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Audience Reactions to Computer-Generated Imagery in Video

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AUDIENCE REACTIONS TO COMPUTER-GENERATED IMAGERY IN VIDEO

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Computer-generated imagery (CGI) has evolved into a common aesthetic fixture within the visual landscape of modern American society. While computers and CGI are relatively new elements of cinematic production, they have a direct and profound impact on the audience experience. This production aesthetic physically stimulates the senses of video consumers potentially at the expense of what many consider to be traditional literary quality. This study examines the interpretation and effects of these CGI enhancements on a college audience by applying Dale's Cone of Experience to audience perceptions and expectations of realism in videos. Audience believability and satisfaction were measured using a two-group, nonrandom selection quasi-experiment with pre-test and post-test design. Groups were matched using a pre-test survey that identified similarities in demographics and video consumption habits. The post-test survey compared results of the influence of CGI enhancements on audience responses to the impact of traditional effects. Among the results of the study, it was found that CGI did not significantly increase believability and satisfaction. It also did not increase audience recall and learning retention.

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CHAPTER 1

THE PROBLEM

Introduction

Video production has experienced a rapid and drastic evolution in technology over the last several decades. Video consumers are supplied with media content on a massive scale from some of the latest and most innovative audiovisual technology available through multiple media outlets (Felschow, 2015). Historically, this technology in video production was comprised of traditional effects methods in makeup, costumes, and physically constructed sets and scenery. The advent of the computer forever changed how videos are made. Computer-generated imagery (CGI) has a profound and, figuratively speaking, explosive impact on the modern cinematic experience. Characters, settings, and experiences once only achievable through physical alterations of costumes and makeup, as well as physical props and settings, are now comparatively easy to create and disseminate through digital technology.

Video productions, whether they are films, television shows, or digital broadcasts, can be understood as a simple binary relationship whereby the producers create the media, and the public chooses whether to consume them. Computers and CGI have become common production elements used in many of these mass media videos consumed by the public for entertainment or educational purposes. As a functioning entity in this economic equation, the consumers of this industry should demand certain levels of product quality (Berger, 1995), and that quality is not necessarily upheld or improved by the growing use of CGI (Bolter, 2002). However, there is little academic research concerning public perceptions of CGI.

Box office and viewership figures shed some light on the popularity of video productions that contain CGI. *Jurassic Park* (1993) used CGI to create real-life renditions of dinosaurs that

likely were unfeasible logistically and financially without the use of computers. It earned $357 million and is one of the highest grossing movies of all time. *Game of Thrones* (2011) is one of the most popular and most expensive contemporary TV shows in part because of its use of effective CGI (Cuccinello, 2016). Despite the potential for enhancing the media, the use of CGI might actually subvert the intended realism of such imagery, as demonstrated by ABC's *Once Upon a Time*, by making content seem too animated (Paxton, 2015). The opposite can be argued for animated films. CGI can increase the visual quality and overall audience satisfaction with a film such as *Toy Story* (1995), which garnered $362 million ("All Time Domestic Gross," 2015). While the effects of CGI on audience satisfaction vary by production, the frequency of CGI usage in mass media videos is growing.

The steadily increasing use of digital filmmaking technology can be directly attributed to the increased commonality of CGI usage (Acland, 2013; Whissel, 2014). While it seems logical that technological developments and advancements would increase the aesthetic and overall quality of a video production, this technological progress does not always equate to improvements and betterment for the involved parties (McLuhan & Powers, 1989). As such, American society is still trying to understand and cope with the impacts CGI has on their viewing experience. This study seeks to explore the extent of these impacts.

This chapter includes a statement of the problem, the purpose of the study, and a presentation of the key research questions asked within the study. A list of key definitions for the terms commonly used in this dissertation is provided. A preview of the methodology and sample selection are subsequently presented. This chapter concludes with a brief overview of the organization of this study.

Questions About CGI

Although conflicting rhetorical arguments can be made about the value, role, and impact of CGI, an examination of audience responses to CGI enhancements in video productions will further illuminate our understanding of the effects of this production aesthetic. Claydon (April, 2005) suggests audiences are required to negotiate an imagined world that must be portrayed as authentic in order for it to be believable so they can immerse themselves in the story. Fornerino, Helme-Guizon, and Gotteland (2008) found deeper immersion in video productions coincided with higher audience satisfaction. Regarding CGI, Whissel (2014) asserts it has the potential to increase audience immersion in videos through increased believability. However, there is a lack of quantitative analysis to support this assertion, and her methods rely heavily on hermeneutic examination of semiotics and emblems (Felschow, 2015). What remains unclear at this point is what role CGI plays in connecting these variables.

This situation raises several important questions about the role of CGI in recent years. What effect does CGI play on audience satisfaction? How effective are CGI enhancements at increasing audience satisfaction? Do audiences see CGI effects as more believable than traditional effects? Do audiences prefer traditional effects more than CGI? What factors or variables, such as demographics and viewing habits, might influence these outcomes? These and several other questions are addressed in the following research.

Statement of the Problem

This study explores CGI as a production aesthetic with the capability to either increase or decrease audience enjoyment and engagement measured most directly by audience satisfaction. This research will explore issues of realism and believability, past studies, the extent of CGI usage, and a brief summary of how CGI usage has changed over time.

Realism and Believability

Two of the fundamental tenets of media that humanity has grappled with for centuries are realism and believability (Coleridge, 1907). Realism and believability are cornerstones of how people analyze, interpret, and interact with media (Ferri, 2007). While these concepts are somewhat distinct, they are intrinsic as well; media content can be realistic without being believable, and it can be believable without being realistic. Science-fiction movies and TV shows can seem realistic in representation while simultaneously being disbelieved as impossible. Toys coming to life in an animated film can be interpreted as believable in their story but seen as unrealistic because toys do not come to life.

Intellectuals, authors, and scientists have explored this paradox for many years in an attempt to understand how realism and believability affect media consumption. Coleridge (1907) theorized audiences naturally disbelieve all media content. Tolkien (1965) argued audiences initially believe media content at face value and subsequently disbelieve what they cannot psychologically construe as real. Masahiro Mori (2012) hypothesized people have a natural hesitance toward media that are perceived as too real for comfort. However, this discomfort is often desired by audiences to increase pleasure and satisfaction (Aurîer & Evrard, 1994).

CGI has induced new debates about and research into these concepts in the digital age. Specifically, CGI has raised scholarly and critical concerns about the overemphasis of computer-generated spectacle instead of quality narrative. Traditional production methods and techniques can now be replaced with digitally constructed images that can maintain, enhance, or detract from believability and realism in a video production (Whissel, 2014). Despite scholarly differences in how audiences construct interpretations of realism and believability, more realistic

and believable media content tends to be more effective in engaging the audience (Dale, 1969). Video productions exhibiting satisfactory realism and believability have a better chance of satisfying the goals of both producers and consumers of the media.

Past Studies

Media scholars often examine CGI as a production aesthetic that predominantly increases the overall quality of a video and helps to achieve the imaginative potential of this particular medium (Isikguner, 2014). Whissel (2014) examines the increasing usage of CGI in movies and notes it has the ability to enhance both realism and believability and thus audience satisfaction. While this may appear to be the case for film, further experimental analysis utilizing CGI enhancements to a classic TV show should produce further insight into the relationships between CGI and audience satisfaction.

A primary motivator for the methodology used in this study is a general lack of quantitative research on CGI specifically, especially its use in TV shows. Weber and Wirth (2014) examined realism and believability through contrasting narratives but their study did not examine special effects such as CGI. Moreover, some scholars examine the use of CGI and other digital effects from a more rhetorical methodology that lacks quantitative support. While this approach is certainly important, it does not account for or examine the resulting positive and negative criticisms of CGI through statistical analysis. Klinger (2013) argues 3D technology made possible by CGI has created a new stylistic normal without lacks numerical support for this assertion. Further, much cinematic research does not adequately address potential criticisms and drawbacks of CGI. These include but are not limited to media redundancy, gatekeeping by media producers, and lower job availability in the entertainment industry for tradespeople and

even actors. A significant reason for these shortcomings in research is CGI is relatively new, and its impact on video production and consumption is still being studied.

Extent of CGI Usage

Prior to the computer age, special effects, costumes, sets, vehicles, and other visual components of video productions had to be created entirely through actual explosions, physical creations of vehicles and sets, and on-site filming in order to establish realism and believability. Actors were also required to be filmed live in order to create their image. CGI allows video producers to create any or all of these elements with only a computer and appropriate software. As MacDorman, Green, Ho, and Koch (2009) note, virtual rendering of faces through CGI has become incredibly effective, efficient and realistic. This can lessen the need for live actor portrayals. Settings, backgrounds, and vehicles also can be portrayed as more realistic through CGI (Moran, 2015). Furthermore, 3D rendering of an entire video production can produce more realistic and believable media content, thus increasing the impact of a video on the audience (Rooney, Benson, & Hennessy, 2012). These attributes have made CGI usage increasingly popular over the last twenty years.

Many video productions do not use extensive CGI. Documentaries, reality TV shows, and game shows are just a few examples of productions that rarely utilize CGI and, when they do, they typically use it sparingly. While this trend holds true for these particular TV productions, movies and other TV shows sometimes use CGI even when explosive special effects, imagined settings, and fantastical settings are not entirely necessary (Giardina, 1994). For example, HBO's *Boardwalk Empire* meshed CGI enhancements with physical set constructions to recreate Atlantic City and crowds of people during the Prohibition Era, even though traditional effects and production methods could have achieved the same goal. As

Resnik and Trost (1996) note, the reason for using CGI in these types of situations is it is sometimes cheaper and more realistic than traditional production methods.

CGI Usage Over Time

The introduction of CGI in the feature film *Futureworld* in 1976 (Apodaca, Gritz, & Barzel, 2000) and its further proliferation into mainstream cinema in the late 1980s in films such as *Batman* and *The Abyss* (Kaba, 2013) ushered in a new era of cinematic history. In this era, consumers of this medium were, and currently are, presented with an aesthetic change in the medium itself. This shift is characterized by a deviation from traditional effects methods such as makeup and physically constructed sets toward characters and settings conceptualized and created almost entirely by using computers. This transition is logical, especially when it is used in fantastical science fiction and dangerous action movies. This change ideally would improve and enhance the cinematic experience because more realistic representations of imagined characters and images could be achieved without those conceptions necessitating actual, physical existences of those settings, people, animals, or imaginary characters (Rooney et al., 2012).

Early CGI was often applied solely to characters in feature-length films. The dinosaurs in *Jurassic Park* and the T-1000 in *Terminator 2* (1991) are some of the quintessential examples of successful early CGI-rendered characters that played a major role in the narrative of each respective production and were elaborate, commonplace fixtures in the production. *The Matrix*, *Star Wars: Episode I- The Phantom Menace*, and *The Mummy* (1999) heavily utilized CGI for multiple elements of their narrative including characters, sets, scenery, and vehicles. *Avatar* (2009) relied heavily on CGI for all literary components, and its audience-perceived believability and realism were extremely high despite the fact it was an entirely fictional work (Michelle, Davis, & Vladica, 2012). However, it is difficult to gauge the impact of CGI as an isolated

variable on audience satisfaction in this context because it is so prevalent. Further, there are numerous questions about this effect when these enhancements are applied to rereleased TV classics that originally utilized traditional production methods.

TV shows and other smaller video productions did not often use CGI in its early days because it was cost-prohibitive (Resnik & Trost, 1996). Even today, CGI prevalence in TV is still far behind film. However, it is becoming more common in TV and it is also being applied to all the literary elements mentioned above. CGI tends to be less realistic and believable in TV than in film. Some contemporary TV shows, such as MTV's *Teen Wolf*, utilize unrealistic CGI that displaces the viewer from the narrative by emphasizing spectacle, thereby reducing the realism and believability of the show for many viewers (Paxton, 2015).

CGI is also being used in rereleases of classic TV shows and movies under the auspice of enhancing the original release itself, and to help the producers reach their full creative potential in those productions (Moran, 2015). It should also be noted a significant underlying motivation for undertaking such revisionist measures is to earn money. In the case of the CGI-infused rerelease of the original *Star Wars* trilogy in 1997, the three revised films earned a combined $251 million. However, each film earned progressively less at the box office: *Episode IV* earned $138 million, *Episode V* earned $68 million, and *Episode VI* earned $45 million ("All Time Domestic Gross," 2015). Despite CGI enhancements to imagery, the narrative of the films was basically unchanged. This pattern influenced the inquiry behind this study to explore the issue of how CGI affects a classic TV episode, especially because there is minimal research on this topic because of its novelty.

Purpose of the Study and Methodology

The purpose of this study is to analyze audience reactions to applications of CGI enhancements to better gauge whether these perceived enhancements are actually improving the cinematic experience of videos, maintaining it, or detracting from it. It specifically seeks to explore how CGI impacts audience perceptions of realism and believability, and subsequently what role those play on satisfaction. To help illuminate audience perceptions of CGI, this quantitative study utilized a two-group, nonrandom selection quasi-experiment with pre-test and post-test design. Groups were matched using a pre-test survey that identified similarities in demographics and video consumption habits. The post-test survey compared results of the influence of CGI enhancements on audience responses to a rereleased video versus the impact of traditional effects in the original release.

In order to produce a stimulus that was not overly saturated with CGI, the 2009 remastered release of *The Doomsday Machine* episode from season two of *Star Trek: The Original Series* was used. This episode has a typical Aristotelian plot structure that negates variation in audience responses stemming from an abnormal narrative arc. More specifically, the remastered 2009 version of the show only differs from the original 1967 broadcast in that CGI is applied to exterior action and transitional sequences. Only settings, vehicles, and some actions were changed by CGI. No characters or interior sets were altered. Another benefit of using a rerelease with CGI additions instead of an original release or remake with CGI is it helps control for possible extraneous factors such as changes in actors and plots. The narrative of this particular episode is unchanged from its original release.

An examination of relevant literature shows a significant gap in research on CGI's role in audience satisfaction, especially concerning applications to rereleased TV shows and movies. To

better understand audience satisfaction with CGI as a component of believability and realism, Dale's (1946) Cone of Experience is used to analyze audience reactions to CGI and its potential to increase realism, engagement, and immersion. These results can be beneficial for video consumers by providing media literacy capabilities and for producers who determine whether to utilize CGI in their productions.

Theory

Several schools of thought on realism and believability are grounded in social and literary theories. Critical theory and mass society theory are social theories pertinent to the sociocultural impacts of media and video. They do not, however, necessarily account specifically for audience satisfaction toward CGI and perceptions of realism (Horkheimer & Adorno, 2002; C.W. Mills & Wolfe, 1999). In these two theories, the spectacle of video (Debord, 2010) is treated primarily as an agent of sociopolitical control rather than an aesthetic that can improve media content for the audience. Suspension of disbelief (Ferri, 2007) and faerie (Tolkien, 1965) focus more specifically on audience interaction but do not effectively account for variability in audience perceptions. The uncanny valley (Mori, MacDorman, & Kageki, 2012) offers insight into audience responses. However, its application to satisfaction is relatively limited. These theories and paradigms help identify and inform the questions addressed in this research. Ultimately, emerging theoretical perspectives in Dale's Cone of Experience make it more applicable to the questions at hand.

Dale's Cone of Experience was used as the primary theoretical foundation for this study to help add to these evolving perspectives. The cone has recently been expanded and applied to entertainment media such as movies (C. E. Baukal, Ausburn, & Ausburn, 2013) and provides an instructional media approach to understanding audience interaction with CGI. The base of

Dale's cone emphasizes interactive participation and realism in these types of experiences enhance learning, retention, and overall impact of the media (Dwyer, 2010). This study applies this notion to viewership as a collective learning experience. According to Badiou (2013), watching a video functions as a collective learning experience when done as a group or individually, and thus Dale's cone is directly applicable to audience perceptions of realism and believability regarding CGI. Examination of these perceptions and reactions will help illuminate collective responses toward and acceptance of this production aesthetic.

Research Questions and Hypotheses

To examine the impacts of CGI on the audience, five research questions were used as the foundation for inquiry into this subject. The first question examines the believability of CGI enhancements while the second looks at audience satisfaction with these effects in a rereleased video production. The third focuses on demographic variability, and the fourth examines consumption variability regarding traditional and CGI effects. The fifth question tests audience recall of video content.

RQ1: Does the audience see traditional effects or CGI effects as more believable?

H1.1: The audience sees CGI effects as more believable than traditional effects.

RQ2: Does CGI evoke stronger emotional responses and associated satisfaction than traditional effects?

H2.1: CGI evokes stronger emotional responses and associated satisfaction than traditional effects.

RQ3: How do audience demographics affect believability and satisfaction?

H3.1: There is no significant difference in believability and satisfaction based on age and type of visual effects.

H3.2: There is no significant difference in believability and satisfaction based on gender and type of visual effects.

H3.3: There is no significant difference in believability and satisfaction based on race and type of visual effects.

RQ4: How do audience video consumption habits and preferences affect believability and satisfaction?

H4.1: There is no significant difference in believability and satisfaction based on a subject's prior video consumption frequency and type of visual effects.

H4.2: There is no significant difference in believability and satisfaction based on the preferred audience size for a subject's prior video experience and type of visual effects.

H4.3: There is no significant difference in believability and satisfaction based on the location where a subject prefers to watch videos and type of visual effects.

H4.4: There is no significant difference in believability and satisfaction based on a subject's preference for literary elements and type of visual effects.

H4.5: There is no significant difference in believability and satisfaction based on a subject's preference for realism and type of visual effects.

RQ5: Do CGI enhancements increase learning retention for the audience?

H5.1: CGI enhancements increase audience recall more than traditional effects.

Definition of Terms

The following terms are defined within the context of the background research and purposes of this study in order to clearly delineate their meaning and role within the study and researcher analysis. These terms are defined by the researcher for the purposes of this research unless otherwise cited:

Believability

Believability is based on the concept of immersion during video consumption. According to Fornerino et al. (2008), this is "A personal experience, resulting from interaction with an experiential environment" (p. 95). For the purposes of this study, believability is the extent to which a video consumer perceives video imagery to be consistent with their expectations and assumptions of pragmatic scenery and characters within the context of the video itself. This concept is operationalized by the assumption that viewers either want or expect the content of the media to resemble real life as accurately as possible, or the viewer can effectively imagine themselves in the world created by the media.

Character

The personality or part an actor recreates. For this research, a character is more specifically considered to be an animistic literary element that can include but is not limited to: humans, animals, plants, and normally inanimate objects.

Computer-Generated Imagery (CGI)

Cinematic imagery created using computers and software in order to create, establish, or manipulate non-physical, imagined content of characters or scenery, often in conjunction with each other, into physical existence onscreen. The resulting images can be either entirely computer-generated or they can be digitally mastered and transposed into or over live action sequences of motion picture capture (Whissel, 2014). CGI is often used in conjunction with 3D technology.

Faerie

Tolkien's (1965) assertion of an imagined world, character or setting being based more in reality than fantasy. For this study, Tolkien's idea serves as an alternative to suspension of disbelief.

Narrative

The plot or representation of an event or story. For this research, plot details such as events and visual details are examined.

Producer(s)

Most specifically, the supervisor or coordinator of a video production responsible for the logistics and production of a video. For this research, this term is more commonly used to identify any person involved in the production of a video. These can include but are not limited to: executive producers, producers, directors, actors, technological personnel, and labor-oriented personnel.

Rerelease

A video production altered in some fashion, often by digital remastering or other CGI effects, that is released to the public subsequent to its original wide release or broadcast (Resnik & Trost, 1996). Rereleases can be supplied through venues or channels including streaming content, movie theaters, or television.

Satisfaction

An emotional response to media whereby the media consumer experiences a desired or expected degree of immersion and believability with the media (Fornerino et al., 2008). Based on (Fornerino et al., 2008), satisfaction is measured by emotional arousal from media.

Scenery/setting

Location where a story takes place. In video, this literary element can consist of inanimate objects such as landscapes, vehicles or machines that can be existent objects and locations or created through the use of CGI.

Spectacle

Cinematic attraction and its relation to narrative (Whissel, 2014). This component of video is affected by special effects created through traditional methods or CGI.

Traditional effects

Video production techniques utilizing physically existent settings and scenery, costumes, makeup and actors. These modalities were traditionally used prior to the computer age (Hall & Neale, 2010).

Limitations and Delimitations

This study took place at a mid-sized, state-funded university in southwestern Pennsylvania. The university population is generally representative of higher education students in Pennsylvania. Approximately 15% of students are minorities and 56% are female ("Enrollment: Crimson Snapshot," 2016). While the sample is representative of Pennsylvania demographic trends as a whole, it is not necessarily representative of every higher education institution in the state, nor is it necessarily representative of college-aged populations of other similar schools in different geographic regions. Additionally, the video utilized in this study is an episode from a classic television show released in wide syndication before many of the research participants were born. There is a chance participants have been exposed to the video prior to participating in the study.

There are limited examples of rereleased TV shows with CGI enhancements, especially ones with altered plots due to these additions. This study used a purposively chosen stimulus with a limited number of these types of enhancements. Additional studies utilizing more varied stimuli would provide more information on audience reactions to different genres, acting, and other production elements. Also, this study used a single, full-length episode that highlights and emphasizes the use or absence of CGI. Future studies using rereleased feature-length films may provide additional contexts to better understand CGI's influence on rereleased classics and contemporary videos as well. This is especially important in today's cinematic situation where sequels, prequels, rereleases, film franchises, and TV spinoffs are produced and released with incredible frequency (Tryon, 2013).

Organization of the Study

This study is organized into five chapters. Chapter 1 has examined the current state of video production in American society and introduced the research problem to be studied. Chapter 2 examines literature relevant to the study of video in American society and theoretical perspectives that influence this research. Chapter 3 presents the methodology used to collect and analyze the data collected from this research. Chapter 4 presents the findings of the data collected and presents descriptive and inferential statistical tests to gauge possible relationships and differences between CGI, believability, and audience satisfaction. Chapter 5 presents the final conclusions of this study along with recommendations for further research.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Introduction

Mass-market video productions in both television and film are the products of centuries of on-stage performances. Motion picture capture radically and quickly changed the process by which audiences consume information and how they interact and respond to the presentation of that information. Hall and Neale (2010) examine this rapid transition during the early days of video production and assert video is a spectacle in American society by the very nature of the medium itself, one that introduced new complexities in our understanding of realism and audience satisfaction.

Video productions up until the late 20th century were little more than plays and performances captured on camera. Modern video productions present an entirely different situation where actors, settings, and soundtracks can be produced entirely by computers with varying degrees of realism (Apodaca et al., 2000). Becker (2012) posits audience preferences have largely transitioned from live productions to digital video productions, which suggests a lack of physical proximity between audience, actors, and stage has little bearing on audience affinity for CGI. However, the newness and increasingly common use of CGI in video productions raises many questions about audience believability and satisfaction with this production aesthetic.

Focus of Study

CGI has significant impacts on the narrative and spectacle of a video production, and these elements subsequently affect audience believability and satisfaction. The transition from live performances to CGI-rendered productions has created a situation where the spectacle of a

production often overrides the importance of narrative (McQuire, 2000). According to Seels (1997), realism and believability directly influence how effectively a message is conveyed by media, and individuals subconsciously mediate and comprehend these effects through learning. While the spectacular nature of video might be alluring to an audience, its realism may be the more dominant factor in determining whether audiences enjoy the production. This conflict between narrative and spectacle is similar to debates about whether education or entertainment is more important in media production (Gordon & Armstrong, 2011). CGI is an important variable in this situation further examined in this research.

The purpose of this literature review is to contextualize this study within the body of research conducted on video productions and CGI. Video as a medium is discussed to explore the role of video and CGI on imagination and perceived realism. CGI's impact on spectacle and narrative is subsequently examined. The effects of video as a product and institution in American society is explored through the lenses of critical theory and mass society theory to situate the sociopolitical impact of this medium in the United States and the role CGI plays in that relationship. The focus of this review then shifts to research and literature relevant to the role of CGI as an element of spectacle that affects believability and satisfaction for the audience. Suspension of disbelief is examined to explicate how this literary theory lends itself to video. Conversely, Tolkien's notion of faerie is then explored as a contrasting paradigm of realism that leads to the role of the uncanny valley in modern video consumption. These perspectives are used as conceptual foundations for exploring the role of Dale's Cone of Experience in understanding audience reactions to CGI.

Video as a Medium

Media follow a pattern; they are invented, they grow in both usage and acceptance, and their sociocultural and political impacts are recognized and debated by the society utilizing them. Various facets of those media, such as CGI, contribute to these discussions. This section examines this progression for video in American society by exploring the role of imagination in video consumption and scholarly reactions to the medium itself.

Video and Imagination

Video is a direct product of the technological developments of the 19th and 20th centuries, and its constant evolution continues thus far into the 21st century. Innovations in image capture, engineering, transportation, and numerous other fields all contributed to the marvel of motion picture capture, distribution, and exhibition. Social affinity for and acceptance of video was almost immediate in American society in the late 1800s and early 1900s as film became a mainstream mass media (Hall & Neale, 2010). Video effectively integrated sight and sound, two of our primary senses, together for media consumers. As Moore (2000) points out, "One of cinema's early seductions was its potential to break the psychological habit of recognizing only signs" (p. 41). Early films and TV productions were not only media novelties in a rapidly changing society. They also were media that revolutionized communication through their audiovisual capabilities and satisfied a social desire for more interactive media.

Video has been a premier and popular form of entertainment since its inception in the late 19th century because it effectively records and repeatedly presents real images in a linear visual montage on the screen (Hall & Neale, 2010). According to McLuhan and Powers (1989), this linearity of expression dates back thousands of years to the collapse of oral tradition in ancient Greece (p. 36), when Western societies began to limit their interaction with media to a geometric

order. Despite this linearity, video does serve as a relatively organic medium that narratively and visually recreates both real and imagined experiences for the audience (Debord, 2010). This audiovisual recreation of reality is both magic and realism, whereby the audience becomes both a static observer of and active participant in imagination and recreation (Moore, 2000).

Video allows producers to explore the relationship between the human experience and the natural world by stimulating our most primitive senses in order to relive and remember our experiences. This recording and recreation of imagery and sound began on chemical-based film for both movies and many pre-filmed television series. It has since evolved into an electric-based medium in the digital age. Despite this transition to a digital format and increased use of CGI, there exists a certain degree of limitation on the magical and imaginative capacity of video for the audience because the cognitive and physiological constraints created by sight as a primary mode of perception limit the viewer's own imagination (Chesebro & Bertelsen, 1996). This cognitive and physical stimulation created by sight and, to some degree, sound, exerts an undeniable influence over our experience with the media, and it affects our singular views on epistemology, at least during the time we consume the media (Postman, 2005). McLuhan (1994) further supports this tendency:

> The business of the writer or the film-maker is to transfer the reader or viewer from one world, his *own*, to another, the world created by typography and film. That is so obvious, and happens so completely, that those undergoing the experience accept it subliminally and without critical awareness. (p. 285)

Although scholars may differ in their views on the constraints of video as a medium, a thematic consistency exists in most scholarship that identifies a transcendent quality to the medium itself,

one that both defines the narrative for the viewer and allows for cognitive displacement from the actual time and space surrounding the viewer.

Imagination is always existent to some extent in media consumption, whether it is in the viewer's attempt to envision themselves in an alternative time and place, or in their attempt to negotiate understanding of that alternative setting within their own perceived environment based on their own reality. This situation often occurs in effective learning environments, whereby learners are able to conceptualize stated facts and information from a an abstraction that is memorized to an understanding based on meaning (Dale, 1946). Contrary to Matravers (2010), who argues imagination is completely inconsequential to video consumption, much scholarship suggests imagination, with the help of technological developments such as CGI, is always synchronistic with media consumption.

Scholarly Reactions to Video

As a product of rapid and constant technological development, video plays a fundamental role in shaping our collective psychosocial experience as we consume media. Part of the reason for this collective experience is we as a society often consume videos in groups (Postman, 2005), which is comparable to students in a classroom receiving a lesson or lecture from a teacher. The simultaneous shared experiences created by group viewing also construct an individualistic interpretation of the story being told for each viewer. As Debord (2010) points out, "Separation is itself part of the unity of the world, of the global social praxis split up into reality and image" (Separation Perfected section, para. 7).

