement, support, and forever love.

With all of your love and support,

I can keep on playing, exploring, learning and having fun.

ACKNOWLEDGEMENTS

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CHAPTER ONE

INTRODUCTION

Research has shown that children's care of real pet animals is associated with higher levels of empathy and more positive attitudes towards the humane treatment of animals. Studies have also shown that interacting with real pet animals can provide children with opportunities to practice and learn important social and emotional skills including role taking, perspective taking, and language skills. Furthermore, children are provided with opportunities to experience different emotions. (Myers, 1998; Nielsen & Delude,1989; Rost & Hartmann, 1994; Melson, 2003). The findings have resulted in suggestions that owning a real pet animal may help promote children's socio-emotional development including empathy, responsibility and the care for others. Research studies have also suggested that pets can be used as a sex-neutral medium that is effective in enhancing the nurturance behaviors of girls and boys (Melson, 2003; Melson & Fogel, 1996; Melson & Fogel, 1989).

Although research has shown that children can benefit socially and emotionally from interacting with pets, not all children have the opportunity to interact with real animals. For example, families with a member who has asthma or allergies to animal hair may not able to keep a pet at home. According to Statistics Canada (2007), almost 2.25 million Canadians older than 12 years have asthma. In addition, the growing trend of urbanization and increased percentage of the population living in apartments may cause greater difficulties in keeping pets such as dogs. According to Statistics Canada (2001) about 4.5 million children under age 14 now live in an urban area. Therefore, it can be

assumed that many children have fewer opportunities to own, interact with, or care for a real pet animal.

In recognition of the limitations but the desire of owning a pet, some recreational software companies such as Bandai, Ubisoft and Nintendo have created a pet replacement market. They have designed and promoted an artificial pet substitute, commonly referred to as a virtual pet, with computer-simulated characteristics similar to real pets. In this introduction, I will first provide a definition of virtual pets. I will then provide some background regarding the history of virtual pets and their development, and conclude this chapter by articulating the purpose for this research study, which includes a presentation of the research questions.

Definitions of Virtual Pets

Virtual pets, also known as cyber pets, digi-pets, digital pets and pet-raising simulation games may be defined as "the collective name given to assorted computational toys that display animal-like features" (Reilly, 2004, p. 46). Similarly, according to Purenelle and Mckean (2004), a virtual pet is "an electronic toy that simulates a real pet and with which human interaction is possible" (pp. 35, 36). Both definitions of virtual pets, share the common conceptualization that a virtual pet is a computerized electronic toy that simulates a real animal through the display of typical animal features and actions.

Another commonly agreed upon concept regarding virtual pets is that they are capable of interacting with and eliciting emotional bonds in human users. Consequently, another term that has been associated with virtual pets is "relational agent." According to Bickmore (2003) "relational agents are computational artifacts designed to build and

maintain long-term, social-emotional relationships with their users" (p. 17). Bickmore further explained that many commercial toys could be classified into this category:

> These commercial artifacts are designed to cultivate a sense of relationship with their users. Most of these artifacts play on people's needs to express nurturance by requiring caretaking in order to thrive, or by engaging in familiar social interaction patterns. Most of these artifacts also change their behavior over time or otherwise provide a highly variable, rich set of expressions to give sense of uniqueness crucial for relationship (pp. 27-28).

Since virtual pets often require users to conduct some form of care or nurturing behavior, and even the building of a relationship with a computer-simulated character, a question that needs to be asked is whether virtual pets can be considered as pets or games. Some game designers believe that virtual pets are not games in the traditional sense because users are not motivated to play in order to achieve an objective (e.g., prize, money, points) as is the case in most other games. Stern (2002), for example, wrote that although virtual pets may have some play characteristics of videogames, they are not traditional games because "they are non-goal oriented; it is the process of having a relationship with a virtual pet that is enjoyable to the user, with no end goal of winning to aim for" (p. 337).

In summary, the various definitions of virtual pets generally include the following characteristics. First, virtual pets are computer simulated; second, they have animal-like features; third, they are capable of eliciting socio-emotional relationships with users;

fourth, they are usually non-goal oriented; and fifth, play with them is motivated through the execution of caring and nurturing activities.

Forms of Virtual Pets

Virtual pets exist in many different forms. Some are three-dimensional such the robot pet dog, Sony AIBO (Kusahara, 2001). Others are two-dimensional and appear on a computer screen such as the Bandai Tamagotchi (Bandai Corporation, 2008), PF Magic Dogz and Catz (Walls, 2006), and Nintendo *Nintendogs* (Jenkins, 2005). Virtual pets also differ according to their interface with users. Some virtual pets have a physical body, which allows manipulation by users, whereas others are displayed on a flat screen and require users to interface by pushing buttons, contacting a touch screen with a stylus or speaking into a built-in microphone. The difference in interface may influence how users interact with the virtual pet. In turn, the interaction might affect how users project their emotions onto the virtual pets, as well as their responses to the perceived needs of the computer-simulated characters.

History of Virtual Pets

The first virtual pet product was Dogz, released by PF Magic in 1995 and later acquired by Ubisoft Entertainment. Dogz was followed by Catz in 1996 (Walls, 2006). The original Dogz and Catz were entertainment software that could be loaded and played on personal computers. Later Dogz and Catz were transferred onto game cartridges that could be quickly inserted and played on handheld Game Boy and Nintendog DS game

systems. New characters including Bunnyz, Tigerz, Hamsterz and Horsez were added to this brand of virtual pet, and the general name of the related products became Petz.

Although Petz is the oldest virtual pet product, perhaps the most well-known virtual pet is Tamagotchi. First released in 1997 by Bandai, Tamagotchi has achieved record sales levels of over 40 million units worldwide (Bandai Corporation, 2008). The original Tamagotchi consisted of an animated character, which resembled a chicken and followed a life cycle. The game started with a graphic representation of an egg that players could hatch and raise. The virtual pet character could age, and even become sick or die from a lack of proper care. Tamagotchi was different from Dogz and Catz, because it was a small, single functioning, pre-installed portable game. The special features including life circle, simulated physical demands, and portability made users, especially young children, strongly attached to them and boosted their international popularity.

The strong emotional attachment to Tamagotchi by young children brought criticisms, protests and calls to ban their play. Some argued that the strong emotional attachment might cause negative effects such as making children form the habit of machine gambling (News.com.au, 2005). In addition, reports from America and Japan showed that children spent too much time playing Tamagotchi. Some schools and teachers responded by prohibiting children from bringing the game to school (Lawson, 1997). Moreover, the feature of the game that enabled children to end or reset a virtual life despite the formation of emotional attachments worried psychologists. Bloch and Lemish (1999) believed that children might become socially and emotionally misguided if they developed the idea that life and relationships can simply be ended and restarted when they become inconvenient, or occur in ways unexpected or undesired.

After the introduction of two-dimensional virtual pets, three-dimensional virtual pets such as Furby and AIBO were created and marketed. Tiger Electronics first introduced Furby in 1998, and similar to other virtual pets, it required care and nurturance. Furby also had the programmable feature that simulated the learning of language, taught to it by players (Kirsner, 1998).

Another popular three-dimensional virtual pet was Sony's AIBO, which has the physical shape of a mechanical robot dog. AIBO was released in 1999 and successfully sold 130,000 units in its first year (Sony Corporation, 2008a). Like other virtual pets, AIBO was designed to elicit emotional attachment from players, for example, by being programmed to respond to players' verbal praises and reprimands. Moreover, AIBO could form its unique personality through use (Sony Corporation, 2008b). Compared to other virtual pet products, AIBO was more expensive but had extra features, which enabled it to be connected to the internet as well as record its own picture diary with comments. Research studies found that children could become connected socially and emotionally to AIBO (Kahn, Friedman, Perez-Granados, & Freier, 2004).

Nintendogs

Several different computer simulation games are available on the market, and one of the newest, most popular is *Nintendogs*. *Nintendogs* is a computer-simulated virtual pet game that operates on the handheld Nintendo DS videogame console. First released in Japan on April 21, 2005 by Nintendo Japan almost 200 thousand units were sold in the first week (Jenkins, 2005). In Europe, about one million units were sold in the first two

months (Nintendo Corporation 2008a), and in North America, almost a quarter million units were sold in the first week of release (Carless, 2005).

Nintendogs is sold in five different versions in the North American market. These editions include Chihuahua, Dachshund, Lab, Dalmatian and Friends, and Best Friends (Nintendo Corporation, 2008b). Each edition consists of six different breeds of dogs such as the dalmatian, golden retriever, yorkshire terrier, beagle, boxer and german shepherd. In addition to popularity as indicated by worldwide sales, *Nintendogs* has won several major awards. For example, *Nintendogs* was selected as the overall Game of the Year and Handheld Game of the Year at the Ninth Annual Interactive Achievement Awards (Academic of Interactive Arts & Sciences, 2008). *Nintendogs* also won in the category of Best Technology Prize and Innovation at 2006 Game Developers Choice Awards (Game Developers, 2008). The animal rights organization, People for the Ethical Treatment of Animals (PETA), gave *Nintendogs* the award for Best Animal-Friendly Videogame in 2006 (People for the Ethical Treatment of Animals, 2008).

Playing the Game

Playing *Nintendogs* consists of caring, training and competing using a computer-simulated virtual pet dog. Players are able to play, feed, touch, brush, wash, train and compete with their virtual dogs by using the game's stylus to contact the unit's touch screen. Players can also interact with the virtual pet dog by speaking into a built-in microphone. The dog has basic needs such as hunger and thirst, which the players should meet by feeding, although the virtual dog does not get sick or die if the players neglect or abuse it. However, the players' success in training and caring for the dog is shown as

higher training scores and the possibility of winning more competition prizes including money, which is accumulated and shown on the screen.

There are several contests in which players can enter their virtual pet dog such as disc competitions, agility trials and obedience trials. Players usually need to train their virtual pet dog and practice before they can win prizes. Through competitions, players can win money, which could be used for buying dog food, accessories, or even a new doghouse for the virtual pet. Training for competitions can encourage players to understand better their virtual pet dog. For example, in disc training, the dog may refuse to play, especially if it is tired. Therefore, players need to understand the dog and learn when to stop training or provide food and water. Obedience trials often require time for the virtual dog to learn a trick. In addition, the virtual dog seems to be programmed to forget old tricks if players do not repeat them regularly. However, once a new trick has been learned, the virtual pet dog can obey the players' commands transmitted either through touching the stylus onto the screen or through speaking into the game unit's built-in microphone.

Nintendogs has a function called Bark Mode in which two players can enable their virtual dogs to play together. However, once another virtual dog has been imported onto the screen, the play between the two dogs is associative rather than cooperative. Although the players' dogs will show up in another player's screen, each player experiences different events and the two screens show different activities and interaction.

For this research, *Nintendogs* was used as the object of study. The *Nintendogs* game cartridges and Nintendo DS systems were bought entirely from retail stores at advertised prices using funds provided by the Social Sciences and Humanities Research

Council of Canada (SSHRC) through grants given to Dr. David Kaufman for his collaborative research initiative entitled "Simulation and Advanced Gaming Environments (SAGE) for Learning." Additional funds were provided by a Simon Fraser University President's Research Stipend awarded to the researcher. To maintain neutrality, no corporate sponsorship was provided by Nintendo. Although the researcher tried to contact Nintendo for technical information regarding the operation and function of *Nintendogs*, no response was received from the company.

Purpose of the Study

Most of the research studies that were reviewed investigated the effects of real pet animals on children's socio-emotional development. Studies found which examined the relationship between children's socio-emotional development and their care of virtual pet animals was, however, quite limited. With the growing popularity and sophistication of handheld mobile computer-based games such as *Nintendogs*, it now becomes increasingly more important to determine the socio-emotional effects of computer game play involving a computer-simulated character.

The purpose of this research study was to investigate the potential of using a handheld commercial virtual pet videogame to improve children's empathy and their humane attitudes towards real animals. Although there is evidence in the literature to suggest that empathy and attitudes could be enhanced through the care of a real pet animal, this study investigated whether empathy and attitude could also be enhanced through the care of a computer-simulated virtual pet animal.

Hopefully, the understanding gained through this study about children's interaction with virtual pets may be applied to help develop new technology that can assist in the facilitation of children's social and emotional development. As Melson (2001) posited:

> If we learn more about children's interaction with real pets and other real animals, as well as children's use of animal symbols, we would better understand this emerging domain of robot pets. We then may have the tools to influence the development of this technology in directions that benefit children (p. 14).

Research Questions

This study focused on addressing the following six research questions:

1) Can playing and interacting with a virtual pet dog help promote children's development of empathy?

2) Can playing and interacting with a virtual pet dog help promote children's development of positive humane attitudes toward animals?

3) Do the duration and type of interaction relate to an enhancement in children's development of empathy and development of humane attitude toward animals?

4) What attitudes and feelings do children have regarding a virtual pet dog?

5) Are there sex differences in children's development of empathy and attitude resulting from playing and interacting with a virtual pet dog?

6) Do children who report greater companion bonds with their virtual pet dog have higher empathy and humane attitude scores?

Organization of the Thesis

This chapter provided an overview and introduction to the thesis. Chapter Two will review literature on the concepts of empathy, the influence of real and computer-simulated animals on children's socio-emotional development, and criticisms about virtual pets. Chapter Three will explicate the methods and instruments used in the study. Chapter Four will present the findings, organized according to the six research questions. Finally, Chapter Five will discuss the findings, draw some conclusions, outline the limitations of this study, and suggest some directions for future research.

CHAPTER TWO

REVIEW OF LITERATURE

Empathy

Empathy is a topic with a broad range of concepts. According to the Oxford

English Dictionary , empathy is defined as "the power of projecting one's personality into

(and so fully comprehending) the object of contemplation" (Empathy, 2008). However,

upon further examination, empathy is more complicated than the simple literary

explanation found in the dictionary. Since 1897, when German philosopher Lipps

introduced the idea of empathy, the concept has gone through various changes as

different scholars and philosophers defined and interpreted empathy in different ways

(Goldstein & Michaels, 1985).

To organize the different theories that contributed to the development of the

conceptual framework of empathy used in this research, I shall first examine empathy in

this chapter by examining the historical evolution of the concept. Then I will discuss the

affective, cognitive, and socialization aspects of empathy in children's development. I

will then conclude with the definition of empathy used in this thesis study.

Historical Concept of Empathy

To postulate a definition of empathy, it is important to define initially what is

meant by the terms "subject" and "object," as used in empathy. In general, the process of

empathy includes the "subject," also known as the observer or the empathizer, and the

object also known as the empathized. In current psychological texts, the empathized often refers to another human being. However, human beings have not been the only object of empathy. Since the 19th Century, German scholars have used the term *Einfühlung* to discuss the concept of empathy. It was not until 1910 that Titchener translated *Einfühlung* into the English word "empathy." The object of empathy, originally, referred to art or a physical entity in the natural environment such as an animal (Goldstein & Michaels, 1985; Pigman, 1995; Verducci, 2000).

The German philosopher, Lipps, is commonly cited as the first to introduce the term *Einfühlung* (Goldstein & Michaels, 1985). However, Lipps' concept of *Einfühlung* was influenced by other German philosophers such as Vischer and Lotze (Freedberg & Gallese, 2007; Gallese, 2003; Verducci, 2000). According to the early concept of empathy, *Einfühlung,* was a psychological process involved in perceiving art and non-human objects in nature. Lotze's *Mikrokosmos* explicated early concepts of *Einfühlung* as the feeling that humans can get from non-human living and non-living objects including art and animals through "placing ourselves into them" (Gallese, 2003, p. 175). Lotze stated that "even on to lifeless things we transfer these interpretive feelings and transform through them the dead weights and supports of buildings into so many limbs of a living body, whose inner tensions come back into us" (Lotez in Pigman 1995, p. 239).

Similar to Lotze, Vischer's early theories on *Einfühlung* were focused on non-human objects, especially those that were aesthetic such as art. According to Vischer, people can have empathic responses through looking at art objects and generating physical response (Koss, 2006). For Vischer, aesthetic empathy can be considered a psychological process that is interrelated with an individual's physical and visual

response, inner imitation, imagination and affective projection (Koss, 2006; Pigman, 1995; Verducci, 2000). Verducci (2000) further explained Vischer's concept of aesthetic empathy as "the projection of [feeling self] into an object signals empathy. The seed of this process lies in the imagination, the flower in the viewer's affective life. The imagined mental representation of an object and the viewer's feelings become inseparable" (p. 67).

Similarly, Lipps (Pigman, 1995) agreed that empathy is related to an individual's physical and visual response as well as to an individual's inner imitation, imagination and affective projection. Lipps stated:

> This unconscious imitation consists of motions. When
>
> something in a landscape strikes us as an intention, a mood, an
>
> affect, this probably happens because through its forms, lights,
>
> and colors it stimulates our inner self to sympathetic and
>
> reactive motions with which our actual body in real life is
>
> accustomed to express conditions and commotions of the soul.
>
> (p. 240).

Lipps further contributed to the evolution of the concept of empathy by transferring the definition of object in empathy, from art, nature and other non-human objects to include also other people. Consequently, this focus helped extended *Einfühlung* from being aesthetic empathy to the psychological understanding of the existence of others (Davis, 1994; Goldstein & Michaels, 1985; Pigman, 1995).

According to Lipps, empathy is an affective projection and inner imitation from the observer. The observer does not understand an object through immediate perception but rather "feel into" and "project into" an object (Pigman, 1995). As Lipps wrote "my

understanding of the living expressions of others is grounded on the instinctive drive of imitation on the one hand, and the instinctive drive to express my own psychic experiences in the distinct way on the other hand" (Lipps in Pigman, 1995, p. 242). Lipps' theories of *Einfühlung* or empathy, in summary, represented the subject's attempts and psychological process in understanding others. This idea later stimulated the conceptualization of empathy from different aspects, particularly cognition, affection and socialization.

Therefore, from Lotze to Vischer to Lipps, the German scholars' concept of empathy focused on the process, which active observers try to perceive objects. The objects can be in different forms such as animals, art or other lifeless objects. Although Lipps included human beings as objects of empathy, he did not exclude the possibility that humans can have empathy to other objects. However, regardless of whether the objects are art, human beings, animals or objects in nature, the focus of empathy in these German scholars' study was based on the subjective emotional projection, imitation and imagination rather than on the cognitive understanding of the objects or even the accuracy of empathy. The German scholars' explanation of empathy, nevertheless, provided an opportunity to explore the empathic process between humans and other objects, and invited the possibility to construct the understanding that the empathy provoked by other objects could be used for enhancing empathy between human beings.

Affective and Cognitive Empathy

Early conceptualizations of empathy based on ideas from Lipps, which tended to regard empathy as an emotional reaction or imitation of another person's emotions, have

evolved in different ways at different times (Goldstein & Michaels, 1985). Titchener who

translated Lipp's idea of *Einfühlung* into English added that, in empathy, it is not possible

to use logical analysis to understand another person's consciousness. Instead, in empathy,

one uses the capacity, which he referred to as the "mind's muscle" (Wispe, 1987, p. 20)

to imitate another's emotional state. The influence of this idea helped further evolve the

concept of empathy to focus more on the cognitive rather than the emotional domain.

Kohler (1929), an early promoter of the cognitive focus of empathy, asserted that

empathy involves the conceptual process of understanding rather than the affective

process of feeling other people's emotions (Davis, 1994). In cognitive empathy, empathy

is not focused on emotional reactions or affective projection, but rather in the ability to

understand others' emotions and thoughts (Davis, 1994; Eisenberg, Murphy & Shepard,

1997; Goldstein & Michaels, 1985). Two influential scholars that supported this new

conceptualization of empathy were Mead and Piaget.

Mead advocated that the study of empathy should focus on the capacities in

understanding others through taking the perspective of others, and placing oneself in

others' dispositions (Davis, 1994; Goldstein & Michaels, 1985). The ability to understand

others' emotional and cognitive states brought important influences on later

developmental psychology. Piaget's cognitive theory, for example, supported the idea

that empathy should be considered as a cognitive instead of just an emotional concept,

and later influenced other empathic studies on children (Borke, 1971).

According to Piaget (1967) in Borke (1971), children younger than about seven

years are basically egocentric and therefore do not have the ability to take another's point

of view. However, as their cognitive development moves from centralized towards

decentralized thinking, children become less egocentric and begin to engage in perspective taking. Consequently, it was believed that children could only start developing empathy after they had learned to distinguish the ideas of self from those of others (Davis, 1994; Eisenberg, Murphy & Shepard, 1997; Piaget, 1965; Zahn-Waxler & Radke-Yarrow, 1990).

Piaget's cognitive theory provided the foundation of cognitive empathy in child development. Cognitive empathy development theory addressed issues such as the ability to recognize the difference between self and others' emotional and mental states, as well as the ability to perceive and decode cues in social context. Also addressed is empathic accuracy, defined as the "ability to accurately infer the specific content of other people's thoughts and feelings" (Ickes, 1997, p. 3). Overall, perspective taking and role taking abilities are at the center of children's cognitive empathy development. In general, cognitive empathy theories suggest that children's empathic abilities increase with cognitive development, age, life experience and socialization. Moreover cognitive empathy theories not only address the empathic process, but also how accurate a subject could understand and perceive an object's emotional and cognitive states (Eisenberg, Murphy & Shepard, 1997).

The definitional emphasis of empathy vacillated between being a cognitive versus an emotional concept (Eisenberg & Strayer, 1987; Goldstein & Michaels, 1985; Hoffman, 1984, 2000). However, I would suggest that empathy should be considered as, both, a cognitive and an emotional process that is involved in perceiving as well as responding to others' emotional states and dispositions. The conceptual framework used in this research study is supported by later theories on empathy.

Goldstein and Michaels (1985) wrote that empathy should include cognition, in addition to emotion:

> A cognitive component in the form of an ability to understand was added to the earlier affective emphasis....the blending or merging of identities notion yielded to a self-other differentiation in which the empathizer temporarily took the role of the other or put themselves in the other's place as the heart of empathic process (p. 4)

Goldstein and Michaels (1985) supported Hoffman (1984). Although Hoffman viewed empathy more from an affective focus, he believed that cognitive factors also influenced empathic development. Hoffman stated that "the interaction of affect and cognition can be seen in the various modes of empathic arousal as well as in the transformations and developmental levels of empathic experience" (p. 103). Hoffman (2000, p. 29) further posited that empathy not only comprises of "the vicarious affective response to another person" but it should also be considered as the "cognitive awareness of another person's internal states, that is, his thoughts, feelings, perceptions, and intentions." Consequently, the definition of empathy further evolved to include reacting or responding to another's internal states in addition to being simply aware of them.

Feshbach (1978, p. 9) used a three-component model to diagram how empathy development includes both cognitive and emotional processes. First, she stated that empathy is "the ability to discriminate and label affective states in others." Second, empathy requires "the ability to assume the perspective and role of another person." Third, empathy involves "emotional capacity and responsiveness." Therefore, in

summary, later theories of children's empathic development have generally supported the inclusion of both emotional and cognitive factors (Davis, 1994; Feshbach, 1978, 1982; Hoffman, 1975, 1978, 1982, 1984, 2000; Roberts & Strayer, 1996; Strayer, 1993; Strayer & Schroeder, 1989).

In the following, I will discuss the important concepts of affective empathy and the role of emotions. Then the relationship between cognition and emotion, as well as social issues in children's development of empathy will be examined.

Emotional Arousal and Empathic-Related Distress

Children's development of empathy includes both emotional and cognitive factors. However, emotional arousal could be considered the initiator of children's empathic development. Cowan in Piaget (1981) described the connection between emotional and cognitive development by stating, "affect is often invoked as a causal mechanism that sets our cognitive apparatus in motion" (Piaget, 1981, p. xi). Cowan further elaborated on Piaget's approach and described children's development using a car as an analogy. He stated:

> Cognition provides the structure for this energy. Affect is likened
>
> to the gasoline that activates the car, while the engine provides
>
> structure for the energy and direction of the car's motion. Affect as
>
> 'energetics' can combine with cognitive structural schemes to
>
> focus the individual's interest on a specific thing or idea (Piaget,
>
> 1981, p. xi)

One of the most commonly discussed emotional arousals, believed to evoke empathy, is "empathic related distress." According to several researchers (Davis, 1994; Eisenberg & Strayer, 1987; Hoffman, 1978), empathic related distress is linked to the earliest stage of empathic development, and is considered as an important emotional arousal and antecedent of empathic development.

