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DePaul University

College of Education

INVESTIGATING THE IMPACT OF VIDEO GAMING ON CHILDREN'S MAGICAL
THINKING IN EARLY CHILDHOOD

A Dissertation in Education

With a Concentration in Early Childhood Education

by

Rafi Antar

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Submitted in Partial Fulfillment
of the Requirements for the Degree of

Doctor of Education

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We approve the dissertation of Rafi Antar.



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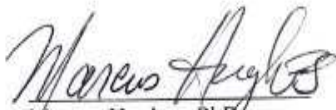
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ABSTRACT

In our present time, young children are exposed to various forms of electronic media, in particular video games. Several studies have discussed the impact of video games on children's behavior, and brain development; however, almost none have framed this impact in the context of magical thinking. By using a qualitative narrative inquiry approach and a grounded theory approach, this dissertation aimed at discussing the meaning three children (ages 4 and 5) made after playing a video game called Super Mario bros. This study answered two questions: (1) how is children's thought processes related to the notion of reality (i.e., understanding what is real, and unreal in the video game) influenced and ultimately formed after playing a video game? (2) And as a result, how do video games impact children's magical thinking? Findings revealed that video games have an impact on children's thought process, and as a result, stimulate their magical thinking. A magical thinking model was created to understand the factors, which stimulate magical thinking in children. The implications of this study suggest more research needs to be done to understand the extent a child engages in a video game, and magical thinking.

Key Words: Magical Thinking, Notion of Reality, Fantasy, Video Games, Super Mario Bros, Emotions, Uncertainty, Confusion, A Magical Thinking Model

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Chapter One

Introduction

Technology plays an increasing role in the lives of children (whether through education or in their daily lives). Currently, there are not enough studies to provide information about the true long term effects of the use of electronic media on children's development. Electronic media is any interactive device that requires software to function, in addition to having the option of having it connected to the internet. Examples of electronic media devices are television, computers, tablets, ipads, video game consoles, and mobile phones. Currently, most electronic media we use runs on software designed specifically for utilizing the internet (Kelly, 1996). There is general agreement that children start using electronic technology as early as primary school (Vandewater & Jung Lee, 2009). There is also growing evidence that in contemporary American society, young children are exposed to a varied and increasing number of media sources (Bazzini, Curtin, Joslin, Regan, & Martz, 2010). Understanding the extent of electronic devices use by children has been of interest to educators, medical practitioners and parents (Ebbeck, Yim, Chan & Goh, 2016). For example, video games, as a form of electronic media, are very popular among children for purposes of entertainment or passing time. Exploring the use of video games, as a particular form of electronic media, among young children is essential to shed light on how virtual reality affects their thought process, and as a result, their magical thinking. Virtual reality is the bridge that connects reality and computer technology, where children can interact with artificial environments while playing a video game (Das, Grimmer, Sparnon, McRae & Thomas, 2005). Magical thinking refers to thoughts or actions that young children create, which are physically unconnected to real events (Bolton, Dearsely, Madronal-Luque & Baron-Cohen, 2002).

According to literature, when children are in a state of confusion or error, they resort to magical thinking (Bolton et. al, 2002). Laura, Demetre, and Read (2009) quoted Zusne and Jones's (1989) definition of magical thinking as "the belief that one's thoughts, words, or actions can achieve specific physical effects in a manner not governed by the principles of ordinary transmission of energy or information (p. 13)." For example, young children might watch a movie about humans with super powers, and believe that they can fly, like Superman. Another good example is what Maureen Ryan (2018) uses, describing a child she encountered in her research, who thought that spinning in circles would make his favorite TV show appear. When children are thinking magically, their thoughts, actions, and beliefs are not associated with reality.

Statement of Purpose

Ryan (2018), explains that magical thinking is the psychological process of relating an event or action to another completely unrelated event or action. This sort of thinking leads children to believe that their actions will influence everyone around them, a reference to the Piagetian egocentric stage (Ryan, 2018). In brief, magical thinking has the propensity to distort a child's perception of reality (Ryan, 2018). Current research on magical thinking is mostly framed in the context of pathology for older children and adolescence. This study focuses on the typical development of magical thinking in children. Therefore, this qualitative narrative study aims at exploring the influence of video games' virtual reality on young children's thought processes, and as a result, their magical thinking. This research can offer further insight into understanding how video games have the ability to shape children's imagination, and notions of reality, as noted by Bertolini and Nissim (2002).

The questions for this dissertation aim at understanding how children's (ages 4 and 5) notions of reality (thought processes of what is real or unreal) are influenced and ultimately formed after playing a video game? And as a result, how do video games impact children's (ages 4 and 5) magical thinking?

Researcher's Positionality

Electronic media helped me as a child to adapt to several adverse situations. A major adversity I faced as a child was the terror of war. Growing up in the 1980s and 1990s in Lebanon made it extremely difficult for me as a child to go outside and play on a regular basis. Armed clashes were everywhere, and playing outdoors was not the best option for a child my age.

Television, especially cartoons, was a means of distraction from what was going on outside of my home. Even though there were times where I had to watch the news with my family, I mostly consumed television to watch cartoons and other children's TV shows. Video gaming was also a way to distract a six year-old child from the effects of war. I remember my first gaming console was the Atari in 1991, and it consumed most of my time during the spring and summer of that year. A year or two later, the same thing happened when I received my first Nintendo console as a reward for my good grades. Two years later I received my Sega game console for the same reason, and I used it the same way I used my previous two consoles. There were times when I went outside to play with peers, but it always ended by being called to go back home, since the situation was not "safe." The time spent watching television and playing video games was enough to keep me home almost all day, away from the terrors of the battles which were going on outside my door.

Today, children use electronic media for different reasons. Electronic media not only provides a safe zone for a child, but it also fulfills other roles for example, entertainment, interaction, and communication. While my parents bought me my gaming consoles as a reward for my good grades, their main reason was, in fact, to keep me safe from going outside during tense times. Perhaps their “trick” worked due to my engagement in magical thinking. During those tough times, playing a fighting/shooting video game made me feel as though I was the strongest man alive, while playing a soccer game made me feel that I was the best athlete that had ever existed. The adventure games I played created powerful thoughts about my sense of self, such as being the smartest man alive. I continue to wonder today: was it my video games and my own magical thinking that kept me safe?

In the present day, electronic media has evolved to present more options than just a television and a gaming console. It has been extended to include smart phones, tablets, laptops, computers, and more advanced televisions and gaming consoles.

Rationale and Significance

Findings from this research tend to answer questions related to how children perceive reality in the setting of early childhood, and to what extent they engage in magical thinking during the ages of five and six. Literature has provided evidence that children begin interacting with video games as early as age two (Blumberg & Randall, 2013), therefore and because of their global popularity, the impact of video games have been of a major concern for social scientists, parents, and even politicians (Saleem, Anderson, & Gentile, 2012). Ideally, this research has the potential to help in raising awareness regarding the realities young children shape after playing video games. It can serve scholars as a starting point to add to the literature

around video games, reality and magical thinking. It will also be beneficial to parents and early childhood educators, to understand certain behaviors by children, which might be associated to video game playing.

CHAPTER TWO

LITERATURE REVIEW

Electronic Media's Benefits and Shortcomings

Not surprisingly, controversy surrounds the topic of digital media, and its impact on young children's play (Johnson & Christie, 2009). Even though many electronic media devices have been created by experts to promote appropriate developmental learning in children from ages three to six, not all digital media was created with developmental expertise taking into account children's developmental needs. According to Lieberman, Bates and So (2009), several research reviews have identified strengths and limitations when it comes to digital media's impact on children. There is an ongoing discussion on how electronic media such as TV, game consoles, and computers affect children's lives (Plowman, McPake & Stephen, 2010). The topic of electronic media and technology has been seen as a controversial topic by many scholars. Where some regard it as developmentally appropriate for children, others believe it has a potentially negative impact on development (Vittrup, Snider, Rose & Rippy, 2016).

As discussed by Durkin and Blades (2009), some studies have revealed some benefits of electronic media. For example, appropriate use of computers has been linked to improving a child's executive functioning development (such as attention and focus, planning, problem solving, inhibition, action), and stimulating their cognitive performance (Durkin & Blades, 2009). Lieberman et al. (2009) have discussed that digital media helps in teaching mathematical and dynamic systems concepts, and in improving communication competence in children. In addition to that, digital media assists with collaborative learning in school settings, reasoning and problem-solving activities. Lieberman et al. (2009) elaborate that this sort of media helps in

expanding a child's vocabulary skills and acquisition of new words, reading and early writing skills. Finally, Lieberman et al.(2009) have stressed how digital media offers more creativity for children and that it can also improve abstract thinking when there is a well-designed computer-based game. In support of Lieberman and colleagues, a more recent study by Vittrup et. al (2016) has found that some educational programs on TV, such as Sesame Street, for preschool children, improve their math skills, vocabulary, pro-social behaviors and school readiness. They add that informative electronic programs that were designed for children have the ability to increase children's academic skills. As well-designed video games, they believe, would help in improving spatial skills, visual attention, and problem-solving skills, fine motor coordination, computer literacy and academic performance in children (Vittrup et al., 2016). In a meta-analysis of 34 studies, Coyne, Linder, Rasmussen, Nelson, and Birkbeck (2016) revealed that a child forms more positive attitude, and has positive behaviors upon watching pro-social television content. According to Vittrup et. al (2016), the use of computers at home has been associated with increased cognitive test scores as well as better performance in science and related areas. Ebbeck et al. (2016) finds that electronic technologies enhance children's productive capacities and help a child in creating social spaces for themselves through the use of the internet. They add that technology helps children in communicating with each other, in turn taking, and in collaborative problem solving. . Some studies suggest that children's video game play may enhance their cognitive skills such as scientific reasoning, problem solving, inductive reasoning, perspective taking, selective and visual attention, and memory (Blumberg & Randall, 2013).

Although the above studies provide evidence regarding the benefit of technology for the development and early education of children, electronic media has been viewed as a risk for children's development. For example, computers are considered damaging to a child's

development and learning (Ebbeck et al. , 2016). Disney films, which have traditionally served as icons of childhood, are also considered to have more influence on a child's values and traditions than school, religious institutions and family (Bazzini et al., 2010). Bazzini et al (2010) discuss how Disney characters have had significant influence on the stereotype known as, "What is beautiful is good." They add that media contributes to the physical attractiveness stereotype. It encourages the association between "Beauty is good" and "Ugly is bad". In addition, mass media messages can play a role in child's social development. In such a context, scholars have suggested that heavy TV viewing results in distorted perceptions about what reality is, and tends to portray the world as far more threatening and dangerous, creating beliefs of a "mean and scary world" (Comer, Furr, Beidas, Babyar, & Kendall, 2008, p. 623). Some other possible negative outcomes of technology have included "irregular sleep patterns, behavioral issues, focus and attention problems, decreased academic performance, negative impact on socialization and language development, and an increase in the amount of time young children spend in front of screens" (Ebbeck et al. , 2016, p.128).

There are other studies that show media such as TV, video, and film can create a cognitive limitation, in which young viewers would find it hard to understand others' mental perspectives (Durkin & Blades, 2009). For example, drawing from previous studies, Nakamuro, Inui, Senoh and Hiromatsu, (2015), discuss that TV viewing has a negative effect on cognitive development in children. Similarly, video games can cause the same cognitive challenges, such as mental perspectives, for young children, adolescents, and adults (Durkin & Blades, 2009). Also, video games were associated with a decrease in academic activities, such as doing homework (Nkamuro et. al, 2015). Children's use of electronic media has been linked to other negative effects, such as social isolation and obesity (Plowman et al., 2010). Plowman et al.

(2010) divided the negative impact of television, computers and game consoles into three broad categories: (1) a negative socio-cultural influence, where children are at risk because they play alone; (2) negative cognitive effects, in which children's imagination and linguistic development are inhibited due to the passivity of such technology; and (3) an adverse effect on children's overall well-being when children spend more time indoors, in addition to being possibly exposed to unsuitable content. "There have been numerous articles raising alarm over childhood exposure to TV, or video games." (Nakamuro et. al, 2015, p. 29).

Children's Use of TV, Computers and Video Games

Media is no longer used for entertainment only (music and movies), but it extended to communication via WhatsApp, Instagram, Snapchat, and Facebook (Crone & Konijn, 2018). Today, all media formats have become available through portable devices which became part of the youth's lifestyle (Crone & Konijn, 2018).

Nikken and Schols' (2015) study on Dutch children (N=896) ages 0-7 revealed that children are likely to use TV sets, game devices, and computers and touch screens when their parents use electronic media more often. Their study also revealed that older children have more media devices in their bedrooms than younger children; hence they spend more time watching television, playing video games and using the computer. The findings showed that computers and touch screens are used to a lesser extent than other devices. However, boys spend more time on gaming than girls (Nikken & Schols, 2015; Duursma, Meijer, & de Bot, 2017). Some studies indicate that boys watch TV, use the internet and play video games more than girls do (Nikken & Schols, 2015). Girls use the computer for communication purposes (Duursma et al., 2017). Other studies; however, suggest that there are no gender differences in using electronic media,

and both genders spend the same amount of time using the internet (Duursma et al., 2017). Duursma et al.'s (2017) study was conducted on a large group (N= 1464) of Dutch children ranging between the ages of seven to twelve. Ninety seven percent of their participants had a computer, an iPad/tablet, or laptop at home. Sixty one percent had their own TV, 72% had their own cell phone or Smartphone, and 80% had a gaming console or a gaming computer. They found that 44% watched TV between 1-3 hours a day, 57% watched movies on the internet for less than an hour, and 40% played computer games for less than an hour. Most children reported that they did not play video games with only 29% playing sports games, and 28% playing party games. In contrast to video games, 75% used a computer in school, while 92% used it at home with 59% using a computer to download games, and 66% used it for social media. Finally, it appeared that using a cell phone was not that popular among this sample, where only 24% used it daily, and 15% used it weekly. In this study, however, there were some gender differences, in that girls used their cell phones for texting, social media, downloading music, and making movies, while boys used it for playing games.

In one study, Vandewater Rideout, Wartella, Huang, Lee, and Shim (2007), with a large sample (N=1051) of children from birth to age six, found that per day, 63% of birth to two year old children, 82% of three to four year old children, and 78% of five to six year old children, watched television. Their study results also revealed that one third of children under study watched videos or DVDs, spending an average of an hour and 18 minutes watching. In contrast to the percentages above, fewer children played video games (Console or hand-held) per day. Statistics showed that only 2% of children ages birth to two, 13% of children ages three to four, and 16% of children between the ages of five and six played video games per day. When it came to using a computer, the results were not as high as watching television, in that only 4% of birth

to two years of age, 20% of children between the ages of three to four, and 27% of children between the ages of five to six, used a computer respectively. What was seen as a major finding in this study was that television remained the most popular form of electronic media that young children still use. According to Vandewater et al. (2007), this was attributed to the fact that young children find it more comfortable using television on their own. In other words, it is easier for them to turn on the television by themselves.

Similar to Vandewater et al.(2007), it has been illustrated that 68% of infants (birth to two years of age) view TV on a daily basis (Bazzinni et al., 2010). Additionally, more than 50% of birth to two years aged children, and over 80% of those three to six year olds are able to turn on the TV by themselves (Bazzinni et al., 2010). Vandewater et al's (2007) study revealed that one fifth of children aged birth to two had a TV in their bedroom and one third of children aged three to six also had a TV in their bedroom. Similarly, Nikken and Schols' (2015) study on Dutch children revealed that TV sets are the most used devices by children, where they watch about 52 minutes per day. Despite the inclusion of new technologies, television remains one of the most popular electronic media in children's lives (Duursma et al., 2017).

Electronic media use by children appears in their play and is not only limited to watching and listening to programs, and playing video games. Children's play includes traditional media such as TV and radio as well as contemporary media such as computer and video games and virtual worlds (Marsh, 2012). As an example, in a study done in the U.K by Marsh (2012) examining the relationship between traditional playground games and children's media cultures, children aged five to eleven were asked about the activities they engaged in on the playground. It appeared that children learn actions and gestures from cartoon characters and films they watch in addition to video games they play. Children in this study explained how they play "Pokémon"

with each other on the playground. Some other children expressed how they own fighting video games such as “Power Rangers” where they play pretend fighting on the playground with one another.

This overview of how children have been using electronic media paves the way for examining how electronic media and video games may impact children’s brain development, and overall development, which is reviewed in the following sections.

Effects of Media Technology and Video games on Children’s Brain and Development

The importance of emotions has been established in philosophy and child development. Greek philosophers such as Socrates, Plato and Aristotle, spoke about the importance of emotions in a children’s life. Child developmentalists such as Erikson, Bowlby, and more recently Greenspan, discussed how children emote first, and then behave according to their emotions. Neuroscience supports this notion of the importance of emotions in child development. In the following section, I will discuss how media technology has the ability to alter children’s emotions, as well as their thoughts, in the context of brain development.

