AN INVESTIGATION INTO THE UNCANNY
CHARACTER DESIGN, BEHAVIOUR AND CONTEXT

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A thesis submitted in partial fulfilment of the requirements of the Media School of Bournemouth University for the degree of Doctor of Philosophy

2013

Abstract

Whilst there has been a substantial amount of research into the uncanny valley, defining research that contextualises a character as they would normally be viewed remains an unexplored area. Often previous research focused solely on realistic render styles giving characters an unfair basis that tended towards the realistic, thus facilitating only one mode of animation style: realism. Furthermore, characters were not contextualized because researchers often used footage from previous productions. These characters also differed in quality as various artists worked on different productions. This research considers characterisation as three key components, the aesthetic, the behaviour and the contextualisation. Attempts were made to develop a greater understanding of how these components contribute to the appeal of a character within the field of 3D computer animation.

Research consisted of two experiments. Both experiments were conducted using an online survey method. The first experiment used five different characters ranging from realistic to abstract. Each character displayed three different behaviours and the characters were contextualized within a six panel narrative. Data obtained from the first experiment was used to refine the second experiment. A further experiment was conducted to further define how combinations of different behaviours and the context containing a character affected the subject's perception. The second experiment used three different character types and the characters were contextualized within a video stimulus.

Findings from the first experiment indicated a strong relationship between character type and context. Interest with the various characters changed depending on adaptions to either the behaviour of the said character or the contextualisation. Certain character types based on appearance where better suited to different contexts than others. An abstract character was more likely to be perceived positively by the subject in a surprising context stipulated by

the behaviour of the character and form of the narrative sequence. Other characters such as one based around an inanimate object found a greater positive reception with the subjects under sad contextual constraints rather than happy or surprise. The first experiment took into account various independent variables obtained from the subject and aimed to draw parallels if found between these variables and the subjects perception of a given character be it positive or negative. However, these variables namely gender, nationality and age had no effect on the subject's perception.

In the second experiment, it was found that in order for the realistic human character to be perceived more positively, the behaviour needed to match the context. When a mismatch occurred the subjects began to perceive the character more negatively. The cartoon character was however not affected by the mismatch of behaviour and context. The experiment was further expanded when two different character types were compared committing negative actions and having negative actions inflicted upon them and what effect it had on the subjects perception. It was found that a cartoon character committing a negative action was perceived positively whilst a human character committing the same act was perceived negatively. However, when a negative action was inflicted on these same characters, subjects were more concerned for the human character than the cartoon character.

Results from both experiments confirm the idea that various characters are perceived very differently by the viewers and come with predefined notions within the viewer of how they should behave. What is expected of one character type is not acceptable for another character type. Cartoon characters can get away with bizarre behaviour. A real human character may have some sort of novel unusual behaviour, whilst a realistic CG human character is assessed on how realistically (normally) it behaves. This research expands upon previous research into this area by offering a greater understanding of character types and emphasising the importance of contextualisation.

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Acknowledgements

It would not have been possible to achieve this doctoral thesis without the help and support of a lot of people around me.

First and foremost, I am deeply grateful to my parents for their encouragement, patience and financial support throughout my studies without which this would not have been possible.

I would like to thank my supervisors Professor Jian Zhang and Dr Mike Molesworth for their guidance, constructive comments and advice for which I am extremely grateful.

My deepest appreciation goes to Miss Chontit Chuenurah for her kindness, love and support during this long and difficult journey.

I would also like to express my gratitude to Ms Jan Lewis for her assistance and kindness throughout my PhD studies.

Chapter I

Introduction

The use of 3D computer animation has all but superseded the use of traditional 2D hand drawn animation in film, television and advertising. 3D computer graphics has also dominated the video game industry which has output games at one time solely that were made using 2D sprite based graphics. That said character design within the medium of 3D computer graphics is still relatively new compared to other art forms which utilise some sort of character in one form or another, hence we are still learning how the design of the character is conducted within the medium of 3D computer graphics. Unlike traditional forms such as stop motion animation and 2D hand drawn animations, 3D computer graphics allows for a highly complex character design to be animated such as those found in films such as Avatar (Cameron, 2009) which allow for realistic facial articulation for a greater level of expression and realism. However, much of the current research which opens a discourse in 3D computers graphical character design relates to the creation of realistic human characters and the inherent problems which surround in the creation of such characters, namely the "uncanny valley" (MacDorman, 2005, McDonnell et al., 2012). This conception comes from the field of robotics and in particular the creation of human like robots called androids. Mori (1970) discovered that making an android more humanlike in both appearance and movement caused the subject who viewed this character to respond more positively to it up to the point where the android becomes too realistic and the appeal would drastically drop. This phenomenon is termed as the "uncanny valley"(Mori, 1970). Mori himself suggests that it is not only the visual appearance of the robots that make them appear unappealing but also the movement (Mori, 1970). Whilst there are a number of studies that measure and investigate a subject's response to a realistic human character (McDonnell and Breidt, 2010, Geller, 2008, Seyama and Nagayama, 2007), few have effectively compared and contrasted how this relates to other

character archetypes particularly with reference to a medium such as animation which in itself has almost an unlimited range of character choices one can call upon. Moreover whilst much research exists to measure the effects of the uncanny valley in 3D computer animation (Dill et al., 2012, Tinwell et al., 2011, MacDorman et al., 2009), few set out with the aims to measure the most crucial component to character design in animation, the appeal of the character.

1.1 What is character appeal?

'Whereas the live action actor has charisma, the animated character has appeal' (Thomas and Johnston, 1995). Character appeal is often incorrectly confused to mean cute or fluffy (Lasseter, 1987). Generally these connotations relate to a positive character. However, we know that many negative characters are also appealing. In the following chapter we will fully explore and discuss the meaning of the word appeal and how it relates to a study which investigates character design in 3D computer animation within of the uncanny valley phenomenon. In the case of the study described within this thesis 'appeal' is used interchangeably with the word 'interest'. This connection is clarified and explained in the following chapter.

With the rise of 3D computer graphics, character design has become complicated. In the past, traditional 2D animation had to contend with cost and labour time involved if an overly complex character was to be designed often leading to an overall simplification or cartooning of a design (Sibley and Brian, 1988). 2D character designs were constructed with as few strokes of the pencil as possible, to aid in the reproduction of the character in preceding frames of animation whereas 3D animation has characters that are vastly more complicated than their 2D counterparts, which much less repercussion. The idea of creating realistic animated characters is now becoming a reality. Animated characters have now been used in place of real actors when dangerous or impossible live action production is required and have been used successfully in films such as *Avatar* (Cameron, 2009) and *Final Fantasy: The Spirits Within* (Sakaguchi and Sakakibara, 2001). Ho et al., (2008) states that the overall image as well as the expression of the character strongly influence the way the viewer perceives the character. Green et al., suggests that a mismatch in

facial proportions are a cause of negative perceptions by the viewers (Green et al., 2008). The reason of what causes a drop in appeal with realistic character types is unclear, however, approaching the problem with a realism bias negates what the field of animation has been successfully producing for many years prior to the emergence of 3D computer animation.

1.2 Previous Studies

Previous research has tackled the problem of how character appeal is affected in 3D computer graphics from the platform of the uncanny valley. Much of the studies tended to focus and favour one particular character archetype, namely the realistic. Stimulus featuring realistic 3D characters in previous research were measured in relation to a subject response towards them often using footage which was not necessarily created for the experiment being conducted (Ho et al., 2008, Dill et al., 2012, MacDorman, 2006). Archetypes of other character types such as cartoon types often retained the same proportions as the realistic thus creating an inferior set of stimulus that is to be compared against a realistic character (McDonnell et al., 2012, MacDorman et al., 2009). Unfortunately, the positioning of previous research seems to put 3D animation on a path towards realism negating the need for other forms or styles of animation which the medium best caters for like no other. While some studies have taken on fully realised characters which conform proportionally and visually to their respective character types, problems emerge with the type of animation techniques involved. Whilst using a diverse range of characters in a study conducted by McDonnell et al. (2008), researchers later used the same motion captured data to animate each of the characters, the data obtained from an actor which closely matched the realistic character with their set causing erratic movements in the characters that did not closely match the realistic character (McDonnell et al., 2008). Such practises give rise to the notion that some previous research gives bias to one particular type of character. Such bias can be controlled though stringent control over the construction of the experiment.

Other studies have been constructed using existing footage from films or other sources not specifically created for the particular experiments in question

(MacDorman, 2006, Ho et al., 2008, Dill et al., 2012). Using existing footage or images may prove problematic for a number of reasons, the first of which is directly related to the notion of the uncanny valley. As Allen et al. (2007) would state if a subject where to be exposed to a character that falls into the uncanny valley they would likely be repulsed, however if then re-exposed to the same character the effect would be significantly reduced (Allen, 2007). When one conducts an investigation into an area such as the uncanny valley with its highly sensitive variables and character nuances the researcher must have control over the features that surround or make up the character as these themselves could have a significant effect on how the subject perceives the character within the stimulus (Ho et al., 2008). Unfortunately, using found footage means, colours, locations characters are places, the mood of the character, expressions, body posture, tone and overall feeling of a character do not match. One study cannot take on all the variables due to the complex nature that make up the construction of a character but should make an attempt to match various character types in terms of behaviour and contextualisation at the very least.

Past research has focused mainly on the uncanny valley theory as a means to explain why such problems may have occurred (Green et al., 2008, MacDorman, 2005). While numerous studies tend to agree with Mori summations (Dill et al., 2012, Tinwell et al., 2011, Gray and Wegner, 2012, Mitchell et al., 2011), some dispute it. David Hanson's research consisted of showing two videos of two different types of robots both of which were created by himself and viewed by a number of participants. None of his participants found the human looking robot disturbing. 'The reaction never dipped into the negative region, thus showed no sign of the repulsion that defined the "valley" of Mashiro Mori's uncanny valley. There does not appear to be an inherent valley' (Hanson et al., 2005).

1.3 Importance of Appeal

Creating appealing characters which engage the interest and compel the audience that views them is important to any medium which implements them. Having unappealing characters as part of any project could cause a failure of the project or a production and at the very least a negative response from the viewer. Use of 3D

characters is utilised and not limited to advertising, film or video gaming. Well executed design of the character contributes to the viewer/user experience, believability and effective story telling. In a discourse which relates to a subjects perception of 3D computer graphical characters, one finds much of the current research relates specifically to one particular type of character, that character archetype being the realistic human character. This needs to be further researched. The problem with this approach is it positions character design within animation as a means to create realistic characters and negates the need for other character archetypes. It is important to investigate how different character types maybe affected by a contextualisation which may or may not have an effect on the perceived appeal/interest of that character by the audience regardless of how humanly realistic the audience find that character.