Despite the capacity for a producer to self-determine the parameters of all the literary and production components of a video production, the audience will always hold some autonomy over the interpretation of the audiovisual narrative based on their own experiences, values, and

imagination (Ferri, 2007; Michelle et al., 2012). This interpretation can be defined either on a personal level by the viewer, or on a broader spectrum by a sociocultural group with its own norms, values, and beliefs (Poole & Hollingshead, 2005). While the consumption and collective interpretation of a video production is often a group activity, the individual's experience itself is equally as important. This consumption functions as a teaching stimulus and is described by Dale (1946) as "…a two-direction process, a sharing process- intercommunication: the reaction and interaction of minds," (p.3). This juxtaposition of imagination with prescribed narrative forms the crux of numerous literary and communicative theories on the nature of video, our interaction with it, and our consumption of it. CGI deepens our inquiry into this relationship because of the potential it has to either increase or decrease realism and believability.

Spectacle and Narrative

Spectacle

American society has a long, established affinity for special effects that contribute to videos' spectacle. Tuck (2008) describes spectacle as "…an individual subjective experience of awe" (p.253). Tuck posits CGI has the ability to represent the real world or be used to create an imaginary one. Traditional special effects and modern CGI both enhance spectacle in a media production, and spectacle is one of the primary stimuli utilized by producers to attract and entertain audiences (Whissel, 2014). While spectacular productions prior to the digital age such as *Gone With the Wind* (1939), *The Ten Commandments* (1956), *The Sound of Music* (1965), *Jaws* (1975), and *Raiders of the Lost Ark* (1981) were devoid of CGI, its prevalence in modern productions has been steadily increasing (Hall & Neale, 2010). Movies such as *Titanic* (1997), *Avatar* (2009), and *Star Wars: The Force Awakens* (2015), were successful financial ventures for

their producers as well as major cultural events for American society because of their spectacular nature ("All Time Domestic Gross," 2015; Mendelson, 2016).

Further evidence of American society's mass consumption of CGI-laden productions can be seen in the explosion of multiplexes constructed around the country in the 1990s (McQuire, 2000) and the incorporation of CGI in television productions as well (Giardina, 1994). Video producers effectively capitalized on Americans' desire to be entertained by videos that rely on computer-generated spectacle. Much of this desire can be attributed to the pleasure and satisfaction videos provide the audience (Plantinga, 2009). Tuck (2008) posits part of the very essence of video consumption is it provides a channel for audience members to achieve a sort of temporary sublime experience that satiates their hunger for personal satisfaction through entertainment. Part of this satisfaction is the audience's participation in collective social activity, identity, and learning. As Debord (2010) notes, "The spectacle is not a collection of images, but a social relation among people, mediated by images" (Separation Perfected section, para. 4). Movies and TV video productions provide mass satisfaction and mass social engagement. Although an individual may not watch a movie or a TV show with another individual, they share a collective experience even if they are displaced from each other by time and place as long as they watch the same production (Debord, 2010).

The level of spectacle in a video production is often influenced by the production's budget. High modern production budgets often coincide with spectacular computer effects and can have a direct impact on the video's popularity and thus its revenue (Gazley, Clark, & Sinha, 2011). Other factors such as star power (actors or actresses) and epic narrative also shape the definition of a video's spectacle (Topf, 2010). However, McQuire (2000) asserts modern spectacle, which is usually achieved through the use of CGI, has become the dominant factor in

the financial success of videos when compared to narrative and other factors. Although the concept of spectacle does not always insinuate CGI is the predominant production aesthetic, it is often indicative of CGI usage, especially in the digital age (Plantinga, 2009). While spectacle created and influenced by CGI is often present in modern movie blockbusters, CGI is rarely found in older TV productions. Due to this situation, the realism and believability of CGI enhancements to previously aired TV shows remains a largely unanswered question.

Narrative

Many videos are produced using a simple narrative and audiovisual effects that stimulate primal senses rather than intellect, albeit on a much grander scale than the spectacles produced during the latter half of the 20th century. Much of this transition can be attributed to the advent of CGI (Whissel, 2014) that has made virtually any imaginary character, setting, or event possible through computer imaging. CGI allows producers to create imagery on a grand scale that offers an audience a seemingly more realistic image than is attainable in the real world. However, this capability also creates the potential to diminish spectacle and decrease audience satisfaction. Tuck (2008) asserts:

> A great part of the devaluation of spectacle derives from the fact that such things were often aimed at the masses and designed to elicit the most basic of 'sensational' pleasure, or, in their higher cultural forms, designed as amusements or tricks and hence seen as fundamentally false. They thus keyed into a long tradition of Western philosophical iconoclasm which from Plato through Descartes to more contemporary theorists such as Lacan and Baudrillard worried that the noblest of senses, vision, was equally the easiest to con. (p. 252)

Further, many modern TV shows often focus on simple "reality" themes and lack clearly discernible narrative arcs other than constant conflict. There is a clear progression towards simpler narratives in video productions that increasingly focuses on physical stimulation rather than critical awareness that is indicative of mass society (Weber & Wirth, 2014). While this study does not examine the role of reality TV in this situation, it will help illuminate how CGI enhancements affect modern audiences. Some of the earliest true blockbusters, such as *Gone With the Wind* (1939), *The Ten Commandments* (1956), and *The Sound of Music* (1965), shared similarities in that part of their spectacle was an epic narrative. This counterbalancing of special effects and narrative often subjects special effects, both traditional and CGI-rendered, to scrutiny from critics regarding perceived narrative deficiency (Berger, 1995). Additionally, there is a longstanding scholarly concern over the quality of narratives in productions that utilize a significant level of spectacle (Lavik, 2009). Many successful digital age video productions can be categorized as action/adventure, sci-fi, or epic fantasies that can rely on both a deep, complex narrative and special effects generated by computers. The mythical and imaginative nature of these genres requires extravagant special effects capabilities in order to create a believable rendition of fantastical characters and environments (Moore, 2000; Whissel, 2014). As Tuck (2008) notes:

> The spectacular and the sublime have an inverse relationship with regard to our faith 'in' and understanding 'of' the conceptual and perceptual aspects of such displays. Spectacles might be impressive and fun, but there is something shallow or depthless about them, while the sublime is the complete opposite, a moment of extraordinary metaphysical density. (p. 252)

The most financially and critically successful productions in these genres are able to negotiate this balance between spectacle driven by CGI and narrative quality to produce good storytelling that provides sensationalistic audiovisual effects. It is, however, unclear exactly what role computer enhancements of spectacle in traditionally produced videos has on a contemporary audience. While spectacle itself is a driving force behind many video productions and video consumption, knowledge about the specific role of CGI in this dynamic is fairly limited (Whissel, 2014).

The Evolution and Role of Computer-Generated Imagery (CGI)

Computer technology was absent in early blockbusters and financially successful TV shows utilizing traditional production techniques. Contemporary productions, however, often utilize this technology as a staple production element to ensure appeal to a wide audience. Technology that increases and sustains profits often finds a permanent home in media production. In the case of CGI, it is now being applied to classic movies and TV shows to create audiovisual enhancements such as digitization and 3D rendering (Allison, Wilcox, & Kazimi, 2013). Further, CGI technology is often necessary in order to achieve the level of spectacle audiences often desire (Culkin & Randle, 2003).

Computer technology was first utilized in the video industry during the early 1970s in productions such as *The Andromeda Strain* (1971) and *Westworld* in 1973 ("Greatest Visual and Special Effects (F/X) - Milestones in Film," 2016). CGI in these films was limited to schematic computerized images of structures and faces respectively rather than actual characters or scenery. CGI's proliferation in video production was not instantaneous in movies or TV (Apodaca et al., 2000). Nor was its use required for financial success at its inception. Today, however, computer-aided production is usually necessary for a film to become a blockbuster (Burgoyne,

2010), and we often see CGI used in contemporary TV productions as well as its application to classic TV shows such as *Star Trek* that originally lacked significant computer influence in their production.

CGI was fairly limited during the 1970s and 1980s. It was used mostly in film until recently, when its presence in TV has been more common. According to Dirks (2016), much of the earliest CGI was found in short, animated segments of animated shorts, featurettes, and features. In the late 1980s, *The Abyss* (1989) and blockbusters such as *Back to the Future, Part II* (1989) and *Indiana Jones and the Last Crusade* (1989) used CGI for settings, vehicles, and character renditions, albeit in a comparatively limited fashion compared to movies in the 2000s. The use of CGI as a supplemental aesthetic continued in animated features such as *Beauty and the Beast* (1991) but found a permanent home in the cinematic world through live-action blockbusters such as *Terminator 2* (1991) and *Jurassic Park* (1993). These films featured characters portrayed through live-action and CGI (e.g. the liquid metal T-1000 terminator) and some that were entirely CGI (dinosaurs). Pixar's *Toy Story* (1995) was the first full-length CGI movie and became a cultural icon of its generation. The *Lord of the Rings* trilogy (2001-2003) was one of the first film franchises to incorporate large-scale CGI images of both characters and scenery. *The Fellowship of the Ring* won the Oscar for Best Cinematography in 2001, and each of the three films won the Oscar for Best Visual Effects in their respective release years ("The Official Academy Awards Database," 2016).

More recent films such as *Avatar* (2009) and the *Spiderman* franchise (2002-2014), and many TV productions such as *Game of Thrones* and *Once Upon a Time*, utilize CGI extensively and have demonstrated a definite taste for computer-rendered spectacle in American society regardless of narrative depth or quality. Characters, settings, vehicles, backdrops, scenery, and

crowds are all literary elements portrayed through CGI in many TV shows (Barnouw, 1990). Subscription-based networks such as HBO and Showtime often use CGI, especially in historical fiction shows such as *Boardwalk Empire* and *The Tudors*.

CGI contributes to the spectacle of numerous video productions each year. However, not all video productions that use CGI are popular or successful simply because they contain CGI spectacle. *John Carter* (2012) is an example that failed to meet its production budget by more than $100 million due to poor marketing strategies. The financial figures cited in this report also emphasize the secrecy involved in blockbuster production budgets, which add to the mystery and ambiguity of Hollywood accounting practices and financial figures in the CGI age (Sylt, 2014). What is certain is CGI has become a common aesthetic in modern video and its use, while not guaranteeing financial success, often coincides with positive financial results, at least for movies. Current domestic box office figures show most of the top all-time domestic grossing movies contain CGI. This further highlights American society's appetite for spectacle, at least in film ("All Time Domestic Gross," 2015). This study will further explore to what extent CGI has enhanced or detracted from perceived quality in a classic TV episode. To avoid possible issues with a changed narrative skewing results, the show used in this research has been altered only by CGI enhancements to transitional shots and action sequences without any changes to its narrative.

Fundamental Theories

Introduction

Video productions, especially movies and TV shows, are mass media that provide a society with collective experiences. For some scholars, collectivity and uniformity, both in media experiences and production, are a cause for concern. As Horkheimer and Adorno (2002)

assert, “The budgeted differences of value in the culture industry have nothing to do with actual differences, with the meaning of the product itself. The technical media, too, are being engulfed by an insatiable uniformity” (p. 97). A common concern of media scholars is this uniformity is part of a consciously elaborate ploy by media producers to control not only the consumptive behavior of society but also to create and define social perception, knowledge, and contentment amongst the general populace. CGI plays an important role in helping to shape these experiences and potentially contributes to this concern through its role in creating spectacle. In order to explore the potential large-scale impacts of CGI, two sociopolitical theories- critical theory and mass society theory- and their relative literature are examined.

Critical Theory

In critical theory, mass media producers function as an aristocratic sect of a society, one that has the financial and physical means to create and control information in conjunction with its desire to uphold its sociopolitical power and station over the masses. Machiavelli (1999) supported this assertion hundreds of years earlier:

> Besides which, it is impossible to satisfy the nobility by fair dealing and without inflicting injury on others, whereas it is very easy to satisfy the mass of the people in this way. For the aim of the people is more honest than that of the nobility, the latter desiring to oppress, and the former merely to avoid oppression. (p. 63-64)

Marx and Engels (1848) defined this upper echelon inherent in every society as the bourgeoisie, a capitalist class descended from and shaped by the medieval aristocracy that dominates the means of social production, including industrial goods such as mass media. Critical theorists equate media producers to the bourgeoisie. This class has historically reshaped and redefined social classes along with their own means of oppressing those classes in their

constant struggle to uphold their supremacy over the proletariat (Marx & Engels, 1848). It is this conflict between social classes underlying the proliferation and dissemination of modern mass media such as video. Rather than media producers utilizing their mass audience as an instrument for creativity, sociopolitical participation and critical awareness, they produce media that are little more than passive entertainment (McLuhan, Fiore, & Agel, 1996).

Television often is considered the physical embodiment of this concern. Other media such as film can serve the same function (Postman, 2005). McLuhan (2002) further warns, "…the effect of mass production and consumption is really to bring about a practical rather than a theoretical communism" (p. 55). While it is not suggested McLuhan is a traditional critical theorist, his works are indicative of these Marxist ideas. Even though the masses may attempt to define popular culture and popular media through their collective taste, it is the bourgeoisie that pays for the production of culture and media and thus holds gatekeeping power over media production.

It is this gatekeeping power that raises concerns over the role of mass media in a democratic society. Mass media prescribe, embody, envision, and disseminate culture amongst the public mass. Sociocultural norms, expectations, and figurative laws are symbolically manifested in the media themselves. Thomas Hobbes noted in 1651 that media producers inherently hold power over creating, determining, and upholding these parameters of popular culture much as a legislator or sovereign creates and enforces official statutes in government (Hobbes, 2013). To provide a Marxist perspective on this, Debord (2010) asserts the only two truly revolutionary classes in any society are the bourgeoisie and the proletariat, and the bourgeoisie's revolution is already completed. Their control over government and mass media is such that the two concepts, government and media, are congruous and dependent on each other.

This raises the question of audience responses to new media technologies such as CGI and whether these technologies are seen as acceptable or preferable to older modalities. Further, the spectacle of video serves to uphold this sociocultural control. CGI, by its spectacular nature, can function as an instrument of suppression by its ability to create hegemony through its portrayal of social emblems and collective meaning (Whissel, 2014). The extent to which this sociopolitical control is exerted through video is debatable. CGI certainly has made the creation, replication, and dissemination of symbols and meanings much more spectacular and potentially more appealing to the audience.

Mass media such as video productions also have the power to construct and deconstruct popular notions of what is culturally acceptable. As Badiou (2013) notes, film is a medium of mass consumption that creates a global understanding and consensus amongst the populace dating back to the films of Charlie Chaplin (p. 234). Further, Horkheimer and Adorno (2002) assert:

> Automobiles, bombs, and films hold the totality together until their leveling element demonstrates its power against the very system of injustice it served. For the present the technology of the culture industry confines itself to standardization and mass production and sacrifices what once distinguished the logic of the work from that society. (p. 95)

The inherent concern in this standardization is contemporary video, which is separated from the work of Horkheimer and Adorno by more than 50 years, may exhibit this tendency through increasing use of CGI.

This increased usage has been made possible by very particular technologies, computerization and digitization, which have as profound an impact on video as the invention of the Kinetoscope (Punt, 2000). These technologies are used to produce spectacular effects that

are sometimes seen as congruous with limited narratives and superficial story developments geared toward mass consumption rather than cultural enlightenment in the digital age (Lavik, 2009). While audiences might hope to achieve a certain level of cultural fulfillment, learning, and entertainment by watching a CGI movie or TV show, they are sometimes denied this "sublime" experience they often seek that is often created by the narrative (Tuck, 2008). However, it is unclear whether CGI enhances, obscures, or undermines the narrative. By examining audience reactions to moderate CGI enhancements in a classic TV show, we can gain some insight on whether audiences see these changes as enhancing or detracting from the production's status as a cultural classic.

Mass Society Theory

Mass society theory builds off and accentuates the concerns of critical theory, especially regarding CGI. Its major tenets warn against the dangers and unfortunate circumstances brought about by a mass society. Much like critical theorists, Mills (2000) acknowledges a difference between societies whose collective culture is determined and enforced by violence and intimidation rather than a consenting public that unconsciously and uncritically accepts these guidelines and prescriptions through their consumption of mass media. This paradoxically conscientious yet unwitting consumption of mass media serves to further isolate the lower classes from the elites in their society (Kornhauser, 2013; Swingewood, 1977), thereby perpetuating the class struggles outlined in Marxist and neo-Marxist schools of thought. The bourgeoisie's success in suppressing and controlling the proletariat is based on their ability to produce and control the messages of the mass media (Hamilton, 2001, p. 10). In essence, mass society asserts control by the elites is exerted in a more diplomatic and subliminal fashion

through the media rather than such control being exhibited through more direct and intimidating methods of communication, such as propaganda, in critical theory.

Videos in particular have an established historical trend in the propagation of mass media. The practice of saturation releasing in the film industry dates as far back as the 1910s (Hall & Neale, 2010), and is suggestive of movie producers' attempt to knowingly garner the largest profit possible while either intentionally or unintentionally functioning as gatekeepers over the media. The mass production of American culture through film both identified the "American way" for immigrants and defined what exactly that "way" was for established Americans until the proliferation of television in the 1950s and 60s (McLuhan, 1994). Television demonstrated similar trends with national news broadcasting and syndication of sitcoms, Westerns, and dramas (Barnouw, 1990). The end result of this media production and consumption pattern was a society being directed to behave in a prescribed way rather than preserving cultural differences amidst the rapid social change of the 20th century.

Movie and TV producers, as a faction of the power elite, exhibit considerable control over cultural symbols and emblems. Further, they often seek to define cultural meanings of symbols and emblems for the mass (audiences) as well (C.W. Mills & Wolfe, 1999). Producers have the ability to define the popular notion of culture through their quest for capital and revenue by selectively choosing which cultural elements and depictions best serve their own purposes. As mentioned in the case of the 1997 rerelease of *Star Wars*, there was notable public backlash toward producers' attempt to redefine elements of the original films. Many people saw the CGI enhancements as a ploy to garner more revenue rather than a sincere artistic attempt to improve the overall quality of one of the most popular films of all time (Moran, 2015). This case

demonstrates incorporating CGI simply for the sake of its use can create negative responses amongst an audience.

Many of the effects of mass society can be attributed to industrialization and mass production of media enhanced by computer technology. More specifically, CGI is now becoming a common aesthetic technique in both film and popular television. Technological progress, in both media and society at large, is commonly embraced by society as a positive progression of history that is part of a journey away from the mythical past to the understood future (Moore, 2000). A significant contributor to this progression is the globalization of societies around the world through mass media. The media often function as a defense of this social affinity for technological progress in an established system whereby media producers uphold the status quo of their social structures and rarely seek to point out relevant criticism of the technology and media they profit from (Hamilton, 2001; Swingewood, 1977).

Even academics cannot always persuade the mass that caution towards technological progression is beneficial. As Kadushin (1982) notes, scholarly media and publications are rarely consumed more than popular mass media amongst the mass. Mills (2000) argues in favor of a democratic public that possesses the required critical awareness to avoid this scenario. However, he posits such a preferable circumstance is not easily attainable. The affirmation and support of the American social status quo are not easily undermined nor resisted by the American public itself. In the case of CGI, however, there is little research into how this technology affects their perceptions of believability and satisfaction with the media and whether CGI is seen as an instrument of social control.

To fully consider and comprehend the negative correlation between public intelligence and technological progression that contributes to a mass society, it is essential to take certain

patterns and precedents into account. While movie attendance historically lacked discernible class distinctions, a certain degree of literary knowledge and awareness was often required to understand the narrative of many films (Christin, 2012; McLuhan & Powers, 1989). Spectacle and visual effects of unprecedented magnitude were certainly an attractive quality in many early blockbusters, and moviegoers shared a fairly common understanding of the literary underpinnings of many of these films (Hall & Neale, 2010). The common thread amongst the populace in the 1930s and 1940s was, regardless of their social rank or class, a critical awareness existed that was of a higher intelligence than later audiences influenced by and accustomed to television consumption (McLuhan & Powers, 1989). Movies, much like television, became media designed to attract a more childish audience by appealing to their most primitive and infantile senses through spectacle (Huitt & Hummel, 2003). The same can be said for the increasing role of CGI in modern movies and television as well, which often use CGI as an instrument to appeal to these senses.

Values and Shortcomings for the Study

Critical theory and mass society theory raise concerns over media production techniques and consumption as well as media effects on the public. Their relatively extreme stances on sociopolitical behavior was born out of the turmoil of WWII and the Cold War, and many of their proponents witnessed this turmoil firsthand. While the sociocultural concerns enumerated by these theories are important to the larger field of communications media research, they do not adequately account for smaller-scale behaviors such as a single audience reacting to a video. They tend to take an absolutist approach to understanding behavior when more subtle nuances are being explored through experimental methodologies.

These theories are similar to the magic bullet theory because they attribute sociopolitical impacts directly to the media. They stipulate media have an immediate and undeniable effect on media consumers. However, more recent research on this phenomenon suggests this theory overstates the power of media and was more of a deterrent to anti-democratic propaganda following World War II (Sproule, 1989). This further begs the question of exactly what effects CGI exhibits on an audience. The narrow foci and stances of these theories necessitate examination of other theoretical perspectives for understanding CGI impacts.

CGI Impacts

The spectacle of CGI and the role it plays in effective narrative have direct ties to believability and audience satisfaction. As discussed previously, video consumption is a group activity that simultaneously creates both collective and individual experiences for audience members as they consume a video. The higher audience believability and satisfaction are, the more effective the video tends to be in the producers' intent to either entertain or educate the audience. To further explore these impacts, several literary paradigms and a cognitive theory are subsequently examined.

Suspension of Disbelief

The art of storytelling precedes the invention of the motion picture by thousands of years. Visual representations such as cave paintings and physical gestures coupled with oral histories, regardless of their complexity or simplicity, constituted the first semi-permanent representation of storytelling in the human world (Chesebro & Bertelsen, 1996). In the 20th century, film and television combined elements of multimedia (print, sound, and photography) to offer a comprehensive communication experience for an audience that provokes multiple sensory receptors. This experience is deeply rooted in literary tradition (McLuhan, 1994). Further, the

psychological and physiological reactions of an audience to media have long been a topic of research for literary figures and communication scholars alike (Ferri, 2007). This relationship between media and audience is a central focus of this study.

In 1817, Samuel Coleridge (1907) offered an explanation for this interaction that he identified as suspension of disbelief:

> … that my endeavors should be directed to persons and characters supernatural, or at least romantic; yet so as to transfer from our inward nature a human interest and a semblance of truth sufficient to procure for these shadows of imagination that willing suspension of disbelief for the moment, which constitutes poetic faith (p. 444).

Coleridge believed for an audience to accept, understand, and enjoy literature and poetry, they set aside their knowledge of the world and their immediate surroundings, their reality, in favor of accepting the author's narrative and explanation of events as limited truth, whether they were real or imagined. While this concept was conceived in the literary era, it has been applied to modern video as well (Ferri, 2007). In this scenario, the audience places their trust in the storyteller rather than relying on their own perceptions of realism. Coleridge identified media consumption as an act where the audience immediately disbelieves media content, which renders realism insignificant, yet sets aside disbelief in order to be entertained.

Several recent studies demonstrate support for suspension of disbelief. Gazley et al. (2011) posit despite the inherent "reality" in narrative in video productions, audiences desire to be presented with creativity and aesthetic beauty more than hyperrealism. This builds on Coleridge's belief that the audience is a passive consumer. Passivity is another element of video consumption that supports the tenets of suspension of disbelief. Becker (2012) asserts the audience is a relatively inactive participant in video consumption. They merely choose what to

watch rather than basing their decision on the potential believability of a production, suggesting the capabilities of CGI in enhancing realism should be moot.

Other studies suggest disbelief is not the initial inclination of an audience (Weber & Wirth, 2014). This draws into question how audiences respond to the believability of CGI and how satisfied they are with its use. If we take Coleridge's postulation at face value, believability should have little impact on satisfaction. According to Claydon (April, 2005), audiences usually desire to perceive media content as realistic as possible rather than mediating their disbelief with an author or producer's imagined or recalled reality.

To expand on the importance of realism and believability, some academics even argue 3D technology as a result of CGI will become the norm in movies because it is more realistic than 2D. This use of negative and positive parallaxes creates depth for the viewer, thereby increasing the realism of the image (Klinger, 2013). This enhancement of realism suggests the audience desires to initially believe rather than disbelieve. Further, many fantasy and science fiction characters are currently portrayed by CGI in conjunction with a performance by a live actor, or they are entirely rendered through computers (Claydon, April, 2005). This suggests one role of CGI in video production is to provide a realistic representation of fantastical characters so the audience's initial reaction is to believe what they see rather than initially disbelieving. These CGI characters often play an important role in creating and maintaining a connection between the viewer and the narrative that is based on believability (Isikguner, 2014).

Holland (2008) uses *Spiderman* (2002) as an example that contradicts suspension of disbelief because the audience actually believes the media content and subsequently disbelieves what it cannot verify or reasonably comprehend as realistic. For example, the beginning of a contemporary film examining the life of an ordinary-enough person such as Peter Parker while

reserving the Spiderman elements of the narrative until later in the movie is much easier to initially believe than to disbelieve as proposed by Coleridge. An emphasis on reality and normality, especially in an audiovisual medium such as video, encourages the mind to psychologically accept the story at hand and willingly submit to its aura because it offers an example of recognized habituation for the audience (Holland, 2004). Watching Peter Parker walk to school does not create an entirely fictional scenario. Watching him sling his way across skyscrapers does. These computer-rendered effects, which are presented after the reality-based narrative hook in this tale, are the element of this particular film that causes disbelief.

It is likely suspension of disbelief applies more effectively to animated films and TV cartoons than to live action productions containing CGI because they are inherently imagined. Ferri (2007) does not explicitly state this but his research indicates audience behavior is indicative of a collective act that ascribes its own notions of realism and believability to video. In the case of animation, whether through CGI or traditional means, the audience watches the production with disbelief because the imagery of an animated movie is conceived entirely in imagination. Further, Bordwell (2010) asserts videos have certain inherent messages and qualities that are, for the most part, universally understood and realized by the audience. Animation functions as a proviso in that the visual representation of the story may appear realistic to some degree even though it obviously is not physically existent. Even though technological progress in 3D technology might enhance realism in live-action movies (Allison et al., 2013), it is not likely to make animated films believable beyond a reasonable doubt (Kaba, 2013; Porter & Susman, 2000). Animated films and cartoons, whether they are produced entirely with CGI or traditional animation techniques, constitute the best example of Coleridge's theory where an audience willingly suspends its disbelief to enjoy media. CGI, however, creates

a situation where the intent of its use is usually to increase realism, believability, and satisfaction in live action productions and in some animated productions as well.

Faerie (Fairy)

At the opposite end of this spectrum on realism and the role CGI plays in believability and satisfaction is J.R.R. Tolkien's notion of fairy. Tolkien (1965) describes this desire to believe:

> …stories about Fairy, that is Faerie, the realm or state in which fairies have their being. Faerie contains many things besides elves and fays, and besides dwarfs, witches, trolls, giants, or dragons: it holds the seas, the sun, the moon, the sky; and the earth, and all things that are in it: tree and bird, water and stone, wine and bread, and ourselves, mortal men, when we are enchanted. (p.4)

Faerie assumes media consumers initially believe all media content because it is based in some way, whether concrete or abstract, on the real world. Conversely, fictional worlds are merely extensions of the real world itself. According to Tolkien, elements of media are not initially regarded as unbelievable as Coleridge asserted. Rather, they are accepted as plausible possibilities despite fictional elements and characteristics of creatures and settings.

Despite the interdependence and similarities of faerie worlds and the real world, Tolkien was apprehensive at the ability to take fantastical literary creatures, settings, and concepts and effectively scale them to an accurate representation on the stage or screen. However, CGI made such imagery possible (Sinker, 2005). He also had abhorrence toward mixing elements of fantasy with the contemporary world because the real world could not be conceptually mingled with fantasy (Coon, 2010). This is curious because of the relationship Tolkien identified between fantasy worlds and the real world. Despite their similarities, Tolkien saw no effective

way to effectively represent the visual description of a fantasy world in a live performance or video recording.