Different scholars and researchers have used slightly different terms and definitions to describe empathic related distress. Eisenberg and Strayer (1987) used the term "personal distress" and illustrated it by stating "when perceiving cues related to another's distress, some people may experience an aversive state such as anxiety or worry that is not congruent with the other's state and, what is more important, that leads to self-oriented, egoistic reaction or concern" (p. 7). Batson and Coke (1981) had a different definition for personal distress. They described it to mean that when one witnesses distress from another, the person would feel "shock, alarm, disgust, shame, and fear" (p. 178).

Hoffman (1975, 1978, 1982, 2000) used the term "empathic distress" and explained that it refers to "the involuntary, at times forceful experiencing of another person's painful emotional state." He further stated that it might be "elicited by expressive cues that directly reflect the other's feelings or by other cues that convey the impact of external events on him" (Hoffman, 1975, p. 613). Therefore, although different researchers have used slightly different ideas to explain empathic related distress, in general, the concept refers to a pain, discomfort or suffering that one would vicariously feel when that person witnesses another's personal plight or circumstance.

Hoffman (1978, 1982, 2000) as well as Zhan-Waxler and Radke-Yarrow (1990) further suggested that distress might be related to the early empathic development of young children. Hoffman (1982) explained that newborn babies' reactive cry contributed to their empathic distress, and young children did not have the sufficient cognitive ability to identify whether the distress is from others or from themselves. However, as children gain more social experiences and reach higher levels of cognitive development, the empathic distress would combine with new empathic skills and continue to be an important empathic arousal. In thus doing, empathic related distress has been concluded to serve as a significant and continual influence on children's empathic reaction and development.

Emotional and Cognitive Factors in Empathic Development

Recent ideas about children's development of empathy are considered to be related to, both, emotional and cognitive factors. Two important models, one from Hoffman (1978, 1982, 1984, 2000) and the other from Feshbach (1978, 1979, 1982) have provided explanations of how emotion and cognition may be interrelated.

Hoffman's Model of Empathy

Although Hoffman's definition of empathy is more emotion-oriented, he still believed that cognitive factors are important component in children's development of empathy. Hoffman (1984) stated, "though empathy is an affective response, it has cognitive as well as affective components" (p. 103). Hoffman's empathy theory includes three important components: the empathic arousal model, life-span cognitive conception,

and four empathic development levels. In the three components, Hoffman explained that emotional and cognitive factors are correlated, and together, influence children's development of empathy.

Hoffman's empathic arousal includes five modes: (a) primary circular reaction; (b) mimicry; (c) conditioning and direct association; (d) language-mediated association; and (e) role-taking (Hoffman, 1987, p. 50). The first three modes are entirely emotional responses, which Hoffman described as preverbal, automatic, and involuntary, and do not require too much cognitive ability (Hoffman, 1987). Often these arousals are believed to be humanly instinctual or natural, and initiate the process of social interaction. Language-mediated association and role taking, however, require more cognitive engagement than the earlier three arousals. Language-mediated association also requires the empathizer to connect his own experience with the empathized person's distress cues through language. In role taking, the empathizer is required to put himself in another's situation, and imagine what it might feel like in those circumstances. Hoffman (1982) further suggested that the five arousals relate not only to children's development, but also to the situation, and that "an arousal mode exists for whatever type of cue about the other's feelings may be present, and multiple cues may increase the level of arousal" (p. 285). Moreover, Hoffman believed that children often react involuntarily to the empathic arousals, most of which only require limited cognitive ability.

Hoffman's cognitive model is based on the "life-span conception of cognitive sense of others" (Hoffman 1982, p. 286). As suggested by this model, children's cognitive development can be divided into four stages. In the first stage, the newborn cannot tell the difference between self and others. In the second stage, one-year-olds start

to become aware of the "person permanence" of others, and begin to understand the physical difference between self and others. In the third stage, which Hoffman recognizes as an early stage of role-taking, two to three year-old children begin to notice the physical existence of others, and start understanding others' inner state. The final stage of the cognitive model occurs in late childhood when children "become aware of others as having personal identities and life experiences beyond the immediate situation" (p. 286). Consequently, according to Hoffman, the cognitive ability of identifying others enables children to move from simple reactions stimulated by empathic related distress towards higher levels of empathy.

Combining the cognitive model and empathic arousals, Hoffman (1982, 1984) developed four levels of empathy: global empathy, egocentric empathy, empathy for another's feeling, and empathy for another's general plight. In global empathy, children younger than one year of age simply react to empathic distress but do not understand whether the distress originated from themselves or others. In egocentric empathy, one to two year-old children can physically understand that they are not the victims of actual distress, but they still could not distinguish the inner states from themselves and others. At this level of empathy, children often give help to victims based on their own thinking or preference.

Children start moving to the third level, "empathy for another's feeling" after two years of age. At this age, children have greater language ability, which enables them to perceive more information and symbolic cues. In addition, after the age of two, children begin to have the capacity for role taking and begin to understand that other people may have different thoughts, feelings or emotional reactions from them. Consequently, as their

cognitive and emotional development progresses, children become increasingly capable of understanding more complicated and even contradictory emotions. In late childhood, children reach the level of having "empathy for another's general plight." At this level, children not only react to situations or event, but they also combine the information, cues and their own imagination to perceive the personal disposition of the victims (Hoffman, 1978, 1982).

Therefore, according to Hoffman's theory of empathy, children start from reacting to empathic distress before gaining higher cognitive abilities including the skills to understand others' personal situations and affective cues. In turn, children's enhancing cognitive development helps them to reach more advanced empathic thinking. However, emotional factors still have important roles in initiating and motivating children through their life-span empathic development. Furthermore, Hoffman also suggested that empathy could be encouraged and enhanced through training and guidance. Examples of training and guidance described by Hoffman include enabling children to experience different emotional experiences and engage in different social and emotional situations such as through game and pretend play. Hoffman further added that children's role-taking abilities should be enhanced through providing opportunities to share life experiences, and improve language and communication abilities (Hoffman, 2000). Role-taking includes the concept of perspective taking which involves acting in the role of another character. For example, while interacting with animals, some children play the role of caregiver.

Feshbach's Model of Empathy

Another significant theorist of empathic development was Feshbach. Like Hoffman, Feshbach (1978) believed in the association between emotional and cognitive factors in the development of children's empathy. She wrote that, "it is possible to conceptualize empathy as a cognitive product mediated by emotional factors or as an affective response mediated by cognitive process" (p. 8). Therefore, it would be difficult for either cognitive or emotional factors to exist in isolation of each other. Feshbach described her ideas of how empathy is combined with emotional and cognitive aspects in the "three component model of empathy." The first two components of the model are dependent on cognitive ability, and the third component requires emotional response (Feshbach, 1978, 1982).

The first component of empathy is "the ability to discriminate affective states of others" (Feshbach, 1982, p. 320). Consequently, children require the cognitive ability to receive emotional cues and identify others' emotions. As Feshbach (1982) explained, "for a child to react empathically to sadness or joy displayed by another person, the child must be able to identify the relevant affective cues that discriminate these emotional states from each other and from a neutral affective state" (p. 320). The second component of empathy requires children to have more advanced cognitive ability such as role-taking and perspective taking. The third component is "emotional responsiveness." This is the capability to experience emotion. Feshbach (1982) stated, "the observing child must be able to experience the emotion that is being witnessed in order to be able to share that emotion" (p. 320). Therefore, according to Feshbach's model, children's development of empathy can increase with their cognitive and emotional development. Consequently, age

and learning experience are recognized as important factors in the empathic development of children.

Similar to Hoffman, Feshbach (1979) also indicated that empathy could be developed through training. Feshbach's ideas for training empathy included two important directions: affective-cognitive training and cognitive training. Affective-cognitive training focuses on training children's ability in affect identification, perspective-taking, and emotional responsiveness. The purpose of this training is to encourage children to explore different emotional experiences as well as freely express and discuss emotions. Cognitive training, conversely, focuses on "non-emotional aspects of social interaction, discrimination of social cues that contain information about the thoughts, intentions, and probable future behavior of others" (p. 240). Furthermore, unlike affective-cognitive training, discussion "centers on intentionality, motivation and problem solving rather than on emotion" (p. 240). Therefore, by learning about social cues, it is believed that one can gain greater understanding of others as well as their emotional states and dispositions to enhance further empathy.

In examining Hoffman and Feshbach's models of empathy, similarities were found. First, Hoffman and Feshbach both believed that children need to have cognitive and emotional abilities in order to develop empathy. Feshbach's theory suggested that cognitive ability and emotional response could not independently exist. Hoffman also suggested the importance of cognitive and emotional factors in empathic development; however, he attributed a greater emphasis on emotional arousal especially empathic distress. Hoffman further believed that empathic distress reactions could be considered as the pre-requisite or antecedent which initiates empathic development. In Hoffman's five

empathic arousals, only role taking requires advanced cognitive ability. Consequently, the highlighting of empathic distress in the early development of empathy made Hoffman's theory unique since his was one of the first to suggest that empathic development can start from infancy. Therefore, this theory provided an alternative view to traditional ideas earlier advocated, based on Piaget's theories on cognitive development, for the investigation of empathic development (Zahn-Waxler, & Radke-Yarrow, 1982).

Recent research studies have also supported Hoffman and Feshbach's theories, and suggested that empathy includes both emotional and cognitive aspects. Smith (2006), for example, posited that empathy consists of cognitive and emotional empathy, and speculated, "empathic concern may emerge from the integration of CE (cognitive empathy) and EE (emotional empathy)" (p. 7). Similarly, in neurological research, Rankin, Karamer, ands Miller (2005) also suggested that there are two types of empathy, cognitive and emotional, and further added they are controlled in different locations of the brain.

Second, Hoffman and Feshbach both suggested that children's empathic development can increase with age. For example, Hoffman's life span cognitive theory indicated that children's age and cognitive development could influence their empathic development. Feshbach's theories also believed that age could affect children's empathic behavior (Feshbach, 1978).

Third, Hoffman and Feshbach both suggested that socialization can significantly influence children's empathic-related cognitive and emotional development. Ideas concerning the socialization influences on children's development of empathy were also

suggested by other researchers. In the next chapter, I shall discuss the influences of socialization on children's empathic development.

Socialization Influences on Empathic Development

In addition to emotional and cognitive factors, several researchers support the importance of socialization in children's development of empathy (Eisenberg, Murphy, & Shepard, 1997; Feshbach, 1975, 1978; Goldstein & Michaels, 1985; Hoffman, 1982; Strayer, 1993; Zahn-Waxler & Radke-Yarrow, 1990). In the following I will discuss some issues including social and emotional experience, social competence, and socialization and sex.

Social and Emotional Experiences

An important process of empathic development is gaining the ability to understand others' inner states and emotions (Davis, 1994; Feshbach, 1978; Hoffman, 1982, 2000; Roberts & Strayer, 1996; Strayer, 1993). To improve the ability to understand, it is important for children to be provided with opportunities to experience what and how others might feel in particular circumstances. Children are more likely to "empathize with someone else's emotions if they had direct experience with that emotion themselves" (Hoffman, 1982, p. 305). Consequently, Hoffman suggested that children should have more opportunities to be exposed to different types of emotion in order to develop their empathic ability.

Aronfreed (1968) in Feshbach (1975), similarly, had earlier advocated the idea that children's emotional responses may be related to their previous experiences.

Feshbach (1975) added to Aronfreed's idea by proposing, "on a broader level, it is suggested that those aspects of the socialization process that relate to the experience, expression and restraint of feeling are highly relevant to the development and manifestation of empathy" (p. 26).

In addition to exposure and experience to different types of emotion, Hoffman also advocated the importance of directing children's attention to others' inner state. Hoffman (1982) suggested that "inductive techniques" (p. 306) can be use to enhanced children's empathy. Inductive techniques can include discipline and instruction. For example, if a child should hurt others, adults can direct the child to attend to the victim's pain, as well as encourage the child to attend to others' personal mental disposition. As Hoffman (1982) described, "we would expect role-taking opportunities to help sharpen the child's cognitive sense of others and increase the likelihood that he or she will pay attention to others, thus extending the child's empathic capability" (p. 306). Therefore, Hoffman's inductive technique implies that children's empathy can be directed and taught.

Research studies exist, which support Hoffman's idea about directing and teaching children to enhance their empathy. Zahn-Xazle, Radke-Yarrow and King (1979), for example, found how children cope with emotions of distress in others is "significantly related to mothers' practices specific to children's encounters with distress" (p. 327). Consequently, the research also implies that appropriate inductive techniques could influence children's emotional learning. Radke-Yarrow, Scott, and Zahn-Waxler (1973) studied the effects of training on preschool children's pro-social behavior and found that adult's modeling of pro-social behavior is related to children's prosocial behavior and

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empathic motivation to help others. Recent research studies have also supported the Hoffman's possibility about the directing children's attention to others' welfare and perspective in enhancing children's empathy development. For example, Batson, Eklund, Chermonk, Hoyt and Ortiz (2007) suggested that teaching children perspective taking and to value the welfare of others are important strategies that could help develop empathic concern.

Based on the review of literature, I would suggest that children's empathy could be enhanced through caregivers' modeling and direction, and through the provision of more opportunities for children to be exposed to different emotions and the emotions of others. As Goldstein and Michaels (1985) indicated, through socialization, children would be able to better understand and attend to others' feelings. Furthermore, children would also have more opportunities to realize the impact of their own behaviors upon others' feelings. Therefore, exposure to different emotions, sufficient experience as well as inductive techniques of teaching and learning may all help to enhance children's development of empathy.

Social Competence

An important part of empathic development is the ability to understand others' feelings and recognize affective cues. With age, cognitive and emotional development, children usually learn more advanced skills in perceiving and accurately interpreting emotional cues. However, social competence can also influence children's ability to decode affective cues. In thus doing, social competence may be considered another

important factor that could influence children's development of empathy (Eisenberg, Murphy, & Shepard, 1997).

Eisenberg, Murphy and Shepard (1997) elaborated the earlier idea of Feldman, Philippot, and Custrini (1991), by concluding that "not only does interpersonal experience enhance decoding ability, but the child's ability to decode emotions affects popularity among peers and overall social competence" (p. 84). Eisenberg, Murphy and Shepard (1997) further suggested that children with more social experience often have more opportunities for social interaction. This, in turn, could help increase their perspective taking skills.

Socialization and Sex Differences

The issue of whether females are more empathic than males is still a topic of continued enquiry. Some research studies support the hypothesis that females are more empathic than males. Feshbach (1978) indicated four studies, which show that girls, age 4 to 7 years old, had higher empathic scores than boys (Feshbach & Feshbach, 1969; Feshbach & Roe, 1968; Kaluk, 1971; Powell, 1971 in Feshbach 1978). However, whether girls are naturally more empathic than boys is an on-going issue for further research and consideration.

Socialization and social values may be possible reasons why females have been shown to be more empathic than males. Bryant (1982), for example, found that younger children tend to show less sex differences in empathy, but by adolescence, girls show more empathy than boys. In her conclusion, Bryant (1982) suggested that male teens may be more hesitant in sharing their feelings because of the worries concerning social

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judgment: "it appears, then, that males in their early adolescence tend to deny the legitimacy of sharing male affective experiences and that the basis of this affective taboo is fear regarding sexual identity and social rejection" (p. 423).

Feshbach (1982) suggested that children's empathy might the result of the reciprocal effects among their cognitive and social development as well as empathic stimulations. She found that boys' scores on empathy tests had a positive correlation to their cognitive ability, such as "competencies in vocabulary, reading skills, comprehensive, spatial perspective taking, fantasy elaboration, and the recognition of changes in feelings of others" (p. 328). Girls' empathy test scores, on the contrary, appeared to be more connected to social behaviors. Based on these findings, Feshbach (1982) hypothesized that, "empathy in girls is associated with a positive self-concept with teacher, peer, and self rating of prosocial behavior" (p. 328).

Another sex difference which Feshbach (1982) found was that girls required lower affective stimulation than do boys in order to evoke empathy. Feshbach (1982) indicated, "for boys to be empathic to the same degree as girls, greater cognitive sophistication or more intense dysphoric affect is apparently required" (p. 331). Feshbach further suggested that socialization might be a possible reason for sex differences between males and females. She noted that women are usually the primary caregivers and consequently may be more experienced in being receptive to the affective cues from others.

Feshbach and Roe (1968) believed that boys might not actually be less empathic than girls, as indicated by test scores. Their hypothesis was derived from the finding that boys had similar performance assessment scores in social comprehension to girls.

Moreover, Feshbach and Roe also found that boys tended to control exhibiting their feelings. In thus doing, social constraint may be another reason that could have affected the empathy score results (Feshbach, 1978; Feshbach & Roe, 1968).

Eisenberg and Lennon (1983) supported Feshbach and Roe's hypothesis by indicating that there may be limited sex differences in the development of empathy. Instead, socialization may influence females to behave more empathically than males. Their study found that there are minimal sex differences in children's empathic capacities in terms of affective role taking and decoding abilities. However, as females reached adulthood, they tended to have significantly higher empathy scores in self-reported scales than males, despite test results, which showed that both sexes were fairly equal in the ability to recognize facial expressions and body gestures.

In their conclusion, Eisenberg and Lennon assumed that the differences, which they found, might be related to women's image and stereotype. They posited that "it is highly likely that females would be more willing than males to present themselves as being empathic and/ or sympathetic, even if there were no real sex difference in responsiveness" (p. 125).

There are also several other research studies which showed that there are limited sex differences in children regarding empathic ability. Strayer (1993) concluded that girls and boys do not show significant differences in terms of affect match. Hughes, Tingle, and Sawin (1981) research on empathic understanding, also showed that sex differences are not reflected in children's empathic understanding or emotional reactions. Therefore, in summary, the results from the various research studies on sex differences in empathy are inconsistent. Consequently, I find it difficult to conclude that girls are naturally more

empathic than boys are. However, there is some evidence which suggest that sex differences do exist, but the differences may be influenced by socialization and social values. In general, these influences usually encourage females to be more empathic. Furthermore, in life experiences, females tend to be more involved in nurturing and caring behaviors. This can allow exposure to different types of emotional experiences, which in turn, may help enhance their empathic development.

Summary

The concept of empathy has evolved as scholars introduced new constructs as an attempt to explore and redefine empathy according to different perspectives and emphases. In child study, empathy is often related to, both, cognitive and emotional components. Hoffman (1984) provided a definition of empathy, which incorporated the recognition of the importance of cognition and emotion. He stated that empathy is the "cognitive awareness of another person's internal states (thoughts, feelings, perceptions, intentions), and the vicarious affective response to another person" (p. 103). Empathy has also been defined in terms of empathic accuracy. However, rigid empathic accuracy might exclude an individual's empathic response toward other objects. As early German philosophers suggested, human beings can form empathic reactions toward objects such as art, animals or objects in nature. The psychological process of feeling into objects should be recognized and valued in empathic development. Moreover, the psychological process could be further discussed and implemented in enhancing general empathic development. Hoffman's suggestions of emphasizing the empathic process and affective response provided an enlarged opportunity to further discuss and introduce new

hypotheses into the conceptualization of empathy. As Hoffman wrote "I conceive of empathy more in terms of the processes underlying the match, that is, the processes responsible for one's having a feeling more appropriate to another's situation than to one's own situation" (p. 103). Consequently, it is important to focus on the empathic process rather than just empathic accuracy.

In addition to cognitive and emotional influences, children's social and life experiences also interact to affect their empathic development. Feshbach (1978) used a broader definition of empathy to include and explain the interaction among cognitive, emotional and social elements:

> At a broader level, empathy may be conceptualized both as
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> an affective response mediating social understanding and
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> also as a consequence of social understanding: it may
>
> influence cognitive judgments and may in turn be
>
> dependent upon particular cognitive process. As some of
>
> the ensuing research will indicate, empathy can be linked to
>
> noncognitive as well as cognitive antecedents and
>
> consequences (p. 8).

The importance of social and life experience can therefore help us to realize that children's empathy may be enhanced through proper guidance. Hoffman and Feshbach suggested that educators and parents could enhance children's empathy through the provision of various life and emotional experiences, including through role-taking, perspective taking, and the greater use of language. They also supported opportunities for children to freely explore and express their emotions, and exercise their perception and

understanding of emotions and non-emotional cues from social context. Furthermore as theorized by the early German scholars such as Lipps, Vischer and Lotze, the concept of aesthetic empathy suggests that non-human objects can stimulate empathic response. Therefore, it is logical to assume that we can use non-human objects to increase children's emotional and life experiences, as well as further promote the development of their empathic abilities. In the following, I shall discuss the possibility of using non-human objects such as animals and virtual characters to enhance children's empathic development.

Relationship between Real Pet Animals and

Children's Development of Empathy and Humane Attitudes

The relationship between children's humane behaviors such as the kindness toward and the care of animals has been discussed for over 100 years. Angell (1884), for example, believed that if children were taught to be kind to animals, the positive attitude can be transferred and influence the development and kindness to other humans (Angell, 1884 in Ascione, 1997, p. 68). Recently, there have been increasingly more studies which suggested that animals may be able to enhance children's humane attitudes and empathic development, or abilities that relate to empathic development (Ascione, 1992, 2005; Ascione &.Weber, 1996; George, 1999; Levinson, 1972, 1978; Paul & Sherpell ,1993; Thompson & Gullone, 2003).

Ascione (1992), an advocate of humane education, investigated whether animal based humane education curriculum could encourage children's caring and positive attitude towards animals, and found that children's humane attitude toward animals was

significantly related to their empathy. The findings led to the suggestion that companion animals can have an important role in children's empathic development and humane attitude. George (1999) also supported the positive influence of animals on children's empathic development and humane attitude. She suggested that direct contact with pets and farm animals could help children enhance their caring attitude toward animals, which in turn could be extended to their general empathy. Similarly, Paul (2000a) concluded that there are "significant correlations between the level and intensity of childhood pet relationships, concerns for the welfare of animals and empathy with humans" (p. 174).

Paul and Sherpell (1993) earlier found that "keeping pet animals in childhood helps to develop more positive and caring attitudes towards pets in adulthood [as well as greater] concern about the treatment and welfare of laboratory, farm and wild animals" (p. 332). The study even found that there was a relationship between children's involvement with pets and "ethical food avoidance practices such as vegetarianism" (p. 332). They suggested that keeping a pet during childhood can help develop empathy and a humane attitude towards animals and their welfare, as well as toward other people as children grew into adolescence and adulthood. Paul (2000b) found that both current and childhood pet owning experience were related to animal-related empathy. Bierer's research (2000) also indicated that children who had a strong bond with dogs tended to have higher empathy scores than children without dogs. Therefore, the literature seems to suggest that direct contact and care for pets and animals have a positive influence on children's humane attitude toward animals, as well as their empathic development.

Several researchers have provided theories which suggested reasons why interacting with animals could enhance children's development of empathy and humane

attitude. Levinson (1978) directly supported the idea that animals can play effectual roles in enhancing children's empathic development and humane attitudes. He believed that since animals do not have the ability to verbally communicate, it is important for children to perceive animals' feeling. In thus doing, practicing perception could enhance children's development of empathy. Levinson wrote "communicating with non-verbal creature-be infant or animal-require empathy, an ability to imagine how another thinks and feels, a capacity for mentally stepping into the other's place and to some extent experiencing what he is experiencing" (Levinson. 1978, p. 1036). Levinson further explained that the interaction between children and animals does not just enhance children's empathy toward animals; it also develops the humane attitude of loving, caring and accepting others including animals. He stated, "empathy develops as the child is able to move away from his egocentric view of the world and can recognize his common humanity with others" (p1036). Levinson also believed that "treated with adequate love and respect [a child] will come to love and respect himself, and then extend these feelings to others as he recognizes that they are like him" (Levinson. 1978, p. 1036).

Myers (1998) similarly posited that people are not separated from animals because animals do not share a common verbal language. Instead, the lack of a common language, he believed, arouses human beings' attempts to understand animals and provide care and welfare. Furthermore, children's curiosity of animal actions and attempts to communicate with animals, often contribute to their language development. Myers (1998) moreover stated that animals represent a potential media, which can encourage children to assume different roles that they seldom engage in their real lives.