In modern Western animation, there is a tendency to focus on the story of a work above the character. While in independent film as well as in Japanese animation, there is a wealth of narratives that are character driven rather than story driven. *Mind Game* (Dir. Yuasa 2004) and *Spirited Away* (Miyazaki, 2001)serve as two examples of character driven animation from Japanese global cinema. With such works, the audience follow the character as they progress through a plot. Pixar like to state the mantra that the 'story is king' (Robinson, 2004), over (Oliver, 2004) and over (Paik, 2007) and over again (Neuwirth, 2003, Wang, 2012). A question arises, is the story the king? From another perspective story could be considered a context which allows a character to exist. It could merely provide the character with opportunities to display the mannerisms and behaviours which the viewer expects to see. To illustrate such a statement we could look at famous characters, such as Mickey Mouse, Goofy, Bugs Bunny, Roger Rabbit, Felix the Cat and Wile E. Coyote. All these characters are remembered in their own right people do not necessarily remember the story of the animation that they featured in. If a subject is supposed to identify with a character for empathic devices, then character driven narrative devices need to be employed. 'Advertising routinely emphasises the characters rather than the settings or plots' (Papke, 2003) allowing the viewer to identify with the needs of the character and how that character may use whatever product was being advertised and fulfilled those needs. The film industry was quick to pick up on this and classical Hollywood films such as that of early Warner Bros. routinely became character

driven. Often those films which are character driven spawn the greater number of sequels, most recently one could consider the Harry Potter franchise (Cartmell and Whelehan, 2005). In creating more durable characters a character driven approach is most likely the better approach. Also in the pursuit of creating more believable and feeling characters within a narrative a character driven approach would seem the most appropriate direction (Ryan, 2000, Newman, 2006, Lankoski and Heliö, 2002).

1.4 The Approach

Past research presented stimulus in a manner that would be highly unusual for the subject to view a character of any sort particularly when discussing a 3D computer graphics constructed character. Characters such as the ones used in the field of computer animation are usually viewed as part of a commercial program, film or advertisement. The approach under taken in this study has the aim of presenting character based stimulus in a manner that is familiar to the subject and closer to how one may be exposed to a character archetype outside of an experiment. The stimulus integrated into an experiment still needs the control and objective qualities of a standard experimental approach. While there have been a number of studies which explore the appeal of a character in one form or another. None of these studies have integrated the characters into an experiment which explores the characters aesthetic appearance, behaviour and contextualisation within a narrative. The approach under taken in this study while presenting stimulus in an approach which should appear more natural to the subject also isolates key components which may be significant to the perceived interest/appeal of a character. The research undertaken within this study aims to provide a method for the objective measurement of the variables of character archetype, behaviour and context.

1.5 Aims and Research Questions

The aim of this study is:

To investigate the perceived relationship between the character archetype, behaviour of the said character and the context in which the character is contained towards a greater understanding of character appeal with the subject.

The Research questions posed are:

This study aims to answer key questions surrounding the character design.

1. Does a 3D character **type** have a significant effect on the notion of appeal/interest with the subject?
2. Does a 3D characters **behaviour** have a significant effect on the notion of appeal/interest with the subject?
3. Does a 3D characters **contextualisation** have a significant effect on the notion of appeal/interest with the subject?
4. Are **different character archetypes** perceived differently when placed in a particular **contextualisation** and exhibiting particular **behaviours**?
5. Do **independent variables relating to a subjects identity** such as the subjects gender, nationality, age affect their perception in terms of appeal/interest with a 3D character type?

The objectives of this study are:

- Design a collection of characters and implement these characters within a contextualised narrative while exhibiting a specific behaviour. Providing each character an experimental scenario to test the research questions..
- Develop an experimental framework and process that can test three different elements at the same time. A final experiment will measure three dependent variables simultaneously.
- Analyse the data collected from the experiment quantitatively to further inform research into areas utilising a character as an integral part of the work.

1.6 Outline of Thesis

Chapter II defines and establishes the core conceptual framework involved with the approaches undertaken within this study. We begin by defining terms and

appropriating the correct semantic approach before continuing with our exploration of literature. Following this we explore key research relating to the **uncanny valley** and discern where the problematic areas exist in terms of character design. We approach and explore concepts of **empathetic relationship** between a synthetic character and a subject which directs us to the approaches towards understanding **appeal** and **interest**. Before further continuing we explore the very notion of **character** and what it means to this study. We later begin to describe what this study understands **context** and **behaviour** to mean which is later further explored and explained in relation to the first experiment in the following chapter. Prior to this we discuss the medium in which this study speaks as well as to form later experimentation that will be comprised and created within **3D computer graphics**. Following this we close the chapter with an explanation and understanding of various and potential **character uses**.

Chapter III describes the construction and execution of **Experiment 1**. Component parts are explained as we further break down **experimental design**, **context**, **participants**, **characters** and **behaviours** in relation to the approach to this experiment. This is followed by a statistical analysis of the data obtained. The data is finally discussed at the end of the Chapter V. Data from this experiment later informs further experimentation.

Initial experimentation is described within *Chapter IV*. This Chapter follows a similar construction to the preceding chapter with slight variations. This Chapter describes a larger experimental process comprising of two separate parts. **Experiment 2A** and **Experiment 2B**, once again **experimental design**, **context**, **participation** and characters are discussed in relation to their respective experimental parts. As with the previous Chapter, data is statistically analysed. However, the discussion relating to these experiments is located within the final Chapter of this thesis.

Chapter V takes data obtained throughout the study and formulates understandings based on the findings of this study. Chapter V first discusses data obtained from experiment 2A and then experiment 2B. Following this the findings and conclusions of the study as a whole are discussed and explained and future work discussed.

Chapter II

Literature Review

This literature review considers the placement of character design within the confines of this particular study, and considers the most prevalent problems surrounding character design. We begin with a historical contextualisation of animation and the place of 3D computer animation within this context. This leads into a discussion of the enduring theoretical problem with character designs created to a highly realistic level using 3D computer graphics. This problem is known as the "uncanny valley". The section dealing with this theory considers previous research and how this problem affects how a character is perceived by a viewer. This review then explores a key factor affected by the uncanny valley which is the empathy a subject feels with a character. Empathy is explored through existing research and placed within a context in this study. This discussion is highlighted by the fact an uncanny character has difficultly eliciting empathy with a subject/viewer. This not only has a detrimental effect of the emotional connection a subject/viewer feels with a character, but more importantly for this study the appeal a subject/viewer feels towards a specific character. Appeal is explored in this Chapter once concepts such as the uncanny and empathy are first probed with relevance to this particular study. Finally characterisation is discussed; we explore how a subject interacts with a character in previous research as well has methods used which utilised a character as a major part of the study. Whilst character is important, so is context in which the character is placed. Following a discussion regarding character we will examine the use of context which will later form a crucial part of this study. This section later focuses on how different behaviours of a character within a context change the viewer's perception of a character. The review concludes with a discussion on character types which gives grounding to the character archetypes used in this study. This is followed by the preceding Chapter which focuses on the particular elements involved in the method implemented in this study. This review begins with a

discussion outlining to the state of animation which positions this particular study and provides the platform for the direction of research undertaken within this thesis.

2.1 The State of Animation

Animation by its very nature can be a unique storytelling medium which potentially allows a creator an almost limitless array of content to enrich the project he or she is developing. There are a number of different forms which could be considered as animation. *The Oxford English Dictionary* defines animation as 'the technique of photographing successive drawings or positions of puppets or models to create an illusion of movement when the film is shown as a sequence' (Hawker and Waite, 2007). This definition can easily be applied to forms of animation such as stop motion, where a physical puppet is photographed in sequential poses to create believable movement. The definition also applies to traditional hand drawn animation, a mode of animation which dominated the form throughout the twentieth century. Hand drawn animation consists of three methods. The first being full animation in which every part of the character that is moving is redrawn (Parrott and Clifford, 2004). This form evolved into a more economic method known as limited animation, a mode in which only the most lively components of the character are redrawn, such as the mouth in a dialog scene but not the head (Kirkpatrick et al., 2003). This mode paved the way for digital animation which later set the animation techniques being used almost exclusively in 2D computer animation. In the past animators needed to restrict the design of a character to be more cost effective for the overall production. In traditional animation, having a character with many buttons on their shirt would have been very costly as animators would have had to animate the buttons in almost every frame. This is the very reason Micky Mouse had only three fingers. Walt Disney is quoted as saying, 'artistically five digits are too many for a mouse. His hand would look like a bunch of bananas. Financially, not having an extra finger in each of 45,000 drawings that make up a six and one half minute short has saved the Studio millions' (Sibley and Brian, 1988) however, with the advances made in 3D computer animation, designs can be more detailed and more elaborate. This potentially opens a gateway for a host of character designs that would have been inconceivable in previous animation modes. 3D computer animation is still developing: productions which use 3D computer graphics tend to be costly (Louchet

et al., 1995). For example a typical Pixar production such as *Up* (Docter and Peterson, 2009) can start at $175,000,000 while a film with little or no animation involved such as *The Blind Side* (Hancock, 2009) has a production cost of $35,000,000. Taking films made in 2013, the cheapest budget found on a major animated film was $85,000,000 for the movie *Hotel Transylvania* (Tartakovsky, 2012) which is more than double of a one of the few films not to contain large sections of computer graphics, *The Guilt Trip* (Fletcher, 2012). Data for this comparison was obtained from The Numbers.com (Numbers, 2013). Due to the production time involved in making a fully animated movie, it is not inconceivable to expect to costs of such a production would be higher. In an interview with Youngzine, Pixar representatives stated it can take seven years to make a finished movie (Kuei and Dooley, 2011). This cost often means producers are cautious and utilise proven ideas in production, favouring the more tried and tested roads. This leads to a situation where character designs tend to be similar to each other. An extreme example of this is interchanging of ideas that have been observed with Pixar and Dreamworks. In 1998 Dreamworks released *Antz* (Darnell and Johnson, 1998). This film featured insects as the main characters. Pixar released *A Bug's Life* (Lasseter and Stanton, 1998) earlier in the same year; this film also featured insects as the main characters and like *Antz* (Darnell and Johnson, 1998), *A Bug's Life* (Lasseter and Stanton, 1998) also featured an ant as the lead character. In 2001, Dreamworks released *Shrek* (Adamson and Jenson, 2001) which featured a monster (ogre) as the lead character. Unsurprisingly in that same year Pixar released *Monsters, Inc.*(Docter and Silverman, 2001). In 2003, Pixar released *Finding Nemo* (Stanton and Unkrich, 2003) which featured fish and other sea creatures as the main focal points. Dreamworks followed this with *Shark Tale* (Bergeron and Jenson, 2004). It should also be noted that all of these animated films from these studios were aimed at the same demographic group. As animation is a proven medium when it comes to the younger demographic combined with the cost and time it takes to produce a movie. As a result a producer may be reluctant to use such a medium for anything that may stray away from the tried and tested successful formula or character..