Video, perhaps more than any other medium, can bridge this gap between imagination and perceived reality. It takes imagined stories and portrays them in such a mediated fashion that the medium becomes a proverbial, if not accurate, representation of sound and imagery perceived by the audience as realistic as watching such activity directly in front of them (Matravers, 2010). In the case of James Cameron's *Avatar* (2009), multicultural audiences often detected relatively overt sociopolitical nuances such as discourse on imperialism and deforestation. Perhaps most striking was a popular and critical affinity for the CGI-rendered realism of a completely fictional world with completely fictional characters (Michelle et al., 2012). The movie was rewarded with nine Oscar nominations and three Oscar wins- Best Achievement in Cinematography, Best Achievement in Visual Effects, and Best Achievement in Art Direction ("The Official Academy Awards Database," 2016). The filmic experience of Avatar even went so far as to induce depression amongst some viewers (Michelle et al., 2012), which suggests individuals had difficulty disbelieving this science fiction epic. Further, Pölönen, Järvenpää, and Bilcu (2013) found physical evidence suggesting realistic CGI can also induce eyestrain and motion sickness in addition to depression as a result of watching video productions. While physiological effects of CGI have been documented in these cases, the role of CGI in enhancing believability and audience satisfaction with classic TV shows is not rigorously examined at this point.

Believability enhanced by CGI can have an impact on the critical reception of a production (MacDorman et al., 2009). The audience's predisposition toward belief rather than disbelief can have a prominent effect on satisfaction and subsequently with the believability of a

movie or TV show. Ladhari (2007) found affirmation of expectations in film consumption positively correlated to satisfaction. This suggests a completely fictional story is not immediately disbelieved by the audience as is suggested by Coleridge. Essentially, the audience has collective experiences that provide common expectations of realism rather than a predisposition toward disbelieving (Bordwell, 2010). According to Moore (2000), video inherently negotiates the balance of believability for the audience much as Tolkien suggests: "Cinema… provides a magical double with which directors can practice their craft, manipulating the spirit world so as to affect the real counterpart" (p. 162). It is therefore likely audiences expect to believe in narrative, settings, visual effects, and character portrayals, and this expectation of realistic representation plays a role in their reaction.

It is important to note some scholarship argues against the role of imagination in this mediation between real and imagined content. While the concepts of fantasy, magic, and imagination are often intertwined with each other in our quest to understand epistemic reality in media, they cannot always be measured effectively against inherently real audiovisual representations in documentaries (Matravers, 2010). Smith (2008) supports this assertion by arguing the collective audience reaction to video is rooted almost entirely in physiological responses that are subsequently mediated by cultural norms and expectations as the media is consumed. These studies support Coleridge's perception of the audience as a passive consumer of media rather than Tolkien's stance in faerie. Despite this difference in the interpretation of the impact of imagination and emotion on the physical body, what can be surmised is video consumption involves some degree of imaginative expectation coupled with physiological consequences. This is likely impacted by the use of CGI in mediating these biocultural

expectations (Smith, 2008). This leads to a third theoretical explanation of the impacts of CGI on audience satisfaction and believability.

The Uncanny Valley

As demonstrated thus far, two literary paradigms lend themselves to the understanding of the role of CGI in creating media that mimic and represent reality in some fashion. However, neither construct sufficiently accounts for alternative possibilities. The uncanny valley offers a more empirical explanation for the role of CGI in audience responses, and its application to media is an ongoing topic of research in communications media studies (Burleigh, Schoenherr, & Lacroix, 2013). Masahiro Mori (2012) first applied this principle to his study of robotics and their evolution towards humanoid representations in 1970. He hypothesized the more human a robot is perceived to be, the more we react to it with fear and revulsion because it is too real for comfort. Essentially, something known to be non-human and non-realistic causes fear when it crosses a certain boundary of acceptable reality. Mori asserts our interaction with existential phenomena falls into three realms: the first contains objects that can be can be explained and understood as deniably human in essence while the second, the uncanny valley, contains objects or creatures such as zombies or actual corpses that cause revulsion because we want to disbelieve yet actually believe the humanity of the object or creature, and the third constitutes actual people.

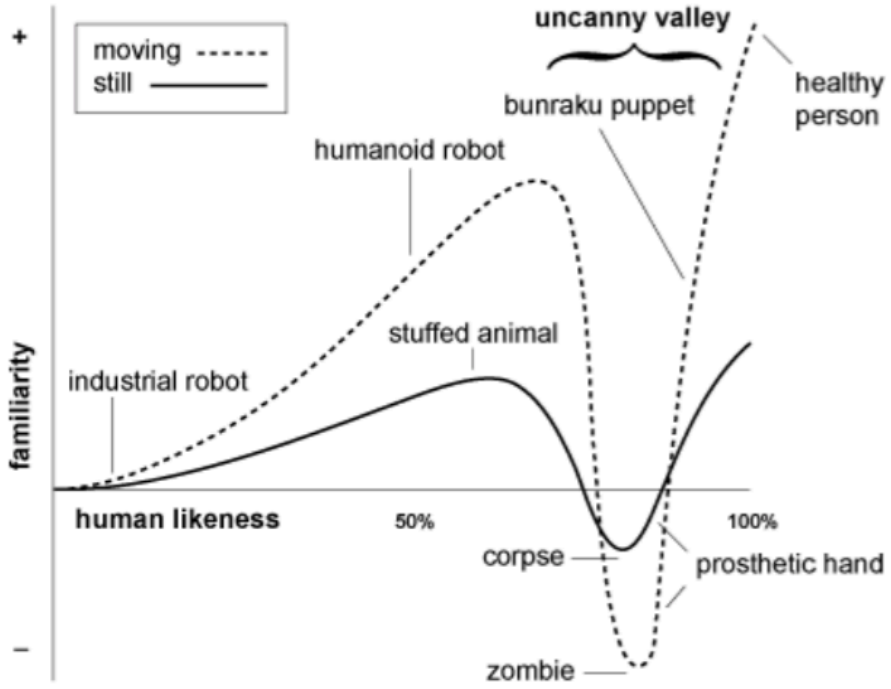

Figure 1. The Uncanny Valley. Adapted from The uncanny valley [from the field] by Mori, M., MacDorman, K. F., & Kageki, N. (2012). *IEEE Robotics & Automation Magazine, 19*(2), 98-100.

As technology progressed over the last few decades, many researchers began to apply this construct to media as well, albeit with widely differing results. Many studies conducted on the uncanny valley employ research that has a very limited focus (Ho & MacDorman, 2010). These often are concerned with the role of the uncanny valley in very specific situations and circumstances, which subverts and ignores the macro-level concept of the uncanny valley. Some studies suggest the uncanny valley does not effectively exist, at least not within most contexts (Burleigh et al., 2013; Gray & Wegner, 2012). Other studies demonstrated stark nuances in the uncanny valley, such as realistically perceived motion decreasing the uncanny valley while static characters deepened it (Piwek, McKay, & Pollick, 2014). This was further supported by findings that suggest non-human behavior and actions by humanoid beings rendered by computers deepens the uncanny valley (Tinwell, Grimshaw, Nabi, & Williams, 2011). Ho and MacDorman

(2010) found nonlinear relationships between eeriness and humanness that support Mori's concept. Kaba (2013) notes that despite scholarly argument over the function and existence of the uncanny valley as it stands at face value, audiences are often presented with increasingly hyper-realistic characters and settings through CGI that cause us to question our interactions with video productions. Rhee (2013) goes a step beyond this to defend Mori's postulation by reminding us Mori's observation was meant to be an explanation of human responses rather than a strictly defined theorem. While many studies examine CGI's role in the uncanny valley in video games and animated movies, there is little examination of that role on audience believability and satisfaction, especially when CGI applications are done in moderation.

There is evidence apprehension toward frightening reality is often a desired outcome when watching a video. Desires and gratifications in media consumption are a relatively new area of study that looks to identify the complexities of audience desires and how producers cater to those desires through technology such as CGI. According to Aurîer and Evrard (1994), fear is actually sought in certain genres by moviegoers and this gratification is potentially enhanced by increased believability made possible by CGI. Realism can be further enhanced by CGI and other computer effects to the point where viewers self report more perceptually realistic environments in 3D rendered movies (Rooney et al., 2012). CGI can also be used to improve movements and motions of characters to make them more acceptable, thereby decreasing the depth of the uncanny valley (Piwek et al., 2014).

This situation is perhaps most pronounced in animated films and cartoons. Kaba (2013) posits animated movie producers make a conscious effort to avoid hyper-reality because negative reactions toward animated characters in an entirely animated movie is counterproductive. Polarized examples of computer-animated characters can be seen in *The Polar Express* (2004)

and *The Incredibles* (2004). Both were produced in the same year but with markedly different aesthetic styles and technologies to create hyper-realistic characters in *The Polar Express* and cartoonish renditions of super humans in *The Incredibles* (Kaba, 2013). The realistic images and sounds of Tom Hanks place audience interaction in the uncanny valley because of a struggle to negotiate an animated movie with a realistic, very human character. This confusion in itself can create discomfort and confusion for the audience because these aesthetics can be simultaneously ambiguous and conflicting (Burleigh et al., 2013). Mr. Incredible, on the other hand, has very disproportionate dimensions and cartoonish qualities that present him as human while he is safely outside the uncanny valley as a disbelieved character because he is not realistic enough. CGI is the common thread between the two scenarios. It has the ability to create hyperrealism and high-quality unrealistic imagery.

The uncanny valley suggests modern video consumers are not just static observers of media with no *real* connection to the story as proposed by Coleridge, and media as accepted reality is not entirely possible through Tolkien's perspective. The uncanny valley suggests a certain degree of realism exists in media that constitutes a frightening and stimulating reaction where the media is perceived as too real for comfort. This negative reaction is a foundation of perceived reality and is actually often desired by the audience (Sparks, 1989). Further, Holland (2008) suggests the audience actually *believes* the content of the media, and then disbelieves content that cannot be psychologically justified as "real." Based on prior research previously discussed, it is possible the uncanny valley represents this ideal interaction between media and audience despite the audience's potential dismay toward the media. It is this lens of satisfaction that will be further explored in this study. While the role of the uncanny valley in media consumption is highly debatable, the premise of this construct offers a more triangulated

explanation for understanding the impacts of CGI than fairy or suspension of disbelief. However, the uncanny valley does not effectively account for the group mentality and reactions that are part of the video consumption experience and the effect spectacle has on the audience (Debord, 2010). To better explore this dynamic of video consumption and how CGI affects it, Dale's Cone of Experience is used as the primary theoretical perspective of this study.

Dale's Cone of Experience

Dale's Cone of Experience emerged during the post-WWII era as a foundational perspective of instructional technology, whereby effective learning outcomes and retention can be enhanced by increasing interactivity and realism for learners (Dale, 1946). This concept grew directly out of instructional design research and has recently been applied to other modalities such as entertainment media (C. E. Baukal et al., 2013) to enhance our understanding of interactivity, engagement, and satisfaction amongst media consumers. According to Badiou (2013), film viewing is a learning activity that elicits a sociocognitive response from the audience, one that is stimulated and effected by the video itself as a form of instructional technology.

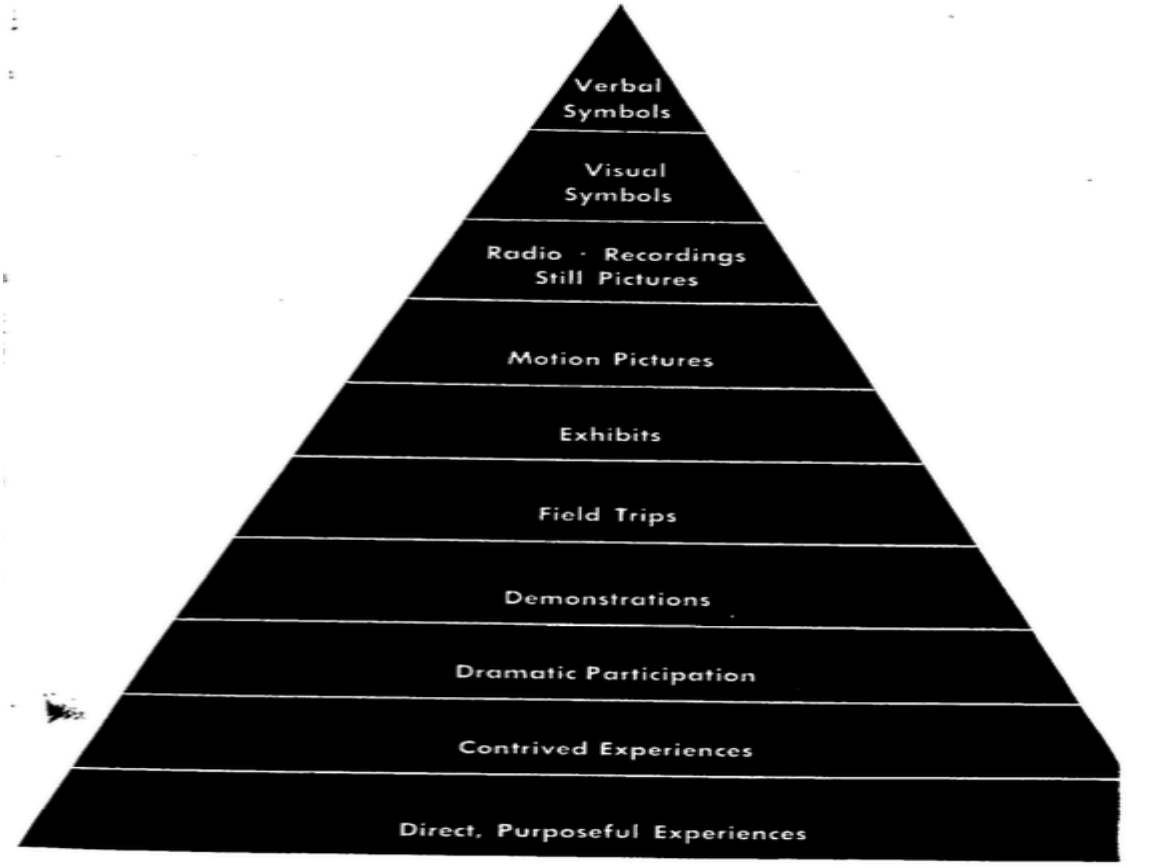

Figure 2. Cone of Experience. Adapted from *Audio-visual methods in teaching* by Dale, E. (1946). New York: Dryden Press.

As such, Dale's Cone provides a useful theoretical perspective for examining the impacts of CGI on an audience as an aesthetic variable that has the ability to enhance or diminish moviegoers' perceptions of believability (realism) and satisfaction with a production (C. E. Baukal, Jr., 2015). Further, Dale's Cone helps to mediate the abstractions of the imagination with a tangible audiovisual media product, such as a movie or TV show (Brail, 2013). Sensory experiences are the foundation of learning that help lead to more abstract nuances of learning (Arendale, Martin, & Arendale, 1993). This tangibility forms the crux of the theoretical foundation for this study.

Dale (1946) acknowledged many of the shortcomings video has in recreating reality. Videos are almost always an edited abstraction of a real or imagined event, and in Dale's time,

very few people had personal cameras to record their experiences live. However he also notes the instructional potential video has for enhancing believability and satisfaction:

> The motion picture can also dramatize events so effectively that we feel as though we are present at the reality itself. This is a great educational boon… Motion pictures can reconstruct (a) period with such dramatic intensity, with such realism and poignancy, that even the slowest child will react to its meaning. (p. 44)

Dale's research was conducted long before the mainstreaming of CGI in video production, and this begs the question of what impact CGI has on the believability of video productions. Further, examining audience reactions to a moderate CGI increase in the spectacle of a classic TV show without alterations to its narrative should help to bridge this gap and help inform our understanding of the entertainment versus education debate in video.

McCann (2014) notes the tendency for audiences to behave as an instructional group most directly affected by psychosocial experiences that awe the group as well as the individuals within it. This learning is not one-dimensional. Rather, the audience reacts in multifaceted ways to a video and the nuances of those reactions are much deeper than previously thought (Austin, 1982). Dale (1969) addresses this concept by emphasizing effective, meaningful learning occurs when the abstraction of information (video), converges with concrete experience that is dependent on realism and believability at the base of the Cone (Seels, 1997). Modern interpretations of Dale's Cone put motion pictures near the apex of the learning Cone and direct, purposeful experiences at the base of the Cone (C. E. Baukal et al., 2013). One of the goals of this study is to explore what effect CGI has on making videos more concrete and realistic for the audience. Essentially, what role does CGI play in enhancing believability to make videos more analogous with the base of Dale's Cone?

Few teachers at any institutional level would disagree that hands-on experience in learning is one of the best methods of instruction for increasing learner retention (White, 2014). Much as Confucius stated over 2,000 years ago, "I hear and I forget, I see and I remember, I do and I understand," (Vaillancourt, 2009). This principle can be seen in instructional activities ranging from kindergarten students making a building out of blocks to pharmaceutical students being required to get hands-on experience in hospitals to learn the necessary information and skills to function effectively in their trade (Vaillancourt, 2009). Regarding video specifically, there is an undeniable tendency for viewers to learn from what they watch, much as Dale asserted (Solomon, 1995). Even media production is taught through hands-on experience because it increases comprehension and retention (Resnik & Trost, 1996). While CGI will likely never make the abstraction of video entirely real for the audience, its capacity to increase believability and satisfaction through more realistic spectacle is worthy of exploration.

It should be noted that scholarly discrepancies exist regarding the numerical values and interpretations of Dale's Cone. According to Dwyer (2010), there are numerous misrepresentations of the percentage values applied to Dale's Cone that obscure the basic premise of Dale's Cone and the valid meaning extracted from it. Further, Masters (2013) states many studies tend to misuse or misinterpret Dale's findings. Other research suggests none of the Cone's levels are superior to the other (Lalley & Miller, 2007). Lalley and Miller (2007) recommend teachers should be not only a guide but a well-rounded practitioner of the learning material as well. Regarding video productions, there is little research examining what role CGI plays in either enhancing or detracting from the educational and entertainment qualities of the media. This is not necessarily contrary to Dale as they assert. The Cone functions as a continuum rather than a hierarchy by its very nature and encompasses multiple teaching methods

that produce a more holistic educational experience for the learner based on the use of sensory stimulation through multimedia (J. Jackson, 2016). Dale never presented his instructional diagram as flawless, nor as a literal quantitative representation of learning (Subramony, Molenda, Betrus, & Thalheimer, 2014). Dale (1946) asserted, "…the principle that all teaching, from the first grade through the college level, can be greatly improved by visual and auditory materials because these teaching materials can make the learning experience far more concrete and memorable." (p. 6)

Because video is sensory stimulation, Dale's Cone is directly applicable to study of this medium. The audiovisual capabilities of video render it as a medium with the power to influence attitudinal change over most demographic distinctions (C. E. Baukal et al., 2013). Further, audiences tend to desire that their affective expectations and disconfirmations are met in order to increase satisfaction with the production itself (Ladhari, 2007). Audiences, whether they intend to or not, learn from watching and are influenced by consumption of video, especially by the audiovisual stimulation from the medium (Badiou, 2013; Debord, 2010). Contrary to suspension of disbelief, most audiences usually want to believe video content as real (Claydon, April, 2005). However, blind faith in the reality of video content is not entirely achievable as Tolkien prescribed (1965). Mori's uncanny valley offers a logical perspective on how audiences react to the realism of CGI and how it can affect their satisfaction with a video production. Its premise is based more on fear of media than realized satisfaction and it does not account for the impact of spectacle created by CGI.

Conclusion

As demonstrated in this literature review, audiences behave as an instructional group. They tend to desire believability in the spectacle of a video and are usually more satisfied with

effective and entertaining narrative. Further, audiences often desire that these affirmations are met in video productions in order to be satisfied with the production and to consume it as a concrete experience. If video content is expected to be unrealistic, as in the case of an animated movie or cartoon, it should be portrayed as unrealistic and vice versa. Video productions are spectacles in their own right, and they contain some internal element of spectacle that can be achieved through special effects and CGI. One of the major unanswered questions regarding CGI is whether audiences tend to see it as more believable than traditional special effects. These reactions toward believability (realism) and the audience's subsequent satisfaction with CGI thus form the primary questions behind this research, and Dale's Cone of Experience forms the theoretical basis for understanding these results. The connection between concrete experience and videos, with CGI being the variable connecting the two, is at the heart of this quasi-experiment.

This chapter explored relevant literature on video and CGI, their historical progression in American society, and the role video plays as a mass medium through film and television. It further examined cultural implications along with theoretical foundations that help provide an understanding of the effects of CGI on believability and what role it plays in audience satisfaction. This review has demonstrated that despite video productions' roots in literary traditions, an adaptation of an instructional design model provides further insight into the impacts of CGI on the audience that consumes them. This perspective's reliance on perceived realism and more tangible media content offers a new approach to understanding how CGI affects culturally accepted norms and expectations of production aesthetics produced prior to the mainstreaming of the digital age specifically through audience perceptions of believability and satisfaction with these computer enhancements.

CHAPTER 3

METHODS

Introduction and Overview

American culture is often quick to embrace new technology, especially technology that enhances media (McLuhan, 1994). Computer technology has dramatically altered multiple mass media such as radio, television, film, and social media over the last several decades. More specifically, the rapid development and increasing use of computers in video production over the last thirty years has prompted the inquiry in this study. A primary goal of this research is to test whether this application of computer effects tends to increase or decrease believability and satisfaction for the audience.

Much of the research on CGI thus far is qualitative. This approach certainly has various merits including micro-level analysis, the ability to explore multiple angles within a research question or topic, rich detail, the ability to be more inferential in analysis, and multiple methods of qualitative research can provide triangulated depth to analysis (Berger, 2011; Corbin, Strauss, & Strauss, 2008; Creswell, 1998, 2014; Lindlof & Taylor, 2011). However, one of the goals of this research is to provide further statistical triangulation to the existing body of research on CGI. A quantitative, quasi-experimental methodology will help us better understand the impacts of CGI, which have largely been explored by qualitative methods thus far. This approach should provide new insights and understandings about the impacts of CGI on audience satisfaction and believability.

To help illuminate audience perceptions of CGI, this quantitative study utilized a two-group, nonrandom convenience sample in a quasi-experiment with pre-test and post-test design. A primary reason for this approach was the use of a convenience sample rather than a more

random sample that lends itself to better analysis through a true experimental design (Creswell, 2014). To provide better statistical control over analysis and isolation of the independent variable (CGI), participants were matched into the control or treatment group using a pre-test survey that identified similarities in demographics and video consumption habits (Buddenbaum & Novak, 2001). The post-test survey compared results of the influence of CGI enhancements (treatment) on audience responses to a rereleased video production with CGI enhancements versus traditional effects in the original release.

Development and Presentation of the Stimulus

The stimulus for this experiment was the application of CGI to a classic episode of the *Star Trek* original series, *The Doomsday Machine*, which was originally broadcast in 1967. The original *Star Trek* series has been remastered and enhanced with CGI to increase the realism and believability of settings and props. This particular episode was chosen because it contains many sequences where the rerelease had specific, notable CGI alterations to those originally released sequences. However, the plot remained completely unchanged and thus helps control the treatment.

The Doomsday Machine episode contains a similar plot and theme to *Moby Dick*, the literary classic written by Herman Melville. Captain Kirk and his crew come upon the *USS Constellation*, commanded by Commodore Matt Decker. This ship has been disabled by an unknown machine. Decker states he ordered his ship to attack the machine. It damaged the *Constellation* and caused heavy casualties. Later in the episode, Decker usurps command of the *USS Enterprise* and orders it to attack the machine, albeit unsuccessfully. It quickly becomes clear Decker is obsessed with his quest to destroy the machine and is possibly mentally unstable, much like Captain Ahab is obsessed with killing the white whale in *Moby Dick*. Decker later

escapes the *Enterprise* and attempts to destroy the machine himself, ultimately meeting his doom. Captain Kirk then guides the *Constellation* into the heart of the machine and disables it.

An interesting example of CGI enhancements to other classic video productions is the 1997 rerelease of the original *Star Wars* movies that contained notable CGI alterations. In the case of *Episode IV*, the Jabba the Hutt scene used in 1997 was not included in the theatrical release. However, its inclusion in the rerelease was a specific result of modern CGI capabilities that were used to replace a human character, the original Jabba the Hutt, with a CGI character that was a giant worm-like creature. This prompted much criticism from traditional *Star Wars* fans similar to audience reactions to zealous CGI usage in the subsequent prequels (*Episodes I-III*). Much of this resentment was from fans that saw the original releases or were accustomed to the original release in other formats such as VHS or LaserDisc, and are not typically proponents of CGI (Moran, 2015).

In *The Doomsday Machine*, however, the CGI used is strictly applied to establishing and transitional action shots. Enhancements were applied to the *Doomsday Machine* itself, the *USS Enterprise*, the *USS Constellation*, and to spatial elements in the setting such as stars and planets. No CGI enhancements were applied to characters or any scenes that visually contained characters (see Appendix A for a content analysis of CGI elements present). There were 83 shots/sequences that contained CGI. All were less than 20 seconds, except for the sixty-second opening credits. The exterior setting was always rendered through CGI, and many of these shots contained CGI-rendered images of the *Doomsday Machine*, the *USS Enterprise*, and the *USS Constellation*. Approximately 8.5 minutes of the entire fifty-minute episode contained CGI of any kind.

These enhancements should provide a stimulus and a more focused study that do not contradict culturally accepted notions and assumptions about characters, such as in the case of *Star Wars*, because no characters were altered by CGI. The alteration of scenery and some action sequences through CGI can increase audience satisfaction with those particular elements, while CGI alterations to characters poses a risk of decreasing audience satisfaction (Moran, 2015). Utilizing a video production such as *Doomsday Machine* that does not contain CGI character enhancements will help to isolate the impact of CGI on the setting and should encourage a less biased response from the audience. This further allows for better control of audience responses to the stimulus because only one significant literary element of the video production is impacted by CGI.

Instrument and Data Collection

A demographic survey and a post-test survey were used to collect the data for this study. Demographic data included categorical items such as gender, age, video consumption habits, and feelings regarding realism in video productions (see Appendix B). Each respondent was assigned an arbitrary number to facilitate assignment into either the experimental or control group. The post-test survey was based on an instrument established by Fornerino, Helme-Guizon, and Gotteland (2008) that examines audience experiences and immersion with movies by utilizing a 5-point Likert scale measurement ranging from one, "strongly disagree," to five "strongly agree" (see Appendix C). Reliability and validity for the instrument were verified during the study through exploratory qualitative research and subsequent factorial analysis ($\alpha>.7$, $\rho vc>.5$). It demonstrated statistically significant relationships between immersion and satisfaction dependent on the genre of the movie with horror movies producing the most

interaction for the audience. Ultimately, immersion and emotions reinforce each other, inducing greater satisfaction.

The instrument established by Fornerino et al. (2008) was adapted for this study and had five questions that were used to specifically address emotions to gauge satisfaction. These questions (questions 7-11) were used to measure emotional stimulation and arousal for the both the control and the experimental group. According to Fornerino et al. (2008), emotional stimulation and arousal in multiple movie genres have a strong and significant correlation to satisfaction (see Table 1). Thus it is possible to measure satisfaction without directly asking participants whether they were satisfied. This situation helps prevent biased responses from individuals who may have strong feelings of affinity or distaste for a particular video or video genre. It should be noted audience satisfaction had differing levels of significance based on the genre of the movie. This study examines one genre, science fiction, to gain a clearer picture of the impacts of CGI on these variables.

Table 1

Emotion-Satisfaction Correlation Index

Movie Genre	N	*r*	*p*
Horror	383	0.48	< .001
Comedy	136	0.301	< .001
Dramatic Comedy	140	0.295	< .001

Note. Adapted from Fornerino, M., Helme-Guizon, A., & Gotteland, D. (2008). Movie consumption experience and immersion: Impact on satisfaction. *Recherche et Applications en Marketing* (English Edition) (AFM c/o ESCP-EAP), 23(3), 93-109.