Since the 1990s, research in neuroscience increased significantly with a focus on brain development in children and adults (O’Connor & Joffe, 2013). According to O’Connor and Joffe (2013), there is an explicit proof that children’s brains are affected by early experiences that would last into adulthood. Brain development continues throughout adolescence and early adulthood, in which this development is both a complex linear, and a nonlinear process (Taki & Kwashima, 2012). Therefore, understanding the brain processes and mechanisms in the area of cognitive and social emotional functioning, can help understand children’s learning and developmental outcomes in these areas (O’Connor & Joffe, 2013). As an example, Taki and

Kawashima (2012), explain that gray matter volume increases with age (from three years of age to adolescence) and then decreases. This fluctuation in gray matter volume occurs during the first and second decade of life (Taki & Kawashima, 2012). It is worth noting that gray matter area includes the regions of the brain responsible for muscle control and sensory perception (seeing, hearing, memory, emotions, speech, decision making, and self-control). Taki and Kawashima (2012), examined the influence of lifestyle on brain development, and found that sleeping habits affect brain maturation in terms of gray matter volume. The authors also found that a healthy diet, especially breakfast, affects the cognitive function of a brain. Even though Taki and Kawashima's (2012) findings seem to be unrelated to the influence of media use on development, children's frequent and intense use of media technology today is in its essence a change in the lifestyle. It is therefore, not unreasonable to expect that engaging with media technology, such as video games for long hours and on a daily basis might negatively affect children's brain development— i.e.: development of gray matter.

Media has witnessed a rapid growth in the video game industry for almost three decades (Saleem et. al, 2012). In the past, children were more involved in outdoor games, but with the advancement of technology, children spend a major part of their free time watching TV, using computers, and playing video games (Lison et. al, 2015). Video game play is undoubtedly a leisure activity in the United States, where 72% of the households play a video or a computer game; and eleven to fourteen year old children play them for almost 90 minutes a day (Blumberg & Randall, 2013). There is evidence that suggests playing long hours of video games per day, does have some adverse effects on children's health. For example, today, children who spend long periods engaging with video games instead of traditional forms of play, on average burn 600 calories less per day than children 50 years ago (Lison et al., 2015).

In an interesting study, Lison et al. (2015), found that children reach higher heart rates while playing active video games, than walking on a treadmill. “Active video games are electronic games that allow players to physically interact by using body movements with images on the screen, in a variety of activities such as sports, dancing or fitness games (Lison et al., 2015, p.373).” In their study, Lison et al. (2015) found that playing with other children increased pleasure, and positive emotions in children. Therefore, they concluded that competitive gaming is healthy for children, since it helps them deal with a competitive society, and it promotes more movement (Lison et al., 2015). However, the authors note that active video gaming is not sufficient to replace recommended daily exercise for children such as free play and sports (Lison et al., 2015). Another study (DeVet, Simons and Wesselman, 2012), which supports the use of active video gaming, suggests that active video games opens up the possibility for using them as a public health strategy in avoiding overweight in youth.

Generally speaking, media, including videogames, affects children’s development more than they would adults’, because children have less developed knowledge structures and existing encoded cognitions (Saleem et al., 2012) Drawing from the social cognitive learning theory used in Saleem et. al’s (2012) study, interacting with scripts, such as video games, tends to have long term effects on children. These effects are represented by the development of changes in precognitive, and cognitive constructs (perceptions and beliefs), cognitive emotional constructs (attitudes and stereotypes), and affective traits such as conditioned emotional responses, empathy, and trait hostility. Saleem et. al (2012), discuss that video games with pro-social content increase helpful behavior and decrease hurtful behaviors, while video games with violent content increase hurtful behavior and decrease helpful behaviors.

One way to study brain development in children is through neuro-imaging methods (Hummer, 2015). Hummer (2015) explains that neuro-imaging helps us understand how exposure to violent media affects children's brain development. It appears that exposure to television, film, and violent computer/video games results in an increase in aggressive thoughts, feelings and behaviors (Hummer, 2015). In support of O'Connor and Joffe's (2013), Hummer (2015) believes that exposure to media violence causes change in relevant brain regions, which would influence individual characteristics and behaviors for many years to come. A delayed neurodevelopment throughout childhood leads to executive dysfunction such as attention deficit hyperactivity disorder (Hummer, 2015). Hummer (2015) also notes that the development of brain regions responsible for motivation, emotion, and reward sensitivity mature earlier than neural regions in the prefrontal cortex. The development of the prefrontal cortex continues into the mid of the second decade, where attention, inhibitory control and emotion or behavior regulation are most vulnerable during adolescence (Hummer, 2015). According to Hummer (2015), these specific functions in the brain seem to be altered by repeated exposure to violent media in early childhood.

In addition, the presence of disruptive behavior is linked to past violent media exposure, which in turn alters brain activity. For example, in one study on adolescents, the group that played a violent video game, during the study, had higher amygdala activity when presented by aggressive words after playing a video game in comparison to the group who played non-violent games (Hummer, 2015). The amygdala is the part of the brain which responds strongly to emotionally arousing stimuli. It is responsible for processing emotions, such as fear, anger, fight or flight. Repeated engagement with violent video games may play a role in altering the amygdala responses to negative stimuli. Since the prefrontal cortex, which provides connections

to the amygdala, has not reached full maturity in adolescence, extensive media violence exposure might have effects on emotional regulation in adulthood (Hummer, 2015).

Research has shown that cognitive and socio-affective development in adolescence goes through structural and functional brain changes where synaptic density is at its peak in early childhood (Crone & Konijn, 2018). However, synaptic pruning (synaptic elimination) increases in adolescence resulting in a decrease of synaptic density in late childhood. Excessive exposure to media is seen as a factor influencing changes in synaptic pruning (Crone & Konijn, 2018). For example, Crone and Konijn (2018), explain that when one group of adolescence was excluded from participating in an online Cyberball computer game, their brain activity was associated with regions that are also activated when experiencing salient emotions, indicating a connection between online gaming and social rejection. On the other hand, children, adolescents and adults who felt accepted on social media, and were not excluded from the online Cyberball computer game, had neural responses represented in their ventral striatum, the area of the brain responsible for the reward system, similar to pleasant taste and receiving money (Crone & Konijn, 2018). Crone and Konijn (2018) continue to explain that more activity in the anterior cingulate cortex, the area of the brain responsible for emotions and cognition, was associated with receiving online peer feedback and viewing oneself; for example, having an increased self-esteem. Another finding by Crone and Konijn (2018) was that social brain activity in young adolescents, twelve to thirteen years old, was more active when they donated money online suggesting that this age is a critical period for social media risk perception and pro-social directions. This part of Crone and Konijn's (2018) study, takes us back to Hummer's (2015) explanation of how the amygdala had a higher activity in adolescents when presented with emotionally arousing stimuli. Both studies focused on the impact media has on emotional regulation. Finally, it appeared that the

dorsolateral prefrontal cortex region, a region in the brain involved in self control, was active when adolescents were exposed to fictional emotional media content; even though they were told the footage is not real, they still reacted the way they may react to a real condition (Crone & Konijn, 2018).

Such research presents evidence in support of altering effects of media use on the areas of the brain that is related to emotions, cognition, and social development. This proposed research aims to understand how video games may similarly influence magical thinking, which is part of the cognitive development in children. The following sections present the literature related to the early cognitive development of children in the context of Piaget's work to provide a background for the concept of magical thinking. Additionally, it will explore the relationship between cognition and egocentrism, and the meaning of magical thinking from different perspectives.

Piagetian Egocentrism

Egocentrism is a central concept in Piaget's theory related to early cognitive development, which stems from his constructivist view of development (Carpendale & Racine, 2011). According to Piaget, the concept of egocentrism is correlated with knowledge development (Carpendale & Racine, 2011). Egocentrism represents a failure to distinguish between the self and its surroundings, in addition to the unconscious confusion of one's perspective with that of the other (Piaget, 1932; Piaget, 1995; Piaget & Inhelder, 1967; & Carpendale & Racine, 2011). An egocentric thought consists of three major aspects of symbolic thought: it has no logical sequence, it is not a conscious process, and it is guided by imagery rather than concepts (Kesselring & Muller, 2011).

Influenced by Freud, Piaget introduced the concept of egocentrism in 1922, and then revised it in the 1930s. He explained that it is a reoccurring phenomenon at the beginning of the developmental stages (Piaget, 1932; Kesselring & Muller, 2011). Piaget distinguished between two modes of thinking. The first is symbolic thinking; a thought process indifferent to truth where a child is a dreamer, and an artist. The second mode of thinking is logical thinking, which is forming rational thoughts (Kesselring & Muller, 2011). According to Piaget (1926), egocentrism occurs from birth until the development of logical thoughts around age seven or eight. In this context, egocentrism becomes the phase where a child transitions from symbolic thinking to logical thinking (Kesselring & Muller, 2011). This process occurs unconsciously, in that every desire is transformed into reality through an image or an illusion (Kesselring & Muller, 2011). Egocentrism is divided into two forms: ontological and logical (Kesselring & Muller, 2011). The first is when a child fails to clearly distinguish a subjective from the objective. The latter represents speech in children where children talk without listening to each other. In this phase, children also fail to understand relational concepts and spatial relations (Kesselring & Muller, 2011). In logical egocentrism, a child views the world from their own perspective, thinking that everyone thinks the way they do (Kesselring & Muller, 2011). This process explained by Kesselring and Muller (2011), forms the introductory phase of egocentrism in the 1920s.

In the 1930s, Piaget revised his concept of egocentrism by explaining that egocentrism is no longer a transitional stage, rather it is a reoccurring process at different stages of development (Piaget, 1932). In Kesselring and Muller's (2011) review of the concept of egocentrism in the context of Piaget's work, they explain that symbolic thinking remains with us through adulthood, and that reason develops at the expense of symbolic thinking. However, we cannot free ourselves

completely from symbolic thinking (Kesselring & Muller, 2011). In Piaget's later work with Inhelder (1955/1958), he discovered a third form of egocentrism which occurs during the formal operations stage. In this stage an individual lacks perspective on the external world and cannot distinguish between interpersonal perspectives. For example, adolescents' egocentrism manifests itself in learning to know "new" cultures (Kesselring & Muller, 2011). Therefore, egocentrism occurs several times during development; at the beginning of the sensorimotor stage, at the beginning of the pre-operational stage, and similarly at the beginning of the formal operations stage (Kesselring & Muller, 2011). "Overcoming egocentrism or developing perspective taking is required for understanding and for human forms of cognition." (Carpendale & Racine, 2011, p. 346). There is research evidence that supports the concept of egocentrism is related to brain development, described in the following section.

Egocentrism and the Brain

A fair amount of research shows that individuals are biased when making judgments in comparing themselves to others (Rose, Jasper & Corser, 2012). Rose et al. (2012) explain that when individuals make judgments, they tend to be egocentric, in which they do not compare themselves to others; rather they tend to focus on their own standing. For example, in task performance, a person tends to overemphasize their skills without taking into account that another person is similarly skilled (Rose et al., 2012). This is linked to the inter-hemispheric interactions in the brain. To elaborate, weighing information about the self and others is dependent on this inter-hemispheric interaction between the left and right hemisphere in the brain (Rose et al., 2012). For example, people with a higher level of interaction between the left and right hemispheres show less egocentrism as opposed to the ones with a lower degree of communication between the hemispheres; they show more egocentrism (Rose et al., 2012).

According to Rose et al. (2012), mental representations of others, along with empathy with others, and the ability to take others' perspectives are all cognitive processes which are located in the right side of the brain. They found that when people were asked to take perspectives of others, functional magnetic resonance imaging (fMRI) showed activation in the right temporoparietal junction area of the brain, which is responsible for distinguishing one's attributions from that of other's. The authors conclude that egocentrism in comparative judgment includes the connectivity of brain structures.

Magical Thinking as a Theoretical Framework

Piaget believed that magical thinking occurs during the egocentric stage of development. He believed that in the egocentric stage, children under the age of seven are afraid of having negative thoughts about someone, because they are fearful that these thoughts will manifest themselves into the reality- that is if these thoughts came true then the child will feel a sense of guilt for causing them (Simonds et. al, 2009).

Piaget defined, object permanence as the assumption that a physical object continues to exist after an individual can no longer see it (Subbotsky, 2005). Magical thinking is related to this concept of object permanence, because it includes the possibility that magical and other types of mental-physical causality can directly affect perceived or imagined objects (Subbotsky, 2005). For example, a child who engages in magical thinking believes that they can change the object by thinking or wishing it to change (Subbotsky, 2005). Subbotsky (2005) distinguishes between two domains of imagined reality. The first is the imagined physical domain where objects still exist and have the same properties (Ex: seeing a dress in a catalogue and wanting to buy it). The second is the fictional domain where the properties of the physical world are

suspended (Ex: dreaming of the impossible such as flying pigs) (Subbotsky, 2005).

Ontologically speaking, imagined reality can be either different than the perceived physical reality, that is nothing remains in that reality; or it can be similar to physical reality, in which all fictional objects remain permanently (Subbotsky, 2005).

In the context of the psychoanalytic theory, magical thinking is a way of thinking that disrupts external reality through replacing it by an invented psychic reality (Ogden, 2010). In magical thinking, an individual experiences psychic reality as “more real” than external reality, so an invented reality becomes external reality for a person who engages in magical thinking (Ogden, 2010). In other words, the purpose of magical thinking is to avoid facing the truth of one’s internal and external experience, which in turn leads an individual to believe that they create the reality that everyone lives in (Ogden, 2010). In extreme cases, an individual might disconnect themselves from external reality through the use of fantasies that create delusional or hallucinatory thoughts, thus a person’s self-awareness is lost (Ogden, 2010). Such sort of thinking does not exist in the real world; rather it only exists in an individual’s mind (Ogden, 2010).

Magical thinking has also been described in the context of specific neurodevelopmental disorders, such as obsessive compulsive disorder (OCD). In this context, magical thinking refers to the belief that a person’s actions, words, or thoughts are capable of creating specific physical effects that are not governed by the laws of nature or ordinary (Simonds et al. , 2009).

Therefore, magical thinking is practiced to achieve the illusion of control in uncontrollable situations. For example, the child or adult might perform certain rituals which give them a sense of control in the face of fear, anxiety, or uncertainty (Simonds et al. , 2009). Therefore in such instances, children’s ritualistic behaviors are correlated with magical beliefs and explanations of

events, and are unrelated to naturalistic or physical explanations (Simonds et al., 2009). Bolton et al., (2002), defined magical thinking as a path children resort to when they are in a state of confusion, so they are not able to distinguish between mind and reality. Bolton et. al's (2002) study revealed an association between magical thinking and OCD, and magical thinking and anxiety. Similarly, Simonds et al. (2009), found that magical thinking is correlated with obsessive compulsiveness and anxiety. While Bolton et al. (2002) did not find any gender difference between these correlations, Simonds et al. (2009), found that boys engage more in magical thinking.

Within most theories of developmental psychology, magical thinking is a stage that children pass through on their way to logical and scientific thought (Bolton et al., 2002). It is also a concept discussed mostly in the context of pathology. However, magical thinking can be also seen as a typical stage in child development. In children, magical thinking can be defined as children's fantasy lives, and their ability to distinguish between what is real and what is not (Wang, 2009). Art and entertainment, media in general, affect magical thinking by creating imaginative scenarios and objects. For example, three to six year olds believe that imagination can create or change a physical object. Similarly, four to six year olds believe that they can influence someone in doing what they want by simply wishing it (Subbotsky, 2005). Researchers studying the theory of mind believe that children less than four years old do not understand how the mind works, thus failing to understand false beliefs (Subbotsky, 2005).

In one study, three years old children were able to differentiate between imagined objects, and the objects they see; however, they believed that imagined entities cannot be touched or seen by other people (Subbotsky, 2005). Subbotsky (2004) believes that there are conflicting ideas about children's engagement in magical thinking. She explains that studies that

were conducted in the early 90s suggest that children between the ages of four and five are able to distinguish between possible and impossible transformation without resorting to magical thinking. In later studies though, children aged four, six and eight use the term “magic” when faced with phenomena that they have no correct physical explanations for. Subbotsky (2004), explains that two and a half years old children are incapable of giving a scientific explanation to a given event, and believe that a real magical transformation has occurred. Similarly, four year olds believe in events as being “really magical”, whereas five year olds insist that they are just tricks.

In a study involving 91 children, 70% of the three year olds reported that Santa is real while 78% believed that the garbage man is real. By age five, their certainty about the garbage man grew; however, 83% of the children believed that Santa is real. At age seven, Santa beliefs decreased, and by age nine only a third believed in Santa (Wang, 2009). At first sight, the results of the five year olds might seem absurd. However, according to Wang (2009), five year olds have the cognitive ability to put the pieces of evidence together, but since the pieces are misleading, they might end up with the wrong conclusion. In other words, five year olds can see their gifts under the Christmas tree, which, to them, is proof enough for Santa’s existence. Wang (2009) explains that three year olds do not have the cognitive skills to put the pieces of evidence together, and that is why the percentage of children who believe in Santa at the age five was higher.