Much of the cautious behaviour of recent 3D computer animated productions stems from the poor reception of 3D animated films which contained characters

depicting less cartoonistic emotions when compared to the 3D Animated cartoons aimed at a younger audience such as *Renaissance* (Volckman, 2006) and *The Polar Express* (Zemeckis, 2004). Realistic characters like those in *The Polar Express* (Zemeckis, 2004) may well be considered to fall into the uncanny valley (Geller, 2008, Pollick, 2010, Ho and MacDorman, 2010, MacGillivray, 2007, Pavey, 2007, Moosa and SM, 2010, Zell and Botsch, 2012), such characters are described to illicit lack of empathy with the with the viewer (McDonnell and Breidt, 2010, Mori et al., 2012, Rowsell). This lack of empathy with realistically animated characters is often referred to as the uncanny valley, a term that first came from android sciences (Walters et al., 2008, Mori et al., 2012, Mori, 1970).

> *'The uncanny valley is a theory that discusses the relationship between a robot's visual resemblance to a human and our perception of the robot. As a robot becomes more human-like, there is a point when the robot appears human enough for us to believe on some level that it is human, only to (sometimes rudely) discover that it is not. At this point, such a robot is said to be perceived as uncanny and is not well accepted. This dropped region of believability is called the uncanny valley'* (Young et al., 2007).

Much of the previous studies which aimed to measure character appeal through the perspective and platform of the uncanny valley used words such as eerie, creepy or less-human to develop an understanding of the specific character design (Brenton et al., 2005, MacDorman, 2006, Bartneck et al., 2009), Semantically these terms have little to do with the interpretation of the appeal of a character in any given context. Just because a character is eerie, creepy or indeed less human, it does not imply that they are any less appealing, empathic or compelling. For clarity the term empathy is defined as 'the ability to understand and share the feelings of another' by *The Oxford English Dictionary* (Hawker and Waite, 2007). For a character to be empathic an illusion of a shared understanding between the subject and the character must exist. Definitions of the terms compelling and appeal will be discussed and evaluated later in this Chapter. In a discourse regarding previous research constructed in such a way that positions other character types as minor derivatives of

a realistic archetype implies a goal of animation that should represent a perfect representation of the human form. These assumptions are clearly problematic when one looks at realist animation and illustrative forms. A case in point, *Snow White and the Seven Dwarfs* (Cottrell and Hand, 1938) which utilised major rotoscoping of the human characters. Rotoscoping is a technique in which an animator traces live-action footage to produce realistic proportioned and animated characters. While the main human characters in the film *Snow White and the Seven Dwarfs* (1938) were rotoscoped, the dwarfs were not. Critics and audiences of the film would later contend that the animation and style of the dwarf characters had greater appeal than any of the realistically animated characters within the film (Thomas and Johnston, 1995). This led to all future Disney productions to only use the technique of rotoscoping which ultimately led to the development of Disney's twelve principles of animation which have since become a mainstay within the animation field (Thomas and Johnston, 1995). The twelve principles of animation were discussed in a book written by Disney animators, Frank Thomas and Ollie Johnston in 1981. The first of the principles is squash and stretch. Squash and stretch is an important principle that makes animation feel more lifelike. It would be easy to make the mistake of thinking a principle such as this may only apply to cartoonist style animation, however, as Thomas and Johnston attest, real bodies also deform in extreme ways. This was discovered when the pair studied sports photographs. The next principle anticipation, refers to the key pose that follows a strong action, with a longer anticipation pose and shorter action pose the more powerful the action will be perceived. Another principle is staging, Thomas and Johnson state that good animation should be readable in silhouette. The following principle, straight ahead action and pose to pose, refer to two different animation techniques. Straight ahead animation is when an animator may start animating a character at point 'A' and move to point 'B' and 'C' chronologically. However, pose to pose refers to techniques where an animator would put in the key poses first. Point 'A' and 'C' would be completed first and point 'B' would be added later as an in-between. The principle follows through and overlapping action refers to strong movement which would not simply stop after the strong action is completed. This links in with the following principle, slow in and slow out, this refers to how most movements should start and end slowly avoiding sudden stops. Arcs refer to circular movements which organic subjects tend to make. Secondary action serves to give a scene more life, such as a

character checking their watch as they walk. The principle of timing is integral to even remotely decent animation as animation which is poorly timed is simply bad animation. The principle of exaggeration like squash and stretch applies to both realistic and cartoonist animation styles. This principle can be seen with still illustrative mediums such as the failed live-action photo comics. One of the only remotely successful photo comics to exist was Harvery Kurtzman's Help! (Kurtzman et al., 1988, Kitchen and Buhle, 2009) which had a short run of five years 1960 – 1965. Arguably this could be put down to the stiffer look of photographic characters compared to the exaggerated superheroes of drawn comics. The next principle Frank Thomas and Ollie Johnston discuss is solid drawing. Solid drawing refers to drawings that have an understanding of their placement within 3D space taking into account mass and weight of the subject. In 3D computer animation much of the work into working out a perspective or angle is done relatively easily. The final principle that Frank Thomas and Ollie Johnston discuss is also the most important of the principles and for the scope of this study is appeal (Thomas and Johnston, 1995).

The state of animation in terms of character design relating to the uncanny valley phenomenon as a means and platform for further understanding the subjects perception of 3D character design in relation to the medium of animation has been defined, we now need to further outline the other definitions involved within this study.

2.2 Definitions of Terminology

John Lasseter states that the word **appeal** is often misunderstood to suggest 'cuddly bunnies and soft kittens. It doesn't; it means anything that a person likes to see: a quality of charm, pleasing design, simplicity, communication, or magnetism' (Lasseter, 1987). Lasseter goes on to state, that poor design lacks appeal. 'A design that is complicated or hard to read lacks appeal. Clumsy shapes and awkward moves all have low appeal'. While the Disney animators discussed a number of key points that in essence seem clear but when applied to the level of detail that can be obtained from 3D computer animation we inherently find a problem.

In creating an experiment to understand and measure a subject's perception of a

type of character, one must first ascertain the analytical semantic language. Phillips, et al. (2010), suggested that studies undertaken with the aims of defining useful measures in aesthetic preference alone are complicated by 'the difficulty in defining some of their constituent parts' (Phillips et al., 2010). A complexity that would be increased without a full understanding of the semantic language employed in the study. Finding the correct expression to describe what is the focus of the study as well as the word that is presented to the subject upon their first reading of the research questions pertaining to the stimulus is also difficult. Obviously the first choice would be to use the word "appeal". Thanks to animators such as Thomas, Johnson and Lasseter (Thomas and Johnston, 1995, Lasseter, 1987), this word has been semantically linked to animation especially when discussing character animation. However, in understanding and defining such a word, we must realise the complexity of analysing it within the context of an experiment. Moreover, Lassester himself states the word appeal is often misunderstood (Lasseter, 1987). This renders the word almost impossible to represent a subject in the form of a question as the definition of the word is itself open to confusion. This makes experiments difficult to conduct as the wording would be required to be explained to the viewer. Therefore, an easier more concise terminology is explored within this study. The terminology is arrived at by redefining the word 'appeal' through various configurations. *The Oxford English Dictionary* defines appeal, 'as a quality that makes somebody/something attractive or interesting' (Hawker and Waite, 2007). This definition is further complicated when one aims to further define the words **attractive** and **interesting**. The word attractive is defined by *The Oxford English Dictionary* as 'pleasant to look at, especially in a sexual way' (Hawker and Waite, 2007). However, when we come to look at the definition of interesting which is defined by *The Oxford English Dictionary* as, 'attracting your attention because it is special, exciting or unusual' (Hawker and Waite, 2007). The definition of the word 'interesting' assumes what is aimed to be measured within this study. Synonyms such as 'special' or 'exciting' may relate to the questions asked of the viewer as based around the key word 'interesting'. Specifically, how interesting is the character perceived to be through adaptation of the character type and behaviour as well as in the case of the second experiment the narrative of the context in which the character is contained. However, while the word 'interesting' is indeed usable for the study, there is a short term nature to the definition, 'attracting your attention' (Hawker and

Waite, 2007). Further definitions elevate the short term nature of the definition provided by the Oxford English dictionary. The American Heritage Dictionary defines interesting as 'arousing or holding the attention; absorbing' (Pickett, 2006). The Collins English dictionary defines interesting as, 'inspiring interest; absorbing' (Dictionary, 2000). While Webster's College dictionary defines interesting as, 'engaging or exciting and holding the attention or curiosity' (Agnes and Guralnik, 1999). To investigate the viewer's response to a character archetype, an experiment would more likely be served better using terminology such as 'interest' rather than words with would likely carry confusing connotations. Thus creating confusion it what the viewer feels is asked of them. It would have been good to define the term in a different way e.g. visually or schematically.

While this research does make contrasts to previous research terms often these do not match exactly. Some may use matching terms such as appeal and interest others may use terms such as 'preference', 'likability', and 'favourability'. These terms relate to appeal and interest on a level of positivity towards the character they are viewing. Meaning if the subject has 'preference', increased 'likability' and 'favourability' then one can argue that the subject finds the character more interesting/appealing. It is important to note this study looks at appeal to contain three aspects of character design these are both the aesthetics of the character, the behaviour of that character and how the character relates/interacts with their context. Previous research tends to only discuss terms in singularly and rarely in relation to one or the other and usually the aesthetics of the character regardless of the context and behaviour. In this review we will discuss the importance of each aspect of the character's design and why each component is crucial to the subject's appeal of the character.