These concepts of believability and satisfaction highlight the potential impact of Dale's Cone in video consumption as an interactive activity by exploring whether heightened believability and satisfaction tend to increase audience recall. To explore this possibility,

questions were also included in the post-test survey that addressed audience recall and retention of both action sequences and narrative to better understand the role of Dale's Cone of Experience in learning during the video consumption process (see Appendix C). If CGI produces higher levels of believability and satisfaction, it is possible the experimental group will perform better in the learning component due to the presence of CGI.

Sample and Sampling Procedure

This research was conducted at Indiana University of Pennsylvania, a mid-sized university in the Pennsylvania State System of Higher Education, located in western Pennsylvania. According to the university's most recent statistics, the institution's enrollment as of Fall, 2015 is 13,775 ("Enrollment: Crimson Snapshot," 2016). Approximately 25% of these students identify as minorities; 56% of the student body is female, and 71% of enrolled students are in-state residents.

A convenience sample was used to obtain participants from introductory communications media courses and liberal arts courses taking place during the fall semester of 2016. These courses included introductory lecture-based topics and media production courses. This group of students was also chosen because of their age range. This demographic was of particular interest during this study because they are typically aware of computerized content in media (Levinson, 2013), yet they were not born at the time when the video used for the stimulus originally was broadcast.

The researcher contacted the instructors of undergraduate courses via email and requested permission to speak to their classes during their respective class times (see Appendix D). A verbal overview of the study was provided to potential participants by the researcher (see Appendix E). Students were given paper sign-up sheets, and those who chose to participate in

this study provided consent via this form. Students who did not want to participate were instructed to leave their form blank and return it to the researcher. They were also informed if they completed full participation in the study, they would be entered into a raffle for gift cards. Those who consented were emailed an electronic demographic survey through Qualtrics to develop matched pair groups for the study. Participants selected an available time slot to participate in the study and were matched according to their initial survey results and time selection to create groups that were evenly distributed as possible. Participants were then emailed notification of their assignment to their respective study date, time, and location.

Experimental Process

The quasi-experiment was conducted during the Fall 2016 semester. The videos were screened individually utilizing a desktop computer equipped with earphones during multiple timeslots for the control and experimental group. The participants were also provided with snacks to consume while watching the video. The researcher was present in the lab during the screening of the videos. The location used in the study was a room appropriate for viewing videos at the participants' university. Participants were assigned to one of two groups prior to the screenings based on the results of the demographic survey. The total number of participants for the experimental and control groups were kept as close as possible based on the total number of participants who completed the study while ensuring each of the two groups had at least 30 participants to ensure proper experimental analysis (Buddenbaum & Novak, 2001).

The participants were each shown the *Doomsday Machine* episode during their chosen timeslot. This episode originally aired October 20th, 1967 and was remastered in 2006 by CBS Paramount Domestic Television with high definition and CGI enhancements. The control group was shown the original version of the show that lacked modern CGI alterations. The

experimental group was shown the recent release of the show that contained noticeable CGI alterations and high definition. After watching the video, participants were provided with a paper copy of the survey that measured their engagement and immersion during the group viewing of the video. Questions in the survey directly addressing CGI in the videos were presented as "special effects" rather than "CGI" specifically to ensure participants understood the context of CGI. The paper copies of this survey were entered into Excel, verified for accuracy, and then destroyed. Once the raffle winners were determined and notified, the personally identifiable information was destroyed. All data was collected and preserved according to Institutional Review Board subject and data protection protocol.

Data Analysis

Data was compiled using Microsoft Excel and was subsequently transferred to SPSS for analysis. After the data was compiled, frequency counts and descriptive statistics were used in analysis of post-test survey results. Independent samples *t-tests* were most appropriate for analyzing RQ1, RQ2, and RQ5 because one dependent variable was examined for statistical significance between two groups in each question. Two-way ANOVA was used for RQ3 and RQ4 to examine potential interactions between the dependent variables (believability and satisfaction) and two independent variables such as demographics and group (control or experimental). Levene's test was used to test homogeneity of variance.

Conclusion

This chapter examined the methodology and sampling technique used in this study and explained the rationale for their use. An overview of the data collection and experimental procedure was provided along with the analytical framework for how the collected data will be

analyzed. Chapter 4 will examine the results of the data collection and provide statistical analysis of the data.

CHAPTER 4

FINDINGS

Introduction

This study explored the impacts and effects of CGI alterations to a classic TV episode of *Star Trek* and what impacts those alterations may have had on audience perceptions of believability and satisfaction. As demonstrated in Chapter 2, video productions can have significant effects on a society, and those effects can be impacted and shaped by technological innovations such as CGI. These effects prompted much of the inquiry behind this study because of the novelty of CGI and the relatively limited scholarship that exists on this subject. Dale's Cone of Experience served as the theoretical foundation for this research because it emphasizes several components of believability and satisfaction through the lens of instructional technology, which offers more measurability of these variables than some other theoretical constructs (Dale, 1946). To test these effects, a pretest/post-test quasi experiment was conducted with a control group and an experimental group.

The pretest survey collected demographic data for subsequent analysis. It focused on research questions three and four, extracting demographic data, audience video consumption habits, and preferences in video consumption location and audience characteristics (i.e. watching videos individually or in a group). The survey further asked respondents to indicate various levels of importance regarding literary elements such as genre, plot, cast and special effects. These responses were analyzed in conjunction with demographic variables and believability and satisfaction composite scores obtained from the post-test survey.

The post-test survey measured audience believability and satisfaction subsequent to exposure to the stimulus described in Chapter 3 along with audience recall of events from the

stimulus. Research question one examined whether the audience saw traditional effects or CGI effects as more believable. Research question two examined whether the audience was more satisfied with traditional effects or CGI. Research question five measured audience recall based on the control variable of the presence or absence of CGI.

Profile of the Sample

Convenience sampling was used to solicit participants from undergraduate communications media courses and business courses. These students were utilized partly because they tend to possess at least moderate familiarity with modern contemporary media and were assumed to have been exposed to CGI (Levinson, 2013). Another factor was the control episode, *The Doomsday Machine*, was broadcast in 1967 prior to most participants' year of birth. Thus most of them likely had limited familiarity with the episode when they participated in the experimental process. The sample pool contained 465 potential participants and the pretest survey received 152 responses. There were 100 participants who completed the full experimental process, with 46 in the control group and 54 in the experimental group. Six of the participants had seen the stimulus episode before, with one of those being in the control group and five in the experimental group. To account for these participants' previous consumption of the stimulus video, an independent samples *t-test* was used to test for statistically significant differences between these groups. No significant difference was found for believability, satisfaction or learning based on previous consumption of the stimulus (see Table 2).

Table 2

T-Test: *Previous Consumption of Stimulus Effects*

Dependent Variable	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Believability	-0.738	98	0.462	-0.18841	0.25515
Satisfaction	0.719	98	0.474	0.25236	0.35113
Recall/Learning	-0.295	98	0.768	-3.15957	10.70014

Note. Levene's [Believability]= 1.155 (df=98) *p*= .285, [Satisfaction]= 0.164 (df=98) *p*= .686 [Recall/Learning]= 0.417 (df=98) *p*= .520

Demographics

All the classes visited by the researcher were undergraduate-level courses. Most participants fell within an 18-21 age range (see Table 3). While 9% of respondents indicated they were 22 or older, most respondents did fall within the 18-21 age range. Thirty percent indicated they were 19 years old and constituted the largest single age group within the surveyed sample. Twenty percent were 18 years old and, combined, these two ages account for 50% of respondents. The researcher visited primarily introductory level courses that typically are comprised of first or second year students and usually have approximately 100 students enrolled.

Table 3

Age of Study Participants

Age	%	Count
18	20%	20
19	30%	30
20	21%	21
21	20%	20
22 or older	9%	9
Total	100%	100

As outlined in Table 4, participants reported gender as 42% male and 58% female in the sample as a whole. The experimental group had 41% male and 59% female (*N*= 46). For the experimental group, 43% were male and 57% were female (*N*= 54). The university where the study took place reported 44% male for its student body and 56% female in 2016 ("Enrollment: Crimson Snapshot," 2016).

Table 4

Gender Breakdown of Study Participants by Sample and Group

Group	Male	Female	Group Total
Control	19	27	46
Experimental	23	31	54
Sample Total	42	58	100

Similarly to age and gender, the self-identified races of respondents were representative of the student body at the university where this research took place (see Table 5). Nineteen percent of participants identified as minorities, which was congruous with the university's demographic data that identified approximately 25% of its student body as minorities. Because 81% of participants identified as white, statistical patterns among racial distinctions were limited and race was not used for matching groups.

Table 5

Self-Identified Race of Study Participants

Race	%	Count
White	81%	81
Black or African American	13%	13
American Indian or Alaska Native	0%	0
Asian	1%	1
Native Hawaiian or Pacific Islander	0%	0
Other	5%	5
Total	100%	100

Video Consumption Habits and Preferences

Video consumption habits were examined in the pretest survey. As demonstrated in Table 6, 4% of respondents watch videos once a week or less, and 71% watch videos daily. This indicates a high level of familiarity with and consumption of video productions among the sample.

Table 6

Study Participants' Video Consumption Frequency

Frequency	%	Count
Daily	71%	71
4-6 times a week	10%	10
2-3 times a week	15%	15
Once a week	3%	3
Never	1%	1
Total	100%	100

As demonstrated in Table 7, 65% of respondents indicated plot was the most important literary element of a video, which made it difficult to match groups by using participants' emphasis of importance on specific literary elements. Twenty percent chose topic/genre as the most important element, while 15% chose cast. It should be noted no participants selected the special effects category that includes the use of CGI as the most important element of a video production. This indicates that the audience went into the experimental procedure with a lack of emphasis on special effects when describing their believability and satisfaction results. This situation suggests respondents may have based their reactions to the stimulus more on literary elements rather than CGI presence. It is likely the science fiction genre of the stimulus had some impact on these responses based on individuals' affinity for this particular genre.

Table 7

Most Important Literary Elements as Indicated by Study Participants

Literary Element	%	Count
Cast	15%	15
Plot	65%	65
Special effects	0%	0
Topic/genre	20%	20
Total	100%	100

It is curious no respondents indicated special effects were the most important element of a video production because there was a clearly demonstrated emphasis on the importance of realism in video productions (see Table 7), which can be impacted positively or negatively by special effects that include CGI. For this study, it was hypothesized CGI additions to the original episode would increase believability, satisfaction, and audience recall because these applications were moderate. Initial group attitudes suggest realism, and thus believability, is highly important

to the audience. Realistic CGI enhancements in the stimulus could potentially enhance believability and satisfaction because settings, scenery, and vehicles were more lifelike than in the original episode. This leads to the hypothesis increased realism for the experimental group would correlate more directly to high expectations of realism in video productions.

It should be noted these CGI alterations also had the potential to decrease believability, satisfaction, and audience recall if the audience felt they did not enhance believability and satisfaction. The results regarding the sample's preconceived determinations regarding realism are presented in Table 8 for both the control group and the experimental group. Results were measured using a five-point Likert scale ranging from not at all important (1) to extremely important (5).

Table 8

Sample Realism Desires and Emphasis in Video Productions Frequency Count

Realistic Characters							
Group		Not at all important	Slightly important	Moderately important	Very important	Extremely important	Total
Control	Count	0	0	10	17	19	46
	% of Group	0%	0%	22%	37%	41%	100%
Experimental	Count	1	1	11	26	15	54
	% of Group	2%	2%	20%	48%	28%	100%
Total within sample	Count	1	1	21	43	34	100
	% of Total	1%	1%	21%	43%	34%	100%
Realistic Scenery							
Group		Not at all important	Slightly important	Moderately important	Very important	Extremely important	Total
Control	Count	1	3	9	19	14	46
	% of Group	2%	7%	20%	41%	30%	100%
Experimental	Count	2	3	9	22	18	54
	% of Group	4%	6%	17%	41%	33%	100%
Total within sample	Count	3	6	18	41	32	100
	% of Total	3%	6%	18%	41%	32%	100%
Realistic Special Effects							
Group		Not at all important	Slightly important	Moderately important	Very important	Extremely important	Total
Control	Count	0	6	12	18	10	46
	% of Group	0%	13%	26%	39%	22%	100%
Experimental	Count	2	4	11	22	15	54
	% of Group	4%	7%	20%	41%	28%	100%
Total within sample	Count	2	10	23	40	25	100
	% of Total	2%	10%	23%	40%	25%	100%

A comparison of the two groups' mean emphasis on the importance of realism for each category demonstrates both groups placed a high overall level of importance on realism in the three proffered categories (see Table 9). Both groups placed the highest emphasis on realistic characters and the least emphasis on realistic special effects, suggesting special effects may not have as much of an impact on believability and satisfaction as realistic characters and scenery. Since no characters were altered by CGI in the stimulus, character realism in the video could not have a negative impact on believability and satisfaction for either group. The sample's determination of character realism likely depended on other factors such as video genre and actors' performances. Scenery and special effects were altered by CGI in the experimental video, presumably to make them more realistic and believable for the audience. Hypothesis 1.1 and hypothesis 2.2 examine this possibility and project that the experimental group would see the CGI video as more believable and more satisfying than the control group based on the high level of importance the sample placed on realism. These results will be discussed in the Results section of Chapter 4.

Table 9

Realism Emphasis Levels by Video Element and Group: Comparison of Means

Group		Realistic Characters	Realistic Scenery	Realistic Special Effects
Control	Mean	4.20	3.91	3.70
	N	46	46	46
	Std. Deviation	0.78	0.98	0.96
Experimental	Mean	3.98	3.94	3.81
	N	54	54	54
	Std. Deviation	0.86	1.04	1.05
Total	Mean	4.08	3.93	3.76
	N	100	100	100
	Std. Deviation	0.82	1.01	1.01

A composite score was calculated for these three questions about realism emphasis and is presented in Table 10. These results demonstrated a slightly higher desire for realism amongst the control group (*N*=46, *M*= 3.93, *SD*= .687) than the experimental group (*N*= 54, *M*= 3.92, *SD*= .810). This situation presented the possibility that the control group might have been more dissatisfied with the believability of the older video used as the stimulus because it lacked CGI and the effects methods used in the production are noticeably less lifelike. It also presented the possibility that the experimental group could be more displeased with CGI in their stimulus if they felt it was not realistic.

Table 10

Sample Realism Desires Composite: Comparison of Means

Group	Mean	*N*	Std. Deviation
Control	3.9326	46	0.68736
Experimental	3.9167	54	0.81025
Total	3.9240	100	0.75252

These scores were used to run an independent samples *t-test* to determine statistical significance between the means of the control and experimental group regarding their realism desires heading into the experimental procedure (see Table 11). No significant difference between the groups was found. This was consistent with both groups' high ratings for desired realism that were well above average. The mean for the whole sample was 3.92 ($M \approx 4$), which places the sample's overall rating of realism importance at very important.

Table 11

Pretest Realism Composite: Independent Samples T-Test

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
0.105	98	0.917	0.01594	0.15175

Note. Levene's= .888 (df=98) p= .348

Statistical Techniques

CGI, or the lack thereof, served as the independent variable in the research questions explored in this study. The researcher matched the groups as evenly as possible according to gender to closely match groups while still keeping those groups reflective of the known population gender distribution. It also was the most reliable variable to match because the expected mortality rate from pretest survey respondents to actual study participants was

estimated to range from 25-50%. Utilizing more complex variables for matching would have been extremely difficult to execute during the experiment sessions. Respondents from the pretest survey indicated 42% male and 58% female, which was consistent with demographics discussed in Chapter 3. As previously shown in Table 2, the experimental group had 41% male and 59% female (N= 46). For the experimental group, 43% were male and 57% were female (N= 54). While group matching by gender could not be completely equal, it was kept as representative of the sample and population as possible when they arrived at the experiment site to watch the video.

The pretest survey results indicated a lack of variance in other demographic categories and video consumption tendencies. Ninety-one percent of the sample self-identified as white. This would have created equal distributions based on this variable with the potential of skewing variance in the other demographic variables (see Table 5). Age was not used for matching groups because four of the age groups (18, 19, 20, 21) were ≥ 20% (see Table 3). Matching groups based on these four categories in this variable would have been logistically difficult due to no-shows and dropouts. Video consumption habits and realism preferences also demonstrated skewed results that would have prevented evenly matched groups with equal internal distributions along one variable. Further, these variables would also have been logistically difficult to enforce at the study site due to no-shows and dropouts.

Satisfaction and believability were examined *post hoc* based on an instrument established by Fornerino et al. (2008). Independent samples *t- tests* were used to examine potential significant differences in the means of the control and experimental groups regarding believability and satisfaction. CGI is hypothesized throughout the study to increase believability, satisfaction, and audience recall. The scores for each respondent's overall believability and

satisfaction indexes were calculated as the average of their responses to the questions in each group of questions.

Two-way ANOVA was used to assess the impacts of demographics and CGI as independent variables on believability and satisfaction. This test was also used to analyze pretest survey questions regarding video consumption frequency, preferred viewing experience (i.e. alone or in a group, at home or at a cinema), and importance applied to realism and various literary elements of videos for each group. Levene's test for equality of variances was used to test the homogeneity of variances for the control and experimental groups.

Basic descriptive statistics were also run for each group and for the whole sample to provide insight into audience responses. This information is beneficial for understanding the viewing habits and preferences for this particular age demographic. This is especially important to researchers and video producers since this age group accounts for the second largest movie-going demographic in the United States ("Theatrical Market Statistics: 2014," 2015).

Results

RQ1: Does the Audience See Traditional Effects or CGI Effects as More Believable?

Research question one addresses audience perceptions of believability within the context of traditional effects and production techniques compared to more modern techniques that utilize CGI. These reactions were measured using a post-test only five point Likert scale immediately after participants watched either the control video or the stimulus video with responses ranging from "strongly disagree" (1) to "strongly agree" (5). The believability questions (questions 1-6) adapted from the established instrument were used to measure audience determinations of believability.

H1.1: The Audience Sees CGI Effects as More Believable Than Traditional Effects.

As discussed in the literature review in chapter 2, one of the assumptions of this study is CGI increases perceived believability in video productions. The first hypothesis investigates the impact of CGI effects on audience believability compared to audience believability for the control. This was the same video but it lacked CGI. The first six questions on the post-test survey specifically examine believability. The results from each of these six questions are presented and discussed individually below to examine potential differences in perceptions of believability for both the control and the experimental group. It should be noted the means for the first four believability questions were higher for the experimental group (*M*= 3.17, 2.70, 2.65, 2.83) than for the control group (*M*= 2.98, 2.63, 2.45, 2.78) as demonstrated in Tables 12, 14, 16, and 18. Conversely, the control group indicated higher levels of believability in the final two believability questions. As indicated in Tables 20 and 22, the means for both groups were very similar in these final two questions (control *M*=3.33, 2.80; experimental *M*= 3.07, 2.69) and their standard deviations were relatively minimal (<1.36). Descriptive statistics are provided for each question along with *t-test* results.

Question 1: The Show Created a New World That Suddenly Disappeared at the End of the Show.

This question asked participants to indicate how much they agreed with the concept that the video created a new world that ceased to exist at its conclusion. The results are shown in Table 12. According to H1.1, it was assumed that the experimental group would exhibit a higher level of agreement with this statement, especially because CGI alterations of the experimental video make the setting, ships, and movements of those ships more realistic. The experimental group exhibited a slightly higher level of agreement with the statement (*M*= 3.17) than the

control group (*M*= 2.98). The experimental group also produced a slightly higher standard deviation (1.34) than the control group (1.18), which suggests a slightly greater variance for the experimental group from their mean. Participants generally agreed overall with this statement.

Table 12

Descriptive Statistics: Believability of Video-Created World that Disappeared

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	2.9783	1.18301	0.17443
Experimental	54	3.1667	1.34234	0.18267

An independent samples *t-test* was run to test for significant difference between the means of each group for this particular question (see Table 13). No significant difference was found between the groups for question one. This is likely due to the moderate nature of these CGI enhancements combined with the genre of the stimulus video, which requires a firm commitment from the viewer to engage in a wholly fictional world. Further, realistic characters likely were not considered by participants in their interpretation of the term "world." Scenery and setting were probably the most influential elements in participants' responses to this question.

Table 13

T-Test: *Believability of Video-Created World that Disappeared*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
-0.738	98	0.462	-0.18841	0.25515

Note. Levene's= 2.24 (df=98) *p*= .138

Question 2: At Times, I Was Unaware of My Surroundings.

Question two asked respondents to indicate how much they agreed with the statement above (see Table 14). This statement draws on the audience's engagement level with the video, which positively correlates to believability. It was hypothesized that the experimental group would exhibit a higher level of agreement with this statement than the control group because they would be more engaged with the video. Both groups indicated they disagreed somewhat with this question, with the experimental group yielding a higher rating (M= 2.70) than the control group (M= 2.63).

Table 14

Descriptive Statistics: Participants' Awareness of Surroundings

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	2.6304	1.43540	0.21164
Experimental	54	2.7037	1.29774	0.17660

The experimental environment likely played a role in audience responses to this question. The videos were screened individually on computers in computer labs that placed the participants in close proximity to each other and likely subjected them to some level of distraction from their surroundings. This was a circumstantial artificial setting that was not a typical movie or television viewing environment. As Badiou (2013) notes, the cinema (or movie theater) environment creates a world that is distinctly separate from the outside world by its very nature. Further, McLuhan (1994) describes the television-viewing experience as an immersive act that separates the audience from their outside world much like the cinema. This viewing scenario could not be replicated exactly to this immersive potential by the researcher due to available experimental facilities and equipment. However, the facilities and equipment utilized

during the procedure did effectively emphasize individual reactions to the video without heavy influence from a collective audience.

The *t-test* results for this question yielded no significant difference between groups (see Table 15). This was reflective of participant responses to this question that indicated a lower level of agreement. It should be noted that both the control and experimental groups watched the video simultaneously in the same computer labs due to space limitations and equipment availability.

Table 15

T-Test: *Participants' Awareness of Surroundings*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
-0.268	98	0.789	-0.07327	0.27341

Note. Levene's= .780 (df=98) *p*= .379

Question 3: During the Show, My Body Was in the Room but My Mind Was in the World Created by the Show.

The third statement proffered a scenario where the participants' bodies were in the room but their minds were in the world created by the show. This situation further explores the depth of audience immersion in the video production and the results are presented in Table 16. It was again hypothesized that the experimental group would agree with this statement more than the control group because of CGI improvements. Each group disagreed with this statement the most out of all six (*M*= 2.46, *M*= 2.65). This could be due to multiple factors including the viewing environment and the nature of the science fiction genre of the video.

Table 16

Descriptive Statistics: Participants' Immersion in Video-Created World

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	2.4565	1.18709	0.17503
Experimental	54	2.6481	1.27616	0.17366

According to Table 16, the *t-test* results were not statistically significant (p= .442). The sample's overall immersion in the video world as demonstrated in Table 17 suggests a relatively low degree of mental separation from the physical world in which they watched the video. Again, the test-site environment could have contributed to this situation.

Table 17

T-Test: *Participants' Immersion in Video-Created World*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
-0.773	98	0.442	-0.19163	0.24801

Note. Levene's= 1.12 (df=98) p= .292

Question 4: The Show Made Me Forget the Realities of the World Outside.

This statement was a slightly different approach to the previous question about audience immersion into the video-created world. Rather than emphasizing physical and mental separation, it asked whether the video helped participants simply forget their immediate surroundings and reality. If CGI significantly enhanced believability, the experimental group would have agreed agree with this statement more strongly than the control group. However, as demonstrated in Table 18, the difference between the groups was extremely minimal, and showed a slight degree of disagreement (M= 2.78, M= 2.83).

Table 18

Descriptive Statistics: Participants' Ability to Forget Outside World

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	2.7826	1.22770	0.18101
Experimental	54	2.8333	1.27012	0.17284

The independent samples *t-test* did not produce a significant difference for this particular question (see Table 19). This is likely due again to the viewing environment and the imaginative nature of science fiction videos. We can deduce that this particular video did not have a dramatic positive effect on many participants' cognitive separation from the physical world while viewing the video.

Table 19

T-Test: *Participants' Immersion in Video-Created World*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
-0.202	98	0.840	-0.05072	0.25097

Note. Levene's= 1.12 (df=98) *p*= .292

Question 5: During the Show, What Happened Before or What Would Happen Afterwards Did Not Matter Anymore.

This statement explored what impact the video viewing experience had on participants' perceptions of importance regarding real-world events prior to and subsequent to watching the video. In contrast to the immersion questions, both groups generally agreed with this statement (*M*= 3.33, *M*= 3.07). Interestingly, the control group exhibited a higher level of agreement with this statement than the experimental group (see Table 20). This was somewhat surprising since the hypothesized results were the experimental group would agree more with all six of these

statements. While the control group did not have a much higher level of agreement, it is noticeable in these results based on a five-point scale (M_{diff}= .26) with the value of 3 being essentially neutral.

Table 20

Descriptive Statistics: Importance of Events Before and After Video

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	3.3261	1.09655	0.16168
Experimental	54	3.0741	1.07899	0.14683

Despite the slightly higher agreement exhibited by the control group, the independent samples *t-test* did not produce significant results (see table 21). It is worth noting the control group agreed more with this statement. This could be a result of the traditional special effects in the control stimulus creating a more believable experience for the audience despite being less realistic than the CGI-enhanced stimulus. It is possible CGI enhancements created a disjointed visual representation between exterior and interior shots and images for the experimental group. If the participants expected a highly fictionalized visual experience denoted by distinctive costumes and settings, it is possible that CGI made exterior action and setting shots too realistic to make the entire story believable.

Table 21

T-Test: *Importance of Events Before and After Video*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
1.155	98	0.251	0.25201	0.21812

Note. Levene's= .067 (df=98) *p*= .796

Question 6: The Show Made Me Forget About My Immediate Surroundings.

The final believability statement on the post-test survey had participants gauge how much the video made them forget the immediate world around them, including the environment where they watched the video. While the experimental procedure emphasized individual interaction with and consumption of the video production, participants consistently indicated an overall lack of ability to mentally separate themselves from the physically existent world around them (see Table 22). Both groups disagreed somewhat with this statement (M= 2.80, M= 2.69), with each being below the neutral point (3). This was again likely due to the computer lab environment, which was distinct from a traditional movie or television viewing experience.

Table 22

Descriptive Statistics: Forgetting Immediate Surroundings

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	2.8043	1.27575	0.18810
Experimental	54	2.6852	1.35736	0.18471

The *t-test* results were not significant for this particular question (see Table 23). While no statistically significant differences were found between groups for these statements, it is interesting that the control group exhibited lower levels of disagreement regarding believability on two of the statements. It can be assumed this situation may be a result of more cohesive visual elements of the control stimulus.

Table 23

T-Test: *Importance of Events Before and After Video*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
0.450	98	0.654	0.11916	0.26495

Note. Levene's= .334 (df=98) *p*= .565

Composite Believability Results

The means of the control and experimental groups' responses in these six questions was used to calculate their overall rating of believability to generate a composite of believability scores (see Table 24). Despite a slightly higher believability composite score in the experimental group, the overall scores demonstrated the stimulus did not significantly enhance believability for either group. Based on the five-point Likert scale utilized, each group indicated slight disagreement with the factors that measured believability. These results can be contextualized by the science fiction genre of the stimulus video that can be more difficult to believe than genres like drama and romance because it is so fictionalized.

Table 24

Control and Experimental Group Believability Composite

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	2.8297	0.79465	0.11716
Experimental	54	2.8519	0.86673	0.11795
Total	100	2.8417	0.83026	.08303

These composite scores were then analyzed through an independent samples *t-test* to provide a broader explanation of each group's reactions to the video stimulus they observed. No significant difference was found for the control and experimental groups in the independent samples *t-test* (see Table 25). The hypothesis for RQ1 is rejected. The audience does not see

CGI effects as more believable than traditional effects. The experimental group reported higher believability in four of the six questions. The difference between the two groups was relatively minimal in each instance. The control group actually reported higher believability in the last two questions. The standard deviations for each group were relatively large considering these measurements were based on a scale of one to five (*SD*= .795, *SD*= .867). These results suggest CGI had no significant impact on believability.