In another study, 44 preschoolers were presented with a new character called “The Candy Witch”. This imaginary character only appears on Halloween and replaces the candy that kids collected with toys. In this study, parents were asked to remove the candy and replace it with a toy as a form of “evidence”. Older preschoolers, average of five years old, were more convinced

of the existence of the “Candy Witch” than their younger counterparts, who were of an average age of three and a half (Wang, 2009). In a different experiment on 91 children, children’s belief in the “Tooth Fairy” changed as their cognitive skills developed. Sixty one percent of the three year olds, 65% of the five year olds, 54% of the seven year olds and 24% of the nine year olds believed in the existence of the “Tooth Fairy” (Wang, 2009). All studies speak to the fact that if children are able to provide “evidence” for a certain event, they will believe it, yet it all depends on their cognitive skills. Unlike Wang (2009), Subbotsky (2004), thinks that age five is when children are actually able to understand physical causality. On the other hand, the study of Bolton et. al (2002), and Simonds et. al (2009), found that children between the ages of five to ten showed high scores indicative of beliefs in magical causation, and neither of both studies found that there is an age-related decline in magical thinking.

Ma and Lillard (2006), explain that three year old children are able to understand that people can only act on real physical objects. For example, a boy with a real cookie can eat the cookie, while a boy who pretends that he has a cookie cannot eat it. Ma and Lillard (2006), suggest that children might fall under the pretend-real confusion in some instances. For example, some children believe that what they imagine might become real, and thus, pretend entities might manifest themselves in the real world (Ma & Lillard, 2006). This idea replicates the Piagetian concepts of magical thinking and egocentrism discussed previously. It is apparent that some children understand the difference between what is real and what is not by the age of three. However, they sometimes confuse what is pretend and what is real (Ma & Lillard, 2006). When there are emotions involved, this pretend-real confusion intensifies. For example, a pretend entity becomes real when there is an emotion attached to it, such as Santa’s Christmas presents, or scary monsters (Ma & Lillard, 2006). This idea also confirms Bolton et. al’s (2002), and

Simonds et. al's (2009) findings about the way children engage in magical thinking (unreal thoughts) when there is anxiety involved.

In terms of play and magical thinking, from a psychoanalytic perspective, children's play is full of meaning making and represents their unconscious fantasies (Bertolini & Nissim, 2002). This echoes Ogden's (2010) definition of magical thinking, where a person can replace physical reality with an invented one. So play, acts as an intermediary between reality and fantasy, where children are able to communicate their mental states (Bertolini & Nissim, 2002). Any kind of play helps in a child's mental, and cognitive development, as well as in building their own image of the world (Bertolini & Nissim, 2002).

Therefore, video game play has the ability to shape a child's image of the world, for this kind of play involves child's direct interactions with specific scenes and settings that evoke certain emotions such as fear, excitement, horror, triumph, or power (Bertolini & Nissim, 2002). In a study of children's video game play, Bertolini and Nissim (2002) describe, "Children were drawn into a virtual world of three dimensional images, full of action, where the experience of travelling and adventure became a form of exploration that could stretch out over time and space in a highly variable manner, possibly even for weeks or months. Meanwhile, the existence of the body and the need for social interaction seemed to fade into the background (p. 308).

The results of studies discussed in this section suggest, depending on the level of children's cognitive development, when they are presented with an "evidence" for a magical event, whether in the context of play or in social contexts, they are likely to believe it.

Controversy of Magical Thinking

According to Subbotsky (2004), some studies found that four and five-year-old children did not engage in magical thinking, and were able to distinguish between possible and impossible events. Accordingly, children of this age insisted on some magical events as being “tricks”. Moreover, there is some research that shows some children are able to make distinctions between what is real and what is not, possible and impossible, as early as age three (Woolley & Ghossainy, 2013). On the other hand, some other studies reported that, children aged four, six, and eight explained phenomena without any physical explanation as magical events (Subbotsky, 2004). Studies of younger children have showed similar findings. Two and a half year olds were able to provide scientific explanations, believing that magical events can occur (Subbotsky, 2004). Similarly, four year olds believed that some events are “really magical.” In the context of video gaming, Johnson and Christie (2009), believed that computer based game playing, impact children’s imagination.

Little is known about the effects video games have on children’s cognitive development, in terms of reality and magical thoughts (Nakamuro et. al, 2015). Simply put, almost two decades ago; it was discussed that, with the advancement in electronic media technology, new digital media needs to be developed, which clears the differences between physical and digital domains (Billinghurts et. al, 2001). In our present time, more advanced electronic media had been introduced to our lives, yet children’s discrimination of what is real, or not, in relation to such media had been an ongoing debate. Even though, some controversy might exist regarding magical thinking, the findings of this study provided evidence for children’s engagement in magical thinking after playing a video game. However, this engagement was based on three factors, which are: Notion of Reality, Uncertainty, and Emotions.

To understand how children, make meaning, and how they distinguish between what is real; reality, and what is not; fantasy, it is important to first look at the definition of fantasy, then consider the meaning making process in children as it relates to what is real and unreal.

Children's Discrimination between Fantasy and Reality

Children are generally skeptical about the reality status of new entities, and events (Woolley & Ghossainy, 2013). Piaget was the first to discuss this claim, explaining that children often confuse between non-realities, such as fantasy, for reality (Woolley & Ghossainy, 2013). Thus, children are often portrayed as confusing between reality, and non-reality (Woolley & Ghossainy, 2013). Similar to magical thoughts, fantasy or fantastical events, are defined as, “physically impossible actions, ones that violate physical law” (Li, Boguszewski, & Lillard, 2015, p. 102).

Media is one important factor contributing to meaning making in the lives of children, as well as adults (Dill-Shackleford, Vinney & Hopper-Losenicky, 2016). Additionally, people interact with media to question their beliefs, and feelings, in order to make meaning of an interaction, thus media possesses the potential of changing one's beliefs ((Dill-Shackleford et. al, 2016). Modern technology, such as video games, continues to push the boundaries between an image and reality (Troseth, Flores & Stuckelman, 2019), resulting in different meaning making ideas among individuals.

Early childhood is associated with fantasy, wonder, and magic, and the media has contributed in maintaining this tradition (Goldstein & Alperson, 2019). The ongoing blending between virtual reality and reality had existed for decades with purposeful and easy interaction between the digital domain, and the real world (Billingshurst, Kato & Poupyrev, 2001). An

important part of children's media is for children to discriminate between what parts should be taken into reality, and what elements should remain in a digital domain- a story, a movie or a film (Goldstein & Alperson, 2019).

In fictional media, people, including children, are introduced to new perspectives about life ((Dill-Shackleford et. al, 2016). We know little about children's discrimination between what they see on electronic media devices, such as TV, and reality (Li et. al, 2015). Further, the distinction between what is real, and what is fantasy in media is actively constructed during the preschool years. The distinction between real and fantasy is more complex considering the screen content (Richert & Schlesinger, 2016). In a study about children and media, Goldstein and Alperson (2019) found that, magical content was extremely high within the media targeted for children, in such a way that it deviates from the laws of nature. Further, the supernatural content is usually portrayed positively and celebrated, filling children's lives with magic and pretend. Such media exposure influences children's understanding, and their knowledge of the world (Thierry & Pipe, 2009).

With technological advancements, children's response to images might deepen their confusion regarding fantasy and reality (Troseth, et. al, 2019). For example, computer, and video game graphics can look so real, in which children cannot distinguish what they see on screen from real entities (Troseth et. al, 2019). The following sections discuss children's perceptions of non reality and reality in the context of media.

Children's Perception of Non-Reality

Woolley and Ghossainy (2013), explain that when children aged five to seven were shown various types of programs on television, they presumed that everything that happens on

television was not real. Cartoons, for example, reduce children's executive functioning, immediately after viewing, due to magical events (Li et. al, 2015). In their study, Li et. al (2015), discuss that children aged four believe that possible (real) events which they see on televised media are not real, because these events can only occur on television. Similarly, the same children also believe that fantastical events, such as what they see in cartoons, cannot happen in real life. The authors discussed special effects that are used in film media in connection with fantastical events, might be misleading to children, even if the context of these events is real. In other words, any real or fantastical event seen on television is perceived as not real. The authors suggest that, children aged four, are more likely to misjudge the status of reality on television, claiming that any event, fantastical or real, presented on television is always unreal (Li et. al, 2015).

Some computer games, which stimulate children's imaginations, elicit pretend play (Johnson & Christie, 2009). While children are aware that the video games they play are not real, they still engage in non real behaviors (Johnson & Christie). For example, children might pretend to chase an invisible balloon, they saw flying on a computer screen, around the classroom. Even though children know that the balloon is not real, they still pretend as though it exists in reality.

In Carrik and Ramirez's (2012) study, when children were reinforced, and were motivated to respond correctly by getting a prize, they were able to report that fantastical events are not real. The authors discuss that certain contexts might prompt children to report magical events as real, even though, they understand it is not.

Children's Perceptions of Reality

According to Li et. al (2015), children confuse the reality status of televised events, and they view them as more real, yet sometimes as less real than they actually are. Richert and Schlesinger's (2016) study revealed that, children between the ages of four and five and a half, did not have a clear understanding that fantastical events they saw in clips were not possible in the real world. Therefore, they reported fantasy as real events. By age six, children become more aware of the boundaries between reality and fantasy, thus they do not mix between real and fantastical events they watch on television (Li et. al, 2015).

Children, sometimes, confuse fantastical events with real ones when such events are presented through video. Due to the high similarity and overlapping that sometimes exists between real life events, and events presented on video, children tend to confuse between what is real and what is not (Thierry & Pipe, 2009).). According to the discriminability principle of source monitoring theory; if the medium of information is similar to reality, it is more likely for an individual to confuse between reality and fantasy (Thierry & Pipe, 2009). According to Thierry and Pipe (2009), several studies provided evidence that children confuse what they observe on video with reality. Thierry and Pipe (2009), use the discriminability principle of source monitoring theory to explain that, children are more likely to confuse fantastical information seen on videos with reality, in contrast to events seen or heard live from another person (Thierry & Pipe, 2009). If the source of information comes from a real person discussing an event, then children are more likely to distinguish between whether this event is real or unreal (Thierry & Pipe, 2009).

By highlighting the body of literature around children's perceptions of reality and non reality in media, the following sections discuss the effects of confusing between fantasy and reality, and the role emotions play in such a confusion.

The Effects of Confusing Fantasy with Reality

Richert and Schlesinger (2016) explained that, when children view media content as real, they are more likely to transfer it to the real world, than content which is perceived as pretend. Additionally, if children are able to relate to characters in media, they are more likely to transfer this content to the world outside of the digital screen (Richert & Schlesinger, 2016). For example, one study found that more than half of four to six year olds transferred information from an on screen character, to the real world, believing that the character was a trustworthy source of information (Richert & Schlesinger, 2016). This notion was supported by Goldstein and Alperson (2019), who explained that preschool children's preference is biased regarding the characters to whom they can relate to, as compared to the "fun" or "magical" characters. Preschoolers are less likely to transfer information from magical characters.

The Role of Emotions in Distinguishing between Reality and Non Reality

Arguably, fictional media is written by real people to stimulate real emotions, thoughts, and behavior ((Dill-Shackleford et. al, 2016). Li et. al (2015) explained that, children between the ages of three to five believe that happy events, real or fantasy, are more likely to occur than scary events. This suggests that when an event is emotionally charged, children make a different judgment whether in pretend or real situations (Li et. al, 2015). This echoes Carrick and Ramirez's (2012) idea that, emotions play a role in children's ability to discriminate fantasy from reality. Children are able to understand fantastic information. However, when there is an

emotion associated with this information, then this understanding weakens (Carrick & Ramirez, 2012).

For example, in Carrick and Ramirez's (2012) study, children between the ages of four and seven were asked to approach a box with a puppy (positive entity), and a box with a monster (negative entity). Children tended to approach the box containing the positive entity, and avoided the one with the negative entity. This suggests that children's emotions play a role in their beliefs about whether or not an entity is real (Carrick & Ramirez, 2012). Additionally, children also believe that frightening fantastic events are not real, but also frightening real events are not real, suggesting that fear can decrease fantasy beliefs, and elicit errors in reality (Carrick & Ramirez, 2012). This also suggests that children are motivated by emotionally pleasant events, in which they believe are real, and approachable, versus unpleasant events, which they report as unreal (Carrick & Ramirez, 2012).

The children in Carrick and Ramirez's (2012) study also reported that, all fantastical happy events could occur more than frightening events, and that real happy events could occur more than sad events. Four and five year olds, reported that happy, and sad events are more likely to happen in reality, than frightening events. This suggest that three year olds judge events based on the events' valence, as well as their positive and negative nature, while four and five year olds judge the events based on their own discrete emotions.

The way children are using fantasy content, and relating it to their understanding of reality, is still unknown (Goldstein & Alperson, 2019). It appears that there is still a controversy regarding children's discrimination between reality, and fantasy. What is clear though, is that children are capable of, and do engage in different kinds of media, from books, films, television,

to more recently, apps and games (Goldstein & Alperson, 2019). The level of how much this engagement affects their fantasy, and reality is still unknown (Goldstein & Alperson, 2019).

CHAPTER THREE

METHODOLOGY

Research Design and Research Questions

Two research questions were answered in this study: (1) how are these children's thought processes that are related to the notion of reality (i.e., what is real or unreal in the context of the Mario Video game) influenced and ultimately formed after playing a specific video game? And as a result, (2) how do videogames impact children's magical thinking?

According to Piaget (1926), magical thinking occurs during the egocentric stage. At that stage, every desire becomes reality (Piaget, 1926; Kesselring & Muller, 2011). Piaget discussed that young children confuse fantasy for reality, where children are often seen as confusing what is magical with reality (Woolley & Ghossainy, 2013). In this study, magical thinking was defined as any thoughts children had, which were not governed by the laws of nature. Thus, it consisted of the child's perceptions, interpretation of actions, thoughts, and at the end what they believed in, despite the fact that those beliefs were unrealistic by nature.

Notion of reality, in this study, was defined as what children perceived as real, and what they perceived as not real in the context of the video game. Therefore, a child's ability to understand the video game character's actions, and transformations was defined as reality. In contrast, non-reality was defined as the actions, and events which children thought to be unrealistic, thus cannot/do not happen in the real world. In brief, children's notion of reality was used interchangeably with children's video game understanding.

In this study, a qualitative approach using a narrative inquiry, and a grounded theory approach was employed to study three four -and five -year-old children. A narrative research focuses on analyzing the stories told (Creswell & Poth, 2018). This approach is suitable for going beyond the narrative (Creswell, 2009) and helped me, as a researcher; explore the thought process of young children after they have completed playing a videogame. I looked at how children made meaning out of what is real and what is not, which is best understood when they describe, and narrate their own thinking processes during, and after playing a video game.

A grounded theory approach was a good design for my study to understand the causes, which led children to think magically. According to Creswell and Poth (2018), a grounded theory approach could be used when the existing theory is not able to inform the results of the sample chosen by the researcher. Knowing that magical thinking was discussed in the context of pathology, my sample consisted of typically developing children. Applying a grounded theory approach to understand the causes of magical thinking in typically developing children was seen as a necessity to inform my results.

Study Participants

Recruitment of participants began, after obtaining approval from the university's Institutional Review Board (IRB). For this study, an opportunity sampling was used. After the IRB approval was granted, I called the parents of my participants to obtain their consent for having their children participate in my study (Appendix B). Before the study took place, I handed out formal written consents to parents to read, and sign. Once I obtained the formal consents (Appendix C) the study procedure took place.

This study had three participants. The participants were two male and one female. All participants have a pseudonym assigned to their names for the sake of confidentiality. These are, Alex, John, and Kylie. Two of my participants were four years old, and one was five years old. All participants were Caucasian, and came from a Midwestern city in the United States. Participants' family's socioeconomic status was; an average of \$50000 annually. The results of a previous unpublished pilot study on the same topic (Antar, 2018), revealed that children do engage magically with the character, after playing a video game. The participants of the pilot study were very articulate and were in the same age range as the participants chosen for this study. Accordingly, I chose three typically developing children for this study. My participants were well articulate, with language skills that are developmentally typical for their age. None of the participants had any prior experience playing the video game that was chosen for this study. Table 1 presents demographic information about these study participants. The table includes each child's age, gender, race, family income, in addition to their video gaming frequency.

Table 1. Children's Demographics and Familiarity with the Mario video game

Child's Pseudonym	Age	Gender	Race	Family average income	Frequency of Video Gaming
Alex	Five years old	Male	Caucasian	\$50000	Sometimes
Jon	Four years old	Male	Caucasian	\$50000	More Frequently
Kylie	Four years old	Female	Caucasian	\$50000	Frequently

Setting

I hosted two participants with the presence of their mothers at my own house, and I traveled to the home of the other participant. At the time of the study, the two participants whom

I hosted lived in the same city I lived in. The other participant lived outside of the city, so I had to travel to meet with her.