Even before cinema and photography was invented, animation has had a place, from magic lanterns to flipbooks. Characters which were created from imagination have been the ones to tell the history of the World. These characters live on well after their creators have long gone. Examples of this can be found in many museums such as parchments depicting Anubis from ancient Egypt, the Bayeux Tapestry from England, Murduk's dragon from ancient Mesopotamia to name a few. Character design within the field of 3D computer graphics is linked with the advancements in

technology which now allows a creator to design highly detailed characters with all the features of real living beings. While such advancements have made the animations life easier, it has also been a troublesome path for animation. As more can be done with a character, it is often expected by viewers to do more . As it was discussed in the previous Chapter, traditional hand drawn methods of animation restrict how much detail can be added to a character (Sibley and Brian, 1988). It is important to note that simplistic designs of traditionally animated characters were not purely technical limitations but also stylistic ones (Sibley and Brian, 1988). Films and 3D illustrations featuring realistic human characters such as *Beowulf* (Zemeckis, 2007) and those with realistically rendered cartoon characters such as *Alvin and the Chipmunks* (Hill, 2007) have been met with negative criticism. A lot of the criticism relates to the characters not seeming truly lifelike (Geller, 2008). Where total realism is the goal it is stated that any character with this aim will ultimately fail, this notion is described as the Uncanny Valley (Bartneck et al., 2007). In the following section the concept of the Uncanny Valley will be discussed followed by a section discussing realistic character types later in this chapter. When comparing the more realistic characters to more abstract ones we begin to discover parallels. This can be seen from games with 8-bit graphics which have had characters survive through to the 64-bit era. Characters such as Sonic, Mario and Zelda are examples of this. These characters existed from the early days of gaming when they were represented through a small amount of pixels. These characters appeal was not necessarily due to their graphical appeal but rather their narrative appeal. If we compare two similar game character's Nintendo's Mario (Miyamoto et al., 1987) and Naughty Dog's Crash Bandicoot (Bandicoot, 1996) both are primarily found in a genre of video game known as a platform game. A platform game involves a character jumping and running from one platform to another, often picking up coins or similar on the way to the end of the stage. Mario originated as a 2D game sprite which through a multitude of different game appearances is still popular to this day and still retains his 2D look, albeit now achieved with the use of cell shaded 3D graphics. When compared to Crash Bandicoot a character that was 3D in their first appearance has now but all disappeared regardless of whatever popularity this character may have had. Later in this chapter, abstract characters will be discussed in relation to this study.

When comparing cartoon characters to live action characters one can draw similar distinctions as with 3D and 2D characters. Cartooned and animated characters possibly have a longer lifespan than their live-action counterparts. Examples of this can be found in the works of Disney, in particular *Alice in Wonderland* (Geronimi and Jackson, 1951) and *Snow White and the Seven Dwarfs* (Cottrell and Hand, 1938) which were made over fifty years ago and are both still found on the latest media form. With 3D graphics and 3D animation, characters can potentially take on a new level of realism, and even attempt to create fully fledged synthetic humans. However, such attempts have fallen flat. 'Audience expectations are higher than they used to be when it comes to animation, and an in-depth character analysis is essential whether you are animating a pre-existing character or creating a character of your own' (Hooks and Naas, 2011). With advancements in technology an animator is expected to create a feature rich character with virtually no compromise to the design. The reaction and expected expectation of the audience of such creations by the creators are towards the realistic. However, what may look more realistic especially in the case of a human character may not necessarily create a more believable character. The issues of a character with such aims are optimised by the uncanny valley which will now be discussed.

2.3 The Uncanny Valley

'The uncanny valley is a theory that discusses the relationship between a robot's visual resemblance to a human and our perception of the robot. As a robot becomes more human-like, there is a point when the robot appears human enough for us to believe on some level that it is human, only to discover that it is not. At this point, such a robot is said to be perceived as uncanny and is not well accepted. This region of believability is called the uncanny valley' (Young et al., 2007). The uncanny valley theory was first coined by robotics expert Mori Masahiro (1970). While the uncanny valley theory comes from robotics, it now relates to 3D computer graphics due to the high level of realism that can now be achieved. While robotic fields could potentially create robots with a realistic human-like appearance in the 1970's when the theory first became prevalent. Precisely when one could use the phrase to describe something created from 3D computer graphics is somewhat difficult to

define. This is due to the various mediums using realistic or at least attempting to use realistic graphics to communicate their story. The first major film to use 3D computer graphics to represent a human in a realistic was the film *Final Fantasy: The Spirits Within* (Sakaguchi and Sakakibara, 2001). This is when the theory of The Uncanny Valley became relevant to 3D computer graphics. The theory while created for robotics is now synonymous with 3D computer graphics.

The definition of the uncanny valley can be seen as a very lucid one. 'Freud describes his extreme discomfort at seeing someone wearing a prosthetic limb. He argues that the uncanny reactions occur when something alien is presented in a familiar context or setting' (Brenton et al., 2005). However, today one would not be as alarmed by the sight of someone with a prosthetic limb as Freud was. We often see people with such devices through a number of media such as the television and the internet. We are increasingly more exposed to it. These media are now everyday stimulus and whereas this was not the case during Freud's time. Computer games often feature an attempt at realism, however, due to hardware and time restraints as well as occasionally lack of artistic focus, game characters fall into the uncanny valley. However, although such games have been successful, the visual appeal has been overlooked. 'Once exposed to the uncanny, it eventually ceases to be so. And in our age of overly-developed communication technology and sensory exposure and overload, the instance of truly contradicting semiotics seems less and less likely. Today, fewer things seem genuinely alien' (Allen, 2007). Results obtained by Dill et al. (2012), support Allen's statement. Dill et al. (2012), 'the curve tends to be moderate for those characters previously known by the subject' (Dill et al., 2012). This suggests that what may have shocked a viewer previously will not likely shock at the same level a second time or indeed at all. One may argue a safer option maybe to avoid realism altogether and perhaps create non-human characters if the creator would rather not risk the character falling into the uncanny realms (Schneider et al., 2007). Obviously, it is conceivably difficult to expect a viewer to emotionally connect to a character that falls into the uncanny valley. Conversely, a character that is so far away from the realm of realism may have trouble communicating a sophisticated range of emotion. Also having a human character allows a multitude of human emotions to be expressed given greater complexities in which a viewer can relate to. Other techniques such as anthropomorphism which allows a character to

emote as a human would without necessarily being human will be discussed later in this chapter. The Uncanny Valley can be explained simply. The more human a character becomes, the more appealing the subject finds it. To a point when the character becomes so realistic the subject no longer assess it as a character but as an actual human being. This test ultimately fails and the character is perceived with repulsion. This repulsion is a reaction that has been developed in humans for thousands of years. It helps us avoid diseased people or potentially diseased corpses (MacDorman, 2005). This reaction is illustrated by a hypothetical curve created by Mori (1970). These reactions are not limited to humans as monkeys when presented with realistic looking monkey faces are also disgusted by what they see (Steckenfinger and Ghazanfar, 2009).

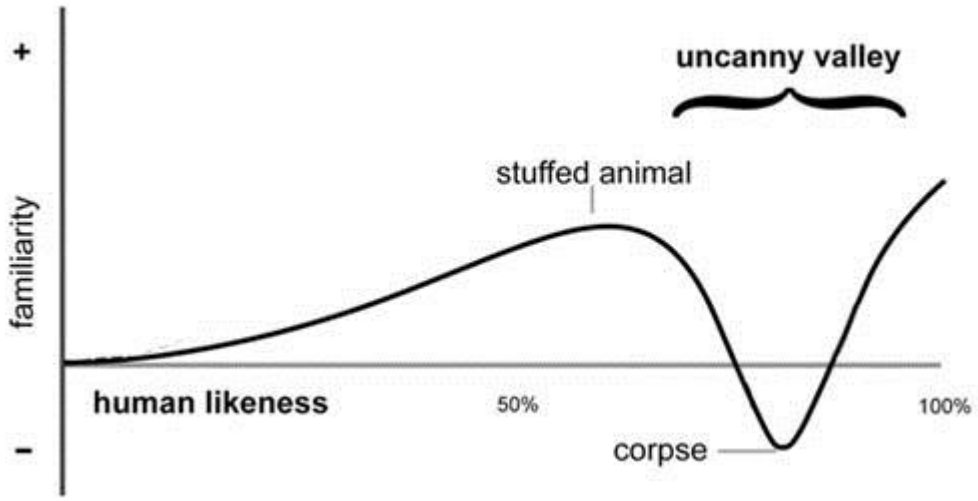


Fig 1: Uncanny Valley Curve (Mori, 1970)

While much of the current research into the uncanny valley is related to robotic and android studies, however, this work is still useful for a study focused on computer graphics as we are still discussing a realistic representation of a character. A key factor where robotics may find itself in an easier position to tackle the problems of the uncanny valley and empathetic issues is in believable presence. The problem with computer graphics in terms of the uncanny is that part of the task is the task of convincing the subject that what they are seeing exists in the real world or indeed convincing enough that the viewer can suspend their disbelief and accept what they are seeing exists. Using head mounted virtual reality interfaces researchers have found 3D computer graphics do illicit similar responses as there real world

counter parts (Pan et al., 2008). However, when behind a screen or printed on paper this remains to be seen. Android robots no matter how unappealing they may look, do exist. They have a 'physical presence that simulated characters lack' (MacDorman 2008) (MacDorman et al., 2009). In research conducted by MacDorman, 'Japanese participants showed the same modesty with an android as when interacted with a human interlocutor if they believed the android were under human control by telepresence' (MacDorman et al., 2009). Robotics has difficulty that computer graphics shares, the problem being the realism in the eyes. In android design it is difficult to achieve wet eyes (Ishiguro, 2007), thankfully in 3D graphics wetness of the eyes is relatively easy to achieve even with basic rendering techniques. In creating a realistic character, it is important to take note from what is hoped to be achieved within the android sciences as well as in 3D graphics. While it is true that 3D computer graphics do lack a physical presence. There are rendering techniques such as careful lighting, sensitive texturing as well as appropriate use of ambient occlusion that can help simulate a physical presence. Approaches to realistic character design in 3D computer graphics will be discussed later in this chapter. The design of the primary realistic character used within this specific research will be discussed in the following Chapter.