Table 25

T-Test: *Control and Experimental Believability Composite*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
-0.132	98	0.895	-0.02214	0.16742

Note. Levene's= .610 (df=98) *p*= .437

RQ1 Summary

The results from RQ1 and H1.1 did not produce any statistically significant results indicating CGI increased overall believability of the stimulus. There were subtle nuances in each question discussed above indicating CGI has *some* potential to increase believability over traditional effects methods but not in a statistically significant or overly substantial manner. Interestingly, believability questions five and six suggest the control group actually experienced higher levels of believability in the context of those respective questions. The believability composite results were also not significant, though the experimental group exhibited a slightly higher overall believability score. Table 26 provides a cumulative overview of the results for each group for each believability question to illustrate these findings. As can be seen from the table, while the CGI group scored slightly higher on four of the questions and the composite,

there are no significant differences between the control and experimental groups on the believability measure. The hypothesis is not supported.

Table 26

Cumulative Results of Post-Test Believability Questions

Question	Control	Experimental	Significant
1. New world disappeared at the end	2.9783	3.1667	No
2. Unaware of my surroundings	2.6304	2.7037	No
3. Body in room, mind in show's world	2.4565	2.6481	No
4. Show made me forget realities of outside world	2.7826	2.8333	No
5. What happened before or afterwards did not matter	3.3261	3.0741	No
6. Show made me forget my immediate surroundings	2.8043	2.6852	No
Believability Composite	2.8297	2.8519	No

RQ2: Does CGI Evoke Stronger Emotional Responses and Associated Satisfaction Than Traditional Effects?

Research question two examines whether CGI or traditional effects produced higher levels of satisfaction for the experimental or control group respectively. As discussed in Chapter 3, an instrument established by Fornerino et al. (2008) was adapted for this study and had five questions that were used to specifically address emotions. These questions (questions 7-11) were used to measure emotional stimulation and arousal for the both the control and the experimental group (Fornerino et al., 2008). As demonstrated in Table 1, emotions were found to have a statistically significant and strong positive correlation with satisfaction.

These emotional reactions were measured using the same post-test only five-point Likert scale immediately after participants watched either the original video or the CGI video. Each satisfaction question relating to RQ2 is individually analyzed through descriptive statistics and

independent samples *t-tests* to measure group responses to each post-test survey question. The composite scores for each group in the satisfaction component are then analyzed.

H2.1: CGI Evokes Stronger Emotional Responses and Associated Satisfaction Than Traditional Effects.

This hypothesis took into account the opportunity for CGI to increase audience satisfaction because of potentially heightened believability and emotional arousal. It was hypothesized that the experimental group would exhibit higher ratings for the emotional arousal questions than the control group. The control group demonstrated slightly lower satisfaction in four of the five emotion questions, except for one that asked if they experienced an unusual emotional state.

Question 7: During the Show, I Felt Strong Emotions.

This statement asked participants to indicate how much they felt strong emotions of any kind while watching the video. For this statement, the experimental group indicated a noticeably higher agreement (M= 3.24) than the control group (M= 2.91). Based on the utilized scale, the experimental group somewhat agreed with the statement while the control group somewhat disagreed (see Table 27). Since many of the action scenes in the video were exterior shots (e.g. Commodore Decker flying the shuttle into the *Doomsday Machine* and meeting his doom), it was possible for CGI to play a role in creating higher emotional arousal and responses to these plot sequences in the treatment group.

Table 27

Descriptive Statistics: Strong Emotions Felt During Show

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	2.9130	1.42714	0.21042
Experimental	54	3.2407	1.30218	0.17720

The results from the independent samples *t-test* for this question indicate no statistical significance between groups (see Table 28). The most noticeable results from this question stem from the discussion above, where the experimental group indicated higher levels of emotional arousal (see Table 27). While the difference was not statistically significant or dramatic, it is noticeable on a five-point measurement scale and suggests CGI has the ability to induce somewhat stronger emotional responses (M_{diff}= .33). The standard deviation for each group ($SD \geq 1.3$) was also relatively large. This indicates a fairly wide range of agreement with the statement.

Table 28

T-Test: *Strong Emotions Felt During Show*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
-1.200	98	0.233	-0.32770	0.27307

Note. Levene's= 1.02 (df=98) *p*= .315

Question 8: During the Show, I Felt Emotions That Were More Intense Than Those I Usually Feel in Daily Life.

This statement explored whether participants felt any emotions more intensely during the show than during a routine day. Again, emotions were not delineated or clearly defined for participants. Rather, the statement asked them to note any sort of emotional arousal or response

to the video. Despite the potential for the genre and outdated nature of the video to reduce satisfaction and believability for college-age participants, both groups indicated they somewhat agreed with this statement (see Table 29). The experimental group again exhibited a higher level of agreement (M= 3.63) than the control group (M= 3.43). However, the difference between means was noticeably less than the first satisfaction question (M_{diff}= .19), and each group rated their experience with this statement above the neutral point (M> 3). It can be surmised that the stimulus video, despite the potential for demographic disconnect because of its outdated production, caused noticeable emotional responses from each group that were stronger than their normal everyday emotions. These responses were likely increased somewhat by CGI.

Table 29

Descriptive Statistics: Emotions Felt that were Stronger than Normal

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	3.4348	1.29361	0.19073
Experimental	54	3.6296	1.20214	0.16359

The independent samples *t-test* for this statement did not produce statistically significant results (see Table 30). Despite the lack of statistical significance between groups, it is important to note that both groups positively indicated the stimulus caused an emotional response. This response of having stronger emotions during the video than those of everyday life was minimally enhanced by the presence of CGI.

Table 30

T-Test: *Emotions Felt that were Stronger than Normal*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
-0.780	98	0.437	-0.19485	0.24980

Note. Levene's= .759 (df=98) *p*= .386

Question 9: During the Show, I Experienced a Series of Very Different Emotions.

This question asked participants to indicate how much they agreed with the idea they felt a range of emotions while watching the video. This statement lacked the comparative element of the previous question and focused on whether participants felt variations in their emotions. According to results presented in Table 31, the control group disagreed very slightly with this statement (*M*= 2.93) and the experimental group neither agreed nor disagreed with the statement (*M*= 3.00). Each group had very similar reactions to this statement (M_{diff}= .07), which suggests the video did not elicit a strong range of emotions from participants. The minimal difference between each group's respective ratings indicate CGI did not have a major impact on the range of emotions felt by the experimental group.

Table 31

Descriptive Statistics: Experienced a Series of Very Different Emotions

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	2.9348	1.30643	0.19262
Experimental	54	3.0000	1.19748	0.16296

The independent samples *t-test* results for this question were also not significant (see Table 32). These findings show there was minimal agreement or disagreement with this statement from both groups. Further, both groups reported a very similar range of emotions (see

Table 31). It does not appear as though CGI had a major impact on the variation of emotional responses to the video. The plot and other narrative elements of the story seem to have had more of an emotional impact at this point than visual effects.

Table 32

T-Test: *Experienced a Series of Very Different Emotions*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
-0.260	98	0.795	-0.06522	0.25054

Note. Levene's= .764 (df=98) *p*= .384

Question 10: At Times, I Was in an Unusual Emotional State.

This statement asked participants to report whether they felt the video put them in an abnormal emotional state. As illustrated in Table 33, each group reported they agreed somewhat with this statement (*M*= 3.52, *M*= 3.44). This was the only question in the satisfaction component of the instrument where the control group agreed with the statement more than the experimental group. This suggests the emotions felt by the control group were very slightly more distinct or abnormal than for the experimental group. It is possible CGI in the experimental stimulus induced slightly more common emotional responses among that audience as a whole than the traditional effects in the control group stimulus. These differences were very small yet noticeable based on the five-point scale.

Table 33

Descriptive Statistics: Unusual Emotional State

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	3.5217	1.14967	0.16951
Experimental	54	3.4444	1.12714	0.15338

The results of the independent samples *t-test* for this question are presented in Table 34. There was no significant difference between the control and the experimental groups based on CGI (p= .736). Again, each group reported they agreed somewhat with the statement. The difference between the two was minimal. The important element of this result was the control group experienced a slightly more unusual emotional state from traditional effects than the experimental group did with CGI.

Table 34

T-Test: *Unusual Emotional State*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
0.339	98	0.736	0.07729	0.339

Note. Levene's= .010 (df=98) p= .922

Question 11: During the Show, I Experienced Moments of Intense Excitement.

Excitement was the specific emotion addressed in this statement. Somewhat curiously, this statement received the least agreement from each group, with their means at 2.78 and 2.83 for the control and experimental groups respectively (see Table 35). Both groups usually ranged from neutral to slight agreement on the five-point scale in the other four satisfaction questions. This suggests that while emotions were usually influenced by the stimulus regardless of CGI, intense excitement was not one of the strongest emotions felt by either group. This is likely due to the participants' lack of familiarity with the chosen episode in the video or the age of the program in general. As stated earlier in Chapter 4, six of the study participants had seen the episode prior to completing the study. It is also possible many participants were not very interested in the subject matter of the video.

Table 35

Descriptive Statistics: Experienced Moments of Intense Excitement

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	2.7826	1.26338	0.18628
Experimental	54	2.8333	1.37017	0.18646

The results of the independent samples *t-test* for this question did not yield significant results (see Table 36). Both groups reported similar reactions, indicating neither felt intense excitement during the video. Therefore, it was hypothesized there would be no statistical significance between the control and experimental group regarding this question.

Table 36

T-Test: *Emotions Felt that were Stronger than Normal*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
-0.191	98	0.849	-0.05072	-0.191

Note. Levene's= 2.31 (df=98) *p*= .132

Composite Satisfaction Results

The means of the control and experimental groups' responses to these satisfaction questions were used to calculate their composite rating of satisfaction. As illustrated in Table 37, the experimental group reported a slightly higher satisfaction composite score than the control group. The ratings demonstrated the stimulus essentially produced neutral reactions in satisfaction for both groups (*M*= 3.12, *M*= 3.18). These results suggest CGI does not significantly impact satisfaction.

Table 37

Control and Experimental Group Satisfaction Composite

Group	*N*	Mean	Std. Deviation	Std. Error Mean
Control	46	3.1196	0.87817	0.12948
Experimental	54	3.1790	0.79757	0.10854
Total	100	3.1517	.83185	.08318

These composite results were then analyzed through an independent samples *t-test* to provide a broader explanation of each group's reactions to the video stimulus they observed. No significant difference was found for the control and experimental groups (see Table 38). Hypothesis 2.1 is not supported by these findings. CGI does not evoke stronger emotional responses and associated satisfaction than traditional effects. The experimental group reported higher satisfaction through emotional stimulation in four of the five questions. The difference between the two groups was again relatively minimal in each instance. The standard deviations for each group were again relatively large considering these measurements were based on a scale of one to five (*SD*= .878, *SD*= .798). The slightly higher composite score for the experimental group suggests CGI has minimal potential to increase satisfaction for the audience.

Table 38

T-Test: *Control and Experimental Satisfaction Composite*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
-0.355	98	0.724	-0.05945	0.16765

Note. Levene's= .329 (df=98) *p*= .567

RQ2 Summary

The results from RQ2 and H2.1 did not produce any statistically significant results indicating CGI increased overall satisfaction for the audience. As was the case in RQ1, there were subtle nuances in results for each question indicating CGI has *some* potential to increase satisfaction over traditional effects methods but not in a statistically significant or substantial manner. The satisfaction composite results were also not significant, though the experimental group exhibited a slightly higher overall satisfaction rating. This was again contrary to the hypothesis, which is rejected based on these findings. Table 39 provides a cumulative overview of the results for each group for each satisfaction question to illustrate these findings.

Table 39

Cumulative Results of Post-Test Satisfaction Questions

Question	Control	Experimental	Significant
1. Felt strong emotions	2.9130	3.2407	No
2. Emotions more intense than daily life	3.4348	3.6296	No
3. Felt series of very different emotions	2.9348	3.0000	No
4. Was in an unusual emotional state	3.5217	3.4444	No
5. Experienced intense excitement	2.7826	2.8333	No
Satisfaction Composite	3.1196	3.1790	No

A comparison of the composite scores for believability and satisfaction is provided in Table 40. These results show that both groups experienced higher satisfaction with the video than believability. The experimental group produced minimal higher results for believability and satisfaction. It can be surmised that both groups were more satisfied with their experience watching the video than they found its subject matter believable. This suggests video producers in television and film should consider whether the use of CGI in their productions is worthwhile. This would be dependent on the producers' goals and objectives with their productions. If they

desire to produce more believable, emotionally satisfying media, CGI may not always be the best option.

Table 40

Believability and Satisfaction Composite Comparison

Group	Believability Composite	Satisfaction Composite
Control	2.8297	3.1196
Experimental	2.8519	3.1790

RQ3: How Do Audience Demographics Affect Believability and Satisfaction?

Research question 3 examines the relationship between the dependent variables, believability and satisfaction, and independent demographic information from study participants based on their assignment to either the control or experimental groups. Questions on the pretest survey asked respondents to indicate their age, gender, and race. Class rank, GPA, major, and other educational demographics were not a major focus of this study because these variables would have made it difficult to evenly match groups based on the overall groups' size and range of variability on these dimensions. As stated previously, the sample did not have much familiarity with the stimulus used in this study. Six participants had seen the stimulus video prior to participating in the study. Two-way ANOVA was used to identify potential significance between demographic independent variables and the dependent variables, believability and satisfaction. Levene's test was used to test homogeneity of variance. No Levene's tests were significant for RQ3.

H3.1: There Is No Significant Difference in Believability and Satisfaction Based on Age and Type of Visual Effects.

Age was measured using a 5-point ordered category scale (see Table 41). The sample consisted of undergraduate college students. Any participants under age 18 were excluded from the study. Students more than 22 years old were not a significant portion of the sample as 9% of participants selected 22 or older. The mode age for the sample was 19 indicating many participants were likely first or second year students. Both groups had 15 students in this age category. It was also the most common age for participants in the control and experimental groups.

Table 41

Age of Study Participants by Group

#	Please select your age	Control	Group %	Experimental	Group %	Total
1	18	9	20%	11	20%	20
2	19	15	33%	15	28%	30
3	20	8	17%	13	24%	21
4	21	8	17%	12	22%	20
5	22 or older	6	13%	3	6%	9
Total		46	100%	54	100%	100

Three of the five age categories in the entire sample reported a believability rating greater than neutral (3), and these figures were only slightly above this mark (see Table 42). Two of these three groups were in the control group, aged 20 and 21 respectively. Only 19-year olds in the experimental group reported a believability composite that was neutral. From the entire sample, it was found that 18-year olds indicated the highest level of believability

(*M*= 2.92), though they also exhibited the highest standard deviation of the five age groups (1.02). The mean differences between each group were very small, indicating that the sample found the stimulus video with and without CGI to be somewhat unbelievable.

Table 42

Mean Believability by Age and Group

Group	Age	Mean	Std. Deviation	*N*
Control	18	2.9444	0.95015	9
	19	2.5556	0.72830	15
	20	3.0417	0.73328	8
	21	3.1250	0.93329	8
	22 or older	2.6667	0.53748	6
	Total	2.8297	0.79465	46
Experimental	18	2.8939	1.11124	11
	19	3.0111	0.90076	15
	20	2.8077	0.85214	13
	21	2.7083	0.66714	12
	22 or older	2.6667	0.92796	3
	Total	2.8519	0.86673	54
Total	18	2.9167	1.01523	20
	19	2.7833	0.83752	30
	20	2.8968	0.79839	21
	21	2.8750	0.78895	20
	22 or older	2.6667	0.62915	9
	Total	2.8417	0.83026	100

Two-way ANOVA was used to measure potential interaction between age and CGI (independent variables) and the believability composite established in RQ1 (dependent variable).

Table 43 illustrates neither independent effect was significant, nor was the interactive effect between them on believability (p= .453). This supports the assumption of H3.1 since there was no significant difference in believability based on age and CGI. The hypothesis is upheld.

Table 43

Two-Way ANOVA: Believability by Age and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Age	0.688	4	0.172	0.238	0.916
Group	0.048	1	0.048	0.067	0.796
Interaction	2.674	4	0.668	0.926	0.453
Error	64.993	90	0.722		
Total	875.750	100			

Note. Levene's= .788 (df= 9,90) p= .628

Three of the five age categories in each group reported a satisfaction rating greater than neutral (3). Interestingly, 18-year olds in the control group produced the highest satisfaction rating by age and group (M= 3.889). Overall the results from both the control and experimental groups were very similar regarding satisfaction based on age and CGI.

From the entire sample, it was found that 21-year olds indicated the highest level of satisfaction with the stimulus video (see Table 44). Four of the five age groups produced a satisfaction mean slightly above neutral (M> 3). The oldest group noted a significantly lower satisfaction level than the rest (M= 2.41). While this category had the fewest participants (N= 9), it is important to note they also exhibited the lowest standard deviation (.57198). Six of these participants were in the control group and three were in the experimental group.

Table 44

Mean Satisfaction by Age and Group

Group	Age	Mean	Std. Deviation	*N*
Control	18	3.3889	0.80795	9
	19	2.7778	0.94421	15
	20	3.2083	0.81528	8
	21	3.7708	0.68393	8
	22 or older	2.5833	0.54518	6
	Total	3.1196	0.87817	46
Experimental	18	3.3788	0.81340	11
	19	3.3111	0.67808	15
	20	2.9615	0.73331	13
	21	3.3472	0.86298	12
	22 or older	2.0556	0.53576	3
	Total	3.1790	0.79757	54
Total	18	3.3833	0.78937	20
	19	3.0444	0.85201	30
	20	3.0556	0.75523	21
	21	3.5167	0.80550	20
	22 or older	2.4074	0.57198	9
	Total	3.1517	0.83185	100

Satisfaction was measured using the same technique and statistical test. Table 45 demonstrates an interactive p-value closer to significance (p= .191) for satisfaction than for believability but it is not statistically significant. Age was a main effect found to be statistically significant (p= .004). Therefore we can conclude it impacted satisfaction regardless of whether the subjects were in the control or experimental group. The hypothesis predicting no significant

difference in satisfaction based on age is upheld. The hypothesis of no significant difference based on age and type of visual effects is supported.

Table 45

Two-Way ANOVA: Satisfaction by Age and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Age	10.212	4	2.553	4.148	0.004
Group	0.366	1	0.366	0.594	0.443
Interaction	3.849	4	0.962	1.563	0.191
Error	55.389	90	0.615		
Total	1061.806	100			

Note. Levene's= .595 (df= 9,90) *p*= .798

H3.2: There Is No Significant Difference in Believability and Satisfaction Based on Gender and Type of Visual Effects.

The gender distribution of the sample was reflective of the demographics at the university where this study took place. Participants reported 42% were male and 58% were female (see Table 46). Gender served as the matching variable when assigning students to the control or experimental group because this variable allowed for the highest level of similarity between the two groups.

Table 46

Gender Distribution by Group

Gender	Control	Group %	Experimental	Group %	Total
Male	19	41%	23	43%	42
Female	27	59%	31	57%	58
Total	46		54		100

As demonstrated in Table 47, males reported overall lower levels of believability (*M*= 2.56) than females (*M*= 3.05). This was also the case for both the control and experimental group factors. Males (*SD*= .64777) also exhibited a lower overall standard deviation than females (*SD*= .88962). While there were 16% more females than males in the sample, the lower believability rating and standard deviation suggest females predominantly found the stimulus more believable than males.

Table 47

Mean Believability by Gender and Group

Gender		Mean	Std. Deviation	*N*
Male	Control	2.6842	0.70469	19
	Experimental	2.4493	0.59126	23
	Total	2.5556	0.64777	42
Female	Control	2.9321	0.85016	27
	Experimental	3.1505	0.92432	31
	Total	3.0489	0.88962	58

A statistically significant interaction between gender and group on believability could not be demonstrated (see Table 48). Gender as a main effect produced statistical significance (*p*= .004). Thus gender had an impact regardless of whether subjects viewed the traditional or CGI version. The lack of a significant difference confirms the hypothesis regarding believability.

Table 48

Two-Way ANOVA: Believability by Gender and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Gender	5.447	1	5.447	8.564	0.004
Group	0.002	1	0.002	0.003	0.960
Interaction	1.243	1	1.243	1.954	0.165
Error	61.052	96	0.636		
Total	875.750	100			

Note. Levene's= 2.69 (df= 3,96) *p*= .051

Mean satisfaction by gender produced results similar to those discussed above for believability (see Table 49). Females reported higher levels of satisfaction than males in both groups. Females in the experimental group exhibited the highest level of satisfaction in the entire sample (*M*= 3.31). Males in the control group reported the lowest level of satisfaction in the sample (*M*= 2.97). Overall, males reported a satisfaction composite score of 2.99 and females reported 3.27. We can conclude that the stimulus was somewhat more satisfying for females than males with or without CGI based on the statistically significant finding of a main effect for gender.

Table 49

Mean Satisfaction by Gender and Group

Gender		Mean	Std. Deviation	*N*
Male	Control	2.9737	0.77033	19
	Experimental	3.0000	0.77033	23
	Total	2.9881	0.80428	42
Female	Control	3.2222	0.94733	27
	Experimental	3.3118	0.74379	31
	Total	3.2701	0.83819	58

As illustrated in Table 50, satisfaction produced no statistically significant interaction between group and gender (p=. 852). Neither main effect was statistically significant for this test. Although gender affected believability, it did not produce any significant effect on satisfaction. The hypothesis of no significant difference in satisfaction based on gender and type of effects is accepted.

Table 50

Two-Way ANOVA: Satisfaction by Gender and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Gender	1.898	1	1.898	2.743	0.101
Group	0.081	1	0.081	0.117	0.733
Interaction	0.024	1	0.024	0.035	0.852
Error	66.445	96	0.692		
Total	1061.806	100			

Note. Levene's= .835 (df= 3,96) p= .478

H3.3: There Is No Significant Difference in Believability and Satisfaction Based on Race and Type of Visual Effects.

Participants were able to choose from five selections to self-identify their ethnic background (see Table 51). These results were indicative of the student body at the university where the study occurred. Students who identify as white made up the majority of both groups and the sample as a whole. Participants indicated 81% were White, 13% were Black or African American, 1% were Asian, and 5% were Other (*N*= 100). No one identified as American Indian, Alaska Native, Native Hawaiian, or Pacific Islander. Five students identified as other.

Table 51

Race Distribution by Group

#	Question	Control	Group %	Experimental	Group %	Total
1	White	39	85%	42	78%	81
2	Black or African American	4	9%	9	17%	13
3	American Indian/Alaskan Native	0	0%	0	0%	0
4	Asian	1	2%	0	0%	1
5	Native Hawaiian/Pacific Islander	0	0%	0	0%	0
6	Other	2	4%	3	6%	5
Total		46	100%	54	100%	100

Hypothesis 3.3 assumes there is no significant difference in believability and satisfaction based on race and effects type for the control and experimental groups. Believability scores by

race were skewed because of the racial distribution of the sample. Results illustrated in Table 52 demonstrated those that identified as Black/African American reported the highest level of believability in both the control and experimental groups. However, it should be noted this demographic in the control group reported the highest level of believability (*M*= 3.8333), with both the control and experimental groups having standard deviations less than one. This group had the second most participants in the sample (*N*= 13), while White contained far more participants with 81. Asian and Other comprised 6% of the sample. Differences in believability scores for each race were minimal based on their assignment to either the control or experimental group.

Table 52

Mean Believability by Race and Group

Group	Race	Mean	Std. Deviation	*N*
Control	White	2.7778	0.77453	39
	Black/African American	2.7500	0.94771	4
	Asian	3.8333		1
	Other	3.5000	0.94281	2
	Total	2.8297	0.79465	46
Experimental	White	2.7143	0.87442	42
	Black/African American	3.3704	0.72062	9
	Other	3.2222	0.58531	3
	Total	2.8519	0.86673	54
Total	White	2.7449	0.82331	81
	Black/African American	3.1795	0.81212	13
	Asian	3.8333		1
	Other	3.3333	0.64550	5
	Total	2.8417	0.83026	100

Prior demographic variables did not have a statistically significant interactive effect on the dependent variables. However, the demographic variables themselves were significant in the context of a main effect on the dependent variable. However, as reported in Table 53, there was no statistically significant interaction between race and group in the two-way ANOVA test for believability. The hypothesis that race and group did not produce a significant difference is upheld.

Table 53

Two-Way ANOVA: Believability by Race and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Race	3.711	3	1.237	1.839	0.146
Group	0.063	1	0.063	0.093	0.761
Interaction	1.239	2	0.620	0.921	0.402
Error	62.568	93	0.673		
Total	875.750	100			

Note. Levene's= .553 (df= 6,93) *p*= .766

As in the case of believability, the results for satisfaction by race are skewed (see Table 54). Participants who identified as Black or African American exhibited the highest level of satisfaction in each group and overall. In the control group, those who identified as Other reported the second highest level of satisfaction and those who identified as White had the lowest mean satisfaction (*M*= 2.9915). For the experimental group, those who identified as White reported a higher level of satisfaction than Other (*M*= 3.0556, *M*= 2.7222). Overall within the sample, participants who identified as Black or African American had the highest satisfaction level (*M*= 3.6923), followed by those who selected White and Other.

Table 54

Mean Satisfaction by Race and Group

Group	Race	Mean	Std. Deviation	*N*
Control	White	2.9915	0.81196	39
	Black/African American	3.8333	0.63828	4
	Asian	4.5000		1
	Other	3.5000	1.88562	2
	Total	3.1196	0.87817	46
Experimental	White	3.1151	0.78389	42
	Black/African American	3.6296	0.74897	9
	Other	2.7222	0.83887	3
	Total	3.1790	0.79757	54
Total	White	3.0556	0.79495	81
	Black/African American	3.6923	0.69671	13
	Asian	4.5000		1
	Other	3.0333	1.19257	5
	Total	3.1517	0.83185	100

The ANOVA results for satisfaction illustrated in Table 55 yielded no statistically significant interactive effects between race, group, and satisfaction. This confirms hypothesis 3.3. Race as an independent variable exhibited a significant effect on satisfaction, whether for the control or treatment group, with no statistically significant interactive effect of the stimulus on satisfaction. This shows demographic independent variables can often have a main effect on believability or satisfaction.

Table 55

Two-Way ANOVA: Satisfaction by Race and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Race	6.091	3	2.030	3.100	0.031
Group	0.592	1	0.592	0.903	0.344
Interaction	1.108	2	0.554	0.846	0.432
Error	60.919	93	0.655		
Total	1061.806	100			

Note. Levene's= 1.35 (df= 6,93) *p*= .242

RQ3 Summary

None of the hypotheses proposed in RQ3 produced statistically significant interactive effects between demographics and group (control/non-CGI, experimental/CGI). Each hypothesis in RQ3 was accepted. No significant difference was found for believability or satisfaction based on age, gender, race, and the presence of CGI. As demonstrated in Table 56, statistical significance was found for several demographic variables as main effects on the dependent variables. However, these impacts in conjunction with CGI on believability and satisfaction are not statistically significant. While demographics can impact believability of and satisfaction with a video production, CGI has not demonstrated a clear connection to these impacts.

Table 56

Summary of Significant Demographic Main Effects

Demographic	Believability	Satisfaction	Interaction
Age	n.s.	Significant	n.s.
Gender	Significant	n.s.	n.s.
Race	n.s.	Significant	n.s.

RQ4: How Do Audience Video Consumption Habits Affect Believability and Satisfaction?

Research question four examines self-identified video consumption behavior and realism expectations by study participants. It explores the relationships between these variables and believability and satisfaction. Hypotheses H4.1 through H4.3 examine consumption frequency, audience size and preferred locations for watching video productions such as movies and TV shows. Hypothesis H4.4 addresses subjects' self-identified importance levels of literary elements such as cast, plot, special effects, and genre. The last hypothesis for this question, H4.5, measures subjects' preferences and desires for realism in video productions. Two-way ANOVA is used in the analysis of all hypotheses in RQ4. Levene's test for homogeneity of variance was used to test for assumed equal variance for each statistical test.

H4.1: There Is No Significant Difference in Believability and Satisfaction Based on a Subject's Prior Video Consumption Frequency and Type of Visual Effects.