Study Procedure

I provided the material for this study, which was a handheld console that included the designated video game. Over the course of two weeks, after the university's winter break, I conducted the study on each child separately. Two participants had their mothers present while one participant had both parents present. Each video game session with a child took approximately 20 minutes, followed by a 15 minutes interview with the child.

I started by introducing the child to the video game. I instructed them on how to play it, for example, I showed each child which buttons are used to jump, walk, and run. Afterwards, the child played the game for approximately 20 minutes. Two participants needed my help with the buttons that moved the character, while one participant was able to do it on his own.

After they finished playing, I took the ascent of each participant to ask questions and audio record their responses. All participants provided their ascent by either nodding or by verbalizing their acknowledgement. I asked each child questions related to their thoughts about the video game (Appendix A). Each child received a chocolate chip cookie after they were done with the interview.

The Video Game

Super Mario Bros is the game chosen for this study. It is a 2D game created by Nintendo in 1985. The reason for choosing this adventure game is the "ease" of play, and its potential to stimulate magical thinking in the child. This adventure consists of the main character Mario and

his younger brother Luigi. In the one player mode, the player plays with Mario. In the two player mode, the player with controller one gets Mario, while the player with controller two gets Luigi. Since each child played individually (One player mode), they had Mario as their main character. The objective of this game is to race through the Mushroom Kingdom (Virtual World), survive obstacles and enemy attacks, and find secret worlds. Once a player is able to reach the final level, then they face the main antagonist of the game “Bowser”. This character is a fire spitting dragon, which has kidnapped princess Toadstool. Mario’s objective is to save the princess, and free the Mushroom Kingdom from Bowser’s oppression.

Figures one through five represent the different stages that Mario goes through during the game. To add, they portray Mario’s actions, such as jumping, shooting, and breaking bricks.

Figure 1: Mario Jumping

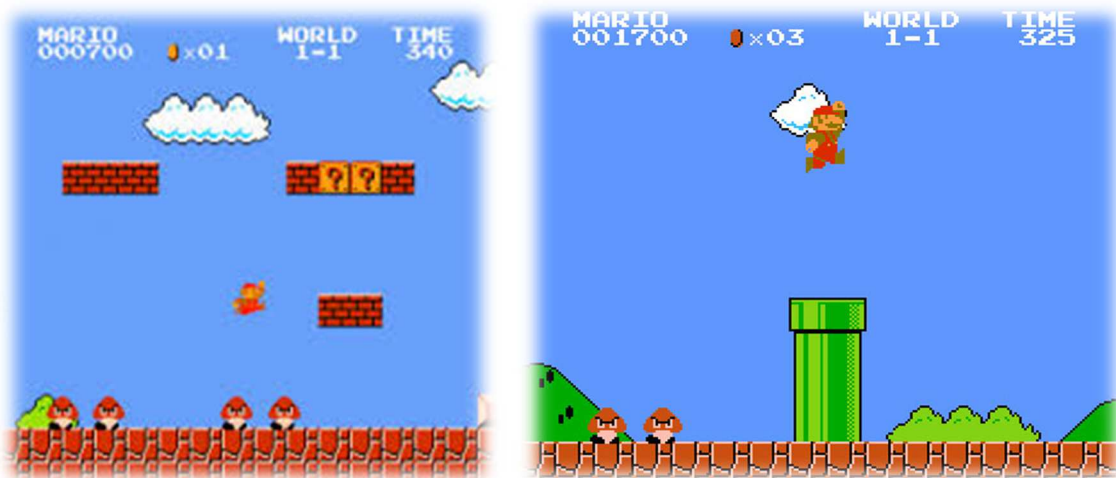


Figure 2: Mario Before and After Eating a Mushroom



Figure 3: Mario Breaking Bricks



Figure 4: Mario Before and After Eating a Flower

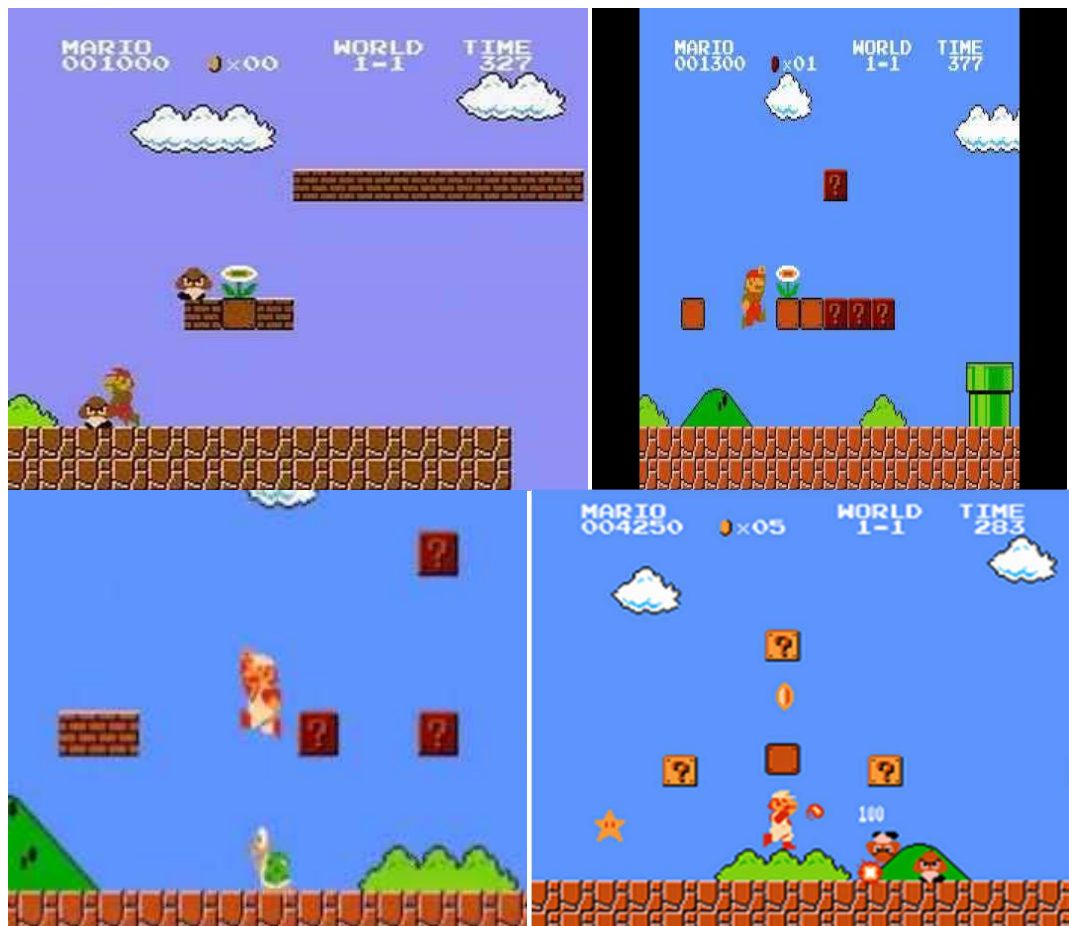
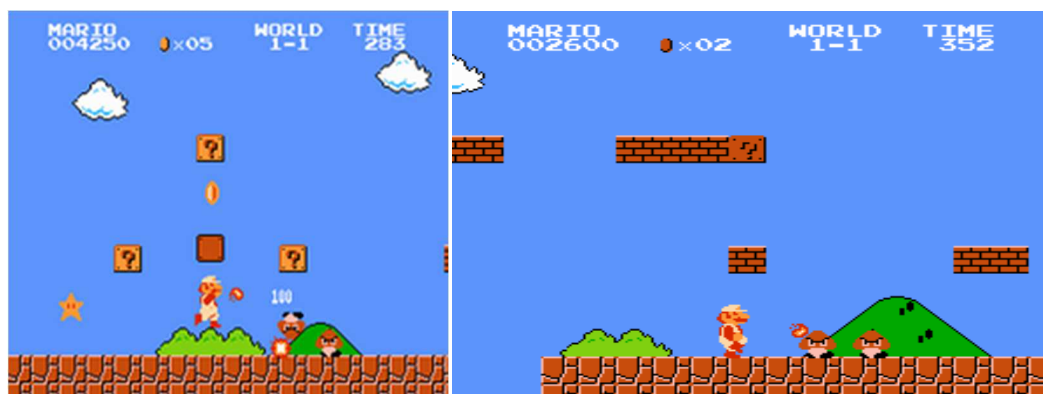


Figure 5: Mario Shooting



Data Collection

I conducted the study on each child individually. Researchers use multiple methods of data collection for more evidence (Lincoln & Guba, 1985). Data was collected from two sources, first, through taking field notes of my observations (Creswell & Poth, 2018), and second, through transcription of interviews conducted with children. I observed the reactions (verbal, physical-body language) of each child individually while playing the video game with them, and took notes of anything relevant they said, which was related to their thought process. Quick notes were taken at every three-minute interval. I was a participant while observing. For example, I engaged with the child during this process (Angrosino, 2007) by responding to their comments, and helping them while playing. Taking notes was an ongoing process from the start of my study until the end (during the play session, and during the interview). Interacting with my participants helped me understand their thought processes, their perceptions of what is real and what is unreal, and whether, for example, they engaged in any kind of magical thinking, such as if they were able to distinguish between their abilities as human beings, and Mario's abilities as a virtual character.

Following the observation and note taking, I conducted a fifteen minute semi structured interview with each child asking them about their experience after playing this video game. Knowing that my participants were at an age where they could articulate their experiences, the semi-structured interviews included probing, and follow up questions, all of which was ideal for this research study (See Appendix A). An interview is a form of social interaction based on a conversation (Rubin & Rubin, 2012; Warren & Xavia Karner, 2015). The reason for asking about their experience was to understand how their thought process might trigger their

perception of reality, and if so, in what ways it might impact their magical thinking. All interviews were audio recorded, using my phone. All data was transcribed later.

Once all data was collected, they were organized in separate folders related to each child. For example, the transcribed interview and field notes taken for each child were organized individually in a separate folder. Three different folders were created, each folder containing the information related to each participant.

Generally speaking, any data collected in narrative research needs to be analyzed for the story children tell, thus unfolding events chronologically (Creswell & Poth, 2018, Riessman, 2008). As a result, the data collected was re-told in the form of a story (Riessman, 2008). I used the transcription of audio data, and the notes I had taken, to identify existing themes in the data to understand what story my participants were trying to tell. Coding the themes that emerge is a central aspect of qualitative research since it makes meaning of the data collected from observations and interviews (Creswell & Poth, 2018). The stories, and epiphanies that emerge from the told stories, were expanded into larger patterns of meanings in relation to children's thought process, magical thinking, and their understanding of reality.

Validity

According to Ravitch and Carl (2016), validity is a concept that provides evidence that a researcher's findings are aligned with key elements of the research design, and in particular, with participants' responses. Developing validity standards in qualitative research is challenging because of the necessity to incorporate rigor and subjectivity as well as creativity into the scientific process (Whittmore, Chase & Lynn Mandle, 2001). Triangulation is a means in qualitative research that enhances the validity of a study. Collecting data from multiple and

different sources creates more validity (Bazeley, 2013; Lincoln & Guba, 1985). In this study, validity was ensured by comparing observations and field notes, to the audio recorded transcriptions. Additionally, member checking, which is a method qualitative researchers use to establish validity, was used (Ravitch & Carl, 2016; Creswell & Poth, 2018). I sent out my interview questions to one of my graduate peers, who was a preschool teacher, to ensure that my interview consisted of language that my participants could understand.

Delimitations

While qualitative studies give us detailed information about a process, generalizing the result to a larger population is difficult. In this study, and to facilitate data collection, I limited my participants to only three individuals. This helped me have a better understanding and insight about the thought processing of each child, which might have implications for future research studies of the same nature.

Analysis of Data

A folder was created for each child. For example, the transcribed interview and field notes taken for each child were organized individually in a separate folder. Three different folders were created, each folder containing the information of each participant.

Overview of the Data Analysis.

Data of this study was analyzed drawing from two qualitative research approaches. The first approach was the narrative analysis approach discussed by Riessman (2008). This type of analysis helps in conveying an idea through the stories told by participants (Riessman, 2008). In this study, a narrative analysis was utilized to describe how children understood the abilities of

the video game character, thus relating his abilities to theirs. According to Creswell and Poth (2018), a narrative approach is best used when a researcher wants to capture the details of the stories told by their participants.

The second approach for data analysis was borrowed from grounded theory, discussed by Strauss and Corbin (1990, 1998). This approach helps in creating relationships between categories of themes, in which a theory is generated (Strauss & Corbin, 1990, 1998). In this study, a theory, in the form of an equation model, was created in order to understand the reasons for why children engaged in magical thinking after playing a video game. Although magical thinking was used as a theoretical framework for this study, a grounded theory approach was necessary since the causes of magical thinking were not tested on typically developing children. According to Creswell and Poth (2018), grounded theory could be used in the case the literature provided a pre-existing theory, which was not tested on samples and populations of interest to the researcher. In the literature collected for this study, it appeared that magical thinking was used in the context of pathology, and not in the context of typically developing children.

Thematic Narrative Analysis.

Drawing from Shukla, Wilson, and Boddy's (2014) methodology, a thematic narrative approach was used in data analysis. A thematic analysis was used to provide the big picture of the data. For example, the thematic analysis in this study provided an overview of how children understood the video game. On the other hand, a narrative analysis was used to focus on the details which caused children to confuse fantasy for reality, such as their uncertainties, and emotions, which led them to think magically.

Through a narrative thematic analysis, the interpretation of the words, and phrases used by the children focused on how they made meaning of the video game (abilities of Mario in comparison to theirs). For example, all children reported that they could jump higher than Mario, which was considered as real to them. Jumping higher than Mario was considered as magical thinking in this study. This analysis did not focus on children's word choice, or grammar. Rather, it focused on the connection between their words/and or phrases, in the form of a narrative, and the identified themes.

The narrative of the children supported thematic analysis, in which it facilitated identifying connections between themes within each case's narrative, and across the cases. For example, the information presented by each child revealed a pattern between uncertainty, emotions, and magical thinking, which was similar across all cases.

The following section describes the first step of data analysis, which was analyzed by using a data driven coding frame. A data driven coding frame is used to code the words and phrases in a participant's narrative, to create coded themes based on the given data (Creswell & Poth, 2018; Gibbs, 2007).

Data Driven Coding/Open Coding.

The first part of the analysis (narrative approach) consisted of identifying emerging themes, that is, those themes that data suggested after a careful examination of the textual data. As Creswell and Poth (2018) explain, this process involves reading the data and creating coded themes which summarizes what is seen in the data. According to Gibbs (2007), this procedure is also called open-coding. Ten themes were identified, after examining my transcriptions and observational notes. The ten themes were coded as: frequency of video gaming, level of

confusion, significant behavior, video game difficulty, feelings about video games, comparison to other video games, video game preference, learning experience, magical thinking, and notion of reality. Table 2 presents all coded themes identified from the narrative of each child.

Table 2. Data Driven Coding Frame/Open Coding

Theme	Description
Frequency of video gaming	Textual data about how often the child plays video games
Level of confusion	Textual data representing that the child was confused about their response
Significant behavior	Observational data representing any behavior such as jumping
Video game difficulty	Observational data about what the child articulated how difficult the game was
Feelings about video games	Textual data about the child's feelings
Comparison to other video games	Textual data representing compare-contrast ideas
Video game preference	Textual data about what video games the child liked to play
Learning experiences	Textual data about what the child had learned after playing the video game
Notion of reality	Textual data about what the child believed as being real or unreal in the game
Magical thinking	Textual data that represented a child thinking magically

Grounded Theory Approach and Axial Coding.

Identifying categories of themes in this part of the analysis was borrowed from the grounded theory approach (Strauss & Corbin, 1990, 1998). This was done to understand if this study could provide a theoretical explanation for children's engagement in magical thinking. In the findings chapter, an equation model was created to explain what caused children's magical thinking in this study.

Open codes, are the same as data-driven codes, which were extracted from the data. Axial codes were codes explaining the connection between all open codes in each category. Selective codes identified the larger themes, which informed the researcher's results.

After identifying all coded themes, categories were created to group all identified themes together, according to closeness of themes and relationship with one another as discussed by Stauss and Corbin in the grounded theory approach (1990, 1998). The second part of the analysis consisted of axial coding, which is clustering and refining the emerging themes from the data driven coding (open coding). At a later stage of data analysis, all identified themes from the data driven coding frame, were examined carefully. Themes which were close together and /or related to each other were grouped together under one category; a process described as axial coding (Strauss &Corbin, 1990, 1998). All themes were grouped together into two categories.

Category one was titled, The Child's Video Game Interests and Feelings. It grouped all themes related to children's level of interest in video gaming, what they thought and how they felt about video gaming, and the frequency with which they played with video games. For example, how many times a day they played a video game, how it made them feel, as well as their thoughts about it. It also included how children understood the character's abilities, along with their magical thoughts.