Jentsch was the first to present the idea of the "The Uncanny". In Jentsch's essay, "on the Psychology of the Uncanny", Jentsch describes "The Uncanny" as a psychological state in which the subject cannot differentiate between that which is alive or that which is dead (Jentsch, 1997). Freud discusses the term "uncanny" in his essay of the same name. In his essay he unpacks the meaning from the German translation of the word uncanny, *unheimlich.* 'The German word *unheimlich* is obviously the opposite of *heimlich*, *heimisch*, meaning "familiar," "native," "belonging to the home"; and we are tempted to conclude that what is "uncanny" is frightening, precisely, because it is *not* known and familiar (Freud, 2003). Freud goes on to discuss what is unknown is not always considered frightening and suggests, 'something has to be added to what is novel and unfamiliar to make it uncanny' (Freud, 2003). The "something" is indeed familiarity. This idea is compatible with Allen's ideas of what is uncanny can only truly be uncanny once per spectator or observer (Allen, 2007).

Searching for the purest form of an example, the uncanny valley leads us to a character once again from the games world. James Payne a fan of the video game series Total War died of cancer at 24 years of age. Prior to his untimely death he was given a tour of the studio where the game is made at Creative Assembly organised by Charity the Willow Foundation. He was among the first people outside of the team actually making the game to play it. What makes it uncanny is a digital version of James is now in the game. The Creative Assembly created a game character of James using photographic reference. Here we have a character that has the same face as a man who sadly died living in ancient Rome within the video game *Total War: Rome II* (Purchese, 2013, Smith, 2013). If the fear of the uncanny stems from a fear of agency to dead matter, then this makes a strong case for an example.

Fig 2: James Payne's character in the game (Purchese, 2013).

The film *Invasion of the Body Snatchers* (Kaufman, 1978) exemplifies the uncanny valley. It also serves as an example of why the uncanny valley phenomenon may not entirely be a visual problem. The film begins with everyday life in the city

of San Francisco we are introduced to the films main characters and we see them behaving in a normal emotional and empathetic level with one another. However, unbeknownst to them a bizarre alien plant like infestation has taken over the city. People who were once emotional have changed into unemotional and un-empathetic beings. While the still look human, there behaviour has changed. Human characters can blend in with the alien characters by behaving as if they have no emotion. Human characters often plead with the alien characters to empathise with them; however the alien seems unable to do so. The features combined lead to an altogether uncanny characterisation of the unappealing alien characters. It is important to note that these purposefully uncanny characters were created not by changing the look of the character, but by changing only the behaviour, significantly the aspect of behaviour that was changed with the characters empathy. In the next section we will further discuss the effects of empathy within character design.

2.4 Empathy

The problem which arises from the uncanny is how difficult it is for a viewer to emotionally connect to a character which happens to fall into the uncanny valley. This leads to a lack of empathy with this character and in turn the character has difficultly in generating appeal with the subject. That said, Hooks et al. (2011) suggests that the most important element of a character is how that character emotes. Other aspects become secondary to how well the characters can convey emotion. 'In animation, creating the "illusion of life" boils down not to mannerisms and naturalistic movements but to emotion. The audience empathises with motion' (Hooks and Naas, 2011). To believe a character is alive, the viewer must believe in the character's emotion and be able to relate to the feelings of the character. 'In ordinary language, empathy is often characterized as the ability to ''put oneself into another's shoes'' where this is meant to involve feeling the other's emotion within oneself. Sympathy, in contrast, is an emotional reaction to the situation of others which does not involve experiencing the emotions they feel. Empathy demands that the emotional reaction is more appropriate to the other person's situation, and that you feel it, because the other person feels it' (Misselhorn, 2009). Duffy suggests that to create a socially accepted robot, it should maintain 'a history of past experiences'

(Duffy, 2003). This means a machine that functions on a social level should remember what has happened to it in the past and to some extent learn and adapt to these events. If we consider this within our context, then this could be applied to a character's story. If a viewer is to watch an artificial character throughout the duration of a film in which a character passes certain milestones this would an idea of a 'life' of some sort and life should therefore be attributed to this character. Potentially character appeal could change with story. To clarify, would one view a character that is not particularly life like contained within a story which was in fact true to life perceive the character as more lifelike. We have all seen the cartoons where a character has been injured in one scene only to be fine in the next scene. This is not an accurate simulation of life. However, we may come to expect this type of behaviour from similarly designed characters; conversely more realistic characters have a more realistic expectation upon their behaviour.

How story affects a character varies. If we consider the film *Short Circuit* (Badham, 1986) the character Johnny Five starts as part of an autonomous group of robots built for combat. These machines all look and behave the same. However, after being struck by lightning he becomes 'alive'. Johnny Five later starts to behave differently, in a more childlike human manner. He expresses himself with mechanical eye lids that the other robot's also have. In the character construction, there is no perceivable difference between Johnny Five and the other machines. Over the course of the film, the viewer is taken through many emotional variations which Johnny Five leads. Johnny Five expresses himself through articulation of his body and the angling of his eye lids. In research conducted by Mather and Reichling, results showed that subtle changes in the angling of their test, robots eyebrows caused them to be judged differently. 'Angling the eyebrows caused a significant decrease in trusting behaviour by the human subjects' (Mathur and Reichling, 2009). As the faces of the robots 'become more human-like, they are judged to be less likeable to the point that they fall below the level of neutrality, seeming 'creepy' and unpleasant' (Mathur and Reichling, 2009). Hooks (2011) suggests that while there are maybe 'only six or seven basic emotions and five thousand facial expressions, humans are more complex than that. Most of our expressions are mixtures, or hybrids'. Clearly Johnny Five has a limited range of emotions that he can convey through expression alone. However, through the narrative the viewer can identify with his plight.

Empathy is an important ability that allows humans to actually be human. '[Empathy] is fundamental to human existence. It is evolutionary. Mothers empathise with their babies, which is how they know to pick them up when they cry' (Hooks and Naas, 2011). Without out the ability to relate to a character which empathy provides, we simply struggle to care about that character. This would seemingly work both ways as often negative characters are presented as unfeeling or apathetic. This resists audience's identification with such characters. While some negative characters are very popular, such as the Joffrey Baratheon from *A Game of Thrones* (Martin, 2011), Cohen et al. (2001) describes this extreme examples of this appeal through identification as tenuous. 'Identifying with extremely negative characters who are evil or very violent may evoke some understanding or even sympathy for them during reading or viewing but strongly identifying with such a character is likely to cause dissonance, guilt, or even fear' (Cohen, 2001).

Johnny Five's limited facial expressions, research by Riek et al. (2009), would suggest that one must emotionally connect to a character enough to see a situation from the character's perspective before empathy can be bestowed upon that character. Riek et al., suggests Simulation Theory applies here. 'Simulation Theory', an established theory in psychology suggests that the way in which we understand the minds of others is through "simulating" another's situation (i.e. putting ourselves in their shoes) in order to understand their mental state/emotion' (Riek et al., 2009). That said, it would be expected that a subject may find it easier to relate and empathise with a character that is more human in their construction or given sufficient ability through construction to give a similar range of emotive response as the subject. The research conducted by Riek et al. used various characters from one extreme of the realism scale to the other. Research stimuli featured mechanical robots,-which were realistic humanoid machines. The machines used were; Roomba - a machine least like human; AUR - a mechanical machine with a slightly more human appearance; Andrew - a humanoid machine and Alicia - a realistic human android. After seeing pictures of the protagonists, the participants were asked the question: 'Imagine there's been an earthquake and you can only save one of the protagonists. Which one would you save?' (Riek et al., 2009). Riek et al. state that they did not find any significant change in results from subjects of different ages or

genders. Their results show that participants would rather save the machine that was near the middle of the realism scale (Andrew) rather than the realistic android. 'In answer to the earthquake question, respondents significantly favoured Alica (39%) and Andrew (47%) over AUR (6%) and Roomba (8%)' (Riek et al., 2009). This idea while originating from the field of robotics clearly shares parallels with existing motivations within the field of 3D computer graphics. Riek et al. (2009) presents an interesting method of assessing there respondents perception to the stimulus which in this case are robots. While 3D graphics and robotics are different as we have discussed in the previous chapter, there are similarities that exist when comparing research from both fields on a character level. Riek et al. (2009) also raises an interesting point in terms of ethics, 'considering our results showed that people empathized nearly as much with the humanoid and android robot protagonists as they did with the human protagonist, witnessing human-like robot abuse could potentially bring emotional harm to other humans' (Riek et al., 2009).

While research by Riek et al., focused on gathering empathy from visual appearance alone, it did not look into the emotions the characters may or may not have been conveying. Research conducted by Tokyo Denki University into emoticons being able to convey emotions with no cognition of faces gave interesting results. Their studies used two averaged photographs based on the male and female students at Tokyo University, Japanese emoticons against 'non-emoticons' which consisted of symbols that represent no schematic face. Sentences with emoticons to complement their meanings were used against sentences with emoticons that contradict the meaning. Subject's brain activity was then measured to discern which parts of the brain were active when viewing the artefacts. As expected, the right fusiform gyrus, a part of the brain normally associated with face perception became active when the subjects were exposed to the photograph. However, this region of the brain did not become active when a subject was exposed to the emoticon. 'It is possible that the emotions were not sufficient to convince the subjects that the target was a face to activate the right fusiform gyrus' (Yuasa et al., 2006). In both cases the right inferior gyrus was affected. The right inferior gyrus is believed to be associated with emotional valence. Tokyo Denki University's research goes some way into showing that text based emoticons give an emotional response while the subject does not recognise the artefact as a face (Yuasa et al., 2006). This would imply that an

abstract character may have the potential to achieve the same level of emotional resonance as a realistic or anthropomorphic character. Given an abstraction of a face as used in the study conducted by Yuasa et al., (2009) can illicit the same response in a viewer as a human face would, it would be reasonable to suggest that the levels of empathy involved with an abstract character as well as a character with more realistic features are the same. Arguably an emoticon is a not a realistic character and no one would be fooled into thinking that something made up of a few simple lines could exist in the real world. However, the interplay of empathy with the subject and stimulus is real. If empathy is critical to the level of interest a subject has with a character then an abstract character can be equally comparable. 'The affective dimension of empathic concern is an appreciation for another's well-being that involves having a nonparallel emotional reaction to another' (Chory-Assad and Cicchirillo, 2005).