Hypothesis 4.1 measured how often subjects viewed video productions. These results show a strong majority of them (71%) watch videos on a daily basis (see Table 57). This skew is one of the reasons this variable was not used to match groups for the experimental process. The next highest percentile (15%) watched videos 2-3 times a week. Slightly less (10%) watched videos 4-6 times a week. These two groups combined make up 25% of the sample. This suggests most participants (96%) watch videos a minimum of 2-3 times a week. This trend was proportional in both groups. One participant stated they never watch video productions.

Table 57

Video Consumption Frequency by Group

Frequency	Control	*N*	Experimental	*N*	Sample	*N*
Daily	70%	32	72%	39	71%	71
4-6 times a week	9%	4	11%	6	10%	10
2-3 times a week	15%	7	15%	8	15%	15
Once a week	4%	2	2%	1	3%	3
Never	2%	1	0%	0	1%	1
Total	100%	46	100%	54	100%	100

The high percentage of participants who frequently watch video productions presents a strong possibility participants are commonly exposed to CGI whether they realize it or not. The types of videos they commonly consume and details about those videos were not a particular interest in this study since the major foci were believability, satisfaction, and audience recall based on the presence of CGI in the stimulus. Because of the skew towards high consumption rates, no significant difference was anticipated regarding believability or satisfaction. Consumption frequency turned out not to be statistically significant as a main effect on believability (p= .087). As demonstrated in Table 58, there was no statistical significance found for interactive effects of video consumption frequency and CGI (p= .945), possibly because of the limited variability in consumption patterns. This result supports the hypothesis.

Table 58

Two-Way ANOVA: Believability by Consumption Frequency and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Consumption Frequency	5.765	4	1.441	2.101	0.087
Group	0.138	1	0.138	0.201	0.655
Interaction	0.258	3	0.086	0.125	0.945
Error	62.439	91	0.686		
Total	875.750	100			

Note. Levene's= 1.02 (df= 8,91) *p*= .425

Satisfaction also produced no statistical significance since each group reported neutral results on the five-point scale for satisfaction (*M*= 3.12, *M*= 3.18). These results are presented in Table 59. Consumption frequency was unlikely to have a noticeable impact on each group's satisfaction with the stimulus video because their consumption frequency did not necessarily tie into their satisfaction with the specific video used as the stimulus. The hypothesis predicting no significant difference in satisfaction was upheld.

Table 59

Two-Way ANOVA: Satisfaction by Consumption Frequency and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Consumption Frequency	0.001	1	0.001	0.002	0.964
Group	3.670	4	0.918	1.290	0.280
Interaction	0.071	3	0.024	0.033	0.992
Error	64.739	91	0.711		
Total	1061.806	100			

Note. Levene's= 1.37 (df= 8,91) *p*= .231

H4.2: There Is No Significant Difference in Believability and Satisfaction Based on the Preferred Audience Size for a Subject's Prior Video Experience and Type of Visual Effects.

The effects of audience size were gauged through two questions on the pretest survey that asked respondents to indicate their preferences for watching videos by themselves and whether watching videos alone was more engaging than in a group. This situation is especially relevant in today's video landscape, where binge-watching alone or in small groups is common and streaming video content is easily accessible for many college students. Further, the presentation of the stimulus through a personal computer mimicked this scenario by allowing participants a singular experience with the video despite being in a room with other participants. This influenced the hypothesis of no significant difference between believability and satisfaction based on preferred audience size and visual effects group.

The control group demonstrated a clear preference for watching videos alone (see Table 60). Over 57% indicated they prefer to watch videos alone, and 13% disagreed with the statement. The experimental group had slightly lower percentages, with 46% agreeing with the statement, and 26% reporting disagreement with the statement. This presented the possibility the control group could exhibit higher levels of believability and satisfaction than the experimental group based on their preference for watching videos alone. Out of the entire sample (N= 100), 51% agreed with the statement, 29% were neutral, and 20% disagreed. A majority of the sample preferred watching videos alone, and this might have played a role in their satisfaction and believability for both groups.

Table 60

Group and Sample Percentages that Prefer to Watch Videos Alone

Group	Strongly Agree (1)	Somewhat Agree (2)	Neither Agree Nor Disagree (3)	Somewhat Disagree (4)	Strongly Disagree (5)	*M*	*SD*
Control	11%	46%	30%	11%	2%	2.4783	.91261
Experimental	11%	35%	28%	24%	2%	2.7037	1.02109
Sample	11%	40%	29%	18%	2%	2.6000	.97442

Two-way ANOVA was used to analyze these results for potential interactive effects between groups regarding their preference for watching videos alone and the presence of CGI (see Table 61). As previously stated, it was assumed the lone-viewing experience of the experimental process combined with participants' preference for watching alone could produce significant results for believability. However, no statistically significant findings or interactive effects occurred (p= .638). Viewers' preference for watching alone and CGI do not display a direct effect on participants' believability of the stimulus video.

Table 61

Two-Way ANOVA: Believability by Audience Size Preference and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Audience Size Preference	2.676	4	0.669	0.941	0.444
Group	0.021	1	0.021	0.029	0.865
Interaction	1.808	4	0.452	0.636	0.638
Error	63.999	90	0.711		
Total	875.750	100			

Note. Levene's= .877 (df= 9,90) p= .549

It was more likely satisfaction could produce statistically significant results in the audience size preference test than believability since lone-viewing was reported to be more satisfying to many participants. However, according to Table 62, this scenario did not take place in conjunction with CGI (p= .880). Neither believability nor satisfaction produced statistically significant interactive effects based on CGI and audience size preference.

Table 62

Two-Way ANOVA: Satisfaction by Audience Size Preference and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Audience Size Preference	1.990	4	0.497	0.682	0.606
Group	0.448	1	0.448	0.615	0.435
Interaction	0.863	4	0.216	0.296	0.880
Error	65.648	90	0.729		
Total	1061.806	100			

Note. Levene's= .739 (df= 9,90) p= .672

Regarding engagement for watching alone or in a group, the control group indicated 52% agreement with the statement, "Watching a TV show or movie alone is more engaging than watching it in a group," (see Table 63). Twenty-six percent disagreed with the statement. Thirty-two percent of the experimental group agreed with this statement while 38% disagreed. It was again possible the experimental group could report lower levels of believability and satisfaction due to less affinity for watching videos alone, though CGI could negate some of this effect by potentially increasing believability and satisfaction. It was demonstrated that 41% of the sample finds watching video productions alone more engaging than in a group while 32% felt watching a video in a group is more engaging. This indicates a noticeable contrast from early cinema history prior to the television age when many people preferred and enjoyed the group

dynamics and experiences offered by watching films and other early video productions at a cinema (Hall & Neale, 2010). It could be assumed the viewing of the stimulus on an individual level could positively impact believability and satisfaction for approximately 40% of the sample based on their preference for watching videos alone.

Table 63

Group and Sample Percentages: Watching Videos Alone is More Engaging than in a Group

Group	Strongly Agree (1)	Somewhat Agree (2)	Neither Agree Nor Disagree (3)	Somewhat Disagree (4)	Strongly Disagree (5)	*M*	*SD*
Control	13%	39%	22%	24%	2%	2.6304	1.06163
Experimental	13%	19%	30%	30%	8%	3.0000	1.14924
Sample	13%	28%	27%	27%	5%	2.8300	1.11966

Two-way ANOVA was used to calculate results of interactive effects for believability based on perceived engagement when watching alone or in a group. According to results displayed in Table 64, no statistically significant interactive effects or main effects were found in this test. It can be assumed CGI had no clearly discernible effect on believability in conjunction with viewer engagement based on their preference for watching alone. This is likely due to the sample's stronger preference for watching alone.

Table 64

Two-Way ANOVA: Believability by Audience Size Engagement Preference and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Audience Engagement	4.044	4	1.011	1.468	0.218
Group	0.735	1	0.735	1.068	0.304
Interaction	3.188	4	0.797	1.158	0.335
Error	61.968	90	0.689		
Total	875.750	100			

Note. Levene's= 1.416 (df= 9,90) *p*= .193

Satisfaction toward the stimulus was also examined through a two-way ANOVA test for interactive effects on satisfaction from audience-size engagement and CGI (see Table 65). No statistically significant results were produced. This was possibly due to the experimental process because participants watched the stimulus alone at a personal desktop computer.

Table 65

Two-Way ANOVA: Satisfaction by Audience Size Engagement Preference and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Audience Size Preference	5.300	4	1.325	1.920	0.114
Group	0.017	1	0.017	0.025	0.875
Interaction	0.389	4	0.097	0.141	0.967
Error	62.107	90	0.690		
Total	1061.806	100			

Note. Levene's= .892 (df= 9,90) *p*= .535

A composite index for these two questions was created to establish any potential significance between CGI, audience size preference, and group believability and satisfaction scores (see Table 66). Based on these scores, the control group exhibited a slightly greater

preference for watching videos alone based on these two audience-size questions (*M*= 2.5543). The experimental group indicated less agreement with the idea that watching videos alone is preferable and more engaging (*M*= 2.8519), albeit with a slightly larger standard deviation than the control group (*SD*= 0.95478).

Table 66

Composite Scores: Preference for Watching Videos Alone

Group	Mean	*N*	Std. Deviation	Believability Composite	Satisfaction Composite
Control	2.5543	46	0.83817	2.8297	3.1196
Experimental	2.8519	54	0.95478	2.8519	3.1790
Total	2.7150	100	0.91081	2.8417	3.1517

Two-way ANOVA was used to analyze audience size preference's impact on believability in conjunction with the presence or lack of CGI (see Table 67). No significant difference was found for believability using the audience preference composite. Thus hypothesis 4.2 is accepted. Two possible scenarios explain this result. First, individuals may prefer to watch videos alone and this does not increase believability. The second possible explanation is despite the fact participants watched the stimulus video in a solo manner, the fact that other participants were in the room may have had an impact on their interpretations of watching videos alone.

Table 67

Two-Way ANOVA: Believability by Audience Composite and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Audience Composite	5.529	8	0.691	0.951	0.480
Group	0.138	1	0.138	0.190	0.664
Interaction	2.773	7	0.396	0.545	0.798
Error	60.303	83	0.727		
Total	875.750	100			

Note. Levene's= 1.54 (df= 16,83) *p*= .105

Satisfaction was tested using the same approach. These results are presented below in Table 68. No statistically significant results were produced utilizing the audience composite. Hypothesis 4.2 is accepted for satisfaction. Again, this situation may have been affected by the dual dynamic of the testing site where participants watched the stimulus video on a personal computer but were physically near other people in the room when they watched the video.

Table 68

Two-Way ANOVA: Satisfaction by Audience Composite and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Audience Composite	4.159	8	0.520	0.691	0.698
Group	0.028	1	0.028	0.037	0.847
Interaction	1.718	7	0.245	0.326	0.940
Error	62.453	83	0.752		
Total	1061.806	100			

Note. Levene's= 1.10 (df= 16,83) *p*= .368

H4.3: There Is No Significant Difference in Believability and Satisfaction Based on the Location Where a Subject Prefers to Watch Videos and Type of Visual Effects.

It was hypothesized there would be no significant difference in believability and satisfaction based on location and type of visual effects. In order to explore differences in audience experiences based on viewing location, participants had the opportunity to rate their engagement levels when consuming videos in a cinema. These results create a bit of a paradox in audience preferences for video consumption location and audience size. Respondents indicated a clear preference for watching videos, both TV shows and movies, by themselves. They also indicated watching alone was more engaging than watching in a group. In response to the statement, "Watching a movie in a cinema is more engaging than at home," each group overwhelmingly indicated watching movies in a cinema is more engaging. This presents the possibility respondents focused more on the TV show aspect of these questions when completing the survey, or they may have answered the movie in a cinema question from a more third person perspective.

The control group reported 74% agreement with the proffered statement and the experimental group reported 73% agreement (see Table 69). A majority in each group felt watching a movie at a cinema is more engaging than watching at home, which is somewhat contradictory to their stated preference for watching alone. Out of the entire sample (N=100), 24% disagreed with the statement, suggesting most participants felt audience size plays some role in their engagement with a video, at least when referring specifically to movies. It is difficult to gauge this for TV shows since watching these videos tends to be done individually or in small groups.

Table 69

Group and Sample Percentages: Watching a Movie in a Cinema is More Engaging than at Home

Group	Strongly Agree	Somewhat Agree	Neither Agree Nor Disagree	Somewhat Disagree	Strongly Disagree	Total
Control	37%	37%	19%	7%	0%	100%
Experimental	28%	45%	10%	17%	0%	100%
Sample	32%	41%	15%	12%	0%	100%

These results were analyzed using two-way ANOVA to ascertain if there were statistically significant interactive effects on believability and satisfaction based on CGI and cinema engagement perception. As illustrated in Table 70, there was no statistical significance (p= .551) for interactive or main effects from these independent variables on believability. The hypothesis regarding believability, location and visual effects group is upheld. This is likely indicative of participants' indication of higher engagement at a cinema. The experimental process took place in a different viewing environment.

Table 70

Two-Way ANOVA: Believability by Cinema Engagement and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Cinema Engagement	3.568	3	1.189	1.773	0.158
Group	0.265	1	0.265	0.395	0.531
Interaction	1.419	3	0.473	0.705	0.551
Error	61.703	92	0.671		
Total	875.750	100			

Note. Levene's= .702 (df= 7,92) p= .671

Similarly to believability, no statistically significant results occurred for satisfaction (see Table 71). The hypothesis is supported for satisfaction. This was again likely due to the

experimental environment and how it differed from a theatrical setting. It should be noted 17% of the experimental group did not agree with the idea that watching a movie at a cinema is more engaging than at home (see Table 69). While most participants agreed watching a movie at a cinema is more engaging than at home, which can often imply watching a video alone, no significant interactive effects were found to influence satisfaction.

Table 71

Two-Way ANOVA: Satisfaction by Cinema Engagement and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Cinema Engagement	2.418	3	0.806	1.196	0.316
Group	0.407	1	0.407	0.604	0.439
Interaction	3.142	3	1.047	1.554	0.206
Error	62.015	92	0.674		
Total	1061.806	100			

Note. Levene's= .753 (df= 7,92) *p*= .628

H4.4: There Is No Significant Difference in Believability and Satisfaction Based on a Subject's Preference for Literary Elements and Type of Visual Effects.

Hypothesis 4.4 predicted no significant difference in believability and satisfaction between groups and their literary element ratings. Participants were asked to rate the importance of various literary elements by selecting one of four options as the most important literary element of a good video production. A particular point of interest was how many subjects would select special effects for this question because special effects that include CGI are rarely seen as a primary indicator of a good video (Chesebro & Bertelsen, 1996).

Literary elements were defined in this study as cast, plot, special effects, and topic/genre. Respondents were asked to indicate which video literary element they felt was the most

important to a good TV show or movie (see Table 72). Plot was chosen as the most important component with 65% of the sample indicating this is the most important aspect. Topic/genre was second with 20%, and cast tallied 15%. Somewhat surprisingly, no one chose special effects as the most important literary element of a video. The strongest evidence to emerge here is college-age video consumers strongly indicate plot is the most important element of a production. Further, this suggests college-age audiences tend to be less concerned with special effects than plot, genre, or cast.

Table 72

Group and Sample Percentages: Most Important Literary Elements

Group	Cast	Plot	Special Effects	Topic/Genre
Control	15%	59%	0%	26%
Experimental	15%	70%	0%	15%
Sample	15%	65%	0%	20%

Two-way ANOVA was used to examine significant interactions between literary element importance and CGI on believability and satisfaction. These results are presented in Table 73. No statistical significance was found for main effects or interactive effects, which upholds the hypothesis. This coincides with the sample indicating a lack of importance on special effects.

Table 73

Two-Way ANOVA: Believability by Literary Element Selection and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Literary Element	0.166	2	0.083	0.115	0.891
Group	0.012	1	0.012	0.017	0.898
Interaction	0.108	2	0.054	0.074	0.928
Error	67.961	94	0.723		
Total	875.750	100			

Note. Levene's= .340 (df= 5,94) *p*= .888

Satisfaction was also tested in the same manner. These results are presented in Table 74. No statistically significant main effects or interactive effects were observed. The hypothesis regarding satisfaction is upheld. These results indicate the sample was not particularly receptive to the plot of the stimulus video despite its popularity amongst more traditional *Star Trek* fans and its plot similarity to *Moby Dick*, a classic of American literature.

Table 74

Two-Way ANOVA: Satisfaction by Literary Element Selection and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Literary Element	1.172	2	0.586	0.836	0.437
Group	0.102	1	0.102	0.146	0.703
Interaction	1.421	2	0.711	1.014	0.367
Error	65.883	94	0.701		
Total	1061.806	100			

Note. Levene's= .857 (df= 5,94) *p*= .513

H4.5: There Is No Significant Difference in Believability and Satisfaction Based on a Subject's Preference for Realism and Type of Visual Effects.

Hypothesis 4.5 assumes there is no significant difference in believability and satisfaction based on group and realism preference. An examination of participants' preferences for realism in three other literary elements of video productions (characters, scenery, and special effects) was conducted to provide insight into their expectations of realism in a video. The survey asked participants to rate importance levels for each of the three elements on a 5-point scale from not at all important to extremely important, with three being the midpoint on the scale.

As illustrated in Table 75, the control group placed its highest emphasis on realistic characters, with 78% of that group stating realistic characters were at least very important. The control group further indicated 71% of them saw realistic scenery as at least very important. Further, 61% rated realistic special effects as at least very important. This correlates to results from H4.4 that indicated special effects were not seen as crucial to the quality of a video.

The experimental group reported a slightly lower emphasis on realistic characters than the control (76%). However, more selected very important in the experimental group and more selected extremely important in the control group. Similarly to the control, 74% of the experimental group rated realistic scenery as at least very important. The experimental group indicated a higher level of importance for realistic special effects, with 69% rating this category as at least very important. It is likely this group would be more satisfied with the potentially increased realism of the CGI effects in the stimulus.

The sample as a whole placed a high level of importance on realism for characters, scenery, and special effects. Out of the entire sample, 77% stated realistic characters were at least very important, 73% said the same about scenery, and 65% indicated realistic special

effects were at least very important. This suggests several scenarios. It is possible modern video audiences are somewhat desensitized to special effects in comparison, or audiences simply are more concerned about characters and plot than visual effects when they watch videos.

Table 75

Group and Sample Percentages: Realism Element Importance in Videos

Realistic Characters						
Group	Extremely Important	Very Important	Moderately Important	Slightly Important	Not At All Important	Total
Control	41%	37%	22%	0%	0%	100%
Experimental	28%	48%	20%	2%	2%	100%
Sample	34%	43%	21%	1%	1%	100%
Realistic Scenery						
Group	Extremely Important	Very Important	Moderately Important	Slightly Important	Not At All Important	Total
Control	30%	41%	20%	7%	2%	100%
Experimental	33%	41%	17%	6%	4%	100%
Sample	32%	41%	18%	6%	3%	100%
Realistic Special Effects						
Group	Extremely Important	Very Important	Moderately Important	Slightly Important	Not At All Important	Total
Control	22%	39%	26%	13%	0%	100%
Experimental	28%	41%	20%	7%	4%	100%
Sample	25%	40%	23%	10%	2%	100%

The means and standard deviations for each group are presented in Table 76. The results for each group were very similar for each of the three realism elements of video productions. The control and experimental group means for each category were very close in each category ($M_{diff} < .22$). The control group expressed a higher level of importance on realistic scenery and

special effects than the control group while the control group reported higher importance for realistic characters. Each group and the sample as a whole placed least emphasis on realistic special effects.

Table 76

Realism Elements: Group Means and Standard Deviations

Group		Realistic Characters	Realistic Scenery	Realistic Special Effects
Control	Mean	4.1957	3.9130	3.6957
	N	46	46	46
	Std. Deviation	0.77802	0.98491	0.96309
Experimental	Mean	3.9815	3.9444	3.8148
	N	54	54	54
	Std. Deviation	0.85761	1.03553	1.04744
Total	Mean	4.0800	3.9300	3.7600
	N	100	100	100
	Std. Deviation	0.82487	1.00760	1.00624

Two-way ANOVA was used to analyze each realism question in conjunction with the stimulus and their resulting impacts on believability and satisfaction. No statistical significance was found for main effects or interactive effects regarding realistic characters, CGI, and believability (see Table 77). It should be noted that all characters in the video were humans that were slightly modified with moderate makeup and costumes.

Table 77

Two-Way ANOVA: Believability by Realistic Characters and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Realistic Characters	0.736	4	0.184	0.251	0.909
Group	0.022	1	0.022	0.031	0.862
Interaction	0.020	2	0.010	0.014	0.986
Error	67.466	92	0.733		
Total	875.750	100			

Note. Levene's= 1.083 (df= 7,92) *p*= .380

Satisfaction was yielded similar results regarding realistic characters and CGI (see Table 78). Although realistic characters were the most important of the three categories for the sample, the video's science fiction genre possibly reduced the overall satisfaction of the sample. No statistical significance was found for the main effects or interactive effects in this scenario.

Table 78

Two-Way ANOVA: Satisfaction by Realistic Characters and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Realistic Characters	1.387	4	0.347	0.476	0.753
Group	0.041	1	0.041	0.057	0.813
Interaction	0.045	2	0.022	0.031	0.970
Error	67.012	92	0.728		
Total	1061.806	100			

Note. Levene's= 1.055 (df= 7,92) *p*= .399

Scenery in the video consisted of live-set scenes within the starships and artificial exterior settings created through CGI or traditional effects. The two-way ANOVA for this

category did not yield statistically significant results (p= .506). No significant interactive effects occurred in this test (see table 79). There were also no main effects observed.

Table 79

Two-Way ANOVA: Believability by Realistic Scenery and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Realistic Scenery	3.380	4	0.845	1.228	0.305
Group	0.033	1	0.033	0.047	0.828
Interaction	2.300	4	0.575	0.836	0.506
Error	61.934	90	0.688		
Total	875.750	100			

Note. Levene's= 1.117 (df= 9,90) p= .359

The two-way ANOVA results for satisfaction and its relation to realistic scenery and CGI are presented in Table 80. No statistically significant main effects or interactive effects were produced (p= .439). There was a slightly higher interactive effect overall on satisfaction than believability but it was not statistically significant. This was reflective of realistic scenery being labeled as less important than realistic characters.

Table 80

Two-Way ANOVA: Satisfaction by Realistic Scenery and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Realistic Scenery	1.719	4	0.430	0.598	0.665
Group	1.417	1	1.417	1.971	0.164
Interaction	2.731	4	0.683	0.950	0.439
Error	64.677	90	0.719		
Total	1061.806	100			

Note. Levene's= .633 (df= 9,90) p= .766

Realistic special effects were the least important of the three categories according to participants. As demonstrated in Table 81, realistic special effects were the furthest of the three categories from producing statistically significant interactive effects on believability. Neither CGI nor realistic special effects was significant as a main effect on believability.

Table 81

Two-Way ANOVA: Believability by Realistic Special Effects and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Special Effects	2.002	4	0.500	0.709	0.588
Group	0.263	1	0.263	0.373	0.543
Interaction	1.762	3	0.587	0.832	0.480
Error	64.256	91	0.706		
Total	875.750	100			

Note. Levene's= .870 (df= 8,91) p= .544

The outcomes for satisfaction yielded interesting results (see Table 82). There were no statistically significant interactive effects (p= .167). It should be noted the realistic special effects variable was close to significance as a main effect on satisfaction (p= .093). While the sample mostly rated realistic special effects as the least important of the three realism variables (see Table 75) and indicated it was the least important literary element in a good video, these results present the possibility that realistic special effects have a greater impact on an audience's satisfaction than they may realize. The experimental group reported a higher emphasis on the importance of realistic special effects than the control group. This helps corroborate the slightly higher satisfaction composite for the experimental group presented in Table 75. While not conclusive based on the collected data, it is possible realistic special effects enhanced by CGI may impact satisfaction more than the audience expects.

Table 82

Two-Way ANOVA: Satisfaction by Realistic Special Effects and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Special Effects	5.483	4	1.371	2.058	0.093
Group	0.451	1	0.451	0.676	0.413
Interaction	3.451	3	1.150	1.727	0.167
Error	60.625	91	0.666		
Total	1061.806	100			

Note. Levene's= 1.500 (df= 8,91) *p*= .168

RQ4 Summary

Two-way ANOVA was used to analyze the composite of respondents' realism scores in conjunction with the stimulus and the resulting impacts on believability and satisfaction. The results for the realism composite were not statistically significant for believability (see Table 83). Hypothesis 4.5 is accepted for believability. Although participants indicated a strong desire for realism in videos, there was no significant difference in believability between those seeing traditional or CGI effects.

Table 83

Two-Way ANOVA: Believability by Realism Composite and Group

Dependent Variable: Believability					
Source of Variation	SS	df	MS	F	Sig.
Realism Composite	7.001	9	0.778	1.149	0.339
Group	0.097	1	0.097	0.144	0.706
Interaction	6.395	8	0.799	1.180	0.321
Error	54.852	81	0.677		
Total	875.750	100			

Note. Levene's= 1.284 (df= 18,81) *p*= .220

The results for satisfaction similarly produced no significant main effects or interactive effects on satisfaction based on realism preferences and the presence or absence of CGI (see Table 84). While realistic special effects did produce a significant main effect on satisfaction as demonstrated in Table 82, the realism preference composite as a whole did not exhibit significant effects on satisfaction. The hypothesis is upheld for satisfaction. These results further support the observations thus far in this study that CGI has not demonstrated a significant, positive impact on either believability or satisfaction.

Table 84

Two-Way ANOVA: Satisfaction by Realism Composite and Group

Dependent Variable: Satisfaction					
Source of Variation	SS	df	MS	F	Sig.
Realism Composite	5.314	9	0.590	0.856	0.568
Group	0.462	1	0.462	0.670	0.416
Interaction	7.362	8	0.920	1.334	0.239
Error	55.899	81	0.690		
Total	1061.806	100			

Note. Levene's= 1.961 (df= 18,81) p= .022* (U= 1208, p= .812)

All hypotheses from RQ4 were accepted. None of the hypotheses proposed in RQ4 produced statistically significant interactive effects between video consumption habits and preferences and the presence or absence of CGI (see Table 85). Audience video consumption habits and preferences, along with their realism preferences, do not directly impact believability or satisfaction. However, as discussed in section H4.5, realistic special effects did exhibit a nearly significant impact on satisfaction.

Table 85

RQ4 Hypotheses Summary

Hypothesis	Significance
H4.1: There is no significant difference in believability and satisfaction based on a subject's prior video consumption frequency.	n.s.
H4.2: There is no significant difference in believability and satisfaction based on the preferred audience size for a subject's prior video experience.	n.s.
H4.3: There is no significant difference in believability and satisfaction based on the location where a subject prefers to watch videos.	n.s.
H4.4: There is no significant difference in believability and satisfaction based on a subject's preference for literary elements.	n.s.
H4.5: There is no significant difference in believability and satisfaction based on a subject's preference for realism.	n.s.

RQ5: Do CGI Enhancements Increase Learning Retention for the Audience?

Research question 5 applies Dale's Cone of Experience to the use of CGI in video productions to explore whether CGI enhancements increase learning ability and information retention for the audience. These questions address specific literary elements of the stimulus video such as colors of machines, plot outcomes, characters and their actions, and other narrative details from the *Doomsday Machine* episode. Table 86 provides the questions from the post-test survey and the correct answer for each.

Table 86

Post-Test Survey and Correct Answers

#	Question	1	2	3	4	Correct Answer
1	The commodore's last name was	Decker	Spock	Kirk	McCoy	1
2	The *USS Enterprise* and the *USS Constellation* were similar-looking ships.	True	False	-	-	1
3	Who primarily advised against attacking the *Doomsday Machine*?	McCoy	Decker	Kirk	Spock	4
4	The *USS Enterprise* was able to defeat the *Doomsday Machine* on its own.	True	False	-	-	2
5	Kirk was the captain of which ship?	USS Nimitz	USS Odyssey	USS Enterprise	USS Constellation	3
6	What happened to the *Doomsday Machine* when it was defeated?	It disintegrated	It shut down	It exploded	It retreated	2

One of the potential threats to the use of this episode as the stimulus was if a significant portion of the sample had already viewed this it. However, this concern turned out to be moot because 6% of the sample indicated they had previously watched this particular video production. One participant in the control group indicated they had already seen the episode and five in the experimental group indicated they had already seen it. These participants' results exhibited no significant effect on their group's ratings and responses (see Table 2).