Category two was titled, Mario and the Child's Impressions. It included all themes related to their learning experience, thoughts and behavior in the context of the Mario video game. This category was a more specific representation of what they learned, and how they behaved after playing this particular video game. For example, it included their abilities in comparison to Mario's, as well as what they have learned about what Mario can, and cannot do.

Additionally, this category included children's level of confusion, which was whether children learned that Mario's abilities as a digital character cannot be performed by typical humans. Similar to category one, this category also included how children understood the character's abilities, along with their magical thoughts. Table 3 presents the coded themes, which were clustered in categories.

Table 3. Categorized Coded Themes from Interviews and Observations

Categories	Themes	Explanation
Category One: The Child's Video Game Interests and Feelings	<ul style="list-style-type: none"> • Frequency of video gaming • video game difficulty • feelings about video games • comparison to other video games • video game preference • Magical thinking • Notion of reality 	Category one represents all themes related to the children's general thoughts, feelings and interactions with video games.
Category Two: Mario and the Child's Impressions	<ul style="list-style-type: none"> • learning experience • level of confusion, • significant behavior • Magical thinking • Notion of reality 	Category two displays children's learning experiences, thoughts and behavior in regards to Mario's abilities

Identifying the Larger Themes.

Axial coding led to creating larger themes based on the connections between the clustered themes in each category. Category one, The Child's Video Game Interests and Feelings, included the frequency of video gaming, feelings about video games, difficulty of the video game, comparison to other video games, video game preference, notion of reality, and magical thinking. From this category, a larger/selective thematic code was identified, and labeled

as “magical thinking as an effect of emotions in video gaming.” Category two, Mario and the Child’s Impressions, consisted of the level of confusion, learning experiences, significant behavior, notion of reality, and magical thinking. From this category, a larger/selective thematic code was identified, and labeled as “magical thinking as an effect of uncertainty in video gaming.” Table 4 displays the procedure used in identifying the selective thematic codes.

Table 4. Open Codes, Axial Codes, and Selective Codes

Open Codes	Axial Codes	Selective code
<ul style="list-style-type: none"> • Frequency of video gaming • video game difficulty • feelings about video games • comparison to other video games • video game preference • learning experience • level of confusion, significant behavior • Learning experience • Notion of reality • Magical thinking 	<ul style="list-style-type: none"> • The Child’s Video Game Interests and Feelings: Children’s general thoughts, feelings and interactions with video games. • Mario and the Child’s Impressions: Children’s learning experiences, thoughts and behavior in regards to Mario’s abilities 	<ul style="list-style-type: none"> • Magical thinking as an effect of emotions • Magical thinking as an effect of uncertainty

By analyzing the data, using a narrative and a grounded theory approach, it appeared that two axial thematic codes were identified. These themes informed the findings of this study, and provided a basis for selective thematic codes, which helped in articulating a new theory

representing the results of this study. Table 5 displays the two final selective themes discussed in the findings chapter, and their explanation.

Table 5. Themes and Explanation

Themes	Explanation
Magical thinking as an effect of uncertainty in video gaming	Explains how children resort to magical thinking when they are uncertain
Magical thinking as an effect of emotions in video gaming	Explains children's tendency to choose when to have magical thoughts when an emotion is present

Analysis of Observational Notes.

As part of this study, children were observed while playing the video game, and during the interview. Quick notes were taken almost every three minute interval, to capture any information, words/statements or actions, which were relevant to their thought process.

After reading the textual data from these observations, this data was compared to the participants' responses from the interviews. For example, a participant wanted to stop playing the video game (observational data), so he put the gaming console aside (observational data), while saying that this game is difficult to play (observational data). This was labeled as "level of difficulty."

Triangulation

Triangulation was established through comparing my observational notes to the interviews. For example, in the case of a participant jumping (observational note), the textual data from the interview revealed that this child was saying that they are jumping real high. Another example was, when some participants were uncertain about their answers regarding an

interview question, and came up with “irrelevant answers”, my observational notes stated “confusion.”

CHAPTER FOUR

FINDINGS

The following section reports the findings of this study. Findings are reported on each child individually, in relation to the developed themes and the literature reviewed. By the end of this section, a common ground is established to show the similarities, and differences between children's responses and the themes, and how it relates to the body of literature reviewed in this dissertation paper.

Current research on magical thinking is limited to pathology in children, and adolescence, in which there is no research about how magical thinking in typically developing children, might influence their thought processes after engaging in video game playing. Findings provide answers to research questions: (1) how are children's (ages 4 and 5) thought processes of the notion of reality (a child's ability to understand the video game character's actions, and transformations vs. the actions, and events which children thought to be unrealistic, thus cannot/do not happen in the real world) influenced and ultimately formed after playing a specific video game? (2) How do videogames impact children's magical thinking?

Findings suggest that children's thought process is affected, one way or another, by video gaming, and resulted in children thinking magically. No differences were found between the gender and ethnicity of the children, and their thought process through the content analysis of the textual data. Therefore, gender, and ethnicity were not considered further during the secondary content analysis. Additionally, none of the participants had any prior experience playing this video game. Therefore, familiarity with the game did not influence the findings.

In the following sections, first, I will discuss how themes were defined in this study, and then I will proceed to present the result as to how each theme relates to each child through their narratives.

Magical Thinking as an Effect of Uncertainty in Video Gaming

Research has provided enough evidence that when children are in a state of confusion, they resort to magical thinking (Bolton et. al, 2002 & Simonds, et. al, 2009). Results of this study confirmed that when children were uncertain of a reality status, they confused between what was real, and what was not, leading them to think magically. This allows children to have a sense of control over the situation they are uncertain of. In this study, the first theme identified was the magical thinking as an effect of uncertainty in video gaming, which provided an explanation of the magical thoughts children engaged in, when they were uncertain of a certain situation. Participants in this study were not sure about their abilities in regards to the digital character's abilities, they resorted to magical thinking.

Magical Thinking as an Effect of Emotions in Video Gaming

Research provided evidence that whenever an emotion is present; children tend to choose magical thoughts over real ones. Emotion has been viewed as a factor that distorts children's notion of reality, and which leads to less distinction between fantasy, and reality (Li et. al, 2015 & Carrick & Ramirez, 2012). This creates a possibility for children to select magical thoughts over real ones (Li et. al, 2015 & Carrick & Ramirez, 2012). In this study, the second theme identified was magical thinking as an effect of emotions in video gaming. This theme describes children's prevalent emotions on their thought processes. Whenever children revealed any kind

of emotions (i.e.: joy, excitement, timidity) during the study, their thoughts deviated from reality; where they engaged in magical thinking.

The following sections first describe each child's development in accordance to the areas of development. Secondly, each child's narrative is explained according to the information provided by them during the study. And finally, I will proceed to present the results as to how each theme relates to each child through their narratives.

Alex

At the time of the study, Alex was a five years old male, who came from a middle class family. His father is originally French, and his mother was born and raised in the United States. He had a typical language development according to his norm, yet he was not very talkative during the study. However, he was able to easily respond to all the questions which were asked of him. As far as his cognitive development is concerned, Alex demonstrated typical development according to his peers. In comparison to other five-year-olds, he demonstrated an average problem solving abilities, a good general awareness and attention to events, including the game events, and responded well to my questions. In terms of social emotional development, Alex displayed minor issues with self-regulation. For example, during the time he played with the game, he seemed to get frustrated easily. At the outset of the study, I was told that his parents had recently gotten a divorce, and that Alex at the time was dealing with some unhappy feelings and moods. Alex's language abilities were average as comparing to peers his age. He spoke in full sentences, and seemed to have an adequate vocabulary. He used a good syntax, using correct tense, pronouns, and adjectives. His narratives had clear beginnings, middle, and end.

As far as Alex's physical development, he seemed to be typical for a child his age, and was healthy. Alex did not seem to have very strong fine motor skills. His visual motor coordination was not strong, as he was not able to hold the console, and use the buttons at the same time. He asked for my help after he started playing the video game. Therefore, I helped him direct the character's movement in the game, using the directional buttons on the handheld console, while he was tapping the buttons to jump, and shoot. He played video games every now and then, and was more familiar with 3D gaming, rather than 2D gaming.

Alex's Narrative.

After playing the video game, I sat down while Alex preferred to stand. We then proceeded to have a conversation about the content of the video game. Alex's responses were valid regarding what the video game content presented, fantastical or real. It was evident that he was able to understand what the video game character can do according to the game. His learning experience was logical in terms of what was real, and what was not real in the video game. For example, he managed to discuss the actions which Mario engaged in, such as jumping, and shooting fire. Throughout our conversation, he also explained that Mario got bigger when he ate a mushroom, and was able to shoot fire when he ate a mushroom. For example, at one point during our conversation, Alex said:

“Mario can jump and shoot fire, [but] only when he is big, only when he is big [twice]...Mario got big when he ate a mushroom. Mario can shoot fire after eating a flower.”

His answers to my questions aligned with the content of the video game. Figures 1 and 5 in chapter three represent Mario jumping, and shooting fire, which Alex was able to fully

comprehend. Figure 2 in chapter 3, represents the transformation Mario went through, after eating a mushroom. This data revealed that Alex had a good understanding of the abilities of the video game character, as well as the content of the video game.

In contrast, Alex did not believe that mushrooms make him (Alex) big or strong. Similarly, he did not believe that flowers have the ability to make him (Alex) shoot fire. He considered both events as unreal. He was able to distinguish between fantasy, and reality. When asked what he thought about the power of mushrooms and flowers, Alex's comments were:

“I do not eat mushrooms, I do not like mushrooms, and mushrooms do not make me big, I don't know why [mushrooms] don't make me big.... meat and French fries make me bigger... I like French fries, French fries make me bigger, but not very because French fries are only potatoes....I don't eat flowers because people don't eat flowers.”

As Alex did not find it real that mushrooms can make him bigger, his rationale was that foods such as meat and French fries had the ability to do so. He believed that eating flowers was unrealistic, and does not occur in real life. Figure 4 in chapter three, portrays Mario eating a flower.

It was obvious at that point that Alex clearly discriminated between what was real in the video game, and what was fantastical. However, and at a later stage of our conversation, it appeared that there was a thin line between fantasy, and reality for Alex. Alex confused fantasy for reality as soon as he engaged in the action of jumping. Based on my observational notes, Alex started jumping as soon as I asked him whether he can jump higher than Mario. Figure 1, in chapter three, reveals how high Mario can jump. It shows that any typical person is incapable of

reaching such a high altitude. That was not the case according to Alex. During our conversation, when I asked him about jumping Alex commented:

“Would you like to see how high I can jump?..I can only jump at home...I can jump like this...I can jump higher than Mario...much higher....like this [jumping]...higher...after I jump, I can make very loud noises.”

As mentioned previously, physically, Alex was typical for a child his age. Therefore, his jumping abilities were also as could be expected of a five-year-old. Alex, however, believed that he could jump “really high,” higher than Mario. When he demonstrated his jumping action, he possibly jumped two to three inches off the ground. At this point, his thoughts were not aligned with the reality of his own ability as he demonstrated. Therefore, he began to deviate from reality, and engaged in magical thinking. This was the only instance that Alex revealed any magical thoughts during our interactions. Alex’s behavior here confirms Piaget’s (1926) and Kesslerling and Muller’s (2011) assertion that every desire can become a reality for a child in an egocentric stage. This type of magical thinking is common in children’s Alex’s age, and playing with Mario’s game gave Alex an opportunity to reflect on his desire regarding his own physical abilities and desires.

Additionally, according to Dill-Shackleford et. al (2016), when people find themselves in the story i.e. relating to the events, and characters, they are more likely to change their perspective according to the story events. Since video games have a story to tell, and is a form of media, Alex’s magical thinking could be attributed to being able to relate to the video game character. For example, Alex put himself in the character’s shoes when he jumped, which in turn resulted in changing his perspective about how high he could jump. Further, Alex engaged in

what Dill-Shackleford et. al (2016), reported as experience taking, which is connecting with a fictional character, and sharing their experiences. For instance, Alex took the jumping experience from a digital character, and applied it to himself.

To add, a theory which can further explain Alex's magical thoughts is the discriminability principle of source monitoring theory (Thierry & Pipe, 2009). This theory explains that if the information coming from the medium is similar to reality, then an individual is more likely to confuse fantasy for reality. As reported by Alex, he managed to comprehend most of the video game content, and events, fantastical or real. Yet, he only reported one magical thought, which was jumping higher than Mario. According to the discriminability principle of source monitoring theory, Alex believed that jumping high was an action which could be performed in reality. Alex therefore believed jumping in the video game was similar to jumping in reality. Therefore he reported that he could jump higher than Mario.

Magical Thinking as an Effect of Uncertainty in Video Gaming.

As discussed earlier, there was only one instance that caused Alex to think magically. That instance was when he stated that he could jump higher than Mario. During our conversation, Alex seemed to be grounded in reality, and was able to distinguish between what was real, and what was not. However, the instance that caused him to be uncertain was when I asked him if he could jump as high as, or higher than Mario. The following textual data was what Alex noted, after asking whether he can jump as high as, or higher than Mario:

“I do not know if I can jump as high as Mario.... [After Jumping] I can jump higher than Mario... like this [jumping]...higher...after I jump, I can make very loud noises.”

Based on my observational notes, he looked at me in a state of confusion, and his tone was that of a confused child. Then he offered to show me his jump. After my approval, he jumped up and down several times. At that point, he became certain that he could jump higher than Mario. His uncertainty was transformed into certainty, and therefore, his magical thoughts took over his rationale thoughts at that moment. Alex's uncertainty about his ability resulted in confusing fantastical actions, which could only be done by Mario, for reality.

A child's level of confusion might impact their thought processes, therefore they engage in magical thoughts (Bolton et. al, 2002, Simonds et. al, 2009). This suggests that Alex's uncertainty could have affected his thought process. Alex only revealed uncertainty when he was asked if he could perform a high jump like Mario. He eliminated any sort of uncertainty by jumping. After jumping, he believed that he could jump higher than Mario. The same way as Christmas presents provided evidence for children that Santa was real (Wang, 2009), Alex's jump provided evidence for him that in reality he could jump very high. Further, Wang (2009) explains that by age five, children have the ability to put the pieces of evidence together, yet come up with false conclusions. In Alex's case, jumping higher than Mario was his false conclusion.

Magical Thinking as an Effect of Emotions in Video Gaming.

As I mentioned earlier, Alex's parents were in the process of divorce. At the beginning of our interaction, Alex seemed a bit subdued, which I interpreted as being natural due to the stressful situation in his family. Yet, he began to show some excitement, when he knew that he was going to play a video game. He was familiar with the 3D Mario game, which is a game on a more graphically advanced console. Generally, Alex liked playing video games. In my

observations during the game play, I noted he got excited at some instances, disappointed at some other instances, and frustrated at other points. Prior to assisting him during game play, he mentioned that he thought that the game was difficult for him to play. However, when I provided him with my assistance, he got excited, and managed to have control over the video game. He articulated his feelings by saying:

“[Video games] make me feel happy, nice, excited that’s all...I feel nice when I play a video game, YES (with a high voice) I feel excited...This game is too difficult for me... I can’t play it...I’m shooting, I’m jumping...This is fun.”

His excitement extended till after playing the video game. That was clear when he said that he wanted to jump. By jumping up and down, he got more excited, thus believed that he was able to jump very high. He intensely jumped to be able to make noises, which he was fully aware of. This suggests that his emotions, which were represented by excitement, engaged him in magical thoughts.

Alex’s emotions were prevalent as soon as he started jumping. He got fairly excited, and enjoyed the loud noise he made as he jumped. At that point, his thoughts turned into magical ones, claiming that he could jump very high. This was not surprising knowing that with the presence of an emotion, children are more likely to confuse fantasy for reality (Li et al., 2015). Furthermore, Carrick and Ramirez (2012) suggested that, children have the ability to choose to have magical thoughts with the presence of an emotion. Alex’s excitement might have distorted his sense of reality, yet he might have chosen his magical thoughts. Carrick and Ramirez (2012) explained that in certain cases children can report an event as real, when they know it is not, which provides explanation for Alex’s thought process in this case.

Conclusion about Alex's Case.

In brief, Alex's thought process was not unusual for a child his age. Research (Dill-Shackleford et. al, 2016; Li et al., 2015; Carrick & Ramirez, 2012; Simonds et. al 2009; Ma & Lillard, 2006; Bolton et. al, 2002) provides enough evidence that children his age are magical thinkers, in which they confuse fantasy for reality. However, Alex did not have many uncertainties, or a high level of excitement to provoke more than one magical thought.

The results of this study suggest that Alex comprehended Mario's abilities, fantastical or real. For example, he identified what he thought to be real, and unreal in the context of the Mario video game. Additionally, he did not have a high level of uncertainty, for it was reported that he only had one incident where he felt uncertain. Further, his emotions could be seen present in the form of excitement. The interaction between his video game understanding, uncertainty, and emotions, resulted in one thought, which was seen to be as magical.