For example, in pretend play, children might assume the role of a caregiver or imitate animal behaviors.

Nielsen and Delude (1989) conducted research which focused on kindergarten age children and suggested "animals clearly act as social catalysts that facilitated verbal interactions" (p. 128). The research further suggested that children are naturally interested in animals, and demonstrate emotional attachment behaviors such as touching and kissing.

Similarly, Rost and Hartmann (1994) provided evidence that a quarter of the children with pets in their research acted as the primary caregiver to their pets. Most of these children asserted that they have emotional attachments and close relationships with their pets, and exhibited behaviors such as talking to and playing with their pets. Covert, Whiren, Keith and Nelson (1985) studied children aged 10 to 14 years and found that younger children self-reported that they gained "responsibility, friendship, love, fun, and knowledge from their pets" (p. 107). They also found that early adolescent tended to report that their "pet was both a source of stress and used for stress reduction" (p. 107). Melson (2003) extended research by Bryant (1985) and concluded, "pet owners were as likely to talk to their pets about sad, angry, happy, and secret experiences as with their siblings" (p. 35). George (1999) wrote, "animals can teach children behaviors not easily acquired by usual learning techniques, such as the capacity to communicate nonverbally, and social behaviors such as sharing and responsibility for others. Animals can also help children to develop self-esteem, a sense of achievement, nurturing, cooperation and socialization, all of which contribute to the building of empathy" (p. 382).

Therefore, research in general, has been quite positive in supporting that interactions with pets can provide children with opportunities to experience different emotional and life experiences, which lead to enhancements in humane attitudes as well as empathic development. Through care, training and playing with animals, children can assume roles including caregiver, playmate and trainer to develop further their role-taking and perspective taking abilities. In addition, pets can also provide children with opportunities to express their thoughts and emotions.

In summary, the review of the various literature, which studied the influence of animals on children's enhancement of humane attitude and development of empathy generally support the theory that interacting with animals can provide children with opportunities to practice role taking and perspective taking abilities. In order to communicate with animals, children also gained opportunities to practice language and learn how to perceive cues through interaction. Through animals, Levinson suggested that children could be guided to progress away from egocentric thinking. This progression according to Piaget's theories on cognitive development is a necessary foundation for the development of empathy. Also through animals, children are provided with opportunities to experience different emotions, as well as to express freely their thoughts and emotions. These cognitive and emotional abilities are important elements, which Hoffman and Feshbach considered are necessary for empathic development.

Relationship between Empathy and Human-Animal Attachment

Poresky and Hendrix (1990) proposed ideas similar to those of Levinson (1972, 1978) and suggested that young children can benefit from interacting with pets in several

different ways. In addition to the development of empathy, interacting with pets can also enhance the development of social competence and cooperation. However, Poresky and Hendrix asserted the new idea that the extent of influence which pets can enhance children's positive development does not depend merely on ownership or the simple presence of pets in a home, but rather on the closeness of the bond between children and their pets. The idea was based on their research, which indicated that the closer the children were attached to their pets, the higher the level of empathy they scored.

Ascione and Weber (1996) and Vidovic, Stetic and Bratko (1999) supported Poresky and Hendrix's ideas regarding the connection between children's empathy level and their human-animal bond. Ascione and Weber (1996) used Poresky's Companion Animal Bonding Scale and found that "children's involvement with pets is positively related to their humane attitudes toward animals" (p. 193). Similarly Vidovic, Stetic and Bratko (1999) concluded that "children who scored higher than average on the attachment to pets scale showed significantly higher scores on the empathy and pro-social orientation scales than non-owners and children who scored lower than average on the attachment tom pet scale" (p. 211). Vidovic et al. was later supported by Daly and Morton (2006) who wrote, "children who have a positive attitude toward pets are more empathic than those who have negative or less positive attitude. Further children, who were highly attached to their pets also indicated a positive attitude toward pets" (p. 123).

Therefore, in general, the research, which examined the connection between animals and empathy either directly or indirectly, suggested that taking care of pets maybe related to children's empathy development. Moreover, the research also suggested that the stronger which children are attached to pets, the higher the level of empathy they

scored; thereby leading to the conclusion that the care of pets may lead to the development of empathy. However, the current research only suggested a co-relational relationship between human-attachment and empathy scores, but did not directly prove the existence of causality. As Melson (2003) suggested, "highly empathic children may have greater skill at bonding with an animal (as well as a person)" (p. 36). Therefore, it is important to further study what is the effect, if any, between greater attachment with animals and scores on empathy tests.

Age and Pet-Related Development of Empathy

Children's age is another factor, which researchers have assumed, could influence the relationship between animal pets and children's empathy (Bryant, 1985; Kidd & Kidd, 1985; Melson, Peet, & Sparks, 1991; Vidovic, Stetic & Bratko, 1999). However, there is no common agreement about which age group can show the highest empathic development through the human-animal pet attachment bond.

Kidd and Kidd (1985) showed that children progressed in empathic development toward their pets from age seven to eleven. At three years, children demonstrated egocentricity in interactions with animals, and were generally not aware of pain felt by animals. However as children progressed to age seven, they started becoming aware of their pet's feelings and showed more empathy. Kidd and Kidd (1985) reported that older children were generally capable of understanding how pets might feel in different situations and circumstances. Kidd and Kidd also found that even though older children still reported continuous mutual love with pets, the tendency of doing so, dropped among thirteen-year-olds compared to younger age children.

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Similar to Kidd and Kidd (1985), Bryant (1985) revealed, "greater reporting of intimate talk with pets was associated with higher empathy scores for the ten-year-olds, but the opposite was the case for seven-year-olds," (p. 51). Therefore, after the age of seven years, a direct correlation seems to appear between children's age with their animal attachment and empathy levels. Vidovic, Stetic and Bratko (1999) study on children and pet ownership also reported that younger age children in Grade 4 and 6 scored higher empathy levels than older age children in Grade 8.

Melson, Peet, and Sparks (1991), however, reported a contrary finding. They found that kindergarten boys and Grade 5 children showed a positive relationship in pet attachment and empathy, but Grade 2 children showed a negative correlation. Therefore, with the exception of Melson, Peet, and Sparks (1991), the other research found in this area, which examined the influence of age in children's development of empathy through bonding with animals, supported the idea that older children tend to show higher empathy and have stronger attachment to animals. However, the pattern of increasing empathy levels generally slowed around the age of thirteen years.

Sex Differences and Pet-Related Development of Empathy

Research studies have found that there are sex differences in the relationship between pet attachment and children's development of empathy. Vidovic, Stetic and Bratko (1999) suggested that girls were more attached to their pets and showed more empathy than boys. Rost and Hartmann (1994, p. 251) research of students in Grade 4 found that "girls more often wished to get one (a pet) than boys" and that girls have stronger emotional attachment to pets than boys. Melson, Peet, and Sparks (1991) also

found some sex differences and reported a negative correlation between Grade 2 boys and empathy but not girls. Another difference was found by Kidd and Kidd (1985) who concluded that boys reported less mutual love with pets than girls did. However, Kidd and Kidd suggested that boys might have the same love toward pets as girls do, but due to sexual stereotyping and the pressure to conform, they were unwilling to report it.

Although sex differences were found in pet attachment and empathy research, pets can still be consider as sex-neutral media for the development of caring behaviors. Nurturing and caring are two pro-social behaviors that relate to empathy. According to Melson and Fogol (1996) and Melson (2001, 2003) caring behaviors are often based on culture and sex. For example, women generally exhibit more caring and nurturing behaviors than males. The pattern usually starts from childhood where girls tend to take care of infant and younger siblings more than boys do. However, Melson (2001) wrote that "caring for pets, unlike caring for babies, young children, or other people, is free of the sex-role association that typecast nurturance as an essentially feminine, perhaps quintessentially feminine, enterprise" (p. 55). Rost and Hartmann (1994) also found that although girls showed stronger desire in having a pet, boys were equally capable and willing to take care of a pet. Therefore, it may be assumed that pets could be used as a sex-neutral media to encourage empathy related caring behaviors.

In summary, most of the limited research found in this field of study, concluded that there is a positive correlation between human-animal or pet attachment bond with children's development of empathy. Furthermore, the correlation appears to be influenced by the children's age. Most research supported that before age eleven, the older the children were, the more empathy they showed toward pets. However, this pattern slowed

down around thirteen years of age. Concerning sex differences, researchers have concluded that there were some sex differences pertaining to children's empathy and attitude toward pets. Nevertheless, pets and animals may still suggested as sex-neutral media in helping to facilitate the development of behaviors related to empathy such as caring and nurturing.

Relationship between Virtual Pet Animals and Children's Development of Empathy and Humane Attitudes

In today's generation, children have more opportunities to be exposed to computer-simulated virtual characters. These characters can be a part of a commercial game or educational program. Since many virtual characters were designed to interact with children, it now becomes critical to understand how they can influence children's social and emotional as well as empathic development.

Studies found which investigated the relationship between commercial virtual pets and children's development was quite limited. Some virtual pet research focused on the technical analysis of special features and functions, and attempted to understand users' motivation in interacting with virtual pets. Kusahara (2001), for example, examined several popular virtual pets in Japan such as Tamagotchi, AIBO, Furby, Postpet, and concluded that important features such as realistic figure and motion, interactivity, and autonomy were designed in consideration with human psychology in order to establish special connections between the users and their virtual pets. Kausahara further suggested that through caring and interactive activities, virtual pets could evoke the users' sense of responsibility, personal attachment, and personal bonding.

Isbister (2006) studied different types of virtual pets and suggested psychological

reasons as to why users develop a strong emotional attachment with their virtual pets:

"the objective in engaging with a pet is to enjoy the pet's development and learning and

its moments of connection and resistance to the player" (p. 233). Isbister further

suggested that the realistic interaction between users and virtual pets can "evoke high

degree of time and emotional investment from the player" and "he or she will care quite a

lot about the pet as an individual" (p. 233). Therefore, research studies have found that

players devoted time and built emotional bond with virtual pets, however, further

explanations about how virtual pets can influence children's development remain

unanswered.

In general, the research studies reported that the computer software's simulated

Although research in this area is limited, some studies were done that

investigated the effects of a computerized educational software called FearNot, which

taught anti-bullying lessons to children age eight to twelve. In this program, participant

children watched interactive scenes of virtual characters in bullying-related situations.

Then they went online in a chat room to interact with the computer-simulated victim and

provide suggestions. The curriculum design of the FearNot program requires children to

be engaged as though they were in the victim's situation. According to FearNot

developers, the "aim in FearNot is to use the empathic agent architecture that has been

developed for its characters to generate dramatic episodes from interaction, in a similar

way to improvised drama" (Dias et al., 2006, p. 249).

In general, the research studies reported that the computer software's simulated

characters were able to evoke empathic emotions among children. For example, Dias et al.

(2006) study of 345 children, age 8 to 11, found that the participants were empathetic

toward the FearNot virtual characters, and showed emotional responses such as sympathy for the victim and anger for the bully. Another FearNot research, which used both children and adult as participants, found that children tend to show stronger empathic responses to virtual characters than adults do. It was also found that girls, age eight to thirteen, were inclined to show relatively the strongest empathic reactions toward virtual characters (Hall et al., 2004).

Research by Pavia et al. (2005) also used children and adults as participants. Their results are consistent with Dias et al. (2006) and Hall et al. (2004) and supported the hypothesis that both children and adults can show empathic reactions to computer-simulated virtual characters. The results also indicated that children tend to have greater empathic reactions than adults did. Moreover, Pavia et al. (2005) further confirmed the hypothesis that girls tend to show stronger empathic reactions than boys do.

In addition to studies, which focused on FearNot, other research investigated the effects of a non-commercial, research-designed robot called Sparky that could demonstrate simulated expressions when interacting with children. The studies revealed and supported the idea that virtual characters can evoke children's emotional and empathic responses. In one research that studied the interaction of children, age four to seven, with Sparky, it was found that the children usually considered Sparky to be a real living pet animal. Moreover, it was also found that Sparky's simulated expressions of sadness or fear were able to evoke strong empathic responses among children (Scheeff, Pinto, Rahardja, Snibbe, & Tow, 2000).

Another report by Scheeff, Pinto, Rahardja, Snibbe and Tow (2002), which also used Sparky, compared adult and children's reactions to it and found that young children

typically engaged in more interactions with Sparky than adults did. Furthermore, some children showed emotional attachment to Sparky that was so strong, that they had difficulty to leave it at the end of the research. Both studies by Scheef et al. (2000, 2002) also identified sex differences among the children. In general, girls between eight years of age to early teens were more inclined to show stronger empathic response to Sparky than boys do.

Consequently, the research findings into the effects of FearNot and Sparky supported the hypothesis that virtual characters could evoke empathic response by children. These research studies also suggested that children are more likely to have emotional and empathic responses to virtual characters than adults and that girls tend to be more empathic to virtual characters than boys are. Therefore, these studies further suggested that it might be possible to design and use computer-simulated virtual character to evoke and even enhance develop empathy in children.

It should be noted that most of the research on virtual characters have been done using characters, which are a part of an educational program or research focus. There has not been sufficient research done using commercially created virtual characters, particularly their effects on children's socio-emotional development. In addition, since children are more likely often to be exposed to commercial virtual characters, it is important to have closer examination at the connection between virtual character and children's emotional and empathic development.

Children's Interaction with Virtual Pets

Virtual pets are designed to have an image and actions similar to real pets as well as responses that simulate emotions. Research has shown that users are inclined to recognize virtual pets as life-like agents, and are willing build relationships with them. Kahn, Friedman, Perez-Granados, and Freier (2004) carried out a research about preschoolers' reasoning and interaction with a robot pet dog, AIBO. They found that despite recognizing AIBO is a non-living robot, young children still believed that AIBO could feel pain. This belief discouraged them from treating the robot pet dog in ways they thought would be hurtful. The research also found that a majority of the children, again despite recognizing that AIBO is non-living, still believed that they could build a social relationship including the giving and receiving of mutual love. To support this finding, the researchers reported that the children showed affectionate behaviors toward AIBO such as "petting, scratching, kissing and embracing, even though AIBO is a metallic object" (p. 429). Consequently, this research showed that although children understood that AIBO is a non-living robot pet dog, they still treated it as though it were a real dog.

Melson, Kahn, Beck, Friedman, Roberts and Garret (2005) supported the conclusion of Kahn, Friedman, Perez-Granados, and Freier (2004) in a related research which compared children's attitudes and interactions toward a real pet dog versus that shown to AIBO. Melson et al. asked the children whether they thought AIBO is a computer or live dog, and concluded that although the children recognized AIBO is a robot dog, a majority of them believed AIBO has emotional states as well as morality and sociability. Therefore Melson et al. (2005) supported Kahn, Friedman, Perez-Granados, and Freier (2004) that children can perceive a non-living robot dog to have emotions,

morals and the capacity to establish social relationships similar to real pet animals. Consequently, computer-simulated characters have been shown to display attributes, which allow children to consider them as social agents.

However, with regards to emotional bond and interaction, research indicated that although virtual pet dogs can not totally replace real dogs, children still showed a strong emotional and physical connection to them. For example, Melson et al. (2005) found that although children spent longer touching a real dog than AIBO, "most children (80%) spent the majority of their time within arms reach of both" (pp. 1651-1652). Furthermore, according to the anecdotal report which indicated caring and empathic attitudes toward AIBO, the children often said "I would like to play with him and his ball and just give him lots of attention and let him know he's a good dog" (Melson et al., 2005, p. 1651).

Research has revealed that even though virtual pets are often displayed as two-dimensional characters on a computer screen rather than in three-dimensional physical forms such as AIBO, relationships with players can still be built. Chesney and Lawson (2007) used *Nintendogs* to determine whether virtual pet dogs can offer similar companionship as real dogs, and concluded that "a virtual pet does not offer as good companionship as a real cat or dog...[but]... a virtual pet clearly offers some companionship to most of the owners" (p. 341). Chesney and Lawson (2007) further explained that *Nintendogs* might offer some "social and therapeutic benefits comparable to real dogs but to a lesser degree" (p. 341).

It should be noted that differences in age might influence players' attitudes toward virtual pets, and that the mean age group of the participants in the research by Chesney and Lawson (2007) is older than the participants in Kahn, Friedman, Perez-Granados, and

Freier (2004) as well as Melson et al (2005). Kahn et al. (2004) focused on preschoolers, and the participants in Melson et al.(2005) were from age 7 to 15. However, the mean age of *Nintendogs* owners in Chesney and Lawson (2007) is 17 years old.

In a separate study by Lawson and Chesney (2007) the assumption that virtual pets, particularly *Nintendogs* and AIBO, can provide companionships to players was confirmed. However, the researchers suggested, "younger virtual pet owners experienced higher values of companionship with their virtual pets than older owners" (p. 1926). Lawson and Chesney further explained that younger virtual pet owners might have more emotional engagement with their virtual pets than older players might.

Empathy, Believability and Attitude toward Virtual Pets

Limited research was found which examined the relationship between players' empathic behaviors and virtual pets. However, the reviewed literature seemed to indicate indirectly that believability and the attitude toward virtual pets are related to the users' empathy and personal attitude. Dautenhahn (1999) wrote, "believability is in the eye of the observers' individual personality, naïve psychology and empathy mechanisms" (p. 3). He concluded that players' conception as to whether virtual pets are believable does not depend on the computer-simulated characters' realistic responses and behaviors, but rather on their "subjective perception and interpretation of the artifact and the context the artifacts is behaving in, as well as on the social and cultural context in which the person is living" (p. 3). Consequently, virtual pets do not appear alive by themselves; instead, their believability is perceived through interactions with the users resulting in their simulated responses becoming understandable and meaningful.

Dautenhahn (1999) further wrote that "cyber-pets are not 'complex' (or 'intelligent') in themselves. What makes them special is the fact that they exhibit interesting behaviors only in the interaction space of agent and user" (p. 5). Frank, Stern and Resner (1997) provided a similar idea, with an earlier claim that: "lifelike computer characters are ultimately perceived through the filter of human interpretation. No computer character can be perceived as truly alive and intelligent unless its builders always keep in mind what the final user will perceive" (p. 6).

Empathy has an important role in social interaction and understanding. The components involved in promoting social understanding are empathy and a "biographic reconstruction which enable the empathizing agent to relate an agent to biography 'story' which help to interpret and understand social interaction" (Dautenhahn , 1999, p. 2). Similarly, users also understand and interact with virtual pets in ways that are comparable to ways in which they would treat real pet dogs and even other people, as well as in ways they would like to be treated. Therefore, Dautenhahn concluded that virtual pets "are examples of how humans view and interact with the (social) world, how they are biased to interpret the world in terms of intentionally" (1999, p. 6).

The idea of biographic reconstruction to assist with interpretation and understanding of social interaction was supported by Frank, Stern, and Resner (1997) with their stated goal behind the creation of Petz. They claimed to want users to explore the characters in any way or pace that they liked. They believed that the flexibility would enable "users to come up with their own interpretation of their pet's feelings and thoughts" (p. 2). In thus doing, users could project their daily life concerns in their interaction with virtual pets. As Dautenhahn (1999) indicated, "users are inclined to

become socially bonded to believable agents, but in the case of virtual pets this can mean that humans adapt their daily routine to cyber-pets welfare concerns" (p. 4).

Criticisms About Virtual Pets

Virtual pets are designed to interact, build relationships and even emotional bonds with users of this technology. However as adults started to believe that virtual pets can have an educational function in encouraging children's nurturing behaviors and sense of responsibility, educational scholars began to criticize virtual pets and speculate on potential problems. Some of potential problems concerned children's social, emotional and cognitive development.

First, games that simulated life tended to over-simplified realistic living situations such as the animated character's unrealistic life spans and impractical social interactions. Some virtual pets have a very short life span whereas others can never grow old, uncharacteristic of living organisms. Bloch and Lomish (1999) argued that "changes in Tamagotchi's occur within a far more limited life span than they tend to for pets or human in reality." Furthermore, "needs are overt, and response are one kind (i.e., pressing the required bottom)" (p. 299). Therefore, interactions become unrealistically over-simplified. Kritt (2000) raised a similar dispute. He claimed that "instead of the complex, nuanced, and protracted sequence of watching an animate being (baby or pet) grow, the virtual pet provides only schematic change in a visual icon display" (p. 81). Therefore, the significant "human aspects of interaction and relationship are much diminished" (p. 81).

Second, there is a potential problem in encouraging temporary and unrealistic relationships. Bloch and Lomish (1999) explained that the ability to end and restart the simulation game in the cycle of play enables users "more chances to create life and develop temporary relationship" (p. 300). In real life situations, it may be more difficult or even impossible to just end relationships with the push of a button and then restart a new cycle. With the reset button, where strong attachments and relationships can be eliminated and restarted immediately, ideas such as love, life and cultivation may become de-valued.

Kritt (2000) questioned the significance of what virtual pets can teach children as well as the emotional bond that they can foster. Unlike human emotion, the way that virtual pets process emotion is based on a pre-programmed set of responses to information. Kritt (2000) wrote: "virtual pet employs a scientifically-based cybernetic representation which abstracts emotion to its informational components. This technological depiction of emotion has become ubiquitous, and provides a powerful metaphor for reconfiguring popular conceptions of emotion" (p. 84). Therefore, the concept of emotions which children develop based on interacting with virtual pet could be considered unrealistic. It may also challenge children's existing ideas of emotions and feelings.

Emotions and feelings are complicated human processes. However, simulated emotions and feelings expressed by virtual characters are synthetically designed and programmed. They may also be logically predicated or follow some easily predictable pattern that is unlike real life situations. Consequently, criticisms have been raised that children might gain a superficial understanding of emotions and feelings by interacting

with virtual pets. Criticisms have been further raised that even if children can develop empathy through interactions with virtual pets, those concepts may lack depth and quality. Turkle (2005), in her studies of children's interaction with computer, summarized the concerns by stating:

> Thought and feeling are inseparable. When they are torn from their complex relationship with each other and improperly defined as mutually exclusive, the cognitive can become mere logical process, the cold, dry, and lifeless, and the affective is reduced to the visceral, the primitive, and the unanalyzeable. The child's sharpened distinction between intellect and emotion can easily lead to a shallow and sentimental way of thinking about feelings (p. 64).

Third, it has been contended that virtual pets provide confusing ideas to young children. Bloch and Lomish (1999, p. 300), for example, suggested that virtual pets can create confusion among several topics including what is the subject and what is the object (i.e., who is manipulating whom). In traditional games, the relationship between player and game was clear; it was the player who controlled the actions of the game characters. The blurring of identification between human users and game characters was also described by Kritt (2000). He claimed that "the dual nature of virtual pets as both machine and pet might lead to some practical confusions (p. 81)," including questions of control and obligation.

Other topics of confusion relates to the difference between carefree play and responsible commitment. At one time, play was considered open-ended, and distinct from being responsible. Now the line between play and responsibility is blurred, with play

becoming close-ended because there is a requirement of responsibility. Another topic of confusion with the introduction of virtual pet is the difference between life and technology. People may become unsure and assume that technology can be alive because it displays living characteristics. Consequently, traditional caring for living organisms may also be confused with technological maintenance.

Therefore, in recognition of the criticisms suggested, and the realization that many simulation games are designed for children's play, the "potential socializing effects should be considered" (Bloch & Lomish, 1999. p. 300). Moreover, as Kritt (2000, p. 83) stated, "as a fetishistic fad, the virtual pet is harmless, but as a participant in a prototypic relationship, it is questionable."

Conclusion

Research studies into the socio-emotional effects of virtual pets on children's empathic development and humane attitudes have been limited. So far, none has been found which conclusively proved that virtual pets could be used to enhance directly children's development of empathy. However, when the effects of interacting with real pets are examined, some research studies have concluded that interacting with real pet animals can provide opportunities, which may be able to enhance children's empathic development. Furthermore, research studies have also shown that children are capable of building positive social and emotional connections with virtual characters.

Consequently, if virtual pets can be successfully programmed to imitate the behaviors of real animals' behaviors and characters, it might therefore be hypothesized that virtual pets can serve as a medium to enhance children's socio-emotional

development. Research studies have found a positive correlation between pet-attachment and empathy development. Studies have also found that children were able to build social relationships, companionship and to form caring attitudes toward virtual pets. However, criticism and questions were raised regarding the type of impact and effects that virtual pets could have on young children. Therefore, it is necessary to conduct further research to determine what, if any, effects virtual pets can have on children's socio-emotional development.