The exterior action sequences in the newer video were the only sequences that were manipulated by CGI (see Appendix A). The CGI transformations were applied to vehicles (starships, *Doomsday Machine*) and settings in these sequences. As stated earlier in Chapter 3, no narrative or significant plot details were altered by the addition of CGI in the rereleased production. Based on studies discussed in Chapter 2, it was possible the experimental group would perform slightly higher in audience recall because of these CGI enhancements that have the potential to induce higher perceived realism.

H5.1: CGI Enhancements Increase Audience Recall More Than Traditional Effects.

The following analysis examines audience recall of specific elements of the video production and tests whether CGI enhancements used in the 2006 rerelease of the *Doomsday Machine* episode caused a significant increase in learning for the audience. Based on previous results earlier in Chapter 4, it was hypothesized CGI would moderately increase audience recall of narrative details. Each question is examined individually to compare results from each group. Overall performance on this quiz portion of the instrument is then analyzed using independent samples *t-tests*.

Question 1: The Commodore's Last Name Was…

The first question asked participants to recall the name of the commodore, one of the main characters in the episode. This question was asked because the commodore is arguably the main character in the episode. His personal struggle in the narrative is more emphasized than traditional main characters such as Kirk, Spock, and McCoy. He originally commanded the *Constellation* and took over the *Enterprise* after being rescued from his damaged ship. As illustrated in Table 87, the control group outperformed the experimental group on this question

with a correct response rate of 83% within this group. The experimental group produced a correct response rate of 76%.

Table 87

Control and Experimental Group Performance: Question 1

Answer	Control	Group %	Experimental	Group %	Total (Sample)
1*	38	83%	41	76%	79%
2	4	9%	7	13%	11%
3	2	4%	4	7%	6%
4	2	4%	2	4%	4%
Total	46	100%	54	100%	100%

Question 2: The *USS Enterprise* and the *USS Constellation* Were Similar-Looking Ships.

This question gave participants a true or false option to answer the question. The two main ships shown most often in the episode were nearly identical. It could be argued one could not tell them apart without seeing the damage the *Doomsday Machine* inflicted on the *Constellation*. This question offered viewers a scenario where three ships could be considered. The *Enterprise* and the *Constellation* were basically the same, while the third ship was a transport vehicle that was markedly different in appearance. The results for each group's performance on this question are presented in Table 88. The control group barely outperformed the experimental group on this question with a correct response rate of 83%. The experimental group scored 81% correct.

Table 88

Control and Experimental Group Performance: Question 2

Answer	Control	Group %	Experimental	Group %	Total (Sample)
1*	38	83%	44	81%	82%
2	8	17%	10	19%	18%
Total	46	100%	54	100%	100%

Question 3: Who Primarily Advised Against Attacking the *Doomsday Machine*?

The third question asked participants to identify which character primarily advised Commodore Decker against attacking the *Doomsday Machine*. Spock repeatedly indicated to Decker that attacking the *Doomsday Machine* was ill-advised and would likely prove catastrophic for the crew of the *Enterprise*. While other characters' apprehension toward attacking was discernible through their facial expressions and actions, Spock was the only character to specifically argue against the attack. The experimental group performed slightly better than the control group on this question with 65% answering correctly (see Table 89). The control group had 63% answer correctly.

Table 89

Control and Experimental Group Performance: Question 3

Answer	Control	Group %	Experimental	Group %	Total (Sample)
1	3	7%	6	11%	9%
2	9	20%	7	13%	16%
3	5	11%	6	11%	11%
4*	29	63%	35	65%	64%
Total	46	100%	54	100%	100%

Question 4: The *USS Enterprise* Was Able to Defeat the *Doomsday Machine* on Its Own.

The fourth question was another true or false question that asked whether the *Enterprise* was able to defeat the *Doomsday Machine* by itself. Decker tried to destroy the machine by using the *Enterprise's* weaponry but was unable to do any harm to his enemy. The *Doomsday Machine* was not defeated until Captain Kirk piloted the disabled *Constellation* into the heart of the *Doomsday Machine*. As illustrated in Table 90, the experimental group again performed better than the control group with 85% correct compared to 80%.

Table 90

Control and Experimental Group Performance: Question 4

Answer	Control	Group %	Experimental	Group %	Total (Sample)
1	9	20%	8	15%	17%
2*	37	80%	46	85%	83%
Total	46	100%	54	100%	100%

Question 5: Kirk Was the Captain of Which Ship?

The fifth question asked which ship Kirk captained. This question could have been somewhat confusing to respondents since Kirk was the captain of the *Enterprise* but spent much of the episode on the *Constellation*. Aside from the *Constellation* and the *Enterprise*, the quiz included *Odyssey*, another *Star Trek* ship, and the *USS Nimitz*, a real American aircraft carrier. The control group scored better on this question with 85% answering correctly (see Table 91). The experimental group had 81% choose the *Enterprise*.

Table 91

Control and Experimental Group Performance: Question 5

Answer	Control	Group %	Experimental	Group %	Total (Sample)
1	0	0%	0	0%	0%
2	1	2%	1	2%	2%
3*	39	85%	44	81%	83%
4	6	13%	9	17%	15%
Total	46	100%	54	100%	100%

Question 6: What Happened to the *Doomsday Machine* When It Was Defeated?

The final quiz question on the post-test survey asked participants to identify the fate of the *Doomsday Machine*. Once Kirk figured out how to defeat the *Doomsday Machine*, he piloted the disabled *Constellation* into its center, thereby disabling it. The *Doomsday Machine* basically shut down and floated off into the distance. The control group scored markedly better on this question (see Table 92). The control group scored 11% higher than the experimental group with 83% of that group choosing the correct answer.

Table 92

Control and Experimental Group Performance: Question 6

Answer	Control	Group %	Experimental	Group %	Total (Sample)
1	3	7%	4	7%	7%
2*	38	83%	39	72%	77%
3	4	9%	7	13%	11%
4	1	2%	4	7%	5%
Total	46	100%	54	100%	100%

Quiz Question Summary

The control group surprisingly scored higher than the experimental group on four of the six quiz questions (see Table 93). Most notably, the control group scored more than 5% better than the experimental group on questions one and six. Each group scored lowest on question three with both groups scoring less than or equal to 65%. The control group scored greater than or equal to 80% on five of the six questions while the experimental group achieved 80% or greater on three questions. The fact that the groups did not have an equal number of participants could possibly have contributed to these results even though both groups were similar in size ($N_{diff} = 8$).

Table 93

Group Performance: Individual Quiz Question Summary

Question	Control % Correct	Experimental % Correct	Group with High Score
The commodore's last name was…	83%	76%	Control
The *USS Enterprise* and the *USS Constellation* were similar-looking ships.	83%	81%	Control
Who primarily advised against attacking the *Doomsday Machine*?	63%	65%	Experimental
The *USS Enterprise* was able to defeat the *Doomsday Machine* on its own.	80%	85%	Experimental
Kirk was the captain of which ship?	85%	81%	Control
What happened to the *Doomsday Machine* when it was defeated?	83%	72%	Control

Cumulative Group Learning Performance

Each respondent's overall score was tallied based on their answers to the six quiz questions previously discussed. The average scores were 79% for the control group and 77% for

the experimental group. This indicates a slightly lower average performance on the quiz portion of the post-test survey for the experimental group (see Table 94). Each group exhibited a high standard deviation because there were only six quiz questions.

Table 94

Control and Experimental Group Learning Retention: Descriptive Statistics

Group	Mean	Std. Deviation	Std. Error Mean
Control	79.2826	24.40552	3.5984
Experimental	76.8519	26.2027	3.56574

An independent samples *t-test* was run to identify a potential significant difference between the control and experimental groups regarding their performance on the quiz (see Table 95). However, no significant difference was found (p= .634). Therefore, Hypothesis 5.1, CGI enhancements increase audience recall more than traditional effects, is rejected. Computer-generated imagery, although having the potential to minimally increase believability and satisfaction, did not increase learning retention. This is possibly due to circumstances such as genre and potential discontinuity between more refined computer-enhanced imagery in external shots and more traditional or rudimentary costumes, sets, and props present in interior shots.

Table 95

T-Test: *Control and Experimental Group Learning Retention*

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
0.477	98	0.634	2.43076	5.09498

Note. Levene's= 1.757 (df= 98) p= .188

Conclusion

This quasi-experiment examined several facets and impacts of CGI on a college-age audience. Based on the theoretical structure of this study and relevant literature discussed in Chapter 2, it was hypothesized CGI would increase believability, satisfaction, and audience recall. The stimulus used to examine these variables presented participants with very similar video consumption experiences with minor alterations to the visual content rather than drastic changes to characters, plot, or narrative. Based on the data, CGI was not found to have a significant impact on these dependent variables.

As discussed in the literature review in Chapter 3, audience recall was of particular interest in this study and the impacts of CGI are somewhat inconsistent with the results in believability and satisfaction. While believability and satisfaction were slightly increased due to heightened realism, audience recall exhibited the opposite effect. The control group outperformed the experimental group on several of the post-test quiz items. The difference in each group's scores on several questions was considerable but no statistical significance was found between their overall performances on the quiz. This leads to several conclusions, observations, and recommendations that will be examined further in Chapter 5.

CHAPTER 5

DISCUSSION AND RECOMMENDATIONS

Introduction

Computer-generated imagery is an increasingly common video production element that has the potential to alter both the visual content of videos and the effects those videos have on the audience. As seen in the literature review in Chapter 2, technological innovations are often rapidly accepted and utilized in American society. However, we do not always apply due critical diligence in our cultural assessments, examinations, and critiques of these innovations (McLuhan, 1994). Video productions such as TV shows and movies can have significant macro-level sociocultural impacts as well as more concentrated impacts on audiences and individuals due to the power of computer alterations and modifications. CGI has become increasingly synonymous with blockbuster movies and hit TV shows throughout recent history. This situation demands research and exploration into the impacts of this production aesthetic, especially since it is being applied to culturally iconic video productions such as *Star Trek* and *Star Wars* that have historical significance in American society.

Research on CGI specifically is fairly limited in contemporary academic literature. To examine its impacts on believability, satisfaction, and learning (audience recall), this study used a quasi-experimental approach to gauge audience responses to moderate and relatively limited CGI usage. *The Doomsday Machine* episode from the original *Star Trek* series was used as the stimulus video because it had moderate CGI applications that did not dramatically alter the visual composition or the narrative flow of the video. As discussed in Chapter 3, the convenience sample for this study was composed entirely of college-age students at a mid-size Pennsylvania university (N=100). Participants completed an electronic pretest survey that measured their

video consumption habits and their self-indicated levels of importance on various literary elements of video productions. Then they watched the same video production that either contained no CGI (control group, *N*= 46) or moderate levels of CGI (experimental group, *N*= 54) applied solely to exterior action sequences. No characters or significant events were modified through CGI. Participants completed a post-test paper survey that asked them to gauge their perceived levels of believability and satisfaction, and tested their ability to recall basic plot and production details.

Dale's Cone of Experience was used as the primary theoretical foundation of this study because it juxtaposes an easily quantifiable measure, learning, with believability and satisfaction (Dale, 1946). Several broader sociopolitical theories, such as critical theory and mass society theory, were examined to demonstrate and explore the cultural impacts of video productions in American society. However, these theories focus more on broad cultural behaviors across a given society rather than isolated reactions to a specific, limited element of video such as CGI. Literary theories and paradigms, including faerie and suspension of disbelief were subsequently considered. While these deal more specifically with direct impacts of CGI, they deal with rather abstract notions of believability and do not easily lend themselves to gauging or measuring specific audience reactions to satisfaction and learning. Mori's (2012) uncanny valley was explored as a more modern explanation of human-media interaction but can be difficult to apply to satisfaction because it functions on the premise of fear. It can be difficult to distinguish the many different effects fear and emotional derivatives of fear can have on satisfaction (Aurîer & Evrard, 1994). Further, the uncanny valley does not examine the roles of realism, believability, and satisfaction on learning. Dale's Cone of Experience thus served as the best foundational theory to examine the dynamic between these components of entertainment and how they affect

learning that takes place on a subconscious level when watching a video for entertainment purposes.

Discussion

Research Question 1: Believability

The first research question examined whether the audience saw traditional effects or CGI as more believable. The hypothesis was they would see CGI as more believable because of CGI technological capabilities making abstract settings (space) and vehicles (starships) appear more accurate and lifelike than older effects and production methods that included puppets, models, and other more traditional cinematic modalities. Prior studies have indicated virtual reality, a recognized goal in video production that is better achieved through CGI, creates a more realized and purposeful viewing experience that is substantiated for the audience by a lack of abstraction in the created media (C. E. Baukal et al., 2013). Essentially, the more accurate and lifelike visual representations are in a video production, the closer they are to accepted reality for the audience. Further, Dale's Cone suggests this reality is a critical component of learning that can either be enhanced or reduced by the perceived realness of media content. It was hypothesized that CGI alterations in the *Doomsday Machine* episode would produce higher levels of perceived believability for the audience and, based on Dale's Cone of Experience, this would induce higher learning proficiency on the post-test quiz.

Six questions from a pre-established instrument (Fornerino et al., 2008) were used to measure believability that was influenced by CGI. The control group reported a believability index score of M= 2.83 while the experimental group reported a score of M= 2.85 on a 5-point scale. No statistical significance was found for CGI on this dependent variable

(p= .437). The standard deviation for the control group was 0.79465 and was 0.86673 for the experimental group. This indicates a similar and high degree of variability on a five-point scale and that differential impacts occurred. This high degree of variability for both groups suggests further research is needed to explain these effects.

Results from this study indicated the CGI group reported higher levels of believability on four of the six questions from the post-test survey that addressed believability specifically. These questions examine believability by emphasizing the isolating nature of constructed realism in video consumption. This sense of believability has been used to explain audience reactions and interpretations of all aspects of video composition including setting, plot, and characters (Claydon, April, 2005). An independent samples *t-test* was used to analyze this dependent variable based on CGI or lack thereof as the independent variable. No significant difference between CGI and non-CGI was found in this study. This result argues against some qualitative studies that promote and present CGI as a distinctly more realistic alternative to traditional production methods (Whissel, 2014), at least in science fiction productions.

Contrary to much existing literature, results from this study show CGI does not always produce a significant or positive effect on believability. However, the degree to which believability is heightened by CGI depends on a multitude of variables including genre, accuracy of CGI renditions of characters and settings, and an effective and engaging storyline. While CGI may increase believability in certain scenarios, it does not appear to solely impact believability in isolation from other literary elements and distinctions of a video production. It is possible older videos such as the stimulus that originally utilized more traditional production and cinematic methods may be seen as less believable when CGI is used to enhance them due to a disconnect between visual and literary elements of the video such as characters, scenery, and vehicles.

Essentially, if the audience expects to observe imagery they predispose to be somewhat unbelievable or fantastic, such as the costumes or vehicles in *Star Trek*, that interpretation becomes the audience's expected believability.

These scenarios may help account for the lack of support for Dale's Cone regarding believability. According to Dwyer (2010), animation does not noticeably improve learning outcomes over carefully designed and strategically deployed static visualizations in educational videos (p. 435). However, Dwyer does not account for audience expectations and how they might impact believability, satisfaction and learning. It should be noted the *Star Trek* stimulus did not contain a large amount of CGI. This makes it difficult to ascertain whether Dwyer's findings were congruous with the results of this study regarding Dale's Cone. It is possible CGI in *The Doomsday Machine* was not obvious enough to the audience to make a big impact.

Further, the college demographic used for the sample does not typically exhibit understanding at the formal operational stage (Arendale et al., 1993). The abstract nature of science fiction combined with this psychological tendency quite possibly inhibited the sample audience's ability to learn plot details in the utilized video format. What can be discerned from existing literature and from this study is further research is needed to better understand, establish and validate Dale's Cone for both educational and instruction purposes.

How CGI is used and applied to various literary components of a video production may be another dimension affecting believability. Heightened visual believability created by CGI in very specific circumstances in this scenario, such as strict application of CGI to exterior shots, may subvert the producers' overall intended believability for the audience. It is highly plausible an audience may struggle to negotiate unexpected believability with their aforementioned predetermined disbelief. A more balanced application of CGI could help ameliorate this

dilemma for the audience. New productions and remastered or altered reproductions using CGI simultaneously for characters, scenery, and action sequences could more positively influence believability. Further research utilizing a stimulus with heavier CGI use than this study's stimulus may produce differing results or help clarify this possibility.

Research Question 2: Satisfaction

Satisfaction was measured using a composite of five questions from the post-test survey that were adapted from a previous study (Fornerino et al., 2008). As presented in Table 1, emotional engagement/arousal was used to gauge satisfaction as this variable positively and significantly correlates to satisfaction (Aurîer & Evrard, 1994; Claydon, April, 2005; Fornerino et al., 2008). An independent samples *t-test* was used to analyze satisfaction based on the independent variable, which was the presence or lack of CGI in the stimulus video.

Based on prior qualitative research, it was possible to expect the experimental group would report higher levels of satisfaction based on the presence of CGI. While they did report slightly higher levels of satisfaction than believability when compared to the control group, these results were again not statistically significant. There was a possibility the uncanny valley could come into play regarding satisfaction in conjunction with Dale's Cone. Heightened believability positively correlates to fear (Kaba, 2013) and fear can positively correlate to satisfaction (Aurîer & Evrard, 1994). Based on prior research indicating satisfaction is partly based on perceived believability and fear (Aurîer & Evrard, 1994) and in conjunction with the uncanny valley, it was possible the experimental group might exhibit significantly higher satisfaction levels than the control group because of potentially heightened realism in the experimental stimulus. This was possible because of increased realism for the actual *Doomsday Machine* vehicle based on more lifelike movements and visual characteristics created through CGI.

As *Star Trek* was originally broadcast in the 1960s and syndicated in the 1970s, it could be argued most college students today would not be familiar with the series. However, the ongoing popularity of the *Star Trek* franchise suggests a possible caution here. The use of an older video, however, could produce generally lower overall levels of believability and satisfaction than if the stimulus were a more contemporary and well-known production such as *The Hunger Games*. A major reason for using *The Doomsday Machine* as the stimulus video was to explore potentially higher results for believability and satisfaction for the experimental group due to CGI. However, the results of this research do not indicate CGI played a prominent role in shaping the viewer experience. Reported satisfaction levels were neutral on a 5-point scale (see Table 37). The lack of a significant difference between the two based on CGI draws into question how much CGI increases believability and satisfaction if at all. According to Dale's Cone, the presence of CGI could have substantially increased satisfaction for the experimental group. The results of this study suggest CGI modifications present in the stimulus were too subtle to make a significant difference or simply did not increase overall satisfaction.

Each group indicated a higher level of satisfaction than believability. This relationship is likely due to the use of a science-fiction video as the stimulus rather than a more reality-based genre. The control group reported a satisfaction index score of M= 3.12 while the experimental group reported a score of M= 3.18 on a 5-point scale. Again, no statistical significance was found for this variable (p=. 567). The standard deviation for the control group was 0.87817 and was 0.79757 for the experimental group, indicating similar and rather large variability for each group. There were substantial differences in both directions from the mean, indicating more and less emotional responses from study participants. This situation suggests that personal

preferences, interests and attitudes of subjects may be an intervening effect worth further exploration.

The use of CGI in the experimental stimulus of this study did not increase emotional responses compared to traditional production methods and techniques used in the original release video. However, other nuances of CGI could impact satisfaction with a video production, including heavier CGI usage and CGI usage in different genres of videos. More consistent applications of CGI to multiple literary elements of a video including characters, scenery, setting, and action sequences may also produce higher satisfaction levels for the audience.

Research Question 3: Demographics

Critical theory and mass society theory were examined in Chapter 2 to provide a broad sociocultural basis for understanding the role and impact of video in American society. While they were not used as a primary theoretical foundation in this study, they provide useful insight into the impacts of video and CGI. A general theme present in each theory is that of societal control through media production. One of the major concerns shared by both theories is media, including video, are geared toward sociopolitical and economic exploitation by the ruling class of a society (Horkheimer & Adorno, 2002; C.W. Mills & Wolfe, 1999). Media producers are traditionally considered by many to be part of this class. Another general concern shared by both theories is media, especially entertainment media such as video, are geared toward mass media production and mass consumption with progressively less emphasis placed on cultural value and significance. Many video producers are essentially assumed to be primarily concerned with profit and psychological control of the masses. The result is a progressively less educated and critically aware public that continuously supplies their superiors with revenue and political power.

Dale's Cone provides an interesting lens to examine these concerns. By examining how much an audience is satisfied with a production and how much they learn from it, we can utilize this information to avoid the sociocultural concerns presented in critical theory and mass society theory. If a production is immensely popular and it becomes culturally iconic, it is likely its message will resonate through a large audience for a long time. If a production is widely disliked, it is highly possible its message and information will have minimal impact. There is little evidence to suggest demographics play a critical role in audience learning retention based on believability and satisfaction. Demographic variables can impact whether a specific group is satisfied with a particular production (e.g. women tend to exhibit higher satisfaction with romance movies than men). However, if any audience is dissatisfied with a production, they will not usually learn much from it regardless of their demographic distinctions (Subramony et al., 2014).

Three general demographic distinctions were included in the pretest survey: age, gender, and race. Age was divided into five categories because it was known that all participants were undergraduate college students. The average age for the sample was 19.7 years with a standard deviation of 1.25. It is unlikely demographic variables play a significant role in examining CGI when the age range for the audience is densely clustered around 20. The gender distribution of the sample was representative of the institution where the study took place with 58% being female and 42% male. The results for race were also representative with 81% white, 13% black or African American, 1% Asian, and 5 % other. While demographic variables sometimes exhibited significant main effects on the dependent variables of believability and satisfaction, no significant interactive effects were observed in conjunction with CGI on these dependent variables. Regarding Dale's Cone, it was not a goal of this research to examine learning through

demographic variables but rather to examine the impact of those variables in conjunction with CGI.

Age produced a significant main effect for satisfaction with participants age 21 reporting the highest satisfaction level (see Table 44). Although there was an impact based on age, this impact is somewhat unclear. Twenty-one year-olds had the highest score and 18 year-olds were second. This suggests cognitive function was not a major factor in participants understanding the narrative of the stimulus (Huitt & Hummel, 2003). These results likely reflect the tendency for science fiction to be more difficult to cognitively mediate between real and imagined.

Gender had a significant main effect on believability with females reporting the highest believability score (see Table 47). This indicates females saw the stimulus video as more believable than males. Although no significant interactive effects were found between group, gender, and believability, and satisfaction, it is worth noting females also reported higher levels of satisfaction with the stimulus than males (see Table 49). It would be worth further examining whether the fact the cast was predominantly male impacted these variables for each gender group by increasing attraction to characters for many females and decreasing this appeal for most males. Further, males are more likely to play CGI-laden video games than females, especially action-oriented first-person shooter games such as Call of Duty (L. A. Jackson et al., 2008). This familiarity with heavier CGI infusion in a media production might have diminished the impact of the moderate CGI alterations to *The Doomsday Machine*.

Race directly impacted satisfaction with Black/African American producing the highest satisfaction rating for groups with more than one participant (see Table 54). This result is particularly interesting because *Star Trek* is not typically perceived as an iconic production in contemporary African American culture. However, the series does have an important role in

African American TV history. The original *Star Trek* series had only one recurring main African American character, Nyota Uhura, played by actress Nichelle Nichols. Nichols' role and performance were notable for several reasons. She was one of the first black actresses to be portrayed on TV in a non-service role and was, in fact, a high-ranking officer on the show (Nichols, 1995). Producer Gene Rodenberry intended to promote racial diversity and equality on *Star Trek* and thus Nichols became iconic in her impact on American TV during the Civil Rights Movement. It is unknown if this historical knowledge impacted the result for race and satisfaction but is important to note and could be part of future research on African American TV history and its impact on contemporary African American pop culture.

Further research focused more specifically on demographics and learning would be beneficial. As Dale's Cone is theoretically affected by believability and satisfaction, further studies focusing more specifically on learning retention performance by particular demographics could shed more light on the role CGI plays in this dynamic. The results from this study indicate there are important differences in reactions to CGI based on demographics and these reactions may impact learning based on variables such as age, gender, and race. Further delineations within these categories would also likely provide further insight into demographic relationships to Dale's Cone.

Research Question 4: Video Consumption Habits and Preferences

Suspension of disbelief and faerie were two literary paradigms used to examine the immersive experience of video in Chapter 2. These paradigms present opposite hypotheses regarding media consumption with suspension of disbelief arguing in favor of immediate disbelief by the audience and faerie presenting the notion the audience only disbelieves what it

cannot construe as at least somewhat real. Literary elements and media consumption habits are key components of these paradigms and are critical elements of video consumption as well.

Today's media technology landscape offers viewers multiple modalities for consuming videos that can directly impact their viewing experience. Screens that vary widely in size, high-resolution images and CGI are all common factors influencing video consumption today. Locations for watching videos have also expanded over the years because of smart devices such as tablets and mobile phones capable of streaming video content anywhere Internet service is available, albeit on a much smaller screen than a television or movie screen. Because of this capability, individuals' preferences for audience characteristics also may be influenced by contemporary technological capabilities. Historically, individuals had two options for watching video productions- a television at home or at the movie theater. Today possibilities for locations to watch videos are nearly endless. Further, modern accessibility to video content through websites and apps such as YouTube provide much greater access to video than ever before. This situation draws into question what roles these variables play in the immersive nature of video consumption and how they affect individuals' reactions to videos they watch.

Suspension of disbelief and faerie are more theoretical in their approach to understanding this interaction and thus Dale's Cone provided a more measurable and tangible means (learning and audience recall) to gauge this interaction. While exploring the impact of the many modalities available for video consumption in further research is still needed, this study specifically examined audience video consumption habits and sentiments regarding literary elements and video viewing preferences in conjunction with CGI. Because of the accessibility and pervasiveness of modern video technology, it was presumed participants would report high levels of video consumption frequency and possibly a preference for smaller audiences, smaller

screens, and more private viewing locations. If participants indicated these preferences, the use of a personal computer to screen the stimulus and the resulting individualized viewing experience from this setup combined with potentially more realistic CGI effects should have produced higher learning results than without CGI.

The pretest survey asked participants about their video consumption habits, including how often they watched videos, their audience size preference, the level of engagement they feel is offered by watching individually or in a group, and whether watching video productions in a cinema is more engaging than in other locations. Most of the participants indicated they watch videos on a daily basis (71%, *N*=100). Four percent of participants indicated they watch videos once a week or less. This shows a college-age audience overwhelmingly watches videos on a regular basis and they are likely exposed to CGI in some fashion through their consumption of these media. Results regarding engagement based on location and audience size were ironic; 51% of the entire sample indicated they preferred to watch videos alone, 41% stated watching a video alone is more engaging than watching in a group, and yet 73% said watching a movie in a cinema is more engaging than at home. It is possible respondents made an arbitrary distinction regarding the nature of video productions between TV shows and movies even though they are the same type of media in principle. No significance was found for each group regarding their video consumption habits, nor was significance demonstrated for the impact of CGI on believability and satisfaction.

Participants were also asked to indicate the level of importance they place on literary elements of a video. Questions on the pretest survey asked respondents to indicate the level of importance they place on various literary elements of video productions including cast, plot, special effects and genre to explain which of these elements might most directly impact

satisfaction. Plot was by far the most important element chosen at 65%. The special effects option was not selected by any of the subjects as the most important component of a video production. This indicates participants were not overly concerned with believability and their resulting satisfaction stemming from special effects. This creates the possibility there is a lack of awareness of CGI in a college-age audience or it simply does not hold much sway over their determination of what constitutes an important element of a quality video production. Another possibility is CGI is so common in modern video that it is widely expected or goes unnoticed. Interestingly, the control group (no CGI) produced similar results for satisfaction with the stimulus as the experimental group that viewed the CGI version of the video. This indicates CGI potentially may not increase believability and satisfaction to a noticeable degree when used in moderation. It should be noted the findings from this particular segment of analysis showed special effects may have a more direct impact on satisfaction than many video consumers realize.