Jon

At the time of the study, Jon was a four years old male, who came from a middle class Caucasian family. Both of his parents were born and raised in the United States. He had a typical language development according to the norm, and was rather talkative throughout the study. He responded with ease to all questions that were asked of him. Cognitively, I found Jon to be above average as compared to his peers. He was thoughtful, observant, and had problem solving skills that are probably above a child his age. In terms of social emotional development, Jon had strong self-regulation abilities. He seemed to enjoy the game and our interactions, and kept laughing, and giggling throughout the study procedure. Physically, although Jon is a bit thin, he is within the typical range of peers his age.

Jon had very good fine motor skills, and good visual motor coordination. He was able to hold the console, and use the buttons at the same time without requiring any assistance. He played video games very often, and was more familiar with 3D gaming, than 2D gaming.

Jon's Narrative.

After playing the video game, I sat down while Jon preferred to stay standing. We had a conversation about what he thought the game was about. Jon was very observant, and detailed when describing the video game content. Jon was the only participant who was able to state most of the actions, which Mario was able to perform. He understood the game content very well. During our conversation, Jon described most of Mario's abilities. For example, he described:

“Mario can jump, and he can walk, look around, and he can run... Mario tries to get away from the bad guys.... Mario can shoot when he ate a flower...Mario got bigger when he ate a mushroom.”

Jon was able to meticulously explain everything he saw in the video game. His responses made me feel as if he had prior experience playing this video game. At times, it felt that I was interviewing an adult, and not a child. For example he described a game he played:

“Well I play a lot on my Xbox because there is a special game that Santa gave us...it's lingo city [Lego city] and we got the cops so [we]can do all the missions, we are not the firefighters or anything, but some people can be the ambulance, but I'm not the ambulance. So you can like get out of your car, and then you can like jump into other cars, and then they use your car.”

While Jon explained everything he saw in the video game, he did not believe that everything he saw could happen in real life. Take, for example, the following comments made by Jon:

“I do not like mushrooms...I do not eat flowers because they are dirty.”

Jon assumed that because he did not like mushrooms, then it was unrealistic for him to eat them. He did not provide any rationale regarding why he did not eat mushrooms. On the other hand, his rationale about not eating flowers was that they were dirty, thus inedible. Jon provided a rationale for what he believed did not happen in reality. This is supported by Wang (2009), who explained that children Jon’s age believed in events, fantastical or real, as long as they could provide a rationale, or evidence for the event.

Jon’s elaborate understanding of the video game might have led to his abundant magical thoughts. He believed that mushrooms made him as big as a giant, and that he could jump higher than Mario. He also deviated from the video game that he played, explaining that Mario cannot touch the floor because it was hot lava, and that Mario is a dog. The following passage, extracted from my textual data, explains Jon’s magical thoughts:

“If I eat a mushroom I will get big, bigger than Mario. I will be “bigger” as a giant, as a cloud and as a sky...Mario can jump higher because he is little, but I can jump higher than Mario when he [Mario] gets bigger because I am small and he[Mario] is big.... Mario cannot touch the wall because it is lava and the floor drops when he is walking on it... Mario can do everything just like me, so he is a dog.”

Jon’s narrative and behavior align with Piaget’s (1926) and Kesselring and Muller’s (2011) notion, that a child’s desire becomes reality during the egocentric stage. Similar to Alex,

his desire of becoming like Mario was reflected in reality. Jon desired the strength, and power of Mario when he ate a mushroom, so by playing this video game, Jon had the chance to reflect on his desire regarding his own physical abilities. According to Piaget (1926), this type of magical thinking is not uncommon for children Jon's age.

Based on Jon's responses, it seemed that he was trying to fit fantasy in reality. For example, every fantastical event that he described in the video game was later transformed into thoughts, and actions he believed he could do in real life. Similar to Alex, Jon altered his perspective to fit the video game; an idea discussed by Dill-Shackleford et. al, (2016). This idea states that individuals might alter their perspective in the direction of the story. Jon's change of perspective transformed his thoughts into magical ones. While his physical development was typical for his age, he still believed that he could jump higher than Mario. Based on my observational notes, Jon jumped a few inches off the ground. However, his rationale was that when Mario gets bigger, Jon could jump higher than him, since he (Jon) was smaller in size.

In the context of the discriminability principle of source monitoring theory (Thierry & Pipe, 2009), Jon confused fantasy for reality at many instances. For instance, the events, fantastical or real, Jon viewed in the video game, were all doable from his perspective. This suggests that getting big as a giant and touching the sky when eating a mushroom, and jumping real high were all real occurrences to him. According to the discriminability principle of source monitoring theory, Jon did not understand the reality status of these fantastical events, and their validity in the real world.

Dill-Shackleford et. al (2016) explain that connecting with a fictional character falls under the idea of experience taking. In this study, Jon shared Mario's experiences that ranged

from jumping to shooting fire. Experience taking was extremely obvious in Jon's case especially that, he verbally articulated that Mario was like him. Interestingly, everything Jon reported were events, fantastical or real, that he believed he could do. Therefore, this might suggest that this experience taking for Jon is a conscious decision. This is in contrast to what Dill-Shackleford et al (2016) explained that, experience taking is "spontaneous rather than a conscious decision" (p.638).

Also, while Jon mentioned earlier that he did not like mushrooms, he still believed that mushrooms could make him big. He also visualized what he could look like after eating a mushroom. His magical thoughts extended to events, which were not part of the video game. Finally, his final thoughts came in form of a joke which was that Mario was a dog. He said:

"[after eating a mushroom] I will be bigger as a giant, as bigger of a cloud, and as bigger as the sky... he [Mario] can do everything as me, so he[Mario] is a dog, so write that down so you remember, cause it is a funny joke

All of this suggested that the more details Jon provided in regards to what he saw in the video game, whether fantastical or real, the more his magical thoughts intensified.

Magical Thinking as an Effect of Uncertainty in Video Gaming.

It became clear at this point that Jon's magical thoughts were plenty. Part of his magical thoughts could be attributed to the uncertainties he faced regarding his responses. During our conversation, based on my observational notes, Jon was hesitant to answer certain questions. The following notes were Jon's responses to certain events that he had interacted with during the video game play:

“Flowers are dirty but I can still eat them because they have honey...I mean nectar... Mario can jump higher because he is little, but I can jump higher than Mario when he gets bigger because I am small and he is big ...I can touch the wall if it is lava...oh no I cannot, oh yes I can... no I cannot...”

Based on my observational notes, Jon seemed to be very confused about his answers, and seemed to be trying to make meaning out of his own responses. Jon had a high level of uncertainty regarding his answers, thus his responses turned to be magical by nature. The above narrative reveals Jon’s uncertainty. His responses aligned with Bolton et. al, (2002) and Simonds et. al (2009), who believed that children might resort to magical thoughts when in a state of uncertainty or confusion. This suggests that, similar to Alex, uncertainty had affected Jon’s thoughts. However, and unlike Alex, Jon did not only provide physical evidence to prove his ability to do fantastical events. Instead, he also provided his own rationale. For example, in addition to jumping up and down to eliminate any doubts, he believed that he could jump higher than Mario, when Mario was bigger in size; and that flowers are edible due to containing honey or nectar. This echoes Wang’s (2009) that whenever children have evidence, they resort to believing in magical thoughts due to the false conclusions they come up with.

Additionally, he kept giggling, and laughing at his own responses. This observation will be discussed further in the following section. He rationalized his own responses by giving proof for why an action or event was possible in real life. For example, according to Jon, flowers were edible since they had nectar. He was not sure if flowers had honey or nectar, yet what mattered to him was avoiding any uncertainty, and creating a new reality, in which flowers were edible. Similarly, he wanted to prove to me that he could jump higher than Mario, so he provided his own evidence. This time he did not only provide a rationale, but he also jumped up and down to

prove to me that he could jump higher than Mario. Providing a rationale and engaging in the action proved to remove any uncertainties Jon had.

Jon's responses revealed a high level of magical thinking caused by his uncertainty. We were both confused about what he meant by the "lava response" he had presented. For example, he said:

"[Mario] he cannot reach the wall, he cannot touch it, because it's lava, and the floor drops when he's [Mario] walking on it, so when he's [Mario] passing by the floor, it goes down, then he [Mario] falls into lava, and then there's water under it."

Interviewer: ohhh... So do you think you can do these things as well? Can you touch the wall if it's lava?

Jon: "No...I can [yelling]...NO [yelling]...I can...No no no."

This situation was not part of the video game, yet it revealed Jon's level of confusion and uncertainty. Perhaps, his magical thoughts went beyond what he saw in the video game, to an extent where Jon created his own video game context using his magical thoughts.

To conclude, Jon's uncertainty was avoided through his rationalizations, and actions, which in turn resulted in magical thoughts.

Magical Thinking as an Effect of Emotions in Video Gaming.

Jon seemed a very happy and excited child. He did not sit still from the beginning till the end of the study. Moreover, his laughter filled the room throughout the study. He was more acquainted with 3D gaming, yet still felt excited about playing the 2D game. The following was

what Jon discussed regarding how he felt about video games in general, and the video game he played:

“Because they are fun, excited... It is hard.”

In my observations, I realized that Jon was very expressive of his emotions. It was as if he was entertaining himself throughout the whole study. He was laughing, and giggling at his own responses, which in turn added to his excitement. For example, he kept jumping while playing the video game, during the interview, and after the interview as well. For example he said:

“[After eating a mushroom] Mario got BIG (giggling and laughing)... [If I eat a mushroom] I will bigger as a giant (laughing)... [After eating a flower] He can shoot (laughing and giggling)... I don't eat flowers because they are dirty (laughing)... In a movie [I watched] there was fire poop pants (laughing hard)... there was a little boy in meet the Robinsons and he had pins under his fire poop... fire proof pants (bursting in laughter)...so silly why did he call them that (laughing).”

Similar to Alex, Jon's emotions played a role in creating magical thoughts. However, Jon was much more expressive with his emotions as compared with Alex. Jon was literally what people might call “a ball of energy”. Given the presence of strong positive emotions in Jon, it was not surprising that he confused fantasy for reality. This idea has been noted by Li et al. (2015) and Carrick and Ramirez (2012), who said that, with the presence of strong emotions, children might confuse fantasy for reality, and might report fantastical events as real, even though they (children) know it is not. As mentioned above, Jon was able to consciously choose to have Mario's experiences. This was contrary to the notion presented by Dill-Shackleford et. al

(2016), who believed that experience taking might have a spontaneous nature. Carrick and Ramirez (2012) support the assertion that with the presence of an emotion, children could report an event as real, even though they know it is not. This provides evidence that Jon chose to think magically, and that it was a conscious thought process.

It should not be of any surprise that Jon's emotions engaged him in magical thinking. He was full of "good" energy throughout the study. Every question he responded to was followed by either giggling or laughter. That said, his salient emotions could be seen as one of the major factors for why he had abundant magical thoughts.

Conclusion about Jon's Case.

In summary, Jon was the "most experienced" participant in video gaming, as well as the most excited of all participants. Research (Dill-Shackleford et. al, 2016; Li et al., 2015; Carrick & Ramirez, 2012); Simonds et. al (2009), Ma & Lillard, 2006; Bolton et. al, (2002) provides enough explanations that uncertainty, and emotions, play a role in confusing fantasy for reality. Jon had several magical thoughts, which were based on what he believed was real, and unreal in the context of the video game (notion of reality). His thought process might be leaning more towards magical realities, than real life's reality.

Kylie

At the time of the study, Kylie was a four years old female, who came from a middle class Caucasian family. Both of her parents were born and raised in the United States. She had a typical language development according to her norm. She was a little bit timid, and was not very talkative throughout the study. Yet, she responded with ease and confidence to all questions that were put to her. Cognitively, she was typical for a child her age. For example, she made meaning

of her interaction with the video game by stating Mario's abilities. She spoke clearly, and provided meaningful sentences in her responses. She also provided logical explanations for her thoughts. Kylie's social emotional development was also typical for her age, as she paid attention to the game she played, and did not show any signs of frustration throughout the study. Her physical development seemed within the range of children her age.

Kylie seemed to have a typical visual motor skills, yet did not have very good fine motor skills. She was not able to hold the console, and use the buttons at the same time. She required my assistance after a few tries of playing by herself. She played video games frequently and was more familiar with 3D gaming, than 2D gaming.

Kylie's Narrative.

After playing the video game, and in time for the interview, we both sat down on the couch to discuss what she had observed, and learned, from the video game. At the beginning, Kylie was timid. For example:

Interviewer: What do you think the video game you just played is about?

Kylie: "hmmm" (while closing her eyes with her hands, and blushing)

Interviewer: It's ok if you don't know

Kylie: I wanted to play another game (While hiding in the cochins).

However, Kylie had no problem in understanding the content of the video game, including the abilities of Mario. She explained that Mario could jump and shoot things. Kylie also observed the change in Mario's color after eating a mushroom. Figures 1 through 5 in

chapter three represent the change in Mario's color when he ate a mushroom, as well as when he ate a flower. Based on the textual data collected, the following were Kylie's comments:

"Mario can jump and shoot things...Mario can also break things...Mario turned into a different color when he [Mario] ate a mushroom."

While Kylie observed similar content as her fellow participants, she also observed events which were not noted by the other children in this study. She had two observations which none of the other children realized. She noticed how Mario can break things. Figure 3 in chapter three depicts this action. She also noticed Mario's slight change of color. It is perhaps that, Kylie was more attracted to Mario's "violent" behavior of breaking bricks, and the fairly vivid colors in the video game, than the content itself. This might also suggest that Kylie paid more attention to details, than the other two children.

Kylie also provided a rationale for certain events she witnessed in the video game. Data from our conversation provided the following response:

"I do not like mushrooms..... I am really allergic to cats but not mushrooms, I am only allergic to cats, but my Grandma is allergic to tea and milk... [Mario] can shoot things just like the hobbit, so in the Hobbit I play the spider level and I got to ride on the fly and didn't have to get off to shoot the spiders, so I could just stay so the fly could shoot things...The Hobbit is stronger [than Mario] cause they [The Hobbit] have swords and bone arrows."

Based on Kylie's narrative, she provided a rationale for several events in the video game. This pattern of providing a rationale was consistent across all participants. This strongly echoes Wang's (2009) notion of children believing in events after providing a rationale, or evidence.

Kylie's rationale for not liking mushrooms was her allergy to cats. She went on to compare her allergy to that of her grandmother's. Perhaps, her attraction to Mario's change of color upon eating a mushroom made her explain her allergy. In other words, Kylie left herself open for the possibility of eating a mushroom, and changing colors if she did. Additionally, Kylie compared the Mario video game to the Hobbit video game, and concluded that the Hobbit was stronger. Again, this aligns with Wang's (2009) notion that children Kylie's age, tend to believe any event or thought, once they provide evidence; even if the evidence was a false one.

Just like the other participants, Kylie had her share of magical thoughts. She identified several events in the video game which were different than the other children. That said, her magical thoughts were related to her own understanding of the video game. What the data revealed, in regards to magical thinking, Kylie's thoughts were slightly different than the other participants. The following passage explains the magical thoughts she revealed during our conversation:

“I can break things [like Mario]... I do not eat mushrooms, but I can get big and strong when I eat mushrooms...I can be very strong [after eating a mushroom]... I can jump and shoot like Mario....Yes I can shoot...I can only jump this high ...I can maybe jump higher than Mario”

Similar to the other participants, Kylie also changed her perspective to fit the video game content. As Piaget (1926) and Kesselring and Muller (2011) suggested, children tend to resort to magical thinking, when they desire something. Her thoughts changed to align with Mario's abilities, revealing a change in her perspective to fit the storyline of the video game (Dill-Shackleford et. al, 2016). She put herself in the character's shoes (Dill-Shackleford et. al, 2016),

and assumed that she was able to do the same things Mario could do. Similar to Jon, her understanding of the video game was also what she believed she could do. Her idea of experience taking, as noted by Dill-Shackleford et. al (2016), was reported by her being able to break things, jump and shoot like Mario, and to get big and strong after eating a mushroom. This similarity regarding what the video game was about, and the fantastical events she reported she can do, suggests that Kylie consciously chose to do these actions. This contradicts Dill-Shackleford et. al's (2016) idea that experience taking is a spontaneous act.

Her confident answers regarding the fantastical events, which she could do in real life, suggests that, she had low discriminability between fantasy, and reality. According to the discriminability principle of source monitoring theory (Thierry & Pipe, 2009), if the information coming from the medium is similar to reality, then an individual is more likely to confuse fantasy for reality. Based on Kylie's reports regarding her understanding of the video game, she believed that the events, fantastical or real, which Mario was able to do, were also valid in reality. This suggests that, to Kylie, breaking things, shooting, and jumping like Mario, are all real events, which could occur in real life.

Magical Thinking as an Effect of Uncertainty in Video Gaming.

Kylie was another participant, who revealed the least instances of uncertainty during the study. She reported one incident, which was seen as uncertain. For the most part, Kylie revealed some confidence in her magical responses, and did not engage in any obvious logical reasoning or rationales to remove her uncertainty. However, Kylie did engage in the action of jumping to remove some uncertainty. Based on her textual data, this was the context of our conversation:

Kylie: "I can only jump this high (hoping)... I can maybe jump higher than Mario."