Furthermore, whether virtual pets can equally influence the empathic and emotional development between both sexes is another important issue. Real pet animals have been suggested by Melson (2003) as a sex-neutral medium in enhancing empathic related behaviors such as caring. However, other researchers have found sex differences in children's interaction with pets (Kidd & Kidd, 1985; Vidovic, Stetic & Bratko, 1999). Therefore, there is also a need to examine sex differences when investigating children's emotional and empathic development through the interaction with virtual pets.

CHAPTER THREE

RESEARCH METHODOLOGY

In this chapter, the procedures involved in this investigation are described. This includes the background information of participants, school, research settings, as well as the rationale for choosing the particular computer game used in the research. The researcher will also describe the measurement tools which were used in this research as well as explain the procedure of data collection and data analysis.

Consent and Recruitment Procedure

Consent to conduct this research was granted through the researcher's academic senior supervisor, Dr. David Kaufman, Simon Fraser University Professor in the Faculty of Education. Consent was also granted by: (a) 52 children who acted as the participants in the study, including the 15 children in the pilot study; (b) the parents of the 52 participants, including the parents of the 15 participants in the pilot study; (c) the school Principal and the school district Associate Superintendent of the elementary school in which the study took place. Consent was also granted by the Simon Fraser University Department of Research Ethics after a review of the intended procedures, instruments used in this research, as well as the communication devices such as orally transmitted messages and written information letters and consent form used for communicating with and obtaining the participation of the children in this study and their parents.

Confidentiality

Confidentiality was maintained in this research. The participants' actual names were not reported in any publication or presentation. To ensure participant confidentiality, the researcher assigned each participant a code number. Only the researcher had access to the name and code match list. The list was destroyed after the research project was completed.

Recruitment Process

The recruitment process was initiated after permission to conduct research was granted by the Simon Fraser University Department of Research Ethics and the Surrey School District Department for Research and Evaluation.

After receiving permission from the university, school district and school, students in Grades 4 and 5 in a public elementary school were invited to voluntarily attend an information session about participating in the university research project. The students were informed that, to control for potential influences on their empathy or attitude towards animals, only those who do not own a dog or have not played *Nintendogs* are eligible to participate. Owning other pets, such as a cat, did not disqualify students from participating based on the literature (Daly & Morton, 2006) that showed a strong relationship between owning a dog (but not a cat) and empathy. If the students were still interested and eligible to participate, they could take home an information letter and consent form that needed to be signed by them as well as their parents or guardians. The letter and consent form (See Appendix A) described the purpose of the research and the tasks which the participants would be involved, as well as the right to withdraw from

the study. The consent form further acknowledged that the children who were interested in participating did not own a dog or had not played *Nintendogs*.

Setting

This research study took place in a typical public elementary school in Surrey, a suburb of Vancouver in British Columbia, Canada. Socio-ecomonically, the school is located in a multicultural working class neighborhood where a majority of the participants' parents had immigrated from another country. In order for the research to take place at the selected school, it had to meet the following research conditions:

1) The school was not directly implementing any specific curriculum for empathy development during the time when the research took place, in order to prevent the results from being affected by extraneous variables that are not related to the experimental treatment and procedure. That the school met this condition was based on discussions between the researcher and the teachers and principal of the school regarding curriculum and initiatives within the school regarding empathy and other aspects of social responsibility.

2) The school needs to have a sufficient student population to enable the recruitment of participants from Grade 4 and Grade 5. In this case, the school had 49 students in Grade 4 and 59 students in Grade 5, for an initial total potential of 108 participants.

3) The school is located in an urban area where there may be relatively fewer opportunities for children to interact with animals, as compared to schools in more rural areas.

Participants

For this investigation, the researcher limited participation to normally developing children who met a particular profile. Based on discussion with the teachers, none of the children had any language difficulties or identified special need such as cognitive, emotional or physical impairment which would prevent from fully participating in the research which included following instructions, answering verbal and written questions and playing the *Nintendogs* game.

To control for potential influences on the development of empathy or humane attitude, only those children who do not own a pet dog or have previous experience playing *Nintendogs* were eligible to participate. It was assumed that presently owning a pet or having already played *Nintendogs* may affect potential participants' interaction and emotional responses.

Second the participants were limited to children who were age 9 to 11 years in Grades 4 and 5. Research has found that differences in children's age can affect the level of empathy as well as the relationship and ways of interacting with pet animals (Bryant, 1985; Kidd & Kidd, 1985; Melson, Peet, & Sparks, 1991; Vidovic, Stetic & Bratko, 1999). Kidd and Kidd (1985) suggested that children generally progressed in their empathic development toward pets from age 3 to 11. Bryant (1985) revealed that 10-year old children, in general, usually had higher empathic scores relative to younger age children. Bryant also found that 10-year-old children, compared to younger children, usually had greater emotional attachment to pets through interactions such as talking to animals despite the animals' inability to understand or verbally respond in ways similar to other human beings. Vidovic, Stetic and Bratko (1999) study on children and pet

ownership reported that children in Grade 4 and 6 had scored higher levels of empathy scores than younger children in Grade 2, but the pattern of increasing empathy levels however slowed around Grade 8.

In recognition that differences in age might be able to affect children's development of empathy through bonding with animals, the researcher decided to establish a base of consistency among the participants and limited the range of participants to those who were 9 to 11 years, with a mean of approximately 10 years of age. Also, in order to independently play with the research game including understanding the written directions involved in the game, the researcher assumed that young children might have greater difficulty, and for this reason wanted to have participants who were at least 9 years of age. Another rationale for setting a minimum age limit of 9 years was because the researcher also assumed that young children might have greater difficulty with fine motor control in manipulating the game stylus, which was important for interacting with the virtual pet dog.

Out of a potential sample population of 108 students in Grades 4 and 5, from five separate classes in the school, fifty-two participants ranging in age from 9 to 11 years initially participated in the study. Out of the 52 participants, 15 participants were members of the pilot study and only completed the pretest and posttest. Thirty-seven children participated in the repeated measures study. Out of the 52 participants, one child withdrew from the study, citing a lack of time in playing the game as the reason for the withdrawal. With the exception of the one participant who withdrew, the rest of the 36 participants completed the repeated measures study (see Fig.1- Research Design)

including writing the original test, pretest and posttest. The participant, who withdrew, only completed the original test and the pretest, but not the posttest.

This research included an examination of sex differences, and children of both sexes were eligible and invited to participate. The number of boys and girls who volunteered to join the research was fairly equal in both the pilot study group and the repeated measures study group. In the pilot study group, 7 participants were boys and 8 were girls. In the repeated measures group, 17 participants were girls and 19 participants were boys, not including the one participant who withdrew from the research. The total sex profile of the participants is 26 boys and 25 girls.

The researcher determined the ethnic background of every child in the study from their teachers. Of the original 51 participants, approximately 78% (n = 40) were of South Asian (Indian), Caribbean or Asian descent including Filipino, Vietnamese, Korean and Chinese. The rest, approximately 22% (n = 11) were of Caucasian or mixed First Nations (Aboriginal) descent. All the participants met the research condition of being able to communicate (i.e., listen, speak, read and write) in English. These language skills were necessary to understand and follow instructions as well as to answer verbal and written questions.

According to the participants, none of them prior to the study either had played or had owned the game *Nintendogs*. The participants further reported that neither they, nor their families, owned a dog during the research study. Eighteen of the participants did report, though, that their family has owned a dog in the past.

Since the participants were from five different classrooms in the elementary school, five elementary teachers were also indirectly involved. One of the teachers

volunteered to assist with this research study by supervising the students in the classroom during recess and lunch breaks when the researcher met with the participants. The teacher also helped to administer the group pre- and post-tests by handing out and collecting the tests. He also reminded the participants to complete and bring the weekly virtual pet interaction log on the due dates. None of the teachers instructed the participants how to play *Nintendogs* or provided any empathy lessons during the research period. None of the teachers scored the pre- and post- tests, and did not refer to the participants' results on empathy and attitudes test scores, including in the calculation of the participants' school academic report card. Furthermore, no participant was given extra credit on his or her report card for participating; and the decision to participate, not participate or withdrawal from the research study did not affect the children's record of academic performance in anyway.

As a token of appreciation for submitting the weekly virtual pet interaction log and for completing the pretest and posttest, a small non-monetary gift such as candy, pencil, eraser and pen were given. Also a pizza party was given at the conclusion of the research, which served as a goodbye for their virtual pet dog. During the information session for interested participants and prior to the beginning of the research, all of the participants were informed that small gifts would be given during and at the end of the research to thank them for their participation. Furthermore the participants were told that it was necessary for their virtual pet dog to go to new owners where they would be nurtured.

Administration of Pre and Posttests

The tests and interviews were conducted during recess and lunch breaks, as well as at other times approved by the participants' classroom teachers, such as independent reading time immediately following lunch. In discussion with the school principal, it was felt that recess and lunch breaks were best to avoid interrupting the participants' in-class learning. After school was not a viable option because many students had an expected routine of being escorted home by parents or older siblings. Furthermore, the principal preferred that students of the intended participants' ages go home promptly after dismissal for safety reasons.

Prior to the administration of the test, all of the participants were informed that the questionnaires were not academic exams, and that their purpose was to help understand the students' personal opinions. Furthermore the participants were informed that the results would not affect their academic standing and that their teachers and parents will not see their answers. However, the participants were told to do their best by taking their time to read and think about each question before putting down an answer which they independently and honestly felt to be the true. The participants were also informed to check their answers when they were finished and that changing answers was allowed. To discourage the participants from quickly completing the questionnaires carelessly, they were further informed that there would be no early dismissal since each test would require the entire 30 minute break. In appreciation for their time, the participants were told that they would be given a small gift such candy or a pencil at the end of the session.

In previewing the Intermediate Attitude Scale, the researcher identified several words (e.g., abandon, roam, preserve, canary, habitat) which could be difficult for some children to understand. To ensure that all participants understood these words, they were defined before the start of the test. The researcher also informed the participants that some questions were negatively phrased and to be aware of the word "not" in a sentence. Then the researcher followed the outline for administrating the test according to the instructions given by the developer (Ascione, 1988). This includes reading each sentence and allowing time for all the participants to answer before continuing with the next question. If the participants were not sure what a word meant, they could raise their hand and receive help.

Research Design

The research employed a mixed method approach, i.e., used both quantitative and qualitative methods. Quantitatively, a quasi-experimental pretest/ posttest repeated measures design was used in which the researcher administered and scored the same measurement instruments to the same group of participants twice (original test and pretest) before the experimental treatment and once (posttest) afterwards (Shadish, Cook, & Campbell, 2001). Members of the pilot study group did not receive the original test, but like the repeated measures study group, did receive the pretest prior to the introduction of the experimental intervention as well as the posttest immediately following the removal of the treatment.

The rationale for choosing a repeated measures design was:

(a) the practical difficulties of recruiting an independent control group of the same number as the experimental group with the same background would not have been possible.

(b) repeated measures designs are commonly used in educational studies to identify students' progress under various learning conditions (Lindsey, 1999);

(c) the research was conducted in a school setting during school hours, and the researcher needed to avoid interrupting the participants' regular learning schedules;

(d) the participants are young, and the researcher needed to consider the number of times that it was possible to meet with them as well as the duration of research. Since the research time occurred during recess and lunch, it was anticipated that having too many meetings and tests over a long period of time might cause some participants to lose interest and withdraw from the research.

For these reasons it was concluded that a repeated measures design would be the most effective means of conducting the research under the particular circumstances.

In addition to the analysis of quantitative data, this research study also collected and analyzed qualitative data. Qualitative analysis was primarily used for answering the research question addressing the attitudes and feelings children have regarding a virtual pet dog. Based on this research question, semi-structured interview questions were asked of the participants based on questions from a questionnaire (see Appendix F) with the interview data collected using audio tape recording supplemented with handwritten notes.

The qualitative methodology in this research study followed Schmidt's guidelines on the analysis of semi-structured interviews (Schmidt, 2004). There were two primary

reasons why semi-structured interviews were conducted. First, the participants were young (age 9 to 11 years). Consequently, it was anticipated that they might need some assistance to elicit their true feelings, through conversation, about the virtual pet dog. Second, the interviews were conducted during scheduled recess and lunch breaks so as not to interfere with the students' regular learning and routines. Consequently, the available time was not sufficient for entirely open-ended conversations. Therefore, although the interviews were partly structured, it still allowed participants to express their personal ideas, feelings and opinions.

The steps in the semi-structured interview analysis were the following: First, categories that corresponded to the interview data were formed. This required the researcher to examine the interview data and identify patterns related to the research questions. The researcher re-examined the patterns and organized the patterns into categories. Next, for validity, a reader (a teacher in the school) checked some randomly selected anonymous transcribed statements and also organized the patterns into themes. The similarities and differences of the identified themes were then compared with those of the researcher. After discussion, the researcher reorganized the themes with the reader and formed the "analytical categories" (Schmidt, 2004, p255).

Second, the researcher developed an agreed definition of the categories and formed a guideline for analysis and coding. The usability of the coding guidelines was tested with some randomly chosen interview data. According to Schmidt (2004) the categories can be refined and changes made to the guidelines.

Third, each interview data was coded according to the coding guidelines. For additional validity, the researcher randomly divided the interview transcripts into three

groups. After coding the first group, the researcher and the reader compared the similarities of the coding. After adjusting for differences, the researcher and reader continued to code and compare the second and third groups. The reliability (i.e., inter-rater agreement) was reported according to the guidelines presented by Miles and Huberman (1994, p. 64). The reliability of the first group was 73.6%, the second group was 82.6%, and the third group was 93.3%.

In the final steps of semi-structured analysis, the researcher summarized the data quantitatively. The coding results were then interpreted and used for responding to the research question.

Observational Duration

The research included two parts, a pilot study and a repeated measures study. The data collection for the pilot study was completed in a four week period from May to June in 2007. The data collection for repeated measures study was completed in an eight week period from November 2007 to January, 2008. To avoid interrupting the participants' learning in class, the testing, interviews, and instructions were conducted during recess and lunch breaks. Due to the time required for checking the game and interaction log, the researcher was only able to meet with approximately three to five students per day. This necessitated the researcher to be at the school approximately four days each week and five days during the last week when interviews were conducted with individual students.

Pilot Study

In the pilot study, fifteen participants each completed the empathy pretest (See Appendix B) and humane attitude pretest (See Appendix C) immediately prior to the introduction of the experimental intervention of interacting with a virtual pet dog.

After completing the pretest, the researcher gave lessons to students on how to play the research game, *Nintendogs* and how to use the research game machine, *Nintendo DS Lite*. The lessons included instructions on how to set up the game including the selection of a virtual pet dog. The lessons also included fundamental instruction on how to interact with the virtual pet dog including the provision of care and training. After that, each participant was loaned a *Nintendo DS* game machine and *Nintendogs* game cartridge for three weeks. Although the participants were asked to play with the game at least once each day if possible, they could decide the amount of time (i.e., duration) and how to play (i.e., interaction) with it. Participants were also asked to complete a virtual pet weekly log (See Appendix E) which recorded their play duration, type of interaction and activities which they engaged in with their virtual pet dog. The researcher met each participant, once per week for approximately ten minutes, for three weeks to collect and confirm the weekly log.

After three weeks of interacting with their virtual pet dog, the participants completed empathy and human attitude posttests identical to the pretests. The participants also completed a questionnaire, which assessed their level of companion animal bond (See Appendix D). At the end of the post testing, the researcher interviewed each participant regarding their attitude and thoughts about their virtual pet dog based on a set of interview questions (See Appendix F).

The researcher, in consultation with the academic senior supervisor, decided that a three-week interaction period would be of sufficient duration for the children to become familiar with the game and establish a connection, if any, with their virtual pet. Furthermore, it was also assumed that a period of three weeks would not be an excessive burden on children's time during recess, lunch or after school.

Although the participants could withdraw from participating at any time during the study, none of the participants did so in the pilot study. To encourage continuance in this study, a small non-monetary incentive (e.g., candy or pencil) was given each week when the interaction log was collected. Also, a pizza party was given at the conclusion of the study to the children in appreciation of their participation.

Repeated Measures Study

Due to the large number of participants (N=36) in the repeated measures study group, the researcher decided to divide the participants into two manageable smaller sized groups. The data from the first repeated measures study group was collected during November and December, 2007. The data from the second repeated measures group was collected during December and January, 2008. The data from both groups were collected over a period of eight weeks.

Different than the pilot study group, the repeated measures group used repeated measures with two identical sets of pretests separated by three weeks to measure any changes in student's empathy and humane attitude without the experimental treatment and determine the test-retest reliability of the instruments. The first set was termed "original test" and the second set was termed "pretest." Similar to the pilot study group,

the participants in the repeated measures group were introduced to the features and functions of *Nintendogs* immediately after the pretest, and then loaned the game cartridge and *Nintendo DS* system for three weeks. Once each week for three weeks, the researcher met with the participants to collect and confirm the weekly log. At the end of three weeks, the participants completed the empathy, attitudes posttests and companion animal bond questionnaire. The participants were then interviewed regarding their feelings, attitudes and ideas about interacting with their virtual pet dog.

The data from original tests, pretests and posttests, weekly log, questionnaire and interview from both pilot and repeated measures groups were used to examine the effect of taking care of a virtual pet dog on children's development of empathy as well as their attitudes concerning the humane treatment of animals. Figure 1 below illustrates the research design.

	O1		O2	X	O3
Duration		3 weeks		3 weeks	
Test	Original Measure	No intervention	Pretest Measure	Intervention	Posttest Measure
Number of Students	$n = 36$		$n = 36$ plus 15 (pilot)		$n = 36$ plus 15 (pilot)

Figure 1: Research Design

Research Game Software

The game software used for the research is *Nintendogs* which operates on the handheld game console *Nintendog DS Lite* that consists of dual LCD screens, of which one is touch sensitive and equipped with a stylus for interacting with the dog. The game

console also has a built-in microphone and wireless system. The inclusion of a touchable screen, microphone and wireless system allow users to have a variety of possible means to interface while playing the virtual pet game. There are other virtual pet games available for sale, but *Nintendogs*, was selected for this research for several reasons.

First, as a product that is around three years old, *Nintendogs* is recent and more innovative in design, image, interaction and activities especially when compared to earlier generation virtual pet games such as the Tamogotchi. The virtual pet dog in *Nintendogs* has been programmed to appear and behave in a more animated and realistic manner. Also, compared to simple products where the game was played by pushing buttons, *Nintendogs* players can interact with their virtual pets in more sophisticated ways, including by speaking through the microphone or using the stylus to contact the touch screen. The contact can simulate various actions such as washing the pet and holding its leash while going for a walk.

Second it is important that the virtual pet game have realistic interactions, images and activities. One assumption of this research is that real animals may be able to enhance children's empathic development because they can provide children with opportunities to engage in different roles and situations. In thus doing, real pet animals can encourage the expression and experiencing of various emotions and responses. Therefore in order for virtual pets to have the similar capability of helping to enhance children's empathic development, they too should be able to provide children with opportunities to engage in different roles and situations.

Compared to other virtual pet games, *Nintendogs'* level of sophistication in terms of its programmed features and functions is better able to simulate some of the

characteristics, images and behaviors of real animals. For example, *Nintendogs* allows users to engage in various activities that simulate interactions which previously could only occur between a person and a real pet. These activities include washing the dog and providing food and water which allow children to assume the role of caregivers. Similarly, being able to call verbally the virtual pet dog through the built in microphone, and training it, encourages children to communicate more with their *Nintendogs*.

Furthermore, the virtual pet dogs of *Nintendogs* were technically designed to have different personalities. Consequently, the players' efforts do not always result in the same outcomes, which make the virtual pet game unpredictable and therefore more like real life rather than a game with a linear progression from start to finish. In thus doing, the experience, facilitated through the playing of *Nintendogs*, may be able to arouse different types of emotions and reactions.

Another reason why *Nintendogs* was chosen for use in this research is because it has been a best-selling virtual pet game for many years that has won numerous awards. Although there are other virtual pet products on the market, *Nintendogs* is one of the best sellers. Since its first release in Japan in 2005, *Nintendogs* has successfully been sold and set sales records in Japan, Europe and North America. As a result of its popularity, more children and adults have become exposed to *Nintendogs* and even played this virtual pet game for themselves (Carless, 2005; Jenkins, 2005; Nintendo World Report, 2005).

Nintendogs has also received positive recognition and won numerous technical, entertainment and even social awards. This list includes Best Animal Friendly Video Game, Best Technology, Best Interactive Achievement Game (AIAS, 2008; Game Developers, 2008; PETA, 2008). Consequently, believing that it is important to select a

virtual pet game that is currently popular and therefore could have the potential to affect a greater number of people more than other virtual pet games, the researcher also chose *Nintendogs* based on its high level of sales and positive acclaims.

Research Instrumentation Tools

1. *Bryant Index of Empathy for Children and Adolescents* (Bryant 1982) - The 22-item binary scale was designed to assess human empathic tendencies in children, and has been used in other companion animal studies with children (Bryant 1985; Malcarne 1986 in Ascione 1992). Both convergent and discriminant validity have been demonstrated. The reported coefficient alphas range from .54 to .79 (Bryant 1982). The range of possible scores is from 0 to 22 with higher scores reflecting greater empathy (See Appendix B). Bryant's Index was chosen for the research because the index had been used in other relevant research studies, and was designed for the age group of the children in this study.

2. *Intermediate Attitude Scale* (Ascione 1988) - The original 36-item Likert scale was designed to measure children's attitudes toward the humane treatment of animals. The scale was planned for use with third, fourth, fifth and sixth grade students in companion animal studies. It contains statements that a child can strongly agree, agree, disagree, or strongly disagree. For each item, the most humane choice is worth four points and the least humane is worth one point. The range of possible scores is from 36 to 144. The reported coefficient alpha is .70, and the validity has been demonstrated (Ascione & Weber, 1996). Since the

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original Intermediate Attitude Scale does not contain a neutral opinion selection, "undecided" was added in this study and the four-point scale was converted to a five-point scale. Participants who chose more than one answer or did not choose any answer were included in this calculation. After this change, the range of possible scores is from 36 to 180 (See Appendix C).

3. Companion Animal Bonding Revised Scale - The original eight-item Companion Animal Bonding Scale (CABS) (Poresky, Hendrix, Mosier & Samuelson, 1987) is a self-reported measure that was designed to look at the quality of the relationship or social interaction between the child and pet. The scale total score is the sum of the item responses with always (5), generally (4), often (3), rarely (2), and never (1). Since some of the items in the original CABS did not correspond to the virtual owner- pet relationship, the scale was revised into the Companion Animal Bonding Revised Scale. Three irrelevant questions were removed: (1) How often did your companion animal sleep in your room? (original item) and How often did you keep your Nintendog in your bedroom instead of other places in your home? (revised item) (2) How often did you travel with your companion animal? (original item) and How often did you travel with your Nintendog? (For example, did you take your Nintendog when you went to other places such as school or to a friend's or relative's home? (revised item) (3) How often did you sleep near your companion animal? (original item) and How often did you sleep with your Nintendog? (revised item e.g., did you put your Nintendog in your bedroom or near you when you were sleeping? (See Appendix D).

4. Virtual Pet Dog Interactions Weekly Log- This self-reported checklist was developed to help children record how they played, interacted with and responded to the virtual pet dog including the approximate minutes of play per day as well as the types of play and care given (See Appendix E).

CHAPTER FOUR

FINDINGS

In this chapter, the researcher will present the findings from quantitative data collection and analysis using a repeated measures design. Subsequently, findings from the qualitative data collection and analysis from the semi-structured interviews will be presented. Finally, the results from both quantitative and qualitative analysis will be synthesized for further discussion.

Quantitative Data Findings

Participants

There were 36 Grades four and five students who completed the empathy and attitude questionnaires at all three points in the study (original, pretest, posttest). An additional 15 students participated in the second and third administration (pretest, posttest) of the questionnaires.