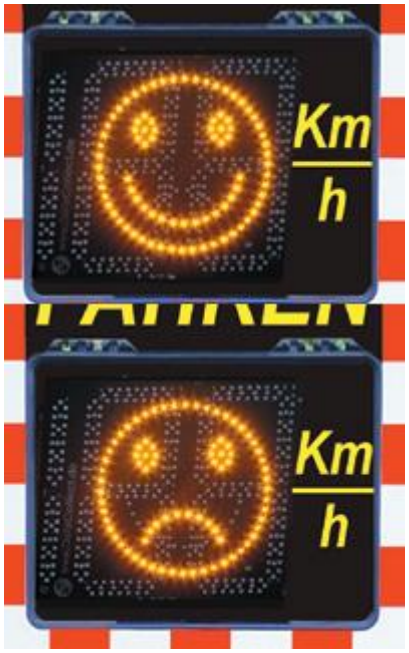


Fig 3: Smiley Sid in action

Those of us who are constantly behind the wheel may notice emotive smiley faces as they drive past (Fig 3). The system is known as a Speed Indication Display (http://www.smileysid.co.uk/). The system displays a face to the driver as they drive past. However, what type of face the driver will see is dependent on the speed which the driver is going. If the driver is driving below or at the speed limit they will see a smiley face on the road. According to the manufacturer the SID system has a 'proven

speed reduction effect' (http://www.smileysid.co.uk/). The SID system has been found to be most effective in 'short bursts' after time of around three weeks they should be moved to a new location (Hollingworth, 2011). The concept seemingly relies on empathy with the character, and requires the driver to feel some sort of remorse at a sub level for making the character upset. Scott McCloud (1994) states that when we look at a realistic face we automatically identify the face as the face of another. Whilst looking at a simplified cartoon face we see the face as a representation of ourselves (McCloud, 1994). The SID system possibly works on this level further enforcing the empathetic relationship between the symbolic and the desired emotive response.

Identification with a character is highly important for advertising. Maccoby et al., discovered children recalled the actions of characters that they most identified with (Maccoby and Wilson, 1957). Taking this statement one could argue that if a subject has not identified with a character in an advert, then they are less or not likely at all to remember the message imparted to them by the character in the advert. Thus forgetting the entire sales pitch. A statement by Huesmann et al. (1984), suggests that personas of characters, particularly those created to identify with children should pay special consideration. Huesmann et al., suggests that children learn aggressive behaviour from characters they identify with at an increased rate (Huesmann et al., 1984). Erikson states that the ability to relate to others is an essential social ability (Erikson, 1994). Indeed, those of whom who lack this ability are deemed unfeeling or anti-social. In an extreme sense sociopathic. The identifiably of a character is therefore a fundamental element that needs to be adhered to.

2.5 Appeal and Interest

While the previous Chapter unpacked the definition of the word 'appeal' this section uses other related words from other studies. As discussed previously, studies relating to the particular study involved in this thesis use the term 'interest' in experimentation, 'interest' was unpacked from the words 'appeal' and 'compelling' in the previous chapter. In this study the terms 'interest' and 'appeal' are used concurrently. Other studies may not have used either word. However, in the case of

this specific section and the studies that will be discussed here, words such as ‘beauty’, and adjectives such as ‘attractive’ work with terms such as ‘appeal’ and ‘interest’ on a superficial level. While ‘beauty’ may encompass the aesthetic of a character only, ‘appeal’ and ‘interest’ gives a more rounded terminology to describe not only the characters aesthetic but also their behaviour and context within a narrative. These features will be further discussed later in this chapter in there appropriate sections. This section focuses on the aesthetic of a character which as aims to investigate the important requirement in the character’s appeal, however, it is not the sole requirement. Nevertheless, terminology used within this section will pertain to that of the aesthetic, allowing for terms relating to this feature to be used.

When one begins to form an understanding of the aesthetic how does one go about measuring and creating rules for appeal when dealing with detailed characters or indeed real human beings? In research conducted by Green et al., (2008) to test which facial proportions work best for human likeness and appeal. Green et al found that there were some gender differences in the results. ‘Female participants showed greater tolerance in acceptable range of facial proportions for all stimulus types (Female, Male, and Robot). Female participants also considered the robot characters to be more humanlike than did the male participants’ (Green et al., 2008). Interestingly, Green et al. states, ‘an uncanny valley was found when participants were most ambivalent about the likeness of a face’(Green et al., 2008). Overly realistic staging and movement may not necessarily be the key to creating an emotive character that viewer would empathise with. As previously discussed, the negative characters in *Gremlins 2: The New Batch* (Dante, 1990) had a rat like appearance. This design choice could contribute to the viewer’s reading of the characters as negative. ‘In our society, rodents are usually portrayed in a negative manner. To overcome this, every department on *Ratatouille* strove to create appeal’ (Konishi and Venturini, 2007). Sonoko Konishi and Michael Venturini discuss the way their lead character for the film *Ratatouille* (Bird and Pinkava, 2007) was created and setup to accentuate its appeal. They highlight key areas where they feel appeal is gathered by such characters as shape and readability, ‘Our rat’s overall body is posed in a teardrop shape with a slight ‘s’ shape down the spine. By lowering the gravity we create a soft appeal, maintain balance when the body is leaning. When considering the body contour, we strove to keep simple direct shapes. By creating

clean silhouettes and simplified forms, we retain the appealing stylized design even in extreme action. Simple shapes also help the rats feel smaller' (Konishi and Venturini, 2007). While an appealing character does not necessarily have to be cute, as was discussed in the previous Chapter, Lasseter states that appeal is often confused to mean cute (Lasseter, 1987). However, increasing a character's cuteness does provide a simple way of increasing the interest in the character. Creating cuteness in a character often involves enlarging the head, giving it large eyes, a small mouth and the proportions of an infant (Kundert-Gibbs and Kundert-Gibbs, 2009). This has been seen with the original *The Looney Tunes* (Ford and Lennon, 1988) which features already cute characters being made even more cute in *The Baby Looney Tunes* (Hack and Heming, 2002). This may explain some of the techniques used in *Gremlins 2: The New Batch* (Dante, 1990) for construction of the cute versions of the characters before they changed into the monster versions as they too like *Ratatouille* feature of round, smooth and fluffy components. This also gives an insight as to why the negative versions are constructed with jagged hard bony shapes, as this is the opposite of a cute likeable character. This does not answer why the sophisticated Gremlin was found to be engaging by human characters, nor how appealing the viewer of the film may have found him. This character's appeal may well have been generated by his behaviour rather than his appearance. This character regardless of his appearance behaved elegantly and spoke eloquently. While the other Gremlins (apart from Gizmo) behaved aggressively and were more animal like; the sophisticated Gremlin was more anthropomorphised than the others.

Duffy suggests, '[Anthropomorphism] constitutes the basic integration/employment of 'humanness' in a system for its behaviour, to domains of expertise and competence, to its social environment in addition to its form' (Duffy, 2003). In essence, anthropomorphism contributes to the appeal. 'It is difficult to get the recipe just right for an appealing character, but when you do, you can create an enduring cultural icon like Mickey Mouse, Bugs Bunny, or Pikachu' (Kundert-Gibbs and Kundert-Gibbs, 2009). Appeal and interested are not simply visual artefacts when it comes to characters. A character by its very nature cannot be assessed on visual alone, this is especially important when it comes to both robotics and animation. In both fields, the character is not simply a static object. Moreover the character must in some way interact with a subject in the case of robotics and

interact with a narrative in the case of animation. Later in this chapter behaviour and context will be discussed in relation to the interest with a character. This section will continue to discuss the image of the character.

The field of classical art has had many theories pertaining to hold the key to creating appealing works. Probably the most widely known of these theories is the Φ (Phi) Ratio, or as it is more widely known as the Golden Ratio. The Golden Ratio is probably to most well-known device used to create compelling art works. Due to how well known the concept of the golden ratio is in terms of aesthetics, it would seem lacking for a study pertaining to character design that did not include a discussion into the concept.

Fensom states that in 'biological organisms, in mathematics and in the arts there occurs the proportion called the Golden Section or Ratio (Φ, phi), which is a division of a volume, an area or a length into parts having a ratio of 1 to 1.618… (or 0.618…), an irrational number' (Fensom, 1981). Fensom goes on to suggest 'it has been learned that individual groups of cells in the human brain lead to the recognition of certain distinct patterns, for example of the vertical and of the horizontal lines, and there is evidence that certain groups of brain cells permit a baby monkey at an early age to recognize a monkey hand' (Fensom, 1981). Fensom suggests a human baby's recognition of his or her mother's face is possibly due to a group of human brain cells that recognize the proportions of the mothers face. He suggests that the facial division (chin-to-eyes-line and chin-to-hair-line), which on average is equal to the ratio of Φ triggers a positive response in the baby as this also contributes to their survival (Fensom, 1981). If all organic artefacts on the planet Earth are an average equal to Φ, then it would seem plausible that there is a recognition system inbuilt into our subconscious as a tool for survival. It would certainly seem that an organic artefact living or not would have somewhat outer worldly properties if it did not conform to the ratio of Φ. In the search for appeal, it would seem the answer is clear. Our brains are predisposed to objects, artworks and characters that conform to this ratio. Thus a character that does not conform to this ratio will be regarded with reduced interest or even no interest towards disgust. Looking at a character from a purely proportionate perspective it would certainly seem fit to use a device such as with the golden ration to create a perfectly

conforming character.

However, George Markowsky (Markowsky, 1992) counters Fensom's arguments. Markowsky states the Golden Ratio Φ is often cited with a great deal of misconception. Often those who are enthusiastic about the idea of Φ suggest that it was used throughout history. It is often stated that the Golden Ratio was used by Leonardo da Vinci in a great number of his works. However, Markowsky states, that the term 'Golden Mean' was used in classical times as a tool to avoid excess in space or subject in either direction. Markowsky goes on to state that some authors incorrectly misinterpret the term the 'Golden Mean' to mean the 'Golden Ratio'. He cites Charles F. Lin as one author who does this. "The confusion of names might have led some people to conclude that 'Golden Mean' was used in classical times to denote the Golden Ratio" (Markowsky, 1992). Markowsky goes on to state that a 'point overlooked by many Golden Ratio enthusiasts is the fact that measurements of real objects can only be approximations. Furthermore, it is necessary to specify the precision of any measurements and to realize that inaccuracies in measurements lead to greater inaccuracies in ratios' (Markowsky, 1992). Kak's ideas support Markowsky, Kak gives further insight into Φ. 'The conception of it (Φ, Phi) as a pleasing shape arose in the late 1800s and there are no written texts that support such usage in the ancient world. Indeed, many non-Western cultures either do not speak of unique ideal or consider other ratios as ideal, such as √2 of the Islamic architecture' (Kak, 2011). While there are a number or sources with support the golden ratio concept (Livio, 2008, Hemenway, 2005, Fett, 2006), there are greater number of sources with reject it as a method to guarantee interesting creations (Markowsky, 1992, Pallett et al., 2010, Adamson and Galli, 2009). Reliance on this concept proves to be tenuous at best.