Interviewer: Can you do the things that Mario can do?

Kylie: “yea”

Interviewer: Can you shoot?

Kylie: “yea”

Interviewer: What are the things that Mario cannot do?

Kylie: hmm (hesitant) break things

Interviewer: but you said previously that you can break things.

Kylie: “uhum” (in acknowledgment while giggling).

Interviewer: so you can break things, but Mario can’t.

Kylie: (nodding)

Interviewer: So what are the things that Mario can do, and you can’t do?

Kylie: “mmmmm(hesitant) exercise?”

While her response about jumping included the word “maybe” representing some sort of uncertainty, Kylie did not try to prove anything to herself, or to me. In terms of actions, based on my observational notes, all Kylie did was a small hop on one foot. She made a comment, “I can maybe jump higher than Mario,” right after this hop, where she felt uncertain about whether she could jump higher than Mario or not. This could be attributed to the fact that she was already confident about her answers, and did not need any proof, or rationale to change her mind.

Kylie changed her initial thoughts when she explained that Mario could not break things, while she could. In other words, Kylie believed that she was stronger than Mario. In this scenario, Kylie could have fallen into a state of confusion, which resulted in magical thoughts, as noted by Bolton et. al (2002), and Simonds et. al (2009). When she was asked again to confirm her answer, she nodded in approval. This takes us back to Piaget (1926), and Kesserling and Muller (2011), who believed that egocentric children usually transform their desires into reality through magical thinking.

Magical Thinking as an Effect of Emotions in Video Gaming.

It is worth noting here that, based on my observational notes, as the game proceeded Kylie became less timid, and began to show a bit of excitement, particularly after I asked her if she could do the same things Mario could do. Kylie's responses, in addition to my observation, revealed how persistent, and confident she was in responding to my questions. She did not hesitate at all in reporting any sort of magical thoughts. Based on the data, Kylie could do almost all fantastical actions that Mario could do. It was perhaps that Kylie was feeling more comfortable around me, more excited, and less timid, which led her to report all these magical events. For example, Kylie said:

“I can be VERY strong (with a loud voice) [after eating a mushroom]...he [Mario] can jump (while hopping) and he can shoot (giggling and making gestures of shooting).”

Kylie enjoyed playing video games, and thought that they were fun to play. Although, she was timid at the beginning of the study, she warmed up to the activity more, and began showing some excitement throughout the study. As Kylie was acclimated to the game and got into the play, with my assistance she learned to get a better control over the video game. The data

representing her feelings about video games in general and this video game in particular, were the following:

“Because [video games] are so fun...I feel good when I play video games, because you can do a lot of things with the controllers... so you can press “B” and shoot a lot of fire...[video games make me]excited... It is difficult...I don’t like this video game.”

Based on my observational data, when I assisted her with the game play, she got less timid, and started giggling as she played. She was clicking the buttons which made the character jump, and shoot.

As mentioned above, Kylie’s showed joy and excitement, and became less timid after she felt comfortable around me, perhaps due to “breaking the ice” between us. This was the first time I saw and interacted with Kylie, as opposed to the other two participants whom I had met earlier. So when we established a sense of “trust” and “friendship”, Kylie became more comfortable, and started acting herself. Based on my observations, she giggled, and laughed each time she lost the game. While she was good at hiding her emotions at some points, data regarding her magical thoughts were a result of her timidity. For example, based on my observation, she was actually hiding her timidity by acting confident, thus reporting magical responses. That was the main reason for why Kylie was not uncertain about some events, yet still engaged in magical thoughts. It was her timidity, which caused her to act over confident, thus reporting magical thoughts. For example,

Interviewer: So you can break things, but Mario can’t?

Kylie: “Uhum” (approving the previous question and giggling).

Interviewer: Mario can exercise, but you can't?

Kylie: yea (nodding her head and laughing).

As mentioned previously, Kylie was very timid for the most part of the study. However, such an emotion did not only create magical thoughts, as noted by Li et al. (2015) and Carrick and Ramirez (2012), it also created more confidence in her responses. This might be seen as a new finding which suggests that “acting confident” plays a role in magical thinking. Similar to Jon, by choosing her magical thoughts, Kylie did not select her thoughts spontaneously, especially that her magical thoughts aligned with her understanding of the video game. This comes in support to Carrick and Ramirez (2012), who suggested that children might report magical ideas, even though they know they are not real.

Conclusion about Kylie's Case.

Kylie was the only participant who reported different, yet valid events which she observed in the video game. She was also the only participant who did not reveal a high level of uncertainty; rather she was more confident about her answers than the other children of this study. Her emotions were more represented through her shyness, even though she got less timid at a latter point of the study. The interaction between her video game understanding, and emotions were, arguably, the only factors for her magical thoughts. She reported around four events, which were considered to be magical thoughts.

Dominant Themes for all Children

This passage provides the dominant themes among all three children.

1. The more events children reported in the video game (understanding the video game), the more they had magical thoughts.
2. Uncertainty was avoided by either providing a false rationale, or engaging in an action, or both.
3. Emotions, represented by happiness, joy, excitement, and timidity resulted in and/or facilitated magical thoughts.

All three points provided the base for children to think magically. For example, understanding where the source of information was coming from was a major factor in children's comprehension of reality. Additionally, uncertainty was a key element in creating magical thoughts and actions. For example, all children's uncertainty was followed by some kind of a magical thought or action. Finally, emotions had the ability to engage children in unrealistic thoughts. Arguably, all children consciously chose these magical thoughts.

It is worth noting that the four year old participants had similar cognitive development skills, proving that children under the age of five are able to provide "evidence", and "rationales" to reach conclusions. And finally, it was apparent that the frequency of video gaming had a direct effect on children's magical thinking, which varied across all children.

A Magical Thinking Model

Based on research provided from previous studies, as well as the findings of this study, a model representing the extent of magical thinking in each child was created. The extent of

magical thinking could be gauged when looking at the video game understanding in children, examine the level of their uncertainty, and examine their emotions all within the context of an event. In this study, the event was playing the Mario video game. In brief, whenever uncertainty and/or emotions are present within the occurrence of an event, magical thinking occurs in children aged four and five.

From the results of this study, it could be discerned that the way a child understands a video game, coupled with their uncertainty and emotions, facilitates formation of magical thoughts. While each child reported their understanding of the video game in their own way, they all engaged in magical thinking. The extent that children engaged in magical thoughts varied among all participants, yet they all revealed behavior, and thoughts, suggesting that they were thinking magically. Further, the extent that children engaged in magical thoughts varied from one child to the next. Nevertheless, they all displayed behaviors and thoughts, which suggested that they were thinking magically.

The magical thinking equation, which was created to explain the process of formation of magical thinking, is:

$$\text{Video Game Understanding} + \text{Uncertainty} + \text{State of Emotions} = \text{Magical Thinking}$$

To understand the level of magical thinking in each child, two criteria are used for the components of typical vs. high are applied to the equation components of video game understanding, uncertainty, and state of emotions.

For example, a typical video game understanding refers to occasions in which a child reported two to three real observations in the video game, whereas a high video game understanding refers to occasions in which a child reported four or more observations of

fantastical or real events in the video game. Similarly, a typical uncertainty is used for a child who mentioned one to two statements which represented confusion, whereas a high uncertainty refers to a child reporting three or more statements that represent confusion. Finally, typical emotions refers to occasions in which a child showed some excitement or joy during, and/ or after playing the video game, whereas high emotions represents intense excitement or joy during and/or after playing the video game.

Looking at the level of quality, for example whether typical or high in each component of the equation (understanding the video game, uncertainty, and emotions), one can conclude whether a child engages in an average level, above average level, or below average level of magical thinking. Thus, in this case, an average level of magical thinking shows a child, who claims to be able to perform one to two Mario tasks/events, that are considered to be fantastical ones. An above average level of magical thinking shows a child who claims to do most of the fantastical Mario tasks/events observed in the video game.

Applying this equation to the participants in this study, the following can be concluded. Alex's thought process and behaviors showed that he engaged in an average level of magical thinking, while Jon and Kyle's behaviors and thoughts processes demonstrated that they engaged in an above average level of magical thinking. Table 6 summarizes the extent of magical thinking, in the context of this study for participants.

Table 6. Children's Magical Thinking Results

	Alex	Jon	Kylie
Video Game	Typical	High	High
Understanding			
+			
Uncertainty	Typical	High	Typical
+			
Emotions	Typical	High	Typical
Magical Thinking	Average	Above Average	Above Average

The Model in Action

Alex's video game understanding was typical, as he only reported three tasks that Mario could do. His uncertainty was typical as well, reporting one instance of being uncertain. Alex occasionally showed some excitement, which resulted in labeling his emotions as typical. By applying the equation on the case of Alex, his magical thinking turns out to be average, as he reported that he could perform one magical task.

Jon reported seven events that occurred in the game, thus he had a high level of video game understanding. He also reported four tasks in which he was uncertain of. This made Jon fall under the criteria of high uncertainty. He was excited throughout the study, thus he had a high level of emotions. The interaction of all three categories resulted in Jon having an above average magical thinking, as he reported that he could do almost all tasks that Mario could do.

Kylie reported four events that happened in the video game. According to the model, this is considered to be a high level of video game understanding. She was uncertain about one event,

thus her uncertainty level was typical. Finally, she got excited on some occasions, which makes her level of emotions typical. The interaction of all three categories resulted in an above average magical thinking level.

Based on this model, it appeared that magical thinking is directly related to a child's understanding of a video game. The more events children reported in the video game (video game understanding), the more they engaged in magical thinking. Since Alex's video game understanding was less than the other children, his magical thoughts were considered to be average. In contrast, Jon and Kylie reported more events that they had seen in the video game, thus they had an above average magical thinking level.

Uncertainty and emotions played a role in adding to the number of the reported magical events. For example, Jon reported more magical events than Kylie did, since he had a higher level of uncertainty and emotions. In contrast, Alex only had one event to be reported as uncertainty, and had typical emotions, thus his magical thinking remained average.

To conclude, and arguably, a major factor that causes children to think magically in video games, is their understanding of the video game. With the advancement of video game graphics that mimic reality, it is important for such a model to exist. The existence of such a model might have the potential to shed light on what video games are most appropriate for preschool children. This model provides a starting point for understanding the process of children's magical thinking after playing a video game. This model can also be used in contexts unrelated to video gaming, such as in pretend play scenarios, or in other symbolic and role play conditions.

Conclusion

The findings of this study suggest that four and five-year old children's magical thinking is dependent on their video game understanding, uncertainties, and emotions. It is not clear what the minimum level required is for each of children's video game understanding, uncertainty, and emotions for them to think magically. However, one thing is clear, that the presence of all three factors; video game understanding and/or uncertainty and/or emotions, triggers magical thinking. Goldstein and Alperson (2019) noted that, it is still unknown how children use unreal content from media, and relate it back to their real lives. This study presents evidence that children use fantastical events in media, video games, and relate it to their lives by becoming the game character, thus thinking magically.

CHAPTER FIVE

DISCUSSION

This dissertation explored the impact of video gaming on children's video game understanding and magical thinking. It was apparent, from this study, that video games play a major role in the thought process of the preschoolers who participated in this study. To elaborate, video gaming distorted the participant children's reality by creating unreal magical thoughts, this in turn, was transferred into the outside world. However, the extent to how much video game interaction should be present for a child to think magically, still needs to be further researched, and studied.

The body of literature regarding electronic media and children's interaction is abundant, and was reviewed thoroughly in this paper, pointing out the controversy that exists regarding the general impact of electronic media on children's lives. While this topic was academically abundant, almost none of the literature reviewed, focused on magical thinking in the context of electronic media, especially, video gaming. Rather, several research studies reviewed, and discussed the influence of media, in general, on children's reality. From this stand point, the study of this paper aimed at bridging the academic gap that exists with respect to video gaming, thought processes, and magical thinking.

Moreover, knowing that magical thinking is part of children's cognitive development, the reviewed literature provided evidence that media has a significant effect on brain development in children. Similarly, since magical thinking occurs during the egocentric stage of children's development, the researcher explored the influence of egocentrism on children's thought

processes, where magical thinking occurs , in the children studied who were in this stage of development

In brief, utilizing magical thinking as a theoretical framework, supported by Piagetian egocentrism, this dissertation explored the impact of video games on children's thought processes when they consider what is real, and what is not. Findings from this study, provided evidence that video games have an impact, and might also trigger magical thinking in children during the egocentric stage. This discussion chapter explains the meaning of the findings of this study, with respect to the notion of reality and magical thinking in three children who participated in this study.

Since magical thinking is a cognitive process that occurs during the egocentric stage of development, the findings of this study were relevant to Piagetian egocentrism, Brain development, and Magical thinking. The following sections discuss uncertainty and emotions in the context of egocentrism and brain development respectively. It also presents alternative explanations for the findings, limitations, implications for future practice, and implications for the field of early childhood education.

Egocentrism, Uncertainty, and Magical Thinking

Sine magical thinking occurs in the egocentric stage, every desire is transformed into a reality when a child is egocentric (Piaget, 1926; Kesselrin & Muller, 2011). This is proof that when children desire something, they resort to magical thinking. In this study, the children desired to have abilities like Mario's, so they believed that they were capable of performing the same actions as the video game character. One of the reasons that children resort to magical

thinking is, to avoid facing certain experiences, thus creating their own realities (Odgen, 2010). This study indicated that, to avoid experiencing uncertainty, children under study used magical

In logical egocentrism, children view the world from their own perspective, thinking that others think the same way they do (Piaget, 1926; Kesselring & Muller, 2011). This was evident in this study from several responses provided by the participants. For example, when children were uncertain about their abilities, they resorted to what Piaget called logical egocentrism. The participants of this study thought that I, the researcher, had the same ideas in relation to mushrooms, flowers, and jumping as they appeared in the video game. It is perhaps that, children's logic was guided by their egocentrism, which was evident in the study, and supported by Piaget's theory. In other words, according to the children of this study, the interviewer, me, also believed that he could jump higher than Mario, shoot fire, and get bigger, and stronger upon eating a mushroom, without comprehending his perspective. This can be explained from a different stand point as well. Since fictional media introduces people to different perspectives, according to Dill-Shackleford et. al (2016), children might have found new perspectives regarding their abilities.

Piaget's later work with Inhelder (1955, 1958), provided a new stage in egocentrism. In this stage, children lack perspective on the external world, where they are not able to distinguish between situations (Kesselring & Muller, 2011). Egocentrism can also be understood as the unconscious confusion of one's perspective with that of the other (Carpendale & Racine, 2011). Children's uncertainty, along with their lack of perspective, made it difficult for them to distinguish between Mario's abilities as a digital character, and their abilities as humans. All this, led them to think magically.

Additionally, when children tend to make judgments, they tend to be egocentric, and are not able to compare their attributes to others; rather they tend to overemphasize their own skills only (Rose et. al, 2012). Children in this study tended to overemphasize their own abilities, such as jumping high, shooting, getting bigger and stronger, without taking into perspective that Mario was not real. Perhaps, if they were able to consciously compare their skills to Mario, they would have understood that their abilities are limited.

Finally, participants of this study were not able to understand their abilities in relation to Mario's. This can be attributed to egocentrism and brain development. Weighing information about the self and others is linked to the inter-hemispheric interaction (Rose et. al, 2012). The more an individual's interaction between their left, and right hemispheres are, the less egocentric they are (Rose et. al, 2012). Since children in this study were not able to distinguish between their abilities, and Mario's abilities, they had a lower degree of communication between both hemispheres.

In brief, during the egocentric stage, children's play is linked to their unconscious fantasies, where magical thinking occurs (Bertolini & Nissim, 2002). This kind of play bridges between fantasy, and reality (Bertolini & Nissim, 2002), yet in this study children were not always able to distinguish between reality and fantasy. As Bertolini and Nissim's (2002) explained, play helps children build their own image of the world, this study helped children create an image of the world, yet it was not always a valid image, especially when it came to their abilities.

Brain Development, Emotions, and Magical Thinking

High level technologies, such as video games, trigger new thoughts, and feelings in children (Nakamuro et. al, 2015). Moreover, children's brains are affected by early experiences, such as video game playing, which might have effects on adulthood. Previous studies by Saleem et. al, (2012) revealed that video games affect children's emotional constructs, in which brain regions responsible for emotions mature early (Hummer, 2015). Also, fictional media, such as certain video games, stimulate emotions (Dill-Shackleford et. al, 2016). To add, emotion is linked to motivation, and action (Dill-Shackleford et. al, 2016), where children's emotions motivated them to act the way the digital character behaved (ex: jumping). This study provided evidence that children's emotional interference was significant in thinking magically.