Reliability Coefficients

The internal consistency reliability (Cronbach's Alpha) of the Bryant Empathy Index questionnaire for the multiple administrations ranged from .68 to .73 (See Table 1), which is marginally acceptable. The internal consistency reliability of the Intermediate Attitude Scale questionnaire for the multiple administrations ranged from .52 to .67 (See Table 1), which is considered to be lower than desirable. Finally, the Companion Animal

Bonding Revised Scale consisted of only the Posttest, and the Alpha coefficient ranged

from .42 to.46 (See Table 1). This value of alpha in this study is considered lower than

the value reported for high school and college students of .82 and .77 respectively

(Poresky et al, 1987).

Table 1
Reliability Coefficients (Alpha)

Instrument	Original test (org)	Pretest (pre)	Posttest (pst)	Mean of alpha coefficient
BI (n = 36)	.68	.69	.68	.68
BI (N = 51)	X	.72	.73	.71
IAS (n = 36)	.52	.56	.67	.58
IAS (N = 51)	X	.56	.62	.56
CABS (n = 36)	X	X	.42	.42
CABS (N = 51)	X	X	.46	.46

Research Questions

Question 1: Can playing and interacting with a virtual pet dog help promote children's development of empathy?

Empathy Scale

The Bryant Empathy Index (Bryant, 1982) was used for measuring the

participants' level of empathy before and after the experimental intervention of the virtual

pet dog in order to determine whether any changes in empathy score occurred after the

treatment. The paired sample t test of the Bryant Empathy Index- Original (BIorg) and

the Pretest (BIpre) of the participant group (n = 36), prior to the experimental

intervention, indicated that the mean score remained relatively stable (See Table 2). The

mean score for BIorg was (M = 13.78, SD = 3.55) and for BIpre (M = 14.03, SD = 3.61).

The paired *t* test was not statistically significant, $t(35) = .61, p = .54$. The test-retest

reliability (Pearson Correlation Coefficient) between BIorg and BIpre was .77 ($n = 36$;

$p = .00$).

After playing and interacting with the virtual pet for three weeks, paired sample

statistical analysis showed that the posttest empathy score ($M = 15.78, SD = 3.56$) on the

Bryant Empathy Index (BIpst) for 51 participants increased an average of 1.86 points

from the pretest score ($M = 13.92, SD = 3.66$) on the 22-item questionnaire test (See

Table 2). This result was statistically significant, $t(50) = 4.53, p = .00$. In the group of 36

participants who completed the questionnaire at all three points (original, pretest,

posttest), the participants' empathy score increased an average of 2.33 points from the

pretest score ($M = 14.03, SD = 3.61$) on the same 22-item questionnaire (See Table 2).

The result was statistically significant, $t(35) = 5.30, p = .00$

Table 2 Paired Sample *t* Test for Empathy Original vs. Pretest and Pretest vs. Posttest						
	Scale	N	Mean	SD	t	p
Pair 1	BIorg	36	13.78	3.55		
	BIpre	36	14.03	3.61	.61	.54
Pair 2 (same participants as pair 1)	BIpre	36	14.03	3.61		
	BIpst	36	16.36	3.18	5.30	.00
Pair 2 (all participants)	BIpre	51	13.92	3.66		
	BIpst	51	15.78	3.56	4.53	.00

Influence of Previous Pet Experiences

Thirty-three participants reported that they had never owned a dog and 18

participants reported they had owned a dog prior to joining the research, but not during

the actual study. The participants without previous dog owning experience included seven students in the pilot study group who only completed the Pretest (BIpre) and Posttest (BIpst). The remaining eight students in the pilot study had previous dog owning experience, and like participants who did not have previous dog owning experience, only completed the Pretest (BIpre) and Posttest (BIpst).

The paired sample t test of the Bryant Empathy Index- Original (BIorg) and the Pretest (BIpre) of the participant group who never owned a dog ($n = 26$) indicated that mean score remained relatively stable prior to the experimental intervention of the virtual pet dog (See Table 3). The mean score for BIorg was ($M = 13.62, SD = 3.51$) and for BIpre was ($M = 14.08, SD = 3.77$). The paired t test was not statistically significant, $t(25) = 1.02; p = .32$.

After playing and interacting with the virtual pet for three weeks, paired sample statistical analysis showed that the posttest empathy score ($M = 16.09, SD = 3.64$) on the Bryant Empathy Index (BIpst) for 33 participants increased an average of ($M = 2.00$) from the pretest score ($M = 14.09, SD = 3.52$) on the 22-items questionnaire test (See Table 3). The result was statistically significant, $t(32) = 4.44, p = .00$.

The paired sample t test of the Bryant Empathy Index- Original (BIorg) and the Pretest (BIpre) of the participant group who did have previous experience in owning a dog (n = 10) indicated that the mean score remained relatively stable prior to the experimental intervention of the virtual pet dog (See Table 4). The mean score for BIorg was ($M = 14.20, SD = 3.80$) and for BIpre ($M = 13.90, SD = 3.32$). The paired t test was not statistically significant, $t(9) = .36, p = .75$.

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After playing, interacting with and responding to the virtual pet for three weeks, paired sample statistical analysis showed that the posttest empathy score ($M = 15.22$, $SD = 3.42$) on the Bryant Empathy Index (BIpst) for 18 participants increased an average of ($M = 1.61$) from the pretest score ($M = 13.61$, $SD = 3.99$) on the 22-items questionnaire test (See Table 4). The result was not statistically significant, $t(17) = 1.92$, $p = .07$.

In comparing the results of the paired sample t tests of the groups with and without previous dog owning experience, it was found that the experimental intervention of a virtual pet dog had a significant difference on the group of participants who did not have experience owning a dog before. However, the group that had previous dog owning experience did not show a significant difference after the three-week experimental intervention of a virtual pet dog.

Table 3 Paired Sample t Test for Empathy Original vs. Pretest and Pretest vs. Posttest (without dog experience)						
	Scale	n	Mean	SD	t	p
Pair 1	BIorg	26	13.62	3.51		
	BIpre	26	14.08	3.77	1.02	.32
Pair 2	BIpre	33	14.09	3.52		
	BIpst	33	16.09	3.64	4.44	.00

Table 4 Paired Sample t Test for Empathy Original vs. Pretest and Pretest vs. Posttest (with dog experience)						
	Scale	n	Mean	SD	t	p
Pair 1	BIorg	10	14.20	3.80	.36	.75
	BIpre	10	13.90	3.32		
Pair 2	BIpre	18	13.61	3.99	1.92	.07
	BIpst	18	15.22	3.42		

Question 2: Can playing and interacting with a virtual pet dog help promote children's development of positive humane attitudes toward animals?

Humane Attitude Scale

The Intermediate Attitude Scale (Ascione, 1988) was used to measure participants' humane attitude scores before and after the experimental intervention of a virtual pet dog in order to determine whether and what, if any, changes occurred after the treatment. The paired sample t test of the Intermediate Attitude Scale- Original (IASorg) and the Pretest (IASpre) of the participant group ($n = 36$), prior to the experimental intervention, indicated that the mean score remained relatively stable (See Table 5). The mean score for IASorg was121.31 ($SD = 11.60$) and for IASpre was 121.36 (SD= 11.64). The paired t test was not statistically significant, $t(35) = .04$; $p = .97$. The test-retest reliability (Pearson Correlation Coefficient) between IASorg and IASpre to was .70 ($n = 36$; $p = .00$).

After playing and interacting with the virtual pet dog for three weeks, paired sample statistical analysis showed that the posttest score ($M = 128.57$, $SD = 12.27$) on the Intermediate Attitude Scale (IASpst) for 51 participants increased an average of 6.65 points from the pretest score ($M = 121.92$, $SD = 11.85$) on the 36-items questionnaire test (See Table 5). The result was statistically significant, $t(50) = 4.62$, $p = .00$. In the group of 36 participants who completed the questionnaire at all three points (original, pretest, posttest), the participants' empathy score increased an average of 8 points from the pretest score ($M = 121.36$, $SD = 11.64$) on the same 36-items questionnaire (See Table 5). The result was statistically significant, t (35) = 4.39, p = .00.

Table 5
Paired Sample *t* Test for Humane Attitude
Original vs. Pretest and Pretest vs. Posttest

	Scale	*n*	*Mean*	*SD*	*t*	*p*
Pair 1	IASorg	36	121.31	11.60		
	IASpre	36	121.36	11.64	.04	.97
Pair 2	IASpre	36	121.36	11.64		
	IASpst	36	129.36	12.33	4.39	.00
Pair 2	IASpre	51	121.92	11.85		
(same participants as pair 1)	IASpst	51	128.57	12.27	4.62	.00

Influence of Previous Pet Experiences

Thirty-three participants reported that they had never owned a dog and 18

participants reported they had owned a dog prior to joining the research, but not during

the actual study. The participants without previous dog experience included seven

students in the pilot study who only completed the Pretest (IASpre) and Posttest (IASpst).

The remaining eight students in the pilot study group had previous dog owning

experience, and like participants who did not have previous dog owning experience, only

completed the Pretest (IASpre) and Posttest (IASpst).

The paired sample *t* test of the Intermediate Attitude Scale- Original (IASorg) and

the Pretest (IASpre) of the participant group (*n* = 26) who never owned a dog indicated

that the mean score remained relatively stable prior to the experimental intervention of

the virtual pet dog (See Table 6). The mean score for IASorg was 121.92, (*SD* = 10.33)

and for IASpre was 120.81 (*SD* = 11.73). The paired *t* test was not statistically significant,

t(25) = .70, *p* = .49.

After playing, interacting with and responding to the virtual pet dog for three

weeks, paired sample statistical analysis showed that the posttest humane attitude score

(M = 127.33, SD = 10.93) on the Intermediate Attitude Scale (IASpst) for 33 participants

increased an average of 5.24 points from the pretest score (M = 122.09, SD = 12.04) on

the 36-item questionnaire (See Table 6). The result was statistically significant,

$t(32) = 2.98, p = .01$.

The paired sample t test of the Intermediate Attitude Scale- Original (IASorg) and

the Pretest (IASpre) of the participant group who had previous experience owning a dog

(n =10) indicated that the mean score remained relatively stable prior to the experimental

intervention of the virtual pet dog (See Table 7). The mean score for IASorg was

119.70 (SD = 14.92) and for IASpre 122.80, (SD = 11.90). The paired t test was not

statistically significant, $t(9) = .93, p = .38$.

After playing, interacting with and responding to the virtual pet for three weeks,

paired sample statistical analysis showed that the posttest empathy score (M = 130.83,

SD = 14.48) on the Intermediate Attitude Scale (IASpst) for 18 participants increased an

average of 9.22 points from the pretest score (M = 121.61, SD = 11.84) on the 36-items

questionnaire (See Table 7). The result was statistically significant, $t(17) = 3.78, p = .00$.

In comparing the results of the paired sample t tests of the groups with and

without previous experience in owning a dog, it was found that the intervention of virtual

pet dog had a significant impact on the humane attitude on both groups.

Table 6 Paired Sample t Test for Humane Attitude Original vs. Pretest and Pretest vs. Posttest (without dog experience)						
	Scale	n	Mean	SD	t	p
Pair 1	IASorg	26	121.92	10.33		
	IASpre	26	120.81	11.73	.70	.49
Pair 2	IASpre	33	122.09	12.04		
	IASpst	33	127.33	10.93	2.98	.01

Table 7 Paired Sample *t* Test for Humane Attitude Original vs. Pretest and Pretest vs. Posttest (with dog experience)						
	Scale	*n*	*Mean*	*SD*	*t*	*p*
Pair 1	IASorg	10	119.70	14.92	.93	.38
	IASpre	10	122.80	11.90		
Pair 2	IASpre	18	121.61	11.84	3.78	.00
	IASpst	18	130.83	14.48		

Correlation between Empathy and Humane Attitude

To investigate whether there were any statistically significant associations among participants' empathy and humane attitude, correlations between participants' Bryant's Empathy Index score (original, pretest, posttest, changes between pretest and posttest), and Intermediate Attitude Scale score (original, pretest, posttest, changes between pretest and posttest) were calculated and analyzed.

The correlation between participants' original tests in empathy (BIorg) and humane attitude (IASorg) were positive and significant (r =.36, p = .03) (See Table 8). Using Cohen's (1988) guidelines, the effect size is small. The correlation between participants' pretests in empathy (BIpre) and humane attitude (IASpre) were positive and significant (r = .56, p = .00) (See Table 9). Using Cohen's (1988) guidelines, the effect size is medium. The correlation between participants' posttests in empathy (BIpst) and humane attitude (IASpst) were positive and significant (r = .48, p = .00) (See table 10). Using Cohen's (1988) guidelines, the effect size is small. The correlation between participants' changes in empathy (BIchange) and humane attitude (IAchange) were not significant (r = .20, p = .17) (See table 11). Therefore, the correlation results indicated

that participants who have higher empathy scores tended to have higher humane attitude

scores in the original test, pretest and posttest.

Table 8
Correlation Between Empathy and Humane Attitude Original Test

		BIorg	IASorg
BIorg	Pearson Correlation	1.00	.36
	Sig. (2-tailed)		.03
	n	36	36
IASorg	Pearson Correlation	.36	1.00
	Sig. (2-tailed)	.03	
	n	36	36

Table 9
Correlation Between Empathy and Humane Attitude Pretest

		BIpre	IASpre
BIpre	Pearson Correlation	1.00	.56
	Sig. (2-tailed)		.00
	n	51	51
IASpre	Pearson Correlation	.56	1.00
	Sig. (2-tailed)	.00	
	n	51	51

Table 10

Correlation Between Empathy and Humane Attitude Posttest

		BIpst	IASpst
BIpst	Pearson Correlation	1.00	.48
	Sig. (2-tailed)		.00
	N	51	51
IASpst	Pearson Correlation	.48	1.00
	Sig. (2-tailed)	.00	
	N	51	51

Table 11

Correlation Between Empathy and Humane Attitude Changes

		BIchange	IASchange
BIchange	Pearson Correlation	1.00	.20
	Sig. (2-tailed)		.17
	N	51	51
IASchange	Pearson Correlation	.20	1.00
	Sig. (2-tailed)	.17	
	N	51	51

Question 3: Do the duration and type of interaction relate to an enhancement in children's development of empathy and their attitude toward the humane treatment of animals?

To investigate whether there were any statistically significant associations between the duration of interacting with a virtual pet dog, number of incidents of performing caring, training, competition behaviors, and the participants' empathy and humane attitude, several correlations were calculated. All of the duration and incidents

were based on the students' self-reports, as recorded in their weekly logs (See Appendix E).

Correlations between duration of interacting with a virtual pet dog and empathy, humane attitude development

To investigate if there were any statistically significant associations among the participants' empathy and humane attitude, and the duration of interacting with a virtual pet dog, correlations between the participants' play duration and Bryant's Empathy Index (original, pretest, posttest, changes between pretest and posttest), and Intermediate Attitude Scale (original, pretest, posttest, changes between pretest and posttest) were calculated.

The correlation among the participants' duration of play and the Intermediate Attitude Scale Original (IASorg) and Pretest (IASpre) were not significant (IASorg, $r = .27, p = .11$; IASpre, $r = .19, p = .18$). However, the correlation between the participants' Intermediate Attitude Scale Posttest (IASpst) and the duration of play was significant ($r = .37, p = .01$). Therefore it is indicated that participants who had longer play durations with their virtual pet dogs tended to have higher scores on the humane attitude questionnaire and vice versa (See Table 13). Using Cohen's (1988) guidelines, the effect size is medium or typical for studies in this area. However, there was no significant association among the participants' empathy and the duration of interacting with a virtual pet dog (BIorg, $r = .20, p = .24$; BIpre, $r = .19, p = .18$; BIpst, $r = .26$, $p = .07$) (See table 12). Also, there was a non significant association between the

participants' empathy and humane attitude changes and the duration of play with a virtual

pet dog either (BIchange, $r = .07$, $p = .61$; IASchange, $r = .22$, $p = .12$) (See Table 14).

			Play Duration	BIorg	BIpre	BIpst
Table 12 Correlations Between Play Duration and Empathy for Original/ Pretest/ Posttest Scores						
Play Duration	Pearson Correlation		1.00	.20	.19	.26
	Sig. (2-tailed)			.24	.18	.07
	n		51	36	51	51
BIorg	Pearson Correlation		.20	1.00	.77	.49
	Sig. (2-tailed)		.24		.00	.01
	n		36	36	36	36
BIpre	Pearson Correlation		.19	.77	1.00	.67
	Sig. (2-tailed)		.18	.00		.00
	n		51	36	51	51
BIpst	Pearson Correlation		.26	.49	.67	1.00
	Sig. (2-tailed)		.07	.01	.00	
	n		51	36	51	51

Table 13

Correlations between Play Duration and Humane Attitude for Original/ Pretest/ Posttest Scores

		Play Duration	IASorg	IASpre	IASpst
Play Duration	Pearson Correlation	1.00	.27	.19	.37
	Sig. (2-tailed)		.11	.18	.01
	n	51	36	51	51
IASorg	Pearson Correlation	.27	1.00	.70	.56
	Sig. (2-tailed)	.11		.00	.00
	n	36	36	36	36
IASpre	Pearson Correlation	.19	.70	1.00	.64
	Sig. (2-tailed)	.18	.00		.00
	n	51	36	51	51
IASpst	Pearson Correlation	.37	.56	.64	1.00
	Sig. (2-tailed)	.01	.00	.00	
	n	51	36	51	51

Table 14

Correlations between Play Duration and Empathy/ Humane Attitude Changes

		Play duration	BIchange	IASchange
Play Duration	Pearson Correlation	1.00	.07	.22
	Sig. (2-tailed)		.61	.12
	n	5	51	51
BIchange	Pearson Correlation	.07	1.00	.20
	Sig. (2-tailed)	.61		.17
	n	51	51	51
IASchange	Pearson Correlation	.22	.20	1.00
	Sig. (2-tailed)	.12	.17	
	N	51	51	51
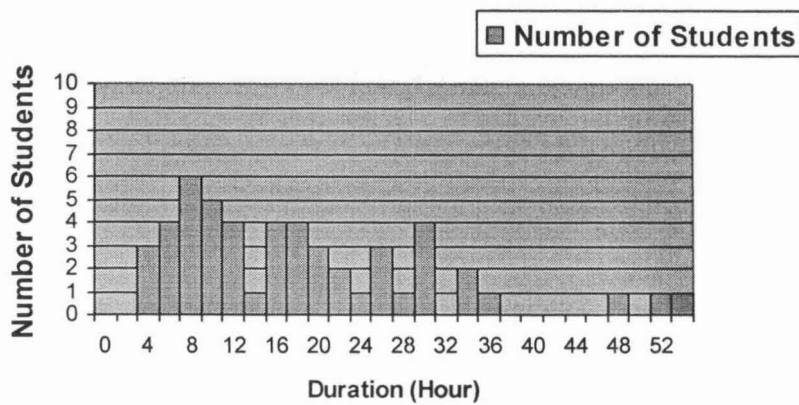
Figure 2: Distribution of Play Duration

Correlations of incidents of caring behaviors with empathy and humane attitude development

To investigate whether there were any statistically significant associations among the participants' empathy, humane attitude, and the quantity of performing caring behaviors, correlations between the participants' incidents of caring behaviors and Bryant's Empathy Index (original, pretest, posttest, changes between pretest and posttest), and Intermediate Attitude Scale (original, pretest, posttest, changes between pretest and posttest) were computed.

The correlation among the participants' incidents of caring behaviors and Intermediate Attitude Scale Original (IASorg) and Pretest (IASpre) were not significant (IASorg, $r = .20$, $p = .25$; IASpre, $r = .03$, $p = .83$). But the direction of the correlation between the participants' Intermediate Attitude Scale Posttest (IASpst) and changes of Intermediate Attitude Scale (IASchange) and the incidents of caring behaviors was positive (IASpst, $r = .32$, $p = .02$; IASchange, $r = .35$, $p = .01$) (See Table 16,17). Using

Cohen's (1988) guidelines, the effect size is medium or typical for studies in this area. Therefore it is indicated that participants who engaged in a greater number of incidents of caring behaviors with a virtual pet dog tended to have higher humane attitude and humane attitude change and vice versa. However, there was no significant association among the participants' empathy, empathy change and the incidents of caring behaviors performed (BIorg, $r = .02$, $p = .91$; BIpre, $r = .07$, $p = .65$; BIpst, $r = .21$, $p = .13$, BIchange, $r = .18$, $p = .22$) (See Tables 15 - 17).

Table 15 Correlations Between Incidents of Caring Behaviors and Empathy for Original/ Pretest/ Posttest Scores					
		Incidents of Caring Behaviors	BIorg	BIpre	BIps
Incidents of Caring Behaviors	Pearson Correlation	1.00	.02	.07	.21
	Sig. (2-tailed)		.91	.65	.13
	n	51	36	51	51
BIorg	Pearson Correlation	.02	1.00	.77	.49
	Sig. (2-tailed)	.91		.00	.00
	n	36	36	36	36
BIpre	Pearson Correlation	.07	.77	1.00	.67
	Sig. (2-tailed)	.65	.00		.00
	n	51	36	51	51
BIpst	Pearson Correlation	.21	.49	.67	1.00
	Sig. (2-tailed)	.13	.00	.00	
	n	51	36	51	51

Table 16

Correlations Between Incidents of Caring Behaviors and Humane Attitude

for Original/ Pretest/ Posttest Scores

		Incidents of Caring Behaviors	IASorg	IASpre	IASpst
Incidents of Caring Behaviors	Pearson Correlation	1.00	.20	.03	.32
	Sig. (2-tailed)		.25	.83	.02
	n	51	36	51	51
IASorg	Pearson Correlation	.20	1.00	.70	.56
	Sig. (2-tailed)	.25		.00	.00
	n	36	36	36	36
IASpre	Pearson Correlation	.03	.70	1.00	.64
	Sig. (2-tailed)	.83	.00		.00
	n	51	36	51	51
IASpst	Pearson Correlation	.33	.56	.64	1.00
	Sig. (2-tailed)	.02	.00	.00	
	n	51	36	51	51

Table 17

Correlations Between Incidents of Caring Behaviors and Empathy/ Humane

Attitude Changes

		Incidents of Caring Behaviors	BIchange	IASchange
Incidents of Caring Behaviors	Pearson Correlation	1.00	.18	.35
	Sig. (2-tailed)		.22	.01
	N	51	51	51
BIchange	Pearson Correlation	.18	1.00	.20
	Sig. (2-tailed)	.22		.17
	N	51	51	51
IASchange	Pearson Correlation	.35	.20	1.00
	Sig. (2-tailed)	.01	.17	
	N	51	51	51
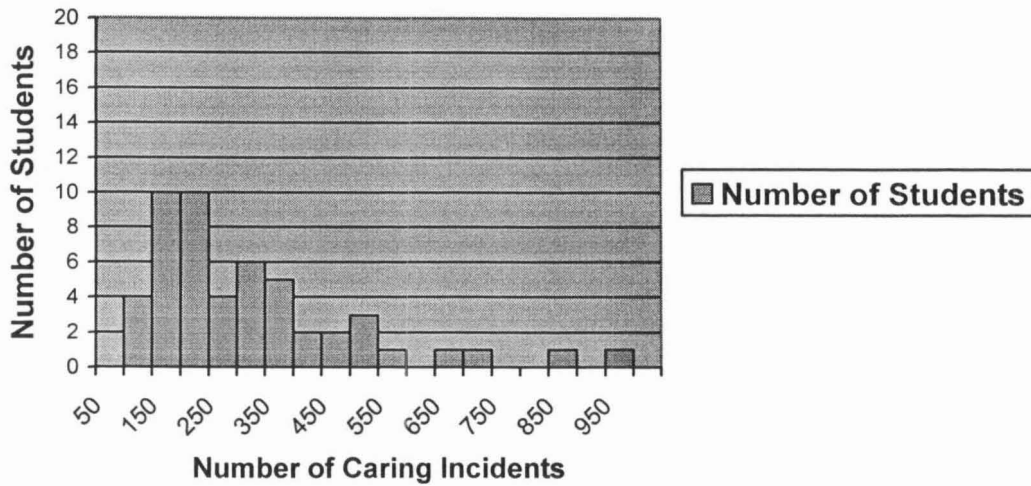
Figure 3: Distribution of Caring Behavior Incidents

Correlations of incidents of training behaviors with empathy and humane attitude development

To investigate whether there were any statistically significant associations among the participants' empathy and humane attitude, and the incidents of performing training behaviors, correlations among the participants' incidents of training behaviors and Bryant's Empathy Index (original, pretest, posttest, changes between pretest and posttest), and Intermediate Attitude Scale (original, pretest, posttest, changes between pretest and posttest) were computed. No significant association among participants' empathy, humane attitude and incidents of training behaviors were found (BIorg, $r = .10$, $p = .55$; BIpre, $r = .14$, $p = .32$; BIpst, $r = .18$, $p = .21$; IASorg, $r = .11$, $p = .52$, IASpre, $r = .09$, $p = .53$; IASpst, $r = .16$, $p = .25$) (See Tables 18 and 19). Also, there were non significant association between the participants' empathy and humane attitude changes and the

number of training incidents (BIchange, $r = .04$, $p = .79$; IASchange, $r = .09$, $p = .53$)

(See Table 20).