While some may argue that Phi ratios relate to a westernised concept of beauty (Kak, 2011) rather than a global concept, this leads us to question how different other cultures understanding of beauty could be. Research conducted by Martin into the attractiveness of certain features found that Americans of both African and European descent both found Caucasians facial features to be more attractive than African features. However, when the same study was conducted in Africa, specifically Nigeria; there was a preference for African features over Caucasian features (Martin,

1964). This work would support an argument that different cultures carry with them a different idea of beauty. Therefore, would carry with them a different idea of character appeal and interest. Also the implied understanding would be that what one sees as appealing and interesting has been in some way imparted to them. External factors may have taught or conditioned a person within their specific cultures. Else, the global consensus on beauty would be the same. Personal beauty affects many facets of our lives. We attribute a wide array of positive qualities, such as being more occupationally and interpersonally competent, better adjusted, and having greater social appeal, to attractive people and their opposites to unattractive people (Chen et al., 2010). The way someone looks often elicits predetermined notions in someone when they see that person. Research conducted by Chu et al states that taller women were perceived as more successful and intelligent than shorter woman (Chu and Geary, 2005). Researchers found that different features correlate to different aspects of human emotion. In the case of trust, Mathur et al., found the eyebrow of the character changed how they were perceived. Specifically the angle of the eyebrow if pointed downward in the middle led subjects to conclude that this character was untrustworthy (Mathur and Reichling, 2009).

In advertising, be it a commercial on television for a bill board one drives past on the way to work the creator only has a few short seconds to capture the viewer's interest. Recent British Gas adverts seem to have taken a bizarre stylistic choice(Fig 4) . When compared to previous adverts created for the same company as part of a 2008 campaign there is a striking distance in style (Fig 5). Both adverts represent two very different character choices. The strange combination of heads and bodies in figure three could very well be described as a mismatch of styles. This mismatch of styles can be attributed to making a character very unappealing (MacDorman et al., 2009). However, the choice to use these characters here could be attributed to a desire to create a shocking character that may grab the viewers' attention, rather than cater for their interest. While the more uncanny a character the more unappealing the viewer may find it.

However, simply because a character maybe unappealing when viewed alone in a detached form context, it does not mean combined with a contextualization it would not emulate into a successful piece of advertisement. However, upon comparing both advertisements the 2013 iterations has significantly more background features surrounding the character compared to the 2008 advertisements. The 2008 characters are almost context free.

Fig 4: British Gas circa 2013

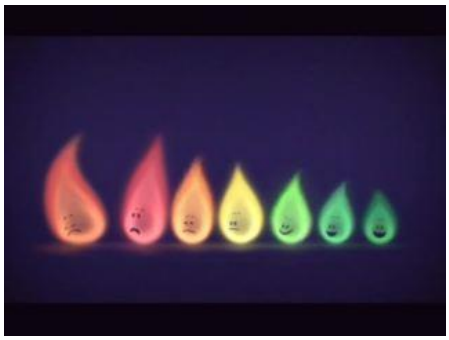


Fig 5: British Gas circa 2008

The 2013 campaign won the IPA gold Effectiveness Award (IPA, 2012). Such recognition goes some way to showing how characters which should fall into the uncanny valley are still successful through effective execution. Both adverts for British Gas feature two different types of characters. Moving from a one to the other may have been due to the bad press the CO2 advert received (Singh, 2008). While one (Fig 4) is attention grabbing the other (Fig 5) aims to strike a different feeling by catering to the viewer's intrigue in cuter imagery. These cuter images nurture a

desire in the viewer to 'own' the character they are seeing. Unfortunately, for the British Gas campaign, no stand out character was ever created with their flame adverts.

This paved the way for a different campaign to create that defining character. Aleksandr Orlov was a character created for an advertising campaign launched by an insurance comparison website Compare the Market (www.comparethemarket.com). Aleksandr Orlov is a fictional anthropomorphic Russian meerkat. The advert often features his family and friends. The character is given a rich backstory as it is portrayed as a wealthy aristocratic billionaire. Aleksandr has a now famous catchphrase, "simples", pronounced "Seem-pels".

> *The campaign has been a phenomenal success, transforming the business of comparethemarket.com. In the first 9 weeks quotes increased 80% and cost per acquisition was reduced by 73%. Spontaneous awareness has almost tripled from 20% to 59%. Aleksandr has over half a million fans on Facebook and over 39,000 followers on Twitter. This makes him officially more popular than Wayne Rooney and more influential than Hillary Clinton! (VCCP 2011)*

Clearly the character has been tremendously successful, perhaps even overtaking the campaign he was originally created for. A fictional book *A Simples Life: My life* (Orlov, 2010) and Time by Aleksandr Orlov was released in 2010 which outsold former Prime Minister Tony Blair's autobiography as well as 'a slew of newly released books by celebrity authors'(Hickman, 2010). Among the other merchandise, the campaign also caters for those who wish to own an Aleksandr for themselves. As of 2011 a stuffed toy which represents one of the characters is given away with each policy sold by comparethemarket.com (Reporter, 2013). The success of this character goes some way into offering an argument to the better understanding of Mori's hypothetical theory of the uncanny valley (Mori, 1970). When taken at face value, as we have previously discussed this often leads to a troublesome understanding that to be more appealing, a character should be more human in appearance. Previous research has contracted to this often measuring the subject's response to characters with increasing humanlike appearance (MacDorman et al.,

2009, Dill et al., 2012, McDonnell and Breidt, 2010). However, when taken literally, only realistic human like characters should warrant a high level of appeal. While studies pertaining to the uncanny valley often use less human characters (Dill et al., 2012, MacDorman, 2006) often we find a predisposition to the realistic especially in the case where 3D graphics are concerned (MacDorman et al., 2009).

Maldonado et al., states that, 'computer characters have been shown to be effective proxy sellers, customer service representatives, and teachers, by engaging us – consciously or unconsciously – through life-like language, presence and behaviours' (Maldonado and Nass, 2007). However, Rickenberg et al., sets out to test this notion. 'Animated characters are common in user interfaces, but important questions remain about whether characters work in all situations and for all users' (Rickenberg and Reeves, 2000). Rickenberg et al., conducted experiments to assess the effects virtual characters have on users of two commerce websites. 'There were three character conditions (no character, a character that ignored the user, and a character that closely monitored work on the website)' (Rickenberg and Reeves, 2000). Rickenberg et al., separated their subjects into two groups prior to testing. These groups had different views on accepting help from other people. 'Results showed that the effects of monitoring and individual differences' in thoughts about control worked as they do in real life. Users felt more anxious when characters monitored their website work and this effect was strongest for users with an external control orientation. Monitoring characters also decreased task performance, but increased trust in website content' (Rickenberg and Reeves, 2000).

Eladhari et al., poses some interesting ideas particularly in terms of self-characterisation or indeed an empathetic level of understanding an external character. 'Observing one's emotional reactions can be a way of getting to define 'myself'. For the question of characterization this is important. Film and literature generally provide a multiplicity of sites of identification. First-person narratives imply strong identification with the narrator, and traditional three-act restorative film structures imply an audience identification with the central hero, although the act of reading/viewing leaves open many different levels and degrees of identification with numerous characters within the text' (Eladhari and Lindley, 2003).

Foss (1993) suggests a novel idea on how appeal could be constructed in an image. One would assume that image clarity and readably is one of the most important features in the construction of appeal. However, Foss (1993) disputes this notion and suggests appeal images should generate a confusion which forces the viewer to try to interpret it. Foss further explains this confusion, 'images that appeal does not simply abandon viewers at the point of tension generated by the technical novelty. They help viewers comprehend the image by clearly referencing associations that point to contexts with positive connotations for them. These associations may be generated by the form of the image, the content of the image, or both. They suggest to viewers familiar contexts of events, objects and qualities they are likely to associate with delight, affection, nostalgia, or other positive attributes' (Foss, 1993). It must be noted that Foss is not talking directly about images of characters, but, of appealing images in general. 'The technical novelty of the image surprises or violates viewers' expectations. The element of the image that is characterised by technical novelty suggests that expectations for the image are incorrect; viewers discover that the context in which they view the image is not appropriate. The image is de-familiarised, consequently, the coding system viewer expected to use in their interpretation of the image is not appropriate' (Foss, 1993).

Fig 6: Valley Curtain by Christo 1972

Foss (1993) uses a piece of work by the artist known as Christo to exemplify the hypothesis she puts forward. The piece was a huge art installation which consisted of

a giant curtain hung across a valley in Colorado, USA. This piece known as *Valley Curtain* was completed in 1972. Foss suggests when a viewer sees the curtain for the first time they are in bewilderment. Foss explains this is due to seeing a colossal curtain across a valley in a very extraordinary sight; this is the curtains primary source of novelty (Foss, 1993). "The technical novelty is produced primarily through its huge size. The curtain measured 1,250 feet across and 200 feet long. Wonderment at the process used to construct and hang the curtain is a second source of novelty" (Foss, 1993). One would surmise from this that for an image (or in our case a character) to appeal it would need to be different or indeed novel. Here the image becomes appealing due to the fact that no one has seen something like it before. In terms of character design this is no easy task. It would seem that for some in pursuit of overcoming the uncanny valley are heading in the wrong direction. However, this does relate to the excellent reception that James Cameron's film *Avatar* (Cameron, 2009) received. The characters within the film are not totally human, however, they are arguably the most anthropomorphic characters that cinema has ever seen. Some of the ideas put forward by Foss (1993) could go some way in explaining how the appeal was constructed in these characters. The bewilderment is there as seeing a photorealistic blue humanoid giant with a tail in stereoscopic 3D is not an everyday sight for most people. This could constitute as what Foss would describe as the 'primary novel factor'. The characters are also of a very high technical standard which caused the production of the film to be delayed for ten years until the technology was able to reproduce the director's vision. The quality of the facial animation and the characters movement is very advanced. The texturing, lighting and rendering of these characters is also at a very advanced level which allows these characters to be placed alongside live action actors. This would be the secondary source of novelty. Foss suggests that the technical accomplishment of an image once a viewer begins to understand what they are seeing is a great source of appeal. 'Some dimension of the form, structure, or construction technique of the image stands out as exceptional or extraordinary. This element may be exquisite detailing, superb craftsmanship, or a finely finished surface' (Foss, 1993).