Audience preference for realism regarding characters, scenery, and special effects were overwhelmingly important to participants. Responses indicate 77% of the sample (N= 100) classified realistic characters as either important or extremely important. This figure was at 73% for realistic scenery and 65% for realistic special effects. This demonstrates a clear pattern where the sample did not place as high a level of importance on special effects and CGI as the other more traditional elements of a video production. Dale's Cone helps explain this situation since the base of the Cone posits real-life experience is critical to learning and is affected by variables such as believability and satisfaction. It is obvious the sample highly desired realism in video productions, especially for characters and scenery. It is therefore curious the experimental group did not rate live-action characters and CGI scenery in the experimental stimulus as

significantly more believable and satisfying. It is also important to note the experimental group scored lower on the learning portion of the post-test than the control.

Research Question 5: Audience Recall (Learning)

This question most directly addressed Dale's Cone of Experience. Although the particulars of Dale's Cone have been hotly debated for decades and scholars still grapple with numerical values and other details (J. Jackson, 2016), the basic premise of effective learning through tangible experience is well-supported (White, 2014). For the purposes of this research, Dale's (1946) original designation for the base of his pyramid of, "Direct, Purposeful Experiences" (p. 38) applies directly to the modern video-viewing experience. It was hypothesized CGI would significantly enhance learning for the experimental group based on this model because CGI could significantly enhance believability and satisfaction, thus making the production more real. This in turn should produce better learning performance.

Hypothesis 5.1, CGI enhancements increase audience recall more than traditional effects, was tested using six questions that required study participants to recall details about the stimulus video. These included questions about characters, their roles, their actions, and action sequences that affected the plot of the stimulus. The underlying assumption was if CGI substantially increased realism and satisfaction, then audience recall would also be increased based on Dale's assertions that increased tangibility and realism improve learning outcomes. It was hypothesized CGI would significantly increase believability and satisfaction and, therefore, learning ability would be increased for the experimental group. However, no statistical significance was found between groups (p= .634). Hypothesis 5.1, CGI enhancements increase audience recall more than traditional effects, was rejected.

Participants' scores on the quiz portion of the post-test survey were graded and compiled into a composite index for each group. The control group performed better on three of the five questions and scored higher than the experimental group overall. These results contradicted the hypothesized expectations of audience recall impacted by CGI. The control group produced a mean score of 79.3 on a 100-point scale. The experimental group had a mean score of 76.9. No statistical significance was found for subjects' performance on the quiz based on the presence of CGI (p= .188).

CGI did not exhibit a significant influence on subjects' performances. Other factors may have contributed to these results. The quiz only had six questions, which reduces the potential for variability. It should also be noted some of the questions did not deal specifically with CGI-enhanced scenes or plot details. This was an intentional approach used in constructing the quiz questions so respondents would not suspect CGI was the main focus of the study. Further, the sample size in this study was small enough and results were similar enough that a minor statistical anomaly in one or both of the groups could have skewed these results. Another reason could be the lack of a significant difference in believability and satisfaction for each group. This suggests a higher concentration of CGI in a video production may be necessary to increase audience recall and learning. Based on the limited focus and capabilities of this study, these results do not disprove Dale's Cone of Experience. Conversely, they demonstrate and suggest further research into CGI as a component of learning should be conducted to effectively gauge when CGI does increase audience recall. These results further support the idea that congruency in production techniques may be essential to increasing believability, satisfaction, and learning. Perhaps the most striking result of this study is the possibility more traditional production techniques that are potentially less realistic and usually more expensive than CGI are perceived

by audiences to be more real, more satisfying, and more effective instructional productions than those utilizing CGI.

Limitations

Statistically significant findings in the study were limited to main effects observed in two-way ANOVA tests. Demographic variables such as age, gender, and race, exhibited significant main effects on believability and satisfaction without significant interactive effects from CGI presence. However, some noticeable trends and assumptions were obtainable from the results of the study and were discussed above. The sample (N= 100) obtained for this study was relatively robust and acceptable for effective experimental quantitative analysis. As is often the case in quantitative research, a larger sample could potentially produce more definitive results regarding believability, satisfaction, and audience recall as a result of CGI usage in video productions. Further, a counterbalanced design with groups receiving both a traditional and CGI video could provide greater insights into the possible impact of CGI than a control-treatment only comparison.

The target population for this study was undergraduate college students. This is a somewhat limited age group typically consisting of subjects aged 18-22. This limit in age range is a common characteristic of a convenience sample. Future research focusing on a wider age range would provide a more thorough examination of CGI and its effects on particular age demographics. Focusing on other age demographics, especially middle-aged and older groups, could help to provide deeper context for understanding the impacts of CGI on video audience satisfaction and believability because older individuals grew up without CGI. This is especially important because of the drastic differences in media exposure between Baby Boomers, Generations X, Y (millennials), and Z. Technology and media production capabilities have

changed dramatically over the last half-century and it is important to understand how these changes affect these various demographics.

Another facet of the utilized sample that likely impacted these results was many of the participants completed the study for bonus points rather than simply for genuine interest in the subject matter. While this doesn't necessarily preclude participants from providing accurate responses, there was a potential for uninterested participants to answer questions without much regard or thought, especially if they were not interested in the show used for the stimulus. Utilizing a broader pan-institutional convenience sample could help address this concern.

The second major limitation in this study was the stimulus itself. While *Star Trek* is often popular among older demographics, younger individuals are less likely to be familiar with the original *Star Trek* series and less likely to show genuine interest in it. Further, respondents demonstrated a high desire for realism in video productions. Science fiction tends to challenge assumptions of reality by its very nature with many characters, settings, and other literary components being entirely fictionalized. We can assume the genre of the stimulus had some impact on how participants perceived the world it created when they watched the video. A stimulus video from a more reality-based genre like drama could yield significantly different results where participants are more engaged with the story of the video because they can more easily and readily relate to its content without having to mediate definitively fictional narrative elements.

The amount of CGI used in the stimulus is detailed in Appendix A. As noted earlier, one of the reasons this episode was chosen as the stimulus was because it only contained moderate CGI usage. It was a goal of this study to present a video that did not contain an obvious and potentially overwhelming amount of CGI so that results were not skewed heavily one way or the

other based solely on this particular variable. Utilizing a stimulus video with more CGI content than *The Doomsday Machine* could potentially influence results more significantly.

The stimulus episode lacked any CGI modifications of characters. These types of changes can cause significant reactions by the audience and have considerable effects on believability and satisfaction. This is especially true when considering a culturally iconic TV series such as *Star Trek* or film franchise such as *Star Wars*. Backlash over CGI in the 1997 rerelease of the CGI-enhanced *Star Wars* films focused heavily on the computer portrayal of Jabba the Hutt, which was viewed by many as cartoonish when compared to the animatronic version of the character used originally in 1983. Despite this negative reaction, it is very likely displeased audience members learned and can easily recall images and plot details of those particular scenes two decades later. It would also be valuable to see if younger audiences have similar reactions to this particular stimulus example.

The quiz portion of the post-test survey could be considered a limitation of this study as well. The number of questions regarding audience recall was limited due to the length of the video utilized as the stimulus and because the post-test survey required multiple questions addressing believability and satisfaction. It was an intentional approach used in this study to limit the number of questions on the post-test survey due to the time commitment required for watching the video and completing the survey. The length of the survey was restricted as much as possible to help ensure participants were not overwhelmed with information and questions.

A post-test that focuses entirely on audience recall could help shed further light on the impact of CGI on learning. This approach could be used with this study's stimulus or any other CGI-enhanced video production. Avoiding questions about perceptions and reactions would allow respondents to focus solely on plot and imagery details. A quiz with more questions

focused on these details could also provide more variability between the control and experimental groups. This tactic would provide a more direct analysis for this particular component of Dale's Cone of Experience.

Recommendations for Future Research

Today's 21st century media landscape offers video consumers multiple avenues for media consumption that differ greatly from the late 20th century when videos were available exclusively through televisions or cinemas. Because of this drastic and rapid change, further avenues of exploration into CGI could also include different types of video delivery systems such as VHS, DVD, Blu-ray, cinemas, and streamed content on television, computers, iPods, smartphones, and other devices. These differences in media modality, screen presentation and audience environment could provide a deeper contextual understanding of how CGI affects audience believability, satisfaction and learning. This study used an older TV show that was shown on a private computer screen. It would be worth examining potential differences across devices and through more recent video productions.

CGI is being applied more often to characters in live-action productions than in years past. These applications vary from moderate (e.g. *Spiderman*, *Ironman*) to significant (e.g. *Avatar*, *The Hobbit*). Further exploration into the usage of CGI for characters specifically could examine the extent and frequency of CGI for main characters versus secondary characters and the impacts these applications have on audiences of varying demographic makeups.

Scenery in live-action productions is also often rendered with or by CGI in contemporary video productions. Shows such as *Emerald City* (2017) and movies such as *Gladiator* (2000) used scenery created or manipulated by CGI because it was deemed either necessary or more cost-effective than traditional production techniques by producers. An examination of this use of

CGI could examine more subtle nuances such as whether audiences recognize when CGI is being used to create scenery and whether they deem it necessary and thus more believable, or whether they see it as a typical approach that is used because it is the cheapest method available to producers. If an audience feels a more physically real representation of scenery should have been used, this could impact believability, satisfaction and learning.

Genre is another avenue of research that should be done on CGI. Fantastical genres such as science-fiction and fantasy lend themselves to obvious CGI usage in order to create imagery that may be otherwise difficult or impossible to produce without computers. We do not know exactly what impacts CGI has on an audience in a more realistic genre such as drama, comedy, or action. While CGI may enhance believability, satisfaction and learning in an action production because many stunts are humanly impossible in the real world, it may negatively impact drama and comedy audiences because these genres often are viewed as realistic to begin with.

Because there is little research conducted specifically on audience experiences with CGI, there are myriad approaches to further quantitative research in this field. Multiple audiences and videos could be used within the same study to examine effects and patterns across groups through multiple stimuli. Utilizing videos that have more disproportionate amounts of CGI content could help to isolate the impact of CGI as a variable that can increase believability, satisfaction and learning. A methodology similar to the one used in this study could be used to explore these impacts on more TV shows in varying genres such as animation that could increase our understanding of CGI and how it affects children. Different movie genres would be applicable to this methodology as well because genre is often an important factor in an individual's determination of whether a video production is good or not. The presence of CGI in

non-traditional CGI genres could be of particular interest to producers who seek to utilize realistic special effects in their productions.

Qualitative inquiry and design for studying CGI would be extremely beneficial during the early stage of research in this particular topic. While rhetorical analysis and similar approaches are certainly useful, phenomenology and focus group designs would offer deeper contextual insight into how people individually respond to CGI or whether they even notice its existence. Qualitative research would allow us to gain a more first-person perspective on people's experiences with CGI and give us more textually descriptive data to better triangulate analysis of this relatively novel yet pervasive production aesthetic that continues to reshape both video production and video consumption.

The crux of these observations is CGI had no real effect on the dependent variables being studied. Much scholarly literature suggests CGI significantly impacts these variables. The results of this study demonstrate limited CGI in conjunction with an unrealistic setting does not support this. More research into CGI's impacts on audience reactions is needed to better understand the dynamics and nuances of the viewer-experience with modern video productions. Based on the audience recall results of this study, there appears to be a figurative disconnect between the reality portrayed in the stimulus video created with traditional production methods and this same reality when it is influenced by CGI additions. It is possible CGI is pushing people's reactions to these types of videos in both directions on believability and satisfaction scales. It is uncertain whether CGI predominantly tends to enhance or decrease believability of and satisfaction with cinematic virtual realities based on multiple variables. One certainty is there are multiple avenues for future exploration of and research on this common and important

aesthetic component of video production. This is especially true because CGI seems to produce variable and sometimes polarized reactions from audience members.

Conclusion

This study examined the impact of CGI on audience believability, satisfaction, and learning retention through a quasi-experimental methodology. There is a noticeable lack of research on this viewer-CGI dynamic resulting in a significant gap in our understanding of the media we commonly consume and how they affect us. This study serves as a starting point for further examining the many scenarios and situations where more complete knowledge of this subject would be beneficial. CGI has grown rapidly in use and popularity over the last two decades. Its mere presence in a video production, whether a TV show or movie, creates the possibility of enormous success (e.g. *Toy Story*) or significant cultural backlash (e.g. *Star Wars Special Edition* rereleases). It is certain CGI is unlikely to disappear from the modern media landscape. Rather, it will likely expand across multimedia more than it already has in the near future because it is easier and often cheaper to produce than physical sets, costumes, makeup, and actions. Just how pervasive it becomes and at what expense it comes at depends on the tastes, desires, and inclinations of consumers and producers of contemporary video.

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Appendix A

Content Analysis of *Doomsday Machine* Episode

SCENE # (FROM BLOCK)	TIME STAMP	DURATION (seconds)	CGI SCENERY/SETTING (Y/N)	DOOMSDAY MACHINE	ENTER PRISE	CONSTEL LATION
INTRO	0-15s	15	X		X	
INTRO	45s-51s	6	X			
INTRO	1m8s-1m17s	9	X		X	
INTRO	2m-2m5s	5	X		X	
INTRO	2m8s-2m13s	5	X			X
INTRO	2m16s-2m18s	2	X			X
INTRO	2m23s-2m33s	10	X			X
INTRO	2m44s-2m48s	4	X		X	X
OPENING CREDITS	2m51s-3m51s	60	X		X	
1	3m53s-4m8s	15	X			X
1	4m52s-4m59s	7	X			X
1	5m22s-5m27s	5	X			X
1	14m39s-14m43s	4	X		X	X
1	15m9s-15m13s	4	X	X	X	
1	15m16s-15m21s	5	X	X	X	
1	15m29s-15m33s	4	X	X	X	
2	15m37s-15m56s	19	X	X	X	X
2	16m48s-16m50s	2	X	X		
2	16m54s-16m57s	3	X		X	X
2	18m6s-18m14s	8	X		X	
2	18m40s-18m42s	2	X	X	X	
2	18m47s-18m50s	3	X	X	X	
2	22m51s-23m2s	11	X		X	
2	23m6s-23m8s	2	X	X		

2	23m12s-23m25s	13	X	X	X	X
2	24m13s-24m22s	9	X	X	X	
2	24m36s-24m38s	2	X	X		
2	24m57s-25m4s	7	X	X	X	
2	25m33s-25m40s	7	X	X	X	
2	25m41s-25m48s	7	X	X	X	
2	25m49s-25m53s	4	X	X		
2	26m5s-26m10s	5	X	X	X	
2	26m28s-26m30s	2	X	X		
2	26m40s-26m42s	2	X	X	X	
2	26m44s-26m46s	2	X	X		
2	28m2s-28m10s	8	X	X	X	
3	28m14s-28m22s	8	X	X	X	
3	29m9s-29m11s	2	X			X
3	29m19s-29m23s	4	X	X	X	
3	29m27s-29m30s	3	X	X		
3	29m34s-29m38s	4	X	X	X	
3	30m6s-30m8s	2	X	X	X	
3	30m9s-03m12s	3	X	X		X
3	30m22s-30m25s	3	X	X	X	
3	30m39s-30m45s	6	X	X	X	
3	30m49s-30m52s	3	X	X	X	
3	35m32s-35m47s	15	X		X	
3	36m16s-36m21s	5	X			X
3	36m46s-37m0s	14	X		X	
3	37m9s-37m14s	5	X		X	
3	37m29s-37m35s	6	X		X(shuttle)	

3	38m4s-38m8s	4	X	X		
3	38m34s-38m40s	6	X	X	X(shuttle)	
3	38m49s-38m52s	3	X	X		
3	39m4s-39m8s	4	X	X	X(shuttle)	
3	39m11s-39m13s	2	X	X		
3	39m15s-39m17s	2	X	X		
3	39m19s-39m21s	2	X	X		
3	39m23s-39m25s	2	X	X		
3	39m28s-39m29s	1	X	X		
3	39m31s-39m35s	4	X	X		
3	39m38s-39m40s	2	X	X		
3	39m47s-39m50s	3	X	X		
4	39m53s-40m4s	11	X		X	
4	44m40s-44m49s	9	X			X
4	44m50s-44m56s	6	X	X		
4	45m24s-45m26s	2	X	X		
4	45m32s-45m49s	17	X	X		X
4	45m53s-45m55s	2	X	X		
4	45m57s-45m59s	2	X	X		
4	46m1s-46m3s	2	X	X		
4	46m21s-46m23s	2	X	X		
4	46m33s-46m38s	5	X	X		X
4	46m49s-46m51s	2	X	X		
4	46m52s-46m57s	5	X	X		X
4	46m58s-47m0s	2	X	X		X
4	47m7s-47m8s	1	X	X		
4	47m13s-47m15s	2	X	X		

4	47m16s-47m25s	9	X	X		X
4	47m27s-47m34s	7	X	X		X
4	47m48s47m52s	4	X	X		
4	48m2s-48m6s	4	X	X		
4	49m21s-49m37s	16	X		X	

Appendix B

Pretest Survey

Q1 Please select your age.
- ❍ 18 (1)
- ❍ 19 (2)
- ❍ 20 (3)
- ❍ 21 (4)
- ❍ 22 or older (5)

Q2 Please select your sex.
- ❍ Male (1)
- ❍ Female (2)

Q3 Please select your race.
- ❍ White (1)
- ❍ Black or African American (2)
- ❍ American Indian or Alaska Native (3)
- ❍ Asian (4)
- ❍ Native Hawaiian or Pacific Islander (5)
- ❍ Other (6)

Q4 How often do you watch videos?
- ❍ Daily (1)
- ❍ 4-6 times a week (2)
- ❍ 2-3 times a week (3)
- ❍ Once a week (4)
- ❍ Never (5)

Q5 Please choose how much you agree with the following statements.

	Strongly agree (1)	Somewhat agree (2)	Neither agree nor disagree (3)	Somewhat disagree (4)	Strongly disagree (5)
I prefer to watch TV shows and movies by myself. (4)	❍	❍	❍	❍	❍
Watching a movie in a cinema is more engaging than at home. (5)	❍	❍	❍	❍	❍
Watching a TV show or movie alone is more engaging than watching it in a group. (6)	❍	❍	❍	❍	❍

Q6 Which of the following do you feel is most important to a good TV show or movie?

- ❍ Cast (1)
- ❍ Plot (2)
- ❍ Special effects (3)
- ❍ Topic/genre (4)

Q7 Please indicate the level of importance you place on the following items in a video production.

	Extremely important (1)	Very important (2)	Moderately important (3)	Slightly important (4)	Not at all important (5)
Realistic characters (1)	❍	❍	❍	❍	❍
Realistic scenery (2)	❍	❍	❍	❍	❍
Realistic special effects (3)	❍	❍	❍	❍	❍

Q8 Please enter your IUP email address below. Please use only your IUP email address. This information is strictly for identification for your participation in this study.

Appendix C

Post-Test Survey

POST-TEST SURVEY (PAPER) revised with permission from Fornerino, M., Helme-Guizon, A., & Gotteland, D. (2008). Movie consumption experience and immersion: Impact on satisfaction. ***Recherche et Applications en Marketing (English Edition) (AFM c/o ESCP-EAP), 23*****(3), 93-109.**

Q1 The show created a new world that suddenly disappeared at the end of the show.
- ❍ Strongly agree (1)
- ❍ Somewhat agree (2)
- ❍ Neither agree nor disagree (3)
- ❍ Somewhat disagree (4)
- ❍ Strongly disagree (5)

Q2 At times, I was unaware of my surroundings.
- ❍ Strongly agree (1)
- ❍ Somewhat agree (2)
- ❍ Neither agree nor disagree (3)
- ❍ Somewhat disagree (4)
- ❍ Strongly disagree (5)

Q3 During the show, my body was in the room but my mind was in the world created by the show.
- ❍ Strongly agree (1)
- ❍ Somewhat agree (2)
- ❍ Neither agree nor disagree (3)
- ❍ Somewhat disagree (4)
- ❍ Strongly disagree (5)

Q4 The show made me forget the realities of the world outside.
- ❍ Strongly agree (1)
- ❍ Somewhat agree (2)
- ❍ Neither agree nor disagree (3)
- ❍ Somewhat disagree (4)
- ❍ Strongly disagree (5)

Q5 During the show, what happened before or what would happen afterwards did not matter anymore.

- ❍ Strongly agree (1)
- ❍ Somewhat agree (2)
- ❍ Neither agree nor disagree (3)
- ❍ Somewhat disagree (4)
- ❍ Strongly disagree (5)

Q6 The show made me forget about my immediate surroundings.

- ❍ Strongly agree (1)
- ❍ Somewhat agree (2)
- ❍ Neither agree nor disagree (3)
- ❍ Somewhat disagree (4)
- ❍ Strongly disagree (5)

Q7 During the show, I felt strong emotions.

- ❍ Strongly agree (1)
- ❍ Somewhat agree (2)
- ❍ Neither agree nor disagree (3)
- ❍ Somewhat disagree (4)
- ❍ Strongly disagree (5)

Q8 During the show, I felt emotions that were more intense than those I usually feel in daily life.

- ❍ Strongly agree (1)
- ❍ Somewhat agree (2)
- ❍ Neither agree nor disagree (3)
- ❍ Somewhat disagree (4)
- ❍ Strongly disagree (5)

Q9 During the show, I experienced a series of very different emotions.

- ❍ Strongly agree (1)
- ❍ Somewhat agree (2)
- ❍ Neither agree nor disagree (3)
- ❍ Somewhat disagree (4)
- ❍ Strongly disagree (5)

Q10 At times, I was in an unusual emotional state.
- ❍ Strongly agree (1)
- ❍ Somewhat agree (2)
- ❍ Neither agree nor disagree (3)
- ❍ Somewhat disagree (4)
- ❍ Strongly disagree (5)

Q11 During the show, I experienced moments of intense excitement.
- ❍ Strongly agree (1)
- ❍ Somewhat agree (2)
- ❍ Neither agree nor disagree (3)
- ❍ Somewhat disagree (4)
- ❍ Strongly disagree (5)

Q12 The commodore's last name was...
- ❍ Decker (1)
- ❍ Spock (2)
- ❍ Kirk (3)
- ❍ McCoy (4)

Q13 The *USS Enterprise* and the *USS Constellation* were similar-looking ships.
- ❍ True (1)
- ❍ False (2)

Q14 Who primarily advised against attacking the *Doomsday Machine*?
- ❍ McCoy (1)
- ❍ Decker (2)
- ❍ Kirk (3)
- ❍ Spock (4)

Q15 The USS *Enterprise* was able to defeat the *Doomsday Machine* on its own.
- ❍ True (1)
- ❍ False (2)

Q16 Kirk was the captain of which ship?
- ❍ USS Nimitz (1)
- ❍ USS Odyssey (2)
- ❍ USS Enterprise (3)
- ❍ USS Constellation (4)

Q17 What happened to the *Doomsday Machine* when it was defeated?

- ❍ It disintegrated (1)
- ❍ It shut down. (2)
- ❍ It exploded. (3)
- ❍ It retreated. (4)

Q18 Have you seen this episode before?

- ❍ Yes (1)
- ❍ No (2)

Appendix D

Instructor Email

(THIS PROJECT HAS BEEN APPROVED BY THE INDIANA UNIVERSITY OF PENNSYLVANIA INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS (PHONE 724.357.7730).)

Dear Instructor,

I am writing to ask for your permission to speak to your classes about participating in an upcoming study that I am conducting for my dissertation. The presentation should take approximately 5 minutes. I am conducting an experiment and would like to speak to your students about participating in the study.

The study will focus on audience reactions and perceptions of a video. The study will be using college students to serve as participants. Participants will be asked to fill out an initial online survey several days before the study, watch a video during the experiment, and answer a short survey at the conclusion of the video.

The students will receive complimentary ear-buds, free snacks after the screening of the video, and their participation will give them an opportunity to win a $50 Amazon gift card. If you use this study as an opportunity to offer extra credit to your students, please be sure to offer an alternative bonus assignment for students who do not participate in the study.

If you are willing to let me speak to your students, I will contact you to arrange a specific date and time. If you have any questions, please contact me at b.m.rohlf@iup.edu, or my dissertation advisor, Dr. Mark Piwinsky at mark.piwinsky@iup.edu. Thank you for your time and consideration.

Best,

Bradley Rohlf
Doctoral Candidate: Communications Media and Instructional Technology
Indiana University of Pennsylvania

Dissertation Advisor: Dr. Mark Piwinsky
mark.piwinsky@iup.edu, 724-357-3954

Appendix E

In-Class Presentation

My name is Brad Rohlf and I'm a Ph.D. candidate in the Communications Media and Instructional Technology program. I am currently working on my dissertation and need your help.

My dissertation is examining audience reactions to a video production. I'm looking for students to complete an online pre-study survey, then watch one episode of a TV show and answer a questionnaire about your reaction to the video. All I need in total is about one hour and ten minutes of your time.

First, if you are willing to participate, please complete the consent form sheet that you have received and place them in the box provided. If you do not wish to participate, just place the blank sheet in the box.

For those who agree to participate, you'll receive an email from me in the next few days. If you choose to participate, there is a link in the email that you will click. The link will take you to Qualtrics, where you will answer a few demographic questions and select a time to come watch the video in Stouffer Hall. This survey will take less than ten minutes to complete. The screening will take approximately 1 hour. You will be provided with a complimentary set of ear-buds for the screening. After watching the video, you will be asked to respond to a paper based survey addressing your reactions to the video.

If you complete the demographic survey, watch the video, and complete the final survey, you can enter to win one of four gift cards worth $50 at Amazon.com. There will also be drinks and snacks provided at the experiment site at the conclusion of the video.

Your participation is voluntary. Individual responses will be kept confidential and any identifying information will be destroyed after the experiment concludes. Your participation will have no impact on your grade or your standing in this course or your Department. You may also withdraw from the study at any time.

This project has been approved by the Indiana University of Pennsylvania's Institutional Review Board for the Projection of Human Subjects. They can be contacted at 724-357-7730. If you have any questions regarding this study, I would be happy to address them now or you can email me at b.m.rohlf@iup.edu.

Thank you for your time!

Appendix F

Instrument Use Approval

Dear Agnes,

Thank you so much! I will be publishing my dissertation in Proquest at the end of this year and will certainly make that available to you. Thanks again and have a good day!

Best,
Brad Rohlf

On Tue, 7 Jun 2016 11:15:53 +0200 (CEST)
AGNÉS HELME-GUIZON <agnes.helme-guizon@univ-grenoble-alpes.fr> wrote:

Dear Bradley

Please apologize for our delayed answer.
Your research project sounds very interesting.
My colleagues and I are pleased to allow you to use the survey we published in 2008 and of course to modify it slightly for research purposes.
Let us know whether about the results of your research

Regards

-----Message d'origine-----
De : Bradley M Rohlf [mailto:b.m.rohlf@iup.edu]
Envoyé : lundi 6 juin 2016 15:10
À : marianela.fornerino@grenoble-em.com; Agnes.Helme-guizon@iae-grenoble.fr; David.gotteland@grenoble-em.com
Objet : Request for use of instrument for dissertation research

Dear Drs. Fornerino, Helme-Guizon, and Gotteland,

My name is Brad Rohlf and I am a Ph.D. candidate in Communications Media and Instructional Technology at Indiana University of Pennsylvania. I am writing to ask your permission to use a survey you developed for your study in 2008, Movie Consumption Experience and Immersion: Impact on Satisfaction. I am writing my dissertation and am conducting an experiment regarding the use of CGI in video productions and its effect on audience believability and satisfaction.

If you would allow me to use your survey, your work will be cited and full credit given to you for development of the instrument. I may have to modify a few questions to suit my study, but the majority of your

instrument is directly examining the variables I intend to measure in my research. Please accept my sincere thanks for your time and consideration. If you have any questions, please feel free to email me at b.m.rohlf@iup.edu.

Best,

Bradley Rohlf
Doctoral Candidate: Communications Media and Instructional Technology- Indiana University of Pennsylvania
Adjunct Instructor: English, History, Liberal Arts- Mount Aloysius College