		Incidents of Training Behaviors	BIorg	BIpre	BIpst
Table 18					
Correlations Between Incidents of Training Behaviors and Empathy					
for Original/ Pretest/ Posttest Scores					
Incidents of Training Behaviors	Pearson Correlation	1.00	.10	.14	.18
	Sig. (2-tailed)		.55	.32	.21
	n	51	36	51	51
BIorg	Pearson Correlation	.10	1.00	.77	.49
	Sig. (2-tailed)	.55		.00	.00
	n	36	36	36	36
BIpre	Pearson Correlation	.14	.77	1.00	.67
	Sig. (2-tailed)	.32	.00		.00
	n	51	36	51	51
BIpst	Pearson Correlation	.18	.49	.67	1.00
	Sig. (2-tailed)	.21	.00	.00	
	n	51	36	51	51

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Table 19 Correlations Between Incidents of Training Behaviors and Humane Attitude for Original/ Pretest/ Posttest Scores					
		Incidents of Training Behaviors	IASorg	IASpre	IASpst
Incidents of Training Behaviors	Pearson Correlation	1.00	.11	.09	.16
	Sig. (2-tailed)		.52	.53	.25
	n	51	36	51	51
IASorg	Pearson Correlation	.11	1.00	.70	.56
	Sig. (2-tailed)	.52		.00	.00
	n	36	36	36	36
IASpre	Pearson Correlation	.09	.70	1.00	.64
	Sig. (2-tailed)	.53	.00		.00
	n	51	36	51	51
IASpst	Pearson Correlation	.16	.56	.64	1.00
	Sig. (2-tailed)	.25	.00	.00	
	n	51	36	51	51

		Incidents of Training Behaviors	BIchange	IASchange

Table 20
Correlations Between Incidents of Training Behaviors and Empathy/ Humane Attitude Changes

		Incidents of Training Behaviors	BIchange	IASchange
Incidents of Training Behaviors	Pearson Correlation	1.00	.04	.09
	Sig. (2-tailed)		.79	.53
	N	51	51	51
BIchange	Pearson Correlation	.04	1.00	.20
	Sig. (2-tailed)	.79		.17
	N	51	51	51
IASchange	Pearson Correlation	.09	.20	1.00
	Sig. (2-tailed)	.53	.17	
	N	51	51	51
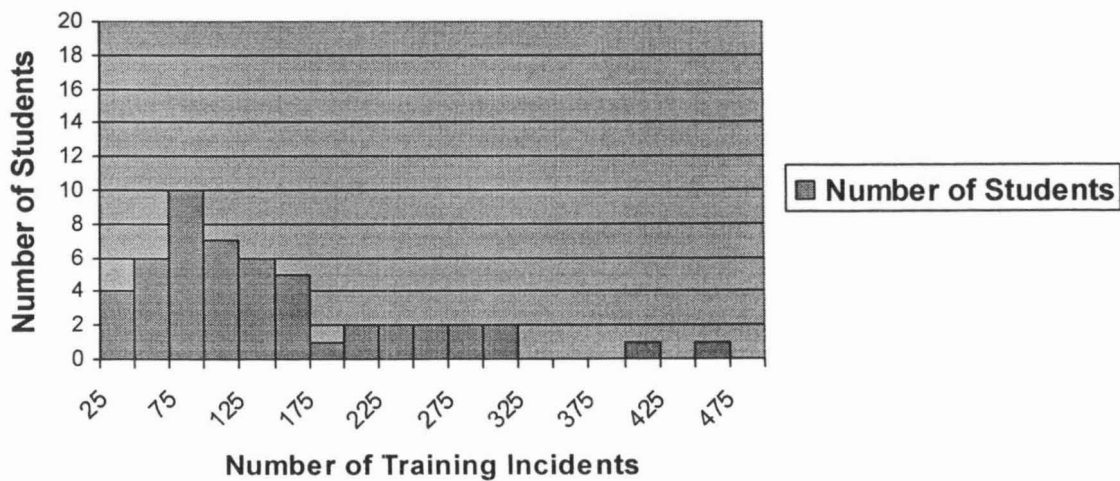
Figure 4: Distribution of Training Behavior Incidents

Correlations of incidents of competing with empathy and humane attitude development

To investigate whether there were any statistically significant associations among the participants' empathy and humane attitude, and the incidents of competing, correlations among the participants' number of incidents of competing and Bryant Empathy Index (original, pretest, posttest, changes between pretest and posttest), and Intermediate Attitude Scale (original, pretest, posttest, changes between pretest and posttest) were computed.

The correlation between the participants' incidents of competing and Bryant Empathy Index Original (BIorg) and Pretest (BIpre) was not significant (BIorg, $r = .11$, $p = .54$; BIpre, $r = .18$, $p = .20$). However, the correlation between the participants' Bryant Empathy Index Posttest (BIpst) and the incidents of competing was significant ($r = .44$, $p = .00$). Therefore it is indicated that participants who engaged in more incidents of competing with a virtual pet dogs tended to have higher empathy and vice versa (see Table 21). Using Cohen's (1988) guidelines, the effect size is medium or typical for studies in this area.

The correlation among participants' incidents of competing and Intermediate Attitude Scale Original (IASorg) and Pretest (IASpre) was not significant (IASorg, $r = .24$, $p = .16$; IASpre, $r = .14$, $p = .31$) but the correlation between the participant's Intermediate Attitude Scale Posttest (IASpst) and the incidents of competing was ($r = .28$, $p = .04$). Therefore it is indicated that participants who engaged more incidents of competing with virtual pet dogs tended to have higher humane attitude and vice versa

(See Table 22). Using Cohen's (1988) guidelines, the effect size is small for studies in this area.

The correlation between participant's empathy change and incidents of competing was positive and significant ($r = .31, p = .03$) indicating that participants who engaged in more incidents of competing with their virtual pet dog tended to have higher empathy change and vice versa. Using Cohen's (1988) guidelines, the effect size is medium or typical for studies in this area. However, there was no significant association among the participants' humane attitude change and the number of incidents competing (IASchange, $r = .17, p = .22$) (See Table 23).

Table 21 Correlations Between Incidents of Competing and Empathy for Original/ Pretest/ Posttest Scores					
		Competing Behavior Incidents	BIorg	BIpre	BIpst
Competing Behavior Incidents	Pearson Correlation	1.00	.11	.18	.44
	Sig. (2-tailed)		.54	.20	.00
	n	51	36	51	51
BIorg	Pearson Correlation	.11	1.00	.77	.49
	Sig. (2-tailed)	.54		.00	.00
	n	36	36	36	36
BIpre	Pearson Correlation	.18	.77	1.00	.67
	Sig. (2-tailed)	.20	.00		.00
	n	51	36	51	51
BIpst	Pearson Correlation	.44	.49	.67	1.00
	Sig. (2-tailed)	.00	.00	.00	
	n	51	36	51	51

		Incidents of Competing	IASorg	IASpre	IASpst
Table 22					
Correlations Between Incidents of Competing and Humane Attitude					
for Original/ Pretest/ Posttest Scores					

		Incidents of Competing	IASorg	IASpre	IASpst
Incidents of Competing	Pearson Correlation	1.00	.24	.14	.28
	Sig. (2-tailed)		.16	.31	.04
	n	51	36	51	51
IASorg	Pearson Correlation	.24	1.00	.70	.56
	Sig. (2-tailed)	.16		.00	.00
	n	36	36	36	36
IASpre	Pearson Correlation	.14	.70	1.00	.64
	Sig. (2-tailed)	.31	.00		.00
	n	51	36	51	51
IASpst	Pearson Correlation	.28	.56	.64	1.00
	Sig. (2-tailed)	.04	.00	.00	
	n	51	36	51	51

		Incidents of Competing	BIchange	IASchange
Table 23 Correlations Between Incidents of Competing and Empathy/ Humane Attitude Changes				
Incidents of Competing	Pearson Correlation	1.00	.31	.17
	Sig. (2-tailed)		.03	.22
	N	51	51	51
BIchange	Pearson Correlation	.31	1.00	.20
	Sig. (2-tailed)	.03		.17
	N	51	51	51
IASchange	Pearson Correlation	.17	.20	1.00
	Sig. (2-tailed)	.22	.17	
	N	51	51	51
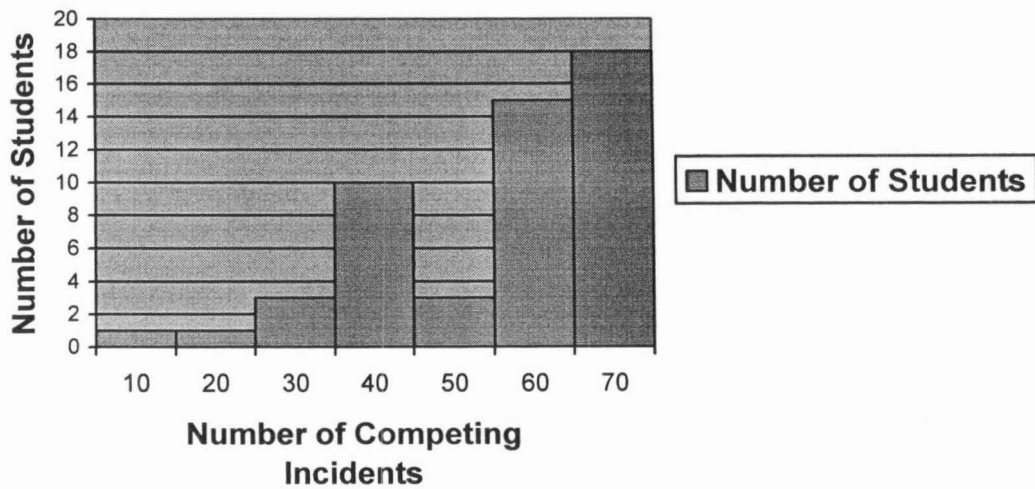
Figure 5: Distribution of Competing Behavior Incidents

Question 4: Are there sex differences in children's development of empathy and attitude resulting from playing and interacting with a virtual pet dog?

Twenty-five female and 26 male children participated in the research. This included eight girls and seven boys in the pilot study group who only completed the pretest and posttest. Consequently, in total, there were 17 female and 19 male participants who completed the original tests, and 25 female and 26 male participants who completed the pretest and posttest.

Table 24 shows that female participants were significantly different from male participants on the Byrant Empathy Index on all three tests: original, BIorg, $t(35) = 2.87$, $p = .01$; pretest , BIpre, $t(50) = 3.06$, $p = .00$, and posttest, BIpst, $t(50) = 2.80$, $p = .01$. However, the differences between females and males on the Intermediate Attitude Scale on all three tests were not significant: original, IASorg, $t(35) = 1.61$, $p = .12$; pretest, IASpre, $t(50) = 1.63$, $p = .11$; and posttest, IASpst, $t(50) = .84$, $p = .41$ (See Table 25).

A review of the original test, pretest and posttest of male and female participant mean scores indicated that the Byrant Empathy Index mean scores for female participants BIorg ($n = 17$) was 15.41, ($SD = 2.74$); BIpre ($n = 25$) was15.40, ($SD = 2.89$); and BIpst ($n = 25$) was 17.12 , ($SD = 2.33$) (See Table 24). These scores were higher than the mean scores for male participants: BIorg ($n = 19$, $M = 12.32$, $SD = 3.61$); BIpre ($n = 26$, $M = 12.50$, $SD = 3.81$); BIpst ($n = 26$, $M = 14.50$, $SD = 4.07$ (See Table 24).

Therefore, the Bryant Empathy test showed that female participants had a slightly higher mean score than the mean score of male participants before and after the experimental intervention of the virtual pet dog. However, both female and male

participants showed stable scores before the introduction of the virtual dog intervention, Female: $n = 17$; BIorg, $M = 15.41$, $SD = 2.74$; BIpre $M = 16.24$, $SD = 2.33$, $t(16) = 1.36$, $p = .19$. Male: $n = 19$; BIorg $M = 12.32$, $SD = 3.61$; BIpre $M = 12.05$, $SD = 3.42$, $t(18) = .49$, $p = .63$. Both female and male participants showed relatively higher mean scores after the three-week experimental intervention of the virtual dog, Female: $n = 25$; BIpre $M = 15.40$, $SD = 2.89$; BIpst $M = 17.12$, $SD = 2.33$, $t(24) = 3.13$, $p = .01$. Male: $n = 26$; BIpre $M = 12.50$, $SD = 3.81$; BIpst $M = 14.50$, $SD = 4.07$, $t(25) = 3.23$, $p = .00$.

A review of the original test, pretest and posttest of male and female participant mean scores indicated that the Intermediate Attitude Scale mean scores for female participants in IASorg ($n = 17$) was 124.53, ($SD = 12.40$); IASpre ($n = 25$) was 124.64, ($SD = 11.97$) in IASpre; IASpst ($n = 25$) was 130.04 , ($SD = 11.81$) (See Table 25). These scores were higher than the mean scores for male participants: IASorg ($n = 19$, $M = 118.42$, $SD = 10.31$); IASpre ($n = 26$, $M = 119.31$, $SD = 11.35$); and IASpst ($n = 26$, $M = 127.15$, $SD = 12.77$) (see Table 25).

Therefore, analysis using the humane attitude scale showed that female participants had a slightly higher mean score than male participants before and after the experimental intervention of the virtual pet dog. However, both female and male participants showed stable scores before the introduction of the virtual dog intervention. Female: $n = 17$; IASorg $M = 124.52$, $SD = 12.40$; IASpre $M = 127.24$, $SD = 10.07$, $t(16) = 1.20$, $p = .27$. Male: $n = 19$; IASorg $M = 118.42$, $SD = 10.31$; IASpre $M = 116.11$, $SD = 10.56$, $t(18) = 1.24$, $p = .23$. Also, both female and male participants showed relatively higher mean scores after the three-week experimental intervention of the virtual dog, Female: $n = 25$; IASpre $M = 124.64$, $SD = 11.97$; IASpst $M = 130.04$, $SD = 11.81$,

$t(24) = 3.09, p = .01$. Male: $n = 26$; IASpre $M = 119.31, SD = 11.35$; IASpst $M = 127.15$, $SD = 12.77, t(25) = 3.44, p = .00$.

In other sex comparisons it was found that female participants were significantly different from male participants on the Companion Animal Bonding Revised Scale, $t(50) = 2.91, p = .01$ (See Table 26). Female participants' mean CABRS score female $(M = 8.44, SD = 1.08)$ was higher than the mean CABRS score of male participants $(M = 7.42, SD = 1.39)$. However, when the sexes were compared in terms of play duration, incidents of caring behaviors, incidents of training behaviors and incidents competing, the results showed that there were no significant differences in all three variables: play duration, $t(50) = 1.51, p = .14$; incidents of caring behaviors $t(50) = 1.39$, $p = .17$; incidents of training behaviors, $t(50) = .10, p = .92$; incidents competing, $t(50) = 1.33, p = .19$ (See Table 27).

Table 24 Comparison of Male and Female Elementary Children on Bryant Empathy Index Original/ Pretest/ Posttest						
	sex	n	Mean	SD	t	p
BIorg	Female	17	15.41	2.74	2.87	.01
	Male	19	12.32	3.61		
BIpre	Female	25	15.40	2.89	3.06	.00
	Male	26	12.50	3.81		
BIpst	Female	25	17.12	2.33	2.80	.01
	Male	26	14.50	4.07		

Table 25
Comparison of Male and Female Elementary Children
on Humane Attitude Test Original/ Pretest/ Posttest

	Sex	n	Mean	SD	t	p
IASorg	Female	17	124.53	12.40	1.61	.12
	Male	19	118.42	10.31		
IASpre	Female	25	124.64	11.97	1.63	.11
	Male	26	119.31	11.35		
IASpst	Female	25	130.04	11.81	.84	.41
	Male	26	127.15	12.77		

Table 26
Comparison of Male and Female Elementary Children
On Companion Animal Bonding Revised Scale

	Sex	n	Mean	SD	t	p
CABRS	Female	25	8.44	1.08	2.91	.01
	Male	26	7.42	1.39		

Table 27
Comparison of Male and Female Activity Differences

	Sex	n	Mean	SD	t	p
Play Duration	Female	25	1328.96	813.25	1.51	.14
	Male	26	1022.58	629.35		
Incidents of Caring Behaviors	Female	25	288.56	123.84	1.39	.17
	Male	26	360.54	299.55		
Incidents of Training Behaviors	Female	25	142.08	100.04	.10	.92
	Male	26	144.73	93.22		
Incidents of Competing	Female	25	52.84	12.51	1.33	.19
	Male	26	46.23	17.09		

Question 5: Do children who report greater companion animal bonds with their virtual pet dog have higher empathy and humane attitude scores?

The Companion Animal Bonding Revised Scale (CABRS) was used to measure the quality of the relationship or social interaction between the child and pet. The original Companion Animal Bonding Scale (CABS) (Poresky, 1987) is an eight-item questionnaire with a 5-point scale. However since some of the questions in the original CABS did not reflect the child and virtual pet relationship, the researcher removed three questions that were deemed irrelevant to this study, and formed a Companion Animal Bonding Revised Scale (CABRS).

The three questions removed are:

1) How often did your companion animal sleep in your room? (original item) and How often did you keep your Nintendog in your bedroom instead of other places in your home? (revised item)

(2) How often did you travel with your companion animal? (original item) and How often did you travel with your Nintendog? (For example, did you take your Nintendog when you went to other places such as school or to a friend or relative's home? (revised item)

(3) How often did you sleep near your companion animal? (original item) and How often did you sleep with your Nintendog? (revised item e.g., did you put your Nintendog in your bedroom or near you when you were sleeping? (revised item)

The distribution of the participants' answers in CABRS was restricted (See Table 28). Most of the participants (58.43%) chose "5" (always) for the answer, and caused

difficulty in analysis. Therefore, the researcher regrouped the answers from scale 1 to 4 into 1, and answers from scale 5 into 2, to create a 2-level dichotomy scale.

To investigate if there were statistically significant associations among the relationship with the virtual pet dog and children's empathy and humane development, correlations between the Companion Animal Bonding Revised Scale (CABRS) and Bryant's Empathy Index (BI) (posttest and changes between pretest and posttest), and Intermediate Attitude Scale (IAS) (posttest and changes between pretest and posttest) were computed.

The correlation among the participants' CABRS and Bryant Empathy Index Posttest was significant ($r = .27, p = .05$). The correlation among the participants' CABRS and Bryant Empathy Index changes (BIchange) was not significant ($r = .05$, $p = .74$) (See Table 31). CABRS was positively correlated to two of the questionnaires from BI (CABRSQ1, $r = .30, p = .04$; CABRSQ2, $r = .35, p = .01$) (See Table 29).

The correlation among the participants' CABRS and Intermediate Attitude Scale Posttest (IASpst) was not significant ($r = .20, p = .15$) (see Table 30). The correlation among the participants' CABRS and Intermediate Attitude Scale changes (IASchange) was not significant either ($r = .03, p = .84$) (See Table 31). IAS was positively correlated to one of the questionnaires from CABRS (CABRSQ2, $r = .36, p = .02$) (See Table 30).

Table 28 Frequency of CABRS					
Question/Scale	5 (Always)	4 (Most of time)	3 (Sometimes)	2 (Once in a while)	1 (Never)
Question 1	38 (74.50%)	12 (23.52%)	1 (1.96%)	0	0
Question 2	36 (70.58%)	8 (15.68%)	6 (11.76%)	1	0
Question 3	22 (43.13%)	18 (35.29%)	8 (15.68%)	3	0
Question 5	21 (41.17%)	22 (43.13%)	7 (13.72%)	1	0
Question 6	32 (62.74%)	15 (29.41%)	3 (5.88%)	1	0
Total	149 (58.43%)	75 (29.41%)	25 (9.80%)	6 (2.35%)	0

Table 29			
Correlations of CABRS Items and Total with BI			
Item Number	Item	Correlation Coefficient	p
CABRSQ1	How often were you responsible for your *Nintendog*'s care?	.30	.04
CABRSQ2	How often did you clean up after your *Nintendog*?	.35	.01
CABRSQ3	How often did you hold, touch, or pet your *Nintendog*?	-.11	.47
CABRSQ5	How often did you feel that your *Nintendog* responded to you?	.12	.41
CABRSQ6	How often do you feel had a close relationship with your *Nintendog*?	.14	.39
CABRS total		.27	.05

Table 30			
Correlations of CABRS Items and Total with IAS			
Item Number	Item	Correlation Coefficient	p
CABRSQ1	How often were you responsible for your *Nintendog*'s care?	.22	.13
CABRSQ2	How often did you clean up after your *Nintendog*?	.36	.02
CABRSQ3	How often did you hold, touch, or pet your *Nintendog*?	-.06	.66
CABRSQ5	How often did you feel that your *Nintendog* responded to you?	-.04	.80
CABRSQ6	How often do you feel had a close relationship with your *Nintendog*?	.15	.31
CABRS total		.20	.15

Table 31		
Correlations of BIchange and IASchange with CABS Total		
	Correlation Coefficient	p
BIchange with CABRS Total	.05	.74
IASchange with CABRS Total	.03	.84

Qualitative Data Findings

Qualitative data were collected through semi-structured interviews. The interview questions focused on eliciting children's experiences, feelings and attitudes toward their virtual pet dog. Based on the interview transcripts, the data were coded into analytical categories. This section describes the categories based on responses received to the individual interview questions, and then reports the results found from analyzing the semi-structured interview data.

Question 1: Why did you choose this *Nintendog*?

Before the introduction of the experimental treatment, most children selected their virtual pet dog based on physical appearance (35.50%) and type of dog breed (29.63%). Participants described their virtual pets' physical appearance by directly referring to the size, color, shape, or general age (i.e., puppy or adult). The participants also used an adjective such as cute or pretty, and may have also associated their virtual dog selection with another dog which they knew (See Table 32).

The most popular breed of dog which the participants chose tended to be small, specifically the Cavalier K. C. Spaniel (29.41%) and Chihuahua (21.57%) (See Table 33). Most of the participants chose their virtual dog by themselves; two participants received advice from an adult. Only one male and one female participant selected their virtual pet dog based on sex, and both of them preferred a male dog (See Table 32).

Table 32 Why did you choose this Nintendog?		
Reasons	Numbers of Respondents Mentioning Items (N=51)	%
Type of breed	24	29.63
Physical appearance	29	35.50
Personality and natural temperament	18	22.22
Abilities	6	7.41
Others	4	4.94
Total	81	
Others include:		
Sex	2	2.47
Adults' suggestion	2	2.47

Table 33 Type of Breed		
Dog Breed	Numbers of Respondents Mentioning Items (N=51)	%
Chihuahua	11	21.57
Yorkshire Terrier	3	5.88
Cavalier K. C. Spaniel	15	29.41
Shetland Sheep Dog	7	13.73
German Shepherd	7	13.73
Boxer	8	15.69

Question 2: Did you name your Nintendog? Why or why not? Why did you give it this name?

Most of the participants, except four, chose the virtual pet's name by themselves. The most common reason why a virtual pet received a particular name was because it was named after someone/ self/ something else (28.07%). This could include a family member, friend, themselves, other animals they know, animated toy characters and television celebrities. The second most popular reason for giving a virtual dog a particular name was due to the fondness of the name by the participant (19.39%). The participant simply stated that he or she "liked" the name. No other explanation was given. Sex was not a common influence for naming the virtual dog (3.51%). Only two participants gave a

virtual pet dog a particular name primarily because they thought the virtual dog would

like it (See Table 34).