Exposure to fiction increases empathy, and decreases prejudice (Dill-Shackleford et. al, 2016). This idea provides evidence that children's exposure to Mario, as a fictional character, increased their sense of "feeling". This was apparent, when children felt that they can do the same things the digital character can do, resulting in "feelings" with the character, which resulted in seeing themselves as one with him. Drawing from previous studies, (Dill-Shackleford et. al, 2016) explain that, some individuals liked watching certain scenes in media because it was emotionally stimulating (ex: feeling with the character). Based on the responses of these study participants, they all felt a certain emotion when playing a video game. This suggests that, children found this video game emotionally stimulating, thus engaged in magical thinking, reporting unreal events as real (Carrick & Ramirez, 2012). Also, in the presence of an emotion (empathy) children used their imagination (ex: getting strong and big upon eating a mushroom) to experience what Mario did, due to the influence of the video game on their mental imagery. In other words, it changed their views, at least temporarily, to be more aligned with the digital character; a notion supported by Dill-Shackleford et. al, (2016).

The amygdala, which is a part of the brain responsible for emotions, is affected by external stimuli (Crone & Konijn, 2018). It was apparent in this study how children's salient emotions, represented by joy, excitement, and feeling good, were correlated with magical thinking. This suggests that, the more children interact with video games, the more active their amygdala becomes. In other words, magical thinking resulting from video game interaction, could impact the development of the amygdala in children. To add, Crone and Konijn (2018) explain that media affects the anterior cingulate cortex (ACC), an area in the brain associated with emotions and viewing oneself. In this study, children viewed themselves as similar to the video game character, which suggests that their magical thoughts play a role in shaping the ACC as well.

Based on Carrick and Ramirez's (2012) explanation, children might report an unreal event, as a real one when it is emotionally charged, even though they might comprehend that it is unreal. In brain studies, this is attributed to the dorsolateral prefrontal cortex (DLPFC), which is a region of the brain responsible for self control (Crone & Konijn, 2018). In one study, adolescents reacted to fictional emotional media content as real, even though they knew it was not (Crone & Konijn, 2018). In this study, there was evidence that children were selecting their magical thoughts, especially when they got excited, which suggests that video games impact brain development, in particular the DLPFC. Another suggestion could be Hummer's (2015) explanation that, the prefrontal cortex, which is responsible for inhibitory control, emotions, and behavior regulation, does not develop until the mid twenties, creating a lack of emotional control for children. This lack of emotional control might have impacted the participants' magical thoughts during this study.

In conclusion, emotions attached to game play, resulted in magical thinking, thus for certain parts of the brain, such as the amygdala, PFC, ACC, and DLPFC to be activated. Even though some suggest that video games, on average, worsens the emotional well-being of children (Nakamuro et. al, 2015), to what degree these emotional regions of the brain are activated, is still unknown. In regards to the results of this study, there seems to be a confirmation on some kind of a relationship between children's brain development, emotions, and magical thinking. In other words, magical thinking is related to emotions, which in turn might trigger activation of specific parts of the brain. It therefore, makes sense to conclude that continuous exposure to video games might disrupt children's brain development.

Alternative Theoretical Explanations of the Findings

Two theories can be utilized in this study to explain the findings. The first is a phenomenon called quarantining (Richert & Schlesinger, 2016). The notion of quarantining explains that children, who have the ability to distinguish between fantasy and reality, do not apply the information they view in fantastical contexts to the real world, thus quarantining this knowledge. From this stand point, children in this study were not able to quarantine this information since they transferred the information presented in the video game to the real world.

A second theory, which could explain the findings, is the discriminability principle of source monitoring theory discussed by Thierry and Pipe (2009). This theory states that, confusion between fantasy and reality depends on the medium of the information. In other words, if the medium of information is similar to reality, it is more likely for an individual to confuse between reality and fantasy. In this study, children's inability to understand that Mario is a digital character that exists in the video game only, resulted in their confusion between their

abilities and his, thus transferring the digital character's ability into the real world. Their inability to distinguish between a 2D game's digital information, and reality should raise concerns. The reason is that, video games today are created with more graphic details, which might be seen as similar to reality. It may be possible that if children are not able to discriminate between a 2D character's abilities and the real world, then the impact of a 3D game character might result in more confusion between digital reality and the outside world for them. This idea would be worthy of future research.

Limitations

A major limitation to this study is that, studying only three children is not sufficient to generalize the findings to the general population. Other limitations to this study include the difficulty level of the video game, especially that children today are used to modern video gaming instead of eighties video games. According to their games of preference, they all preferred playing 3D (three dimensional) games. All children agreed that the game they played was a little bit difficult. This can be attributed to the fact that all children were used to playing 3D games, while the game they played was a 2D game. Also, a more diverse sample might have suggested if any differences exist between ethnic groups in terms of how they understand the notion of reality.

As the researcher, my own biases cannot be disregarded in the context of this study. While the author did not intervene in the course or the findings of this study, some unconscious interference could have happened during data collection. On the other hand, while I had my own experience with magical thinking and video gaming, the results of this study in relation to

children's thought processes and magical thinking were completely different from my experiences.

Implications for Early Childhood Education

This study shed light on the impact technology can have on children. Research have previously discussed that children are exposed to electronic media as early as primary school, and there is a growing evidence that, in the American society, children have an increased access to varied sources of electronic media, such as video games (Vandewater & Jung Lee, 2009; Bazzini, et. al, 2010). It is also evident in research that, children start playing video games starting at two years of age (Blumberg & Randall, 2013). This has led to a growing interest for social scientists, and parents to understand the impact of video games on children (Saleem et. al, 2012). While there is still a controversy around the benefits, and shortcomings of electronic media in the lives' of children, the results of this study provided a new perspective on how video games are able to distort their thought processes, and as a result their magical thinking.

1. What do these findings represent for early childhood education?

As this study indicated three common ideas were present among all participants in the study. These ideas were; 1) the more events children reported in the video game (understanding the video game), the more their magical thoughts were. 2) Uncertainty was avoided by either providing a false rationale, or engaging in an action, or both, 3) Emotions, represented by happiness, joy, excitement, and timidness resulted in and/or facilitated magical thoughts.

By now, it should be apparent that video games could distort children's realities, and lead them to think magically. This could serve as caution for parents, caregivers, and educators to limit children's video gaming time, including educational games. Arguably, transferring what

children see on screen to the outside world might be seen as a benefit for children's cognitive development. Yet, children's inability to understand that digital characters are not real, might prompt them to think that everything they see on the screen can be transferred to the outside world, including violent behaviors. The fact that this study provides evidence that children had low discrimination between reality and fantasy is supportive of this idea.

What this study did not thoroughly delve into, was the amount of time spend on video gaming. In other words, we still do not know if continuous exposure to video games leads to distorting reality, and how long children's invented reality might last. However, this study looked at the frequency by which children played video games, which suggested that there is no difference between the time children were exposed to the video game, and magical thoughts. All participants transferred digital information into reality, yet this transference varied among them. For example, some engaged in more magical thoughts than others.

2. What do emotions tell us about early childhood with respect to video games and magical thinking?

These findings could also serve early childhood education in the context of children with challenging behaviors, in particular, emotionally reactive children. Since emotions proved to distort children's reality, it may not be wise to provide emotionally reactive children with video games as a way for them to calm down. While a well developed educational video game could help children be engaged in productive social emotional and cognitive thought processes, such as learning about helping others, sharing, or problem solving, etc., the result might not be the same in case of an emotionally reactive child playing a violent video game. In such a case, high negative emotions might trigger aggressive behavior. Thus, such a child might possibly engage

in aggressive magical thoughts, mixing between reality and fantasy, and transferring what they had played to the real world. It is worth pointing out, that not all educational video games are developed by experts in the field (Lieberman et. al, 2009), so there is a high risk for children to transfer inappropriate behavior, and/or knowledge into the real world.

3. What does uncertainty tell us about early childhood with respect to video games and magical thinking?

Many children are unsure about nature of certain events, and objects. When children respond to certain events with “silly” unrealistic answers, this should not be alarming to parents or educators. Rather, they need to be aware that the child is engaged in magical thinking. A good way of dealing with such a situation is to, ask them open-ended questions about their ideas related to the event, and engage them in critical thinking at an early age.

Implications for Future Research

It is hoped that this study would serve as a starting point for future research regarding video gaming and child development, given the scarcity of such research in the context of magical thinking. Future studies could focus on several areas: First, using larger samples of children is important to understand how children’s notion of reality, uncertainty, and emotions could work together in triggering magical thinking. Further quantitative studies in this area are needed to be conducted to examine association between magical thinking and other variables such as emotions, thoughts, and aggressive behaviors, after repetitive video game playing. Choosing a 3D video game on a modern console is also important for future study.

Another line of inquiry that could be useful to pursue is examining the link between video games, and children magical thinking in predicting resilience in children. According to

Bayat and Jamnia (2018), children's lack of control leads to helplessness. Simonds et. al (2009), argue that children's lack of control leads to magical thinking. The way to avoid helplessness is by having control over certain tasks through explaining bad events in a more positive way, thus optimism (Seligman, 1990, 2007). Accordingly, there might exist a relationship between optimism, and magical thinking. Drawing from Seligman's (1990, 2007) ideas on optimism, Bayat and Jamnia (2018), explain that positive thoughts, and optimism can play a major factor in a children's resilience. In other words, if children's lack of control can lead to positive magical thinking, then magical thinking can be viewed as a protective factor in resilience studies. Similarly, dark magical thoughts can prevent resilience in children. Future research can look in depth on how video games can influence resilience, through the magical thoughts they create in children.

In relation to the researcher's positionality section, magical thinking proved to be a protective factor in times of adversity. Several questions can be asked regarding this notion. To what extent could magical thinking promote resilience in neighborhoods that suffer of gun violence, and considered to be unsafe for a child's development? And is there a real relationship between magical thinking and resilience? Finally, would magical thinking be looked at, as strength or a weakness in child development?

Conclusion

This study suggested that several factors might lead to magical thinking, so it is up for future research to delve thoroughly into each factor, and suggest new ideas. This research aimed at understanding children's thought processes in relation to playing a video game. While the research around this topic is scarce, this study has the potential to create a new perspective for

parents, early childhood educators and scholars regarding children's interaction with video games. Finally, in this study, a model explaining the equation which leads to magical thinking was created for scholars to evaluate and possibly use in future research.

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Appendix A: Interview Protocol

1. Can you tell me how old are you, and what grade are you in?
2. Do you like to play games? If yes, why do you think you like to play games? If no, why do you think you don't like to play games?
3. How often do you play video games?
4. What kinds of games do you like to play?
5. How do you feel when you play this game? Why do you feel this way?
6. What do you think this video game is about?
7. What are the things that "Mario" can do? Can you also do these things? Why do you think you can do these things?
8. Now, tell me, what things "Mario" can't do? Are there things you can't do? Why do you think you can't do these things?
9. How high can you jump? Can you jump higher than Mario?
10. How big and strong can you get when you eat a mushroom?
11. What have you learned from playing this video game?

Appendix B: Telephone Recruitment Script

Hello, my name is Rafik Antar. I'm a DePaul Doctoral student currently writing his dissertation in early childhood education.

Is this a good time to talk? I expect this phone call will take about 10 minutes.

I'm calling about a research study called investigating the impact of video gaming on children's magical thinking in early childhood. The purpose of this research study is to learn more about the notions of reality children might form after playing a video game, and as a result how their magical thinking might be affected.

I'm calling to see if you are interested in letting your child participate in this study. Your child might be eligible for this study since he/she is in the age range of 4-6, typically developing and can speak and understand English.

If you allow your child to be in this study, being in the research involves playing Super Mario Bros video game, and afterwards completing an interview about their experience playing this video game. I will be observing your child while they play the game and take notes about what they say and do while playing. Open ended questions will be asked about your child's thought process and whether they are able to distinguish between their abilities and the video game's character's abilities. The interview will be audio recorded and transcribed into written notes later in order to get an accurate record of what your child said.

This study will take about 40 minutes of your child's time. The game play will be about 20 minutes, and the interview will take around 15 to 20 minutes. The study can take place based on your location preference. This study does not involve any risks other than what your child would encounter in daily life.

Your child will not be paid for being in the research, but they will be offered a cookie after they are done with the interview if you approve.

If you allow your child to participate, then I will ask you to sign a written consent after we go over it together in case you had any questions or concerns.

Thank you for your time

Appendix C: Consent Form**PARENT/LEGAL GUARDIAN PERMISSION FOR A CHILD'S PARTICIPATE IN RESEARCH****Investigating the Impact of Video Gaming on Children's Magical Thinking in Early Childhood****Principal Investigator:** Rafik Antar. Doctoral Student**Institution:** DePaul University, Chicago, Illinois, USA**Department (School, College):** College of Education**Faculty Advisor:** Mojdeh Bayat, Phd Teacher Education, College of Education**Collaborators:****What is the purpose of this research?**

We are asking your child to be in a research study because we are trying to learn more about the impact of video gaming on magical thinking in early childhood. This study is being conducted by Rafik Antar at DePaul University. This study is being conducted by Rafik Antar, a graduate student at DePaul University as a requirement to obtain his Doctoral degree. This research is being supervised by his faculty advisor, Mojdeh Bayat.

We hope to include about three people in the research.

Why is your child being asked to be in the research?

Since your child is between 4-6 years old, is a typically developing child, and can speak and understand English, he/she is invited to participate in this study because this is the stage where magical thinking is prevalent.

Magical thinking is the psychological process of relating an event or action to another completely unrelated event or action.

What is involved in being in the research study?

If you allow your child to be in this study, being in the research involves playing Super Mario Bros video game, and afterwards completing an interview about their experience playing this video game. I will be observing your child while they play the game and take notes about what they say and do while playing. Open ended questions will be asked about your child's thought process and whether they are able to distinguish between their abilities and the video game's character's abilities. The interview will be audio recorded and transcribed into written notes later in order to get an accurate record of what your child said.

How much time will this take?

This study will take about 40 minutes of your child's time. The game play will be about 20 minutes, and the interview will take around 15 to 20 minutes.

Are there any risks involved in participating in this study?

Being in this study does not involve any risks other than what your child would encounter in daily life. The only risk that might potentially arise from playing a video game is that, your child might want to keep playing the video game for more than the allotted time, or might be frustrated for not playing the game well. Your child does not have to answer any question he/she does not want to.

Are there any benefits to participating in this study?

Your child will not personally benefit from being in this study.

We hope that what we learn will help in raising awareness regarding the realities young children shape after playing video games. We also hope it will serve scholars as a starting point to add to the literature around video games, reality and magical thinking. Finally we hope it will be beneficial to parents and early childhood educators, to understand certain behaviors by children, which might be associated to video game playing.

Is there any kind of payment, reimbursement or credit for being in this study?

Your child will not be paid for being in the research, but they will be offered a cookie after they are done with the interview if you approve.

Can you decide not to let your child participate?

Your child's participation is voluntary, which means you can choose not to allow your child to participate. Even if you agree to allow your child to be in the research, your child may decide that he/she does not want to be in this study now or once he/she starts the study, he/she can withdraw at any time. There will be no negative consequences, penalties, or loss of benefits if you decide not to allow your child to participate or if you change your mind later and withdraw your child from the research after he/she has begun participating.

Who will see my child's study information and how will the confidentiality of the information collected for the research be protected?

The research records will be kept and stored securely. Your child's information will be combined with information from other people taking part in the study. When we write about the study or publish a paper to share the research with other researchers, we will write about the combined information we have gathered. We will not include your child's name or any information that will directly identify your child; rather we will assign a code to identify your child. We will make every effort to prevent anyone who is not on the research team from knowing that your child gave us information, or what that information is. However, some people might review or copy our records that may identify your child in order to make sure we are following the required

rules, laws, and regulations. For example, the DePaul University Institutional Review Board. If they look at our records, they will keep your child's information confidential.

The audio recordings will be kept until the approval of the dissertation, and then they will be destroyed.

Who should be contacted for more information about the research?

Before you decide whether or not to allow your child to take part in the study, please ask any questions that might come to mind now. Later, if you or your child have questions, suggestions, concerns, or complaints about the study or you or your child want to get additional information or provide input about this research, you or your child can contact the researcher, Rafik Antar 773-865-6187, rafiantar@gmail.com.

This research has been reviewed and approved by the DePaul Institutional Review Board (IRB). If you (or your child) have questions about your child's rights as a research subject you or your child may contact Susan Loess-Perez, DePaul University's Director of Research Compliance, in the Office of Research Services at 312-362-7593 or by email at sloesspe@depaul.edu.

You or your child may also contact DePaul's Office of Research Services if:

- Your (or your child's) questions, concerns, or complaints are not being answered by the research team.
- You (or your child) cannot reach the research team.
- You (or your child) want to talk to someone besides the research team.

You will be given a copy of this information to keep for your records.

Statement of Parent/Legal guardian Permission for a Child's Participation in Research:

I have read the above information. I have had all my questions and concerns answered. By signing below, I indicate my permission for my child to be in the research.

Child's Name: _____

Parent/Legal Guardian's Signature: _____

Parent/Legal Guardian's Printed Name: _____

Date: _____