Table 34 Why did you give this name?		
Reasons	Numbers of Respondents Mentioning Item (*N*=51)	%
Matched the virtual dog's characteristics	9	15.79
Named the virtual dog after someone or something	16	28.07
Participant's fondness for the name	11	19.30
First name to come to mind	10	17.54
Received idea from someone else	4	7.02
Others	7	12.28
Total	57	
Others include		
Sex	2	3.51
Considered the virtual dog's fondness for the name	2	3.51
Technical reasons	2	3.51
Expectations for the virtual dog	1	1.75

Question 3: How would you describe your Nintendog?

After interacting with a virtual pet dog for three weeks, most of the participants

described their pet in terms of the virtual dog's perceived personality (38.55%) and

abilities (19.28%). Some participants still described their virtual dog by mentioning its

physical appearance (19.28%), but this percentage is half of those who recognized the

virtual dog by its personality including emotions. In describing the virtual dog's

personality, some of the adjectives that the participants used included nice, playful,

energetic, fun and shy. Some participants also provided a more detailed observation of

the virtual dog's behavior. For example, Student 4 described the virtual dog's personality

by referring to insights of their interaction, as well as interpretation of the virtual dog's

moods such as anger: "He gets mad if I don't give him food. If I forget, if he's really hungry, he doesn't come."

Some participants (13.25%) also tried to understand their virtual dog's interests. For example, Student 51 described her dog's interests by stating, "She likes to play a lot. She likes to go on walks. She likes to eat a lot." Some participants (3.61%) also related their virtual dog to real dogs. For example, Student 48 said, "It's a dog, it's like you have to take care of it like real life." Student 34 said, "He is like a real dog. He always comes when I just open the screen and I start, it comes to me." There was one participant, Student 6, who believed that it was possible to establish mutual understanding with the dog: "I got to know her very easily. It didn't take that long time. She knows me and that was pretty easy." Two descriptors, which the participants did not frequently use in describing their dog, were sex (1.2%) and dog breed (1.2%) (See Table 35). Although breed was not how the participants regarded their virtual dog, the type of breed was however the second most popular reason why the participants selected a particular virtual dog.

Table 35 How would you describe your Nintendog?		
Basis of Description	Numbers of Respondents Mentioning Item ($N=51$)	%
Personality	32	38.55
Abilities	16	19.28
Physical Appearance	16	19.28
Virtual dog's interests	11	13.25
Others	8	9.64
Total	83	
Others include		
Similarity to real dogs	3	3.61
Type of breed	2	2.41
Sex	1	1.20
Fondness for the virtual dog	1	1.20
Mutual Ease of Understanding	1	1.20

Question 4: How would you describe your relationship with the Nintendog?

In general, the participants described the relationship with their virtual dog as being positive. This included good pet and owner relationship (32.86%), general positive relationship (31.43%), balanced interaction (17.14%) and friendship (12.86%), family (1.43%) and relation to self (1.43%). Only one participant gave a negative description (1.43%) of their relationship, and one participant did not give an answer (1.43%). Pet and owner relationship includes direct mentioning of the virtual pet as a real pet or real dog, or to interactions that relate to pet and owner relationships such as obeying, listening, or caring related behaviors. For example, Student 37 described the virtual dog's loyalty by stating that: "He does listen to me but not other people." Student 19 stated, "He responds to me a lot. It's just like taking care of a real dog and I want to take care of two more." Some participants gave a detailed description of their interaction with the virtual pets. For example, Student 32 reported, "We always go walking, meeting other dogs. We always have good time." Student 8 expressed her feeling and personal connection to the virtual dog: "We are a kind of the same. When I was a little baby, they thought I will be a girl, then, they said, I might be a boy. And they were not very sure. At the day I was born, I turned out to be a girl. That's what I mean we are the same. The first time I met the dog, I thought it was a girl, but it turned out to a boy." Only one participant negatively described the virtual dog by stating that the virtual dog does not listen sometimes but in doing so, still inferred that the virtual dog had a personality of its own including not wanting to obey. None of the participants described their relationship as a game and player (See Table 36).

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Table 36 How would you describe your relationship with the Nintendog?		
Answers	Numbers of Respondents Mentioning Item (N=51)	%
Friends	9	12.86
Balanced Interaction	12	17.14
Positive relationship	22	31.43
Pet and owner	23	32.86
Others	4	5.71
Total	70	
Others include		
No answer	1	1.43
Negative description	1	1.43
Sister	1	1.43
Relation to self	1	1.43

Question 5: What types of activities did you mostly like to do with your Nintendog?

The most common activity that the participants liked to engage in was general play (35.34%). This included play with or without toys. This type of play is generally for amusement and is non-goal oriented, in that it does not enable participants to win prizes or money for accomplishing a particular task. The second most popular activity was training and competition (31.90%). This included practicing disc catching for competition, as well as agility and obedience training. Engaging in this type of activity, participants may be able to get prizes and money if they do well in competitions. Caring is another popular activity (24.14%). Providing care included walking, petting, washing, buying or getting things for the virtual dog. Caring behaviors does not directly allow participants to get prizes or money for providing good care. However, caring behaviors do relate to obtaining a higher trainer status (See Table 37).

Table 37 What types of activities did you mostly like to do with your Nintendog?		
Answers	Numbers of Respondents Mentioning Item (*N*=51)	%
General play and sports	41	35.34
Training and competition tests	37	31.90
Caring	28	24.14
Meeting friends and socializing	5	4.31
Others	5	4.31
Total	116	
Others include		
Everything	1	0.86
Dance	1	0.86
Shopping	1	0.86
Get things while walking	2	1.72

Question 5-1: Why did you mostly like to do these activities with your Nintendog?

When deciding what activities to engage in with their virtual pet dog, a majority of the participants (66.67%) indicated that they wanted to do something that they and their virtual dog were both interested in doing. Some participants (23.53%) based their decision primarily on whether the dog was interested in the activity or could benefit from it. A minority of participants (7.84%) only consider their own interest in selecting what activity to do (See Table 38).

Table 38 Why do you like mostly like to do these activities with your Nintendog?		
Reasons	Numbers of Respondents Mentioning Item (*N*=51)	%
Based on the virtual dog's interests and benefits	12	23.53
Based on participant's self-interest	4	7.84
Based on mutual interests and benefits	34	66.67
Others	1	1.96
Total	51	
Others include		
No answer	1	1.96

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Question 6: Which activity did you not like doing with your Nintendog?

Many participants (17.58%) stated that there were no activities which they did not like doing with their virtual pet dog. Of the activities that were mentioned, most of the participants (60.44%) did not like to do training activities, especially obedience and agility training, with their virtual dogs (See Table 39). One of the least mentioned disliked activity was socialization, which involved taking their virtual dog to meet other dogs. Student 19 expressed the problem of meeting other dogs: "I don't like to play with the dog sometimes like when we go to the park. Other dogs are bigger than her and kind of push her around." Student 45 also expressed not liking to play with other dogs because she thought that other dogs were rude: "Sometimes, meeting other dogs, I don't like it. Like one day, my dog did a dropping on the ground, we bumped into another dog, and it sent us a message. I looked at the message, and it said, 'I saw you did!'"

Table 39 Which activity did you not like doing with your Nintendog?		
Answers	Numbers of Respondents Mentioning Item (N=51)	
Nothing (Liked all activities)	16	17.58%
Training (Obedience, Agility)	55	60.44%
Toys (General toys, Sport toys, Objects)	9	9.89%
Caring (Petting, Bathing, Walking)	7	7.69%
Socialization	2	2.20%
Shopping	1	1.10%
Dress up	1	1.10%
Total	91	

Question 6-1: Why did you not like doing this activity with your Nintendog?

Approximately a third (31.37%) of the participants did not have an activity which they disliked doing with their virtual dogs, and therefore did not answer this question. However, a majority of the participants (42.86%) who answered this question, considered their virtual dog's interests and needs in deciding why they did not like a particular activity. There were 20% of participants who did not like a particular activity because they believed that the virtual dog was not good at it (See Table 40). The participants who chose to avoid activities that were against their virtual dog's interests and needs often provided their observation and emotional projection into their answer. For example, Student 18 expressed the worries of playing the bubble blower with his virtual dog: "When I play the bubble blower, it kinds of going into his eyes. When it goes into his eyes, he is kind of try to rub it, but he can't."

Table 40 Why did you not like doing this activity with your Nintendog?		
Reasons	Numbers of Respondents Mentioning Item (*N*=51)	%
Based on the virtual dog's interests and needs	15	42.86
Based on the virtual dog's abilities	7	20.00
Based on the participant's interests	13	37.14
Total	35	
Note: Students who did not dislike any activity did not answer this question	16	31.37

Question 7: If you could decide, how long you would like to play with your Nintendog?

A majority of participants stated that they would like to keep the virtual dog for longer than the experimental duration of *three* weeks. Only two participants (3.92%) asserted that the *three*-week duration was sufficient. More than a third of the participants (35.29%) expressed wanting to keep the virtual dog forever, and 27.45% participants would like to keep the virtual dog for long period of time, from one more month to one year (See Table 41).

Table 41		
If you could decide, how long you would like to play with your Nintendog?		
Answers	Numbers of Respondents Mentioning Item (*N*=51)	
Three weeks is sufficient	2	3.92
One month or less than one month	9	17.65
Longer than one month up to a year	14	27.45
Longer than one year	8	15.69
Forever	18	35.29
Total	51	

Question 7-1: What is the reason for the desired length of time for keeping the virtual pet?

Most of the participants (43.28%) expressed wanting to keep the virtual dog longer because they liked playing with it and had fun. Some participants (20.90%) indicated that they had bonded emotionally with their virtual dog. For example, Student 1 described her intention to keep the virtual dog longer: "I got use to Cleo and I don't want to leave him." Some participants (11.94%) used their virtual dog as a substitute for a real dog (See Table 42). For example, Student 29 articulated the desire to keep the virtual dog

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longer "because I really like it. I wouldn't be able to have a dog in my family because I have a brother and a sister who are allergic to dogs."

The length of the participants' expressed desire in keeping the virtual dog did not reflect how much they were concerned about their virtual pet. Student 5 and 8 for example, would not like to keep the virtual dog forever because they considered the virtual dog's feelings. Student 5 said the virtual dog might like new friend later: "2 years because I have fun with her... She might be ready for another friend." Student 8 worried that her virtual dog might form a strong attachment to her, which might result in the virtual dog having hurt feelings if she did not like playing with the virtual dog one day that much: "If you play with it too much, it will get too responsive. When I turn it off, it will wait and wait and wait and it doesn't even run away because it likes you too much."

Two participants thought three weeks were long enough. One expressed that he had a hard time in taking care of the virtual pet, and the other expressed only liking to play with the virtual dog when she can connect it with other players in school.

Table 42 Reason for the desired length of time for keeping the virtual dog		
Reasons	Numbers of Respondents Mentioning Item (N=51)	%
Emotional bond	14	20.90
Playing and having fun	29	43.28
Caring	4	5.97
Substitute for a real dog	8	11.94
No answer	7	10.45
Others	5	7.46
Total	67	
Others include		
Based on the virtual dog's feeling	2	2.99
Socialize with other players in school	1	1.49
Want a Nintendo DS	1	1.49
Difficulty in taking care of the virtual dog	1	1.49

Question 8: Do you think the Nintendog is a pet or a video game and why?

A majority of the participants asserted that their virtual dog is a pet rather than a video game. Only 3.92% of the participants believed it was a video game, and 3.92% of the participants believed it was both a video game and a pet (See Table 43). Of the two students who believed that their virtual dog is a video game, Student 12, reasoned that real dogs look and act differently than the virtual dog: "It's a video game because a real dog is much bigger, and real dog will come to you when to want to do a trick." Another participant simply expressed he got a video game in the beginning of the research (See Table 45).

For participants who suggested that the virtual dog was a real pet, most of them (52.38%) asserted that it looked and acted real. A third (33.33%) also mentioned that virtual dogs need care just as do real dogs. For example, Student 43 expressed the needs of the virtual dog: "It's just like taking care of a real dog. You got to feed it, you got to give it water, you got to take it for a walk, you got to clean up after it. You got to enter it into competitions, just like taking care of a real dog." Three participants (4.76%) indicated that the virtual dog has feelings. For example, Student 29 said, "I think it's a pet because it's like she has feelings." Three participants used their virtual dog as a substitute for a real dog and would rather consider it as real pet. For example, Student 3 said, "A pet, because it is a dog. I want to get a dog and I am too young for it. I need too wait until 11 and I will get a dog." (See Table 44)

Table 43		
Do you think Nintendog is a pet or a video game?		
Answers	Numbers of Respondents Mentioning Item (N=51)	%
Pet	47	92.16
Video Game	2	3.92
Both	2	3.92
Total	51	

Table 44		
Why do you think Nintendog is a pet?		
Reasons	Numbers of Respondents Mentioning Item (N=51)	%
Looks and acts like a real dog	33	52.38
Possession of emotion	3	4.76
Caring behaviors	21	33.33
Substitute for a real dog	3	4.76
No specific answer	3	4.76
Total	63	

Table 45	
Why do you think Nintendog is a video game?	
Reasons	Numbers of Respondents Mentioning Item (N=51)
Got a video game	3
Looks and acts differently from a real dog	1
Total	4

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CHAPTER 5

DISCUSSION AND CONCLUSION

Discussion

In this chapter, the findings from the quantitative analysis of the measurement instruments, and the findings from the qualitative analysis of semi-structured interviews will be used for responding to the following proposed research questions:

(a) Can playing and interacting with a virtual pet dog help promote children's development of empathy and positive humane attitudes toward animals?

(b) Do the duration and type of interaction relate to an enhancement in children's development of empathy and their attitude toward the humane treatment of animals?

(c) What attitudes and feelings do children have regarding a virtual pet dog?

(d) Are there sex differences in children's development of empathy and attitude resulting from playing and interacting with a virtual pet dog?

(e) Do children who report greater companion animal bonds with their virtual pet dog have higher empathy and humane attitude scores?

Virtual Pets and Children's Development of Empathy

Animal research studies have suggested that animals could play effectual roles in enhancing children's empathic development or abilities that relate to empathic development (Ascione, 1992, 2005; Ascione & Weber, 1996; George, 1999; Levinson, 1972, 1978, Myers, 1998). Research studies on virtual characters have suggested that

virtual characters may be able to evoke empathic responses by children (Dias et al, 2006; Scheef, et al, 2000, 2002). However, studies have not been found which directly found a conclusive association that playing, interacting with, and responding to a virtual pet dog could promote children's development of empathy.

In this research, the findings support the assumption that a virtual pet dog could be used as a medium to facilitate the development of children's empathy. The study found that the participants' scores on the Bryant Empathy Index remained fairly stable during the first three weeks without the experimental intervention of a virtual pet dog, real pet dog or the provision of any explicit lessons on teaching empathy to children. However, after playing and interacting with a virtual pet dog for three weeks, it was found that the participants' scores on the Bryant Empathy Index had increased significantly. Therefore, the findings seem to suggest and support the hypothesis that a virtual pet dog may be able to help enhance children's empathic development.

Virtual Pets and Children's Enhancement of Humane Attitudes

Research studies have suggested that direct interaction with animal pets or farm animals can enhance children's humane attitudes (George, 1999). The research from Paul and Sherpell (1993) supported George's theory and further elaborated that the experience of pet ownership during childhood can help children to develop positive humane attitudes toward animals and people. However, studies have not been found which conclusively established an association between interacting with a virtual pet and the enhancement of humane attitude.

In this research, the findings support the assumption that a virtual pet dog could be used as a medium to facilitate the enhancement of children's humane attitudes. The study found that participants' scores in the Intermediate Attitude Scale remained fairly stable during the first three weeks without the experimental intervention of a virtual pet dog, real pet dog or the provision of any explicit lessons on teaching empathy to children. However after playing and interacting with a virtual pet dog for three weeks, it was found that the participants' scores on Intermediate Attitude Scales had improved. Therefore, the findings of this research seem to suggest and support the hypothesis that a virtual pet dog may be able to enhance children's humane attitude toward animals through playing, interacting, and responding to a virtual pet dog.

This research also showed that, by comparing the participant group who had previous dog owning experience and the participant group who did not have previous dog owning experience, both groups attained higher humane attitude scores after the experimental intervention with virtual pet dog. However, the research found that, participants who had previously owned a dog, did not have significant empathic improvements on their posttest scores after playing, interacting with, and responding to virtual pet dogs.

No explicit reasons were determined which indicated why participants with dog owning experience did not show significant empathic improvement. Perhaps participants who owned a dog might have had prior influences from earlier exposure to dogs. This possibility is supported by animal research studies, which have suggested that animals could influence children's empathic development and their empathic test scores. Another possible reason why the study did not find a significant increase in empathy scores might

be that the group with previous dog owning experience is small *(n=18)*. Perhaps if the participant group were larger, empathic changes might be more certain.

Research studies have suggested that enhancing children's humane attitude toward animals can later influence their empathy and humane attitude toward other people (Angell, 1884 in Ascione, 1992, 1997). Paul (2000a) supported a similar idea and concluded that there are "significant correlations between level and intensity of childhood pet relationships, concerns for the welfare of animals and empathy with humans" (p. 174).

This research found that participants with higher humane attitude scores also had higher empathy scores in pretest and posttest. However, the research could only suggest that there is a positive correlation between humane attitude toward animals and empathy, but could not suggest the causal relationship. In addition, this research found that there was no correlation between the change in empathy score and humane attitude score after the 3-week intervention of the virtual pet dog. A possible explanation could be that the participants had different life and learning experiences before the experiment, which may have influenced their empathy and humane attitude posttest scores.

Direct contact and care for pets and animals were suggested to have positive influences on children's humane attitude toward animals and empathic development. Some researchers have theorized that interacting with animals could enhance children's development of empathy through the facilitation of opportunities to experience different emotions and feelings (Covert, Whiren, Keith & Nelson, 1985; Rost and Hartmann, 1994) as well as opportunities to practice role taking and perspective taking abilities (Levison, 1978; Myers, 1998). Consequently, these opportunities facilitated by animals may be able

to assist children in developing skills to perceive emotional and non-emotional cues from social context.

In this research, the participants reported that they engaged in different activities that served as important catalysts for empathy, particularly caring behaviors, experiencing emotions, perspective taking and role taking. For example, a third of the participants (33.33%) believed that their virtual pet dog is a pet instead of video game because it required caring. Almost a quarter of the participants (24.14%) stated that caring was their favorite activity with their virtual pet dog. In the weekly log, all of the participants reported that they engaged in caring behaviors on a daily basis. For perspective taking and experiencing emotions, the participants reported that they would consider their virtual pet dog's interests, needs and benefits when determining which activities to do. Therefore, this research has indicated that the experimental intervention of a virtual pet dog was able to provide children with opportunities to practice skills in understanding others' needs and emotions, as well as practice skills in considering others' perspectives.

Some participants provided a description of their virtual dog's reactions to particular activities. For example, one participant (Student 26) reported that he did not like playing the bubble blower, because "when you blow, my dog doesn't like it and my dog gets scared." Some participants also noticed vulnerability in their virtual pet dog, and avoided activities that they believed might hurt it. Student 34, for example, said, "I don't play with the rope because when I play, it hurts him." Although the research did not directly prove that these caring, role taking and perspective taking behaviors conclusively enhanced children's development of empathy and humane attitude, it did show that

through interacting with virtual pet dogs, children did receive the opportunity to practice critical abilities. These opportunities could have influenced the increase in their humane attitude and empathy posttest scores.

Influence of Playing Duration and Interaction Types

Research studies have suggested that caring behaviors or opportunities that allow role taking and perspective taking may be able to enhance children's development of empathy and development of humane attitude toward animals (Ascione, 2005; George, 1992; Myers, 1998; Paul and Sherpell, 1993). Based on the students' self- reported weekly logs, this research found that participants who reported devoting longer duration of time in playing with their virtual pet dog tended to have higher humane attitude scores. The correlation between play duration and participant's empathy score was also positive, although the result was not significant (BIpst, $r = .26$, $p = .07$). In terms of the correlation between the activities, which the participants and their virtual pet dog engaged in and the participants' empathy and human attitude change, the research showed that the more the participants engaged in caring behaviors, the higher were their humane attitude scores. . In addition, the participants also tended to score higher empathy and humane attitude posttest when they engaged in more competitions with their virtual pet dog. The research however found that the amount of care provided did not correlate to empathic test score, and that training provided did not correlate to either empathic score or humane attitude score.

Although the results did not prove that the number of caring activities can directly influence the participants' empathy posttest score, competitive behavior was associated

with higher empathy and humane attitude posttest scores. It should be noted that before the participants can enter their virtual pet dog in competitions, they must devote time in training and playing with their virtual dogs. Moreover, when deciding to join competitions, the participants did not necessarily only care about wining or getting prizes. Sometimes the virtual dog's interests and needs could also be the reason for entering. For example, Student 5 reported that he liked to take his virtual dog for agility competition because "he jumps and he gets energy, and it helps to have a walk." Student 8 reported, "I like to take him for the competition because he always tried his best." Therefore, the purposes and the process of joining competitions may influence the outcome in which participants who joined in more competition attained higher posttest scores in empathy and humane attitude.

Attitudes and Feelings Regarding a Virtual Pet Dog

After playing, interacting with and responding to the virtual pet dogs, participants received a semi-structured interview in which they were encouraged to express their feelings and attitudes toward their virtual pet dog. The research found that a majority of the participants (92.16%) considered their virtual pet to be a real pet rather than a video game. Half of the participants (52.38%) said that their virtual pet was a real pet instead of a video game because their dog appeared or behaved like a real dog. A third of the participants (33.33%) said that their virtual pet was like a real pet because it had physical needs and required care.

Regarding the length of time that the participants expressed wanting to keep the virtual pet, a definite majority (96.08%) stated that they would like to keep the virtual pet

longer than the three-week research period. A third of the participants (35.29%) reported they would like to keep the virtual pet forever. According to participants, the reasons for wanting to keep the virtual pet dogs longer were relate to emotional factors, such as emotional bond (20.90%), enjoy playing and having fun (43.28%), desire to continue to provide care (5.97%), or as a substitute for a real dog (11.94%).

The participants' emotional reactions toward the virtual pets were evident in their interview conversations. For example, Student 1 expressed her emotional bond with the virtual pet by saying, "I got used to Cleo and I don't want to leave him." Another participant (Student 43) said, "I want to have a real dog, but I am not allowed. I want to have a *Nintendogs* because it is just like taking care of a real dog."

The research also found that the participants not only built an emotional connection to the virtual pet dogs, but the participants also believed that their virtual pet dog had feelings that could be hurt. For example, Student 8 stated that her virtual pet might become too attached: "If you play with it too much, it will get too responsive. When I turn it off, it will wait and wait and wait and it doesn't even run away because it likes you too much."

The research further found that the participants tended to personify their virtual pet dog, and believe that it has its own interests (13.25%) and personality (38.55%). Consequently, it was not surprising to find that participants actually considered their virtual pet dog's interests, needs and benefits when deciding which activities they liked to engage in. Two-thirds of the participants (66.67%) indicated that they would consider an activity if it was mutually interesting and benefiting to them and their virtual dog. Almost a quarter of the participants (23.53%) expressed that they would consider their virtual pet

dog's benefits and interests when deciding which activity to do. For example, a participant (Student 5) mentioned that she liked to play a rubber bone with her virtual pet dog because "it's her [dog's] favorite." When asked "which activity do you not like doing with your virtual pet dog?" many of the participants (42.86%) also mentioned that they would consider their virtual pet's interests and benefits. A fifth of the participants (20%) avoided activities, which they thought their virtual pet dogs were not good at engaging.

Therefore, the findings of this research suggest and support that a virtual pet could provide children with opportunities to practice altruistic behaviors and that children could have a humane attitude toward virtual pet dogs. In thus doing, the research results support a previous virtual pet research by Kahn, Friedman, Perez-Granados, and Freier (2004), which reported that preschoolers believe a robot dog have feelings and would need to consider the robot dog's welfare while doing something with it.

Research studies have posited that children's empathic development could be enhanced through training. Hoffman (1982, 2000) and Feshbach (1979) for example, suggested that children should be exposed to different life and emotional experiences, which would allow them to practice role-taking and perspective taking skills. They also suggested that children should be encouraged to freely express their emotions and learn how to perceive emotional and non-emotional cues in social contexts.

This research showed that children could have different feelings such as caring, having fun, and emotionally bond with their virtual pet dog. Also in the context of choosing which activities to play with it, the participants showed that they were practicing perspective-taking skills by observing their virtual pet dog's interests and benefits. Moreover, through the interaction with a virtual pet dog, the participants further

assumed different roles, which they usually did not have the opportunity to assume in real life such as caregiver or dog trainer. Therefore, virtual pet dogs could serve as a medium in facilitating experiences that enable children to practice important skills, which might further help enhance their humane attitude and empathic development.

The research findings suggest that participants could form different types of relationships with their virtual pet dog. For example, 12.86% of participants believed that they could form social relationships such as friendship with the virtual pet dogs. One participant even described her virtual pet was like a sister. A third of the participants (32.86%) believed that their relationship was more like pet and owner, another third (31.43%) reported that their relationship was positive. Almost a fifth of the participants (17.14%) stated their relationship was balanced in terms of interaction. There was only one participant who did not answer the question. None of the participants indicated that they considered their virtual pet dog as only a game and could not form a relationship with it.

Therefore, this research generally supported the conclusions from Kahn et al. (2004) who reported that preschoolers could form a social human-animal relationship with a pet animal, and extended the relationship to include virtual pet. This research further suggested that children in middle childhood are still able to form social relationship with virtual pets because a variety of relationships such as friendship, family and pet-owner relationship was found.

Sex Differences

The research found that female participants had higher empathy test scores than male participants before and after the experimental intervention with the virtual pet dog, and that the differences in scores are statistically significant. Furthermore, the research found that both females and males' empathy posttest scores improved after the three-week experimental intervention of the virtual pet dog.

Analysis based on the Intermediate Attitude Scale questionnaire found that female participants had higher humane scores than males. However, the differences were not statistically significant. Both female and male participants' humane attitude scores improved after 3 weeks experimental intervention with virtual pet dogs.

Using the Companion Animal Bonding Revised Scale, the research found that female scores were higher than males, and the difference is statistically significant in terms of the quality of the relationship between child and virtual pet, as well as the social interaction. However, analysis that compared the duration, types of activities (e.g., caring, training and competing) did not reveal any statistically significant difference between female and male participants.

Therefore, the findings of this research support the conclusions of empathy studies by Feshbach (1978) and Ascione (1992) who both found that females tended to have higher empathy scores than males. The findings of this research also support the animal study by Vidovic, Stetic , and Bratko (1999) which concluded that girls are more inclined to be attached to animals and also more empathic than boys. Rost and Hartman (1994) suggested that boys and girls are equally capable and willing to take care of pets. Consequently, the findings are also supportive of Rost and Hartman (1994) because no

significant difference was found between female and male participants regarding the duration of interaction and the type of activities, which the participants engaged including caring, training and competing behaviors. Despite girls being found to be more empathic than boys, animals could be used as a sex-neutral media to encourage empathy-related caring behaviors (Melson, 2003).

In summary, both female and male participants had improvements in empathy and humane attitude posttest scores after the 3-weeks experimental intervention of playing, interacting with and responding to a virtual pet dog. There was no sex differences found regarding the types of activities which the participants engaged in, nor in the time devoted to playing with virtual pet dogs. Therefore, this research suggest that virtual pet dogs could be used as a sex-neutral medium to enhance children's development of empathy and humane attitude.

Virtual Pets and Children's Bonding with Children's Development of Empathy and Humane Attitude

The Companion Animal Bonding Revised Scale was used in this research for measuring the quality of the child and virtual pet relationship and social interaction. Analysis found a positive correlation between empathy and animal bonding score. The findings are consistent with Melson (2003) which suggested that "highly empathic children may have greater skill at bonding with an animal (as well as a person)" (p. 36).

Ascione (1996) concluded that children's CABS scores are positively related to their humane attitude toward animals. However, the research did not find a strong correlation between animal bond and humane attitude. When individual items in the

Companion Animal Bonding Revised Scale were examined, it was revealed that participants who often cared for their virtual pet dog's needs tended to have higher empathy posttest scores. In addition, participants who often cleaned up after their virtual pet dog tended to have higher empathy and humane attitude posttests scores.

The analysis could not definitely explain why participants who had higher humane attitude scores did not necessarily have higher bonding scores with their virtual pet dog. Some possible explanations could be that the Companion Animal Bonding Scale was designed for measuring children and real pet interactions under real life situations. The scale designers, Poresky and Hendrix (1987), emphasized that human-animal relationships should focus on bonding and attachment instead of pet ownership. In real life, children might own the pets with their family but may not the primary caregiver of their pets. In addition, children may not necessarily interact with their pets on a regular basis.

The relationship between a child and a virtual pet dog is however somewhat different. Consequently, a difference exists between the original design of the scale to be used between a real pet and owner, and the relationship between virtual pet and child. This difference might influence the results of Companion Animal Boding Revised Scale. A virtual pet dog is often owned by a specific owner rather than by the whole family. For example, the researcher found the distribution of participants' answers for the CABRS was restricted because they usually answered "always" or "most of the time" for nearly all of the questions. Therefore, this may be different from real life situations where children are not the only caregivers of their family's dog.

Furthermore, some questions may not reflect the true bond between a virtual pet and its owner. Although participants who reported being engaged in more caring behaviors tended to have higher empathy score, the only item found to positively correlate to the participants' empathy and humane attitude scores was how often the participants indicated that they cleaned up after their virtual pet dog. No research has been found which directly supported that a specific clean up behavior strongly related to children's empathy and humane attitude. Possibly, though, cleaning up is one of the most disliked responsibilities for many dog owners. Consequently, if participants were willing to do the most disliked jobs, then it may be assumed that they might possibly have higher empathy and humane attitudes.

Limitations and Suggestions for Future Research

The analysis of the quantitative data from the measurement instruments and the qualitative data from the semi-structured interviews resulted in many findings. There were, however, some limitations encountered that could be improved in future research. There were also some questions that remained unanswered and ideas that need that further study. In addition, there are more issues waiting to be discovered and discussed in future research.

Possible ways in which the research-design could be improved in future studies include expanding the number of research group participants, providing a longer experimental duration, and using or creating additional reliable instruments for the virtual pet research. Furthermore, it would be interesting to compare the differences between interacting with real pet dogs and virtual pet dogs.

Expanding the Research Group

In this research, 51 students in Grades 4 and 5, whose age ranged from 9 to 11 years with a mean of 10 years, participated in the study. Although more participants would have been preferred, it was practically difficult for the researcher to obtain a larger, but still fairly homogenous, group where the participants had similar backgrounds and were of a similar age to prevent the influence of extraneous variables.

One reason for the difficulty in recruiting more participants was the nature of the study. Many schools that were approached about hosting the study declined citing that the administrator or teachers did not personally like the idea of children using a videogame in school even for research purposes. It was also found that some schools had a rule that prohibited the play of handheld computer games by students during recess and lunch break time. In addition to philosophical reasons against the playing of videogames, another reason why a larger research group was difficult to obtain was that the introduction, testing, meeting, interviewing and assessing parts of the study were to be conducted in the school setting during school time. Some schools expressed worry that the experiment might interfere with their curriculum and the students' routines including getting a physical break during recess or lunch. To avoid these difficulties in school settings, and to locate a larger research sample, future research studies could be conducted in after school programs.

Having a larger research group would have better substantiated the research results. The research used quasi-experimental repeated measurement method because there were insufficient participants to establish an independent control group. It would be ideal if, in future studies, a more formal research could be conducted using a separate

control and experiment group. Furthermore, if a large participant group is available, future studies might also include a third group, which receives teacher directed lessons on empathy training. The results of the group with empathy training could then be compared with the results of the experimental group with the virtual pet dog but not teacher directed lessons on empathy.

A larger research group could have also substantiated comparisons between the participants with previous dog owning experience and the participants without dog owing experience. In this study, there were only 18 participants who had previous dog owning experience. Although the study found that they had general improvements in empathy posttest, the results were not statistically significant $(t = 1.92, p = .07)$. The statistically insignificance may be due to the small number of participants in this group. Consequently, with a larger research group, the results might have been clear.

In this research, the males and females were compared for similarities and differences in the effects of a virtual pet dog. With a larger research group, cross-cultural analysis could have also been done to examine what, if any, effect a virtual pet dog might have on members from different cultural groups.

Longer Experimental Duration

This research was designed to have an experimental intervention period of 3 weeks because the researcher was required to meet with the participants during school hours. It was anticipated that a too long period might disrupt the school's curriculum and students' routines. Furthermore, it was anticipated that the participants might lose interest

in continuing with the research if they could not go outside for recess or lunch breaks instead of staying insider to meet with the researcher.

Future studies should be designed with an extended research period in order determine whether a virtual pet dog could have a long term effect on children's humane attitude and empathic development, as well as whether and how long the effects could be sustained. For example, although Bloch and Lomish (1999) posited that virtual pets might encourage temporary and unrealistic relationships, this particular research was unable to address this question because a longer research duration is needed to properly respond. Long term studies could also address Paul and Sherpell (1993) who posited that having pet animals in childhood may be able to positively influence humane attitudes and empathic development later in life. Consequently, in this age of increased computerization of children's toys, as well as increased urbanization where families have less ability to own a dog in cities, it is important to determine whether a computer simulated virtual pet can have positive social and emotional influences during childhood and later as adults.

Reliability of the Research Instruments

The reliability of the Companion Animal Bonding Revised Scale was not particularly high. Analysis showed that the Cronbach's Alpha ranged from .42 to .46. The probable reason for the low Alpha coefficient could be that the original Companion Animal Bonding Scale was designed for real life situations with a real pet animal. Consequently, some questions were not relevant to the relationship and interaction with a virtual pet. Also, the small number of items could have affected the reliability. Therefore,

it is important to use or create another instrument, which can more accurately assess the true interaction and relationship that children could have with virtual pet animals. With it, further research can determine whether a strong bond with a virtual pet would relate to children's empathy, humane attitudes or other areas of socio-emotional development.

Another limitation was the reliability of the data regarding the participants' play duration and interaction activities. This data was based on the participants' self-reported weekly logs, and may have been subjected to recording errors due to under or over-estimating the amount of time that they actually played and how they played with the virtual pet. Some participants may have also deliberately inflated the time, believing that it was better to show more time engaged with the virtual pet dog despite being informed not to do so.

To record accurately the play duration, as a suggestion, future research might need to be done under clinical conditions using video recording. However, it was the intent of this particular research to focus on naturalistic conditions similar to real pet and owner relationships where interactions could happen over many, short periods of time instead of a long sitting in an observation laboratory. To improve the accuracy and reliability in future research, the participants' parents could also be invited to be a part of the research by keeping track and entering the data into the participants' weekly log. Alternatively, there could be a separate parent report which could be compared to the participants' self-reports to improve the reliability.

Comparisons to Real Pet Animals

The research hypothesis was based on whether interacting with real animals can increase children's development of empathy and humane attitude. However, whether we can or should use virtual pets to replace real animals is another question. Therefore, it would be important to conduct further research using real pets and virtual pets in different experimental groups and determine whether real pet and virtual pet can result in different effects and directions in the social and emotional development of children.

Furthermore, in the literature review, some educators worried that a virtual pet might over-simplify the real living situation and social interaction, or encourage children to build a temporary and unrealistic relationship. In this research, children showed that they formed emotional bonds with virtual pets. Some even used their virtual pet to substitute for a real dog or to form a strong emotional connection to their virtual pet. It is important to be aware of the emotional impact a virtual pet might have and to conduct further research that focuses on better understanding of the psychological impacts that virtual pets might have on children who interact with them.

Conclusion

Combining the research analysis of quantitative and qualitative data, the findings can be summarized as the following: First, the participants' empathy and humane attitude posttest scores were generally higher on the Bryant Empathy Index and Intermediate Attitude Scale, respectively after the experimental intervention of the virtual pet dog. Second, in terms of play duration and interaction types, the research found that the participants' self-reported duration of play and times of engaging in caring behaviors

positively correlated to their humane attitude. In addition, the more the participants engaged in competition activities, the higher was their empathy and humane attitude posttest scores. Third, when the participants discussed their attitude and feelings toward the virtual pet dogs, most stated that they considered the virtual pet as a real pet instead of a videogame character. Fourth, the participants reported they had formed an emotional bond and positive relationships with their virtual pet dogs. Fifth, the participants believed that the virtual pet dog has emotions and interests, which the participants felt were important to consider when deciding which activities to engage. Six, the virtual pet game provided children with opportunities to practice important skills that may positively influence their humane attitude and empathic development such as role taking, perspective taking and caring behaviors. Seventh, sex analysis revealed that both female and male participants had improvements in their empathy and humane attitude posttest scores after the experimental intervention of the virtual pet dog, although female participants generally attained higher empathy and humane attitude scores than male participants. Eighth, there were no significant differences found in both sexes' play duration and the activities which they engaged in with virtual pet dogs the research, thereby suggesting that a virtual pet dog could be used as a sex neutral medium to encourage both humane attitude and empathic development. Ninth, the research found that the participants who scored stronger companion bonds with their virtual pet dogs on the Companion Animal Bonding Revised Scale tended to have higher empathy test scores. Tenth, the research revealed that the participants' attitude toward a virtual pet dog's care was related to empathy score, and that their willingness in clean up after the virtual pet dog was positively related to both empathy and humane attitude posttest scores.

During the research, some participant children expressed to me how much they wanted to have a real pet dog. However due to reasons such as allergies, apartment rules, or the participant's young age, these children were not able to have a real pet dog. Although the research would not suggest that virtual pets could replace real pets, the study did show that most children had positive interactional experiences with their virtual pet dogs. The research further found that playing, responding to, and interacting with a virtual pet were positively correlated with the participants' humane attitude and empathic posttest scores. In thus doing, the research suggests that playing, interacting with and caring for a virtual pet may be able to enhance children's humane attitude and development of empathy, and thereby serves to support future research into the effects of virtual pets on children's development.

Furthermore, computer games such as *Nintendogs* could possibly be used as a component of an educational unit to address the goal of the BC curriculum regarding the promotion of social responsibility including empathy and positive attitude toward all living organisms. The educational unit could incorporate a multimedia approach comprising elements such as print, video, and computer simulated virtual characters to help facilitate the social and emotional development of children.

APPENDICES

Appendix A: Consent

Form 3: INFORMED CONSENT FOR MINORS (under age of 19) or CAPTIVE AND DEPENDENT POPULATIONS

Consent by Parent or Guardian to allow participation of their Ward in a research study.

Title: The Effects of a Virtual Pet Dog on Children's Development of Empathy and Attitudes (Phase 2)
Investigator Name: Yueh-Feng Tsai
Investigator Department: Education

The University and those conducting this study subscribe to the ethical conduct of research and to the protection at all times of the interests, comfort, and safety of participants. This form and the information it contains are given to you for your own protection and to ensure your full understanding of the procedures, risks, and benefits described below.

Risks to the participant, third parties or society:

There are no anticipated risks to the participants, third parties or society. Interested participants will be asked to volunteer. Participation is completely voluntary and the decision to participate or not participate will not have any positive or negative effect on their grade or evaluation in the classroom. Furthermore, the parent's refusal to allow their child to participate will have no adverse effects on their child's grade or evaluation in a class or coursework. The decision, by either the child or the child's parent, to participate or not participate will be not be told to others. The participants' names will be kept confidential. None will be identified by name. To ensure confidentiality, the researcher will assign each participating student a code number. Only the researcher will have access to the name and code match list.

Benefits of study to the development of new knowledge:

The benefits of this study are to help understand whether and how a computer-based game (virtual pet) can have educationally positive effects on children's social and emotional development. The use of virtual pets to develop children's empathy and attitude has not been studied before. The results of the study can be obtained from the researcher after the findings have been published.

Procedures:

The participants in the experimental group will be loaned a mobile hand-held computer-based game machine and software which they can play with for about 3 weeks. They will also keep a weekly log of how they played (interacted) with the game. All participants (experimental and control group) will write a pre-test and post-test. But if there are not enough volunteer participants, then no control group will be used. Participants in the experimental group will also need to answer some interview questions. All meetings with the researcher will take place during recess, lunch or other times arranged with the school.

Summarize:

My name is Lily. I am a student at Simon Fraser University. I am trying to find out whether children can learn to understand how others feel and to treat animals nicely by playing a computer game. Students who do not own pets or have not played Nintendogs alot can join this activity. If you decide to join this activity, you will be loaned a Nintendog DS and Nintendogs game for about 3 weeks. This game involves taking care of a computer dog. You can decide how to play with it and how long to play with it at home, or during recess or lunch at school. You will also need to answer some questions before playing, keep a weekly log of how you played with it, and answer some questions after playing. These questions are about how you think others feels and how you feel about animals. I will meet with you: about 3 times during the first week to ask the questions and teach you how to play; once for 3 weeks to collect the weekly log, and about twice during the last week to ask some more questions. All meetings will take place during recess, lunch or other times allowed by your teacher. Your name will not be written or told to anyone, and your decision to participate or not participate in the activity will also not be told to others. No one will know your specific answers to the questions. I will keep your answers to the questions and interviews, and information about how you played with the game in a safe place only I can get to. I might call you after the activity if I need more information. The information collected in this activity might be used in other reasearch studies.

Your signature on this form will signify that you have received a document which describes the procedures, possible risks, and benefits of this research study, that you have received an adequate opportunity to consider the information in the document, and that you voluntarily agree to allow the minor named below to participate in the study.

Name of Parent or Guardian (PRINT):_____

Name of Minor Participant: (PRINT):_____

who is the (*relationship to minor*) (PRINT):_____

I certify that I understand the procedures to be used and have fully explained them to the minor participant:

Name of minor participant:_____

and the participant knows that myself, or he or she has the right to withdraw from the study at any time, and that any complaints about the study may be brought to:

Dr.Hal Weinberg, Director
Office of Research Ethics
Simon Fraser University
hal_weinberg@sfu.ca
778-782-6593

I may obtain copies of the results of this study, upon its completion by contacting the researcher named above or:

Print Name Parent or Guardian:_____

Signature of Parent or Guardian:_____

Date (use format MM/DD/YYYY) :_____

Appendix B: Bryant Index of Empathy

Choose either yes or no.

N	Questions	Yes	No
1	It makes me sad to see a girl who can't find anyone to play with.		
2	People who kiss and hug in public are silly.		
3	Boys who cry because they are happy are silly.		
4	I really like to watch people open presents, even when I don't get a present myself.		
5	Seeing a boy who is crying makes me feel like crying.		
6	I get upset when I see a girl being hurt.		
7	Even when I don't know why someone is laughing, I laugh too.		
8	Sometimes I cry when I watch TV.		
9	Girls who cry because they are happy are silly.		
10	It's hard for me to see why someone else gets upset.		
11	I get upset when I see an animal being hurt.		
12	It makes me sad to see a boy who can't find anyone to play with.		
13	Some songs make me so sad that I feel like crying.		
14	I get upset when I see a boy being hurt.		
15	Grown-ups sometimes cry even when they have nothing to be sad about.		
16	It's silly to treat dogs and cats as though they have feelings like people.		
17	I get mad when I see a classmate pretending to need help from the teacher all the time.		

N	Questions	Yes	No
18	Kids who have no friends probably don't want any.		
19	Seeing a girl who is crying makes me feel like crying.		
20	I think that it is funny that some people cry during a sad movie or while reading a sad book.		
21	I am able to eat all my cookies even when I see someone looking at me wanting one.		
22	I don't feel upset when I see a classmate being punished by a teacher for not obeying school rules.		

Appendix C: Intermediate Attitude Scale

Choose either: Strongly Agree, Agree, Disagree or Strongly Disagree.

N	Questions	Strongly Agree	Agree	Disagree	Strongly Disagree
1	It is better to abandon a pet than to bring it to an animal shelter to be killed.				
2	All cats like to be taken on trips.				
3	Pet animals should not be allowed to roam around free in their neighborhood.				
4	It's wrong for other people to tell you what kinds of animals you can and cannot hunt.				
5	A cat might feel lonely if it had no one to care for it over a weekend.				
6	Wild animals are not able to preserve their own habitats and need help from people.				
7	You can never know how an animal feels because animals can't talk.				
8	People who abandon pets do not really care about pets.				
9	It's exciting when you see a galloping horse fall down on a TV show.				
10	There are good things about all animals even those I don't like.				
11	We will always have room in our world for all the pet animals that are born.				
12	People should not try to make wild animals become pets.				
13	If I owned a place that keeps animals I would try to keep as many animals in a pen as I could fit in.				

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N	Questions	Strongly Agree	Agree	Disagree	Strongly Disagree
14	Watching birds with binoculars is more fun than shooting pheasants.				
15	A dog that strays away from home can make its owner sad but it won't affect other people in the neighborhood.				
16	Pet cats can usually take care of themselves when a family goes on vacation.				
*17	I would like to be a vegetarian.				
18	A littered environment is a bad environment for most animals.				
19	Bearskin rugs are beautiful, and I would live to own one.				
20	Operating on pets so they can't have babies is horrible, and these operations should not be performed.				
21	The people I know do not all feel the same way about pets.				
22	Whether or not an animal will adapt well to a human environment should be a concern when you are choosing a pet.				
23	If I had a dog, I would want it to run free around the neighborhood.				
24	I would like to spend some of my time telling people about the problems that face an endangered animal.				
25	It's mean to leave your pet at a place that keeps animals if you can't take it on vacation with you.				
26	People who are vegetarians and don't eat meat are just being silly.				

N	Questions	Strongly Agree	Agree	Disagree	Strongly Disagree
27	Listening to a canary sing makes me feel happy.				
28	None of the needs that animals have are similar to human needs.				
29	Products made from animals should only be used if these products are a necessity for humans.				
30	I think that operations to keep animals from having any baby animals would help solve the pet overpopulation problem.				
31	Laws that tell us what kinds of wild animals can be kept as pets are unfair.				
32	Hunting wild animals should not be allowed under any circumstances.				
33	Keeping farm animals in small places is not good even if it increases food production.				
34	It's wrong to have animals fight just so people can be entertained.				
35	If a neighbor's cat scratches a baby, it's the cat fault that the baby got hurt.				
36	Destroying wild animals' habitats is always acceptable if it leads to increased food production.				

* The researcher made a typographical error on Item 17. It should have read "I would like to be a veterinarian."

Appendix D: Companion Animal Bonding Scale

Choose either: always, most of the time, sometimes, once in a while, or never

N	Questions	Always	most of the time	Some-times	once in a while	never
1	How often were you responsible for your Nintendog's care (e.g., feeding , walking, washing)?					
2	How often did you clean up after your Nintendog?					
3	How often did you hold, touch, or pet your Nintendo?					
4	How often did you keep your Nintendog in your bedroom instead of other places in your home?					
5	How often did you feel that your Nintendog responded to you?					
6	How often did you feel that you had a close relationship with your Nintendog?					
7	How often did you travel with your Nintendog? (For example, did you take your Nintendog when you went to other places such school or to a friend's or relative's home?)					
8	How often did you sleep with your Nintendog? (For example, did you put your Nintendog in your bedroom or near you when you were sleeping)?					

Appendix E: Virtual Pet Interactions Weekly Log

Behaviors	Date						
Caring Behaviors	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
How many times did I feed my dog?							
How many times did I walk my dog?							
How many times did I wash my dog?							
How many times did I play a toy/sport item with my dog?							
Interacting and Training Behaviors	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
How many times did I train my dog to obey?							
How many times did I train my dog to catch a disc or for agility trials?							
Competitions	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
How many times did I take my dog to competitions?							
Points	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
How many total points do I have at the end of day?							
Time	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
How many minutes did I spend with my with my dog today?							

For researcher use only:

Date Given: **Date Collected:**
Accumulated Points on the date collected:
Accumulated Time on the date collected:

Appendix F: Interview Questionnaire

1) Why did you choose this Nintendog?

2) What is your Nintendog's name?

3) Did you name your Nintendog? Why? Why not? Why did you give this name?

4) How would you describe your Nintendog?

5) How would you describe your relationship with the Nintendog?

6) What do you like to do with your Nintendog the most? Why?

7) If you can choose, how long you would like to play with your Nintendog? Why?

8) What types of activity do you like to do with your Nintendog the most? Why?

9) Which activities do you not like to do with your Nintendog? Why?

10) Do you think Nintendogs is a pet or Video game? Why?

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