Fig 7: Avatar (Cameron, 2009)

While *Avatar* (Cameron, 2009) caters more towards the photorealistic, these high levels of appeal have been seen in less photorealistic characters. In the film *Who Framed Roger Rabbit* (Zemeckis, 1988) cartoon characters act alongside live action actors. However, unlike *Avatar* (Cameron, 2009), the characters in *Who Framed Roger Rabbit* (Zemeckis, 1988) are not photorealistic, nor are their movements or facial animation so highly anthropomorphic. They are cartoony in every way. However, Foss may argue that seeing a cartoon character existing alongside a live action actor in a real world and being able to interact with props and scenery is extraordinary. This would be the films primary source of novelty. These characters are created with humorous attributes which is commonly associated with cartoon characters. This could be the secondary source of novelty, and from a technical point of view cartoon, characters acting alongside live action actors is a technical accomplishment which viewer may wonder how such a special effect was accomplished. Another source of appeal contained within this film is the films setting- the 1950's .This embeds the film with nostalgia which Foss suggests is a source of appeal.

Fig 8: *Who Framed Roger Rabbit* (Zemeckis, 1988)

This notion of novel characterizations generating high levels of appeal can be seen in other characters such as Mickey Mouse and more recently The Simpsons. *The Simpsons* (Groening 1989 –Present) was unique in the way it represented a typical American suburban family in a sitcom setting. The Simpsons within its context and plot are novel. Mickey Mouse was one of the first cartoon characters to speak. In that respect it is a novel character. It would seem for a character to be critically acclaimed, it needs to be unique; there cannot be anything like it before. Further examples of this can be found, and contrasted to similar productions. *The Flintstones* (1960) was the first time viewers could see a sitcom Stone Age family. This show was highly successful, while a later show featuring a caveman protagonist *Captain Caveman and the Teen Angels* (1977) was less so. A show featuring similar contexts of the aforementioned would generate the levels of appeal as was previously seen with *The Flintstones* (1960), unless, it was to feature an exceptional technical execution.

2.6 Characters

"People interact with characters in all aspects of their lives. Fictional characters draw us into their stories in films, books, and TV. Celebrities captivate us with their escapades in public life. Our children learn and play with puppets, dolls, stuffed animals, and action figures. All of us bask in the company of real-life characters who are our family, friends, and business associates" (Hayes-Roth and Doyle, 1998).

Researchers working on a new character based learning tool for schools have drawn on interesting results. Their software eSchool teaches a student via an animated character or still avatar. Students can also integrate themselves or an avatar representing themselves into the virtual class room. Within the virtual classroom, students are also presented with virtual student who learns alongside them. The student can also pick the look of this character. 'Students can choose the look and feel of their avatar and their co-learner from a wide range of embodiment options, of several ethnicities, age, appearance, and genders' (Maldonado and Nass, 2007). The emotions of each character change to reflect what is happening in the virtual classroom, 'this change is reflected in their facial expressions. Answering a question right, for example, increases the student's confidence and happiness, and also affects the emotions of the autonomous co-learner, depending on his or her personality traits' (Maldonado and Nass, 2007). The eSchool software was first evaluated to better understand its emotion resonance and effectiveness as a learning tool. Researchers Maldnado et al., 'partnered with an English language college class at International Christian University, in Tokyo, Japan, and sought to determine the impact of the co-learner character on the students' understanding, recall, recognition, and motivation' (Maldonado and Nass, 2007). The students taking part in this evaluation were then selected to learn with either an expressive co-learner, a non-emotive co-leaner, or in some cases with no virtual co-learner present at all (Maldonado and Nass, 2007). Questionnaires were given to the students who took part in this test. The results obtained from this test proved interesting. 'Participants accurately perceived the substantial differences in the treatment variable, and correctly interpreted the emotive co-learner to be expressive and caring. Participants who leant alongside the inexpressive co-learner rated their co-learner as less trustworthy and less intelligent than those that learned alongside the emotive co-learner' (Maldonado and Nass, 2007). Students which took the test along with the inexpressive co-learner or no co-learner did not perform as well as those interacting with an emotional co-learner. The unemotional co-learner also reduced enjoyment of the program (Maldonado and Nass, 2007).

Maldonado et al., states that, 'characters may be cast as expert teachers or coaches, presented as role-play partners in simulations of real-world situations, or act as learners whom the human student teaches. Most often, computer characters

inhabit the role of expert or knowledgeable teacher, experienced coach, or erudite tutor' (Maldonado and Nass, 2007). This draws on questions of representation and not simply from a semiotic perspective as Maldonado previously stated that students found the unemotional co-learner to be perceived unintelligent. This leaves us with questions of what attributes and context a virtual character is viewed. When we think of character usage simplistically we are drawn to either film or a literature, this often leads us to the assumption that a characters primary function is to entertain though it's appeal. However, implementations such as e-learning provide an entirely different context for a character as well as a different primary function. Here a characters primary function is to either teach or assist in the teaching process. The appeal and interest of the character assist the primary objective which is teaching. While the appeal of the character is not of primary importance the facets of character design as described in this research such as the character's behaviour which in which this specific study aims to prove is interconnected to the interest that the subject has with the character. Maldonado and Nass (2007) demonstrate a method which allows for the measurement of a behaviour of a character. Their study used only two different behaviour types as was necessary to their study. However, for the study presented in this thesis a larger array of behaviours are required. Later in this chapter studies which utilise behaviour are discussed further as well as how behaviour interacts with a contextualisation of a narrative to affect the perception of a character. In the following character we discuss specific procedures to create a measurement tool to calculate the effect of behaviour is created. We once again discuss further studies which inform the method of this study.

Unfortunately in the endeavour to study how behaviour affects a 3D character design we find much of the research has not been conducted to correlate the two factors. However, previous research which concentrated on one or the other can still inform the method involved in this study on the processes needed to interlink the two. Fortunately, there is now a wealth of visual research that provides further insights into the measurements as well as the semantics of specific features. 'As much as scholars who work in the area of public address may feel nostalgia for culture in which public speeches had a primary impact, that culture is gone; visual images now have the significance that public speeches once did. To study only verbal discourse, then, is to study a minute portion of the symbols that affect us

daily' (Foss, 1993). Fouts et al. (2006), conducted research into how children's television cartoons and Disney animated films 'demonise' characters. A coding manual was developed that was used to analyse the content of 34 Disney movies and 19 children's television shows. Simply researchers counted how many times a 'demonising' word was used to describe a character or a character's actions. Research found that 'seventy-four per cent of the Disney films contained verbal references or the modelling of demonising, with an average of 5.6 references per film. The most prevalent demonising words were "evil", "wicked", "devil" and "demon" (Fouts et al., 2006). Fouts et al., suggests that watching Disney animated movies has the potential to 'influence children's acquisition of demonizing labels and stereotypes as well as subsequent imitation of the use of such labelling behaviour when observing people engaging in inappropriate or ''bad'' behaviour' (Fouts et al., 2006). Research conducted by Fouts et al., (2006) provides a method with uses a number of adjectives that a are attributed to the behaviour of the character. While our study is not concerned with the affect that the characters behaviour has on the subjects actual behaviour, the study conducted by Fouts et al., (2006) informs our study by describing a method that uses more than one word to mean the same term. In our research we use interest and appeal to relate to the same notion. Fouts et al., (2006) also informs our study as to a method that breaks down semantically a state of perception on the subjects behalf allowing for a measurement to occur which would otherwise be problematic to obtain.

2.7 Context & Behaviour

Ho (2008) suggests that the image as a whole (this is commonly referred to as the Mise-en-scène in film studies), framing as well as the expression/pose and movement of a particular character play an important part concerning whether or not it is perceived to be more appealing/interesting. 'Appearance and motion quality strongly influence how people feel about robots, especially in head shots. The experiments of Reeves and Nass indicate that an object's larger size in a close up will make it seem more likeable, memorable, and arousing' (Ho et al., 2008). It is interesting to note that no research considered such aspects as the stimuli used. Ho states that 'Future research needs to clarify more precisely what aspects of a robot's appearance, motion quality, and contingent interaction contribute to the feeling that

the robot is uncanny' (Ho et al., 2008). Ho suggests that his results go some way into proving what surrounds the body image and as well as facial performance 'dramatically influence people's impression of the robot' (Ho et al., 2008). He states that careful consideration should be given to such aspects to ensure the stimuli is well received. 'The results cannot rule out the view that the uncanny valley is associated with the fear of one's own mortality and with disgust as an evolved mechanism for pathogen avoidance, or a number of other plausible explanations. Indeed, they suggest that the uncanny valley may not be a single phenomenon to be explained by a single theory but rather a nexus of phenomena with disparate causes' (Ho et al., 2008). In the following chapter we discuss how each character to be used within the study described within this thesis will be contextualised within the confines of an experimental apparatus. We will discuss how contextualization and behaviour interacted with the audience perception of a character to affect how positively or negatively they are perceived. Where some characters may have appeal others may have an anti-appeal which in itself could be desirable within a given context such as a horror film. However, this anti-appeal or repulsion makes a subject want to create a distance between themselves and the offending character.

We will now discuss two interesting examples in cinema. 'Likeness to human appearance can put a robot into the uncanny valley while likeness in behaviour will not. However, given a robot which falls into the uncanny valley, increasing the likeness to human behaviour may help pull it out of the valley without other changes to appearance' (Young et al., 2007). Gray, et al., suggests their research points to experience as an implicit factor in the uncanny behaviour of a machine. Gray, et al., suggests that while intelligence may be a desirable factor in the perception by a human of a robot, feeling or experience may be deemed unsettling by the human perceiving the machine. 'We are happy to have robots that do things, but not feel things' (Gray and Wegner, 2012).

If we contrast the robot in the film *Saturn 3* (Donen, 1980) to Johnny Five from *Short Circuit* (Badham, 1986) we find an interesting distinction. While Johnny Five looks more robotic than the machine from *Saturn 3(Donen, 1980)*, his appeal is higher due to his behaviour. Nietzsche (1999) suggests that if art is to be appealing then an element of sadness should be incorporated. The greatest art according to Nietzsche is tragic (Nietzsche et al., 1999).

Fig 9: Johnny Five from Short Circuit (Badham, 1986)

Fig 10 : The machine from Saturn 3 (Donen, 1980)

The robot in *Saturn 3* (Donen, 1980) is a machine who after absorbing the desires of a less than reputable man has a distorted understanding of human emotion. In an attempt to make itself more human to seduce a female member of the crew, it takes a man's head and forces it over its own robotic head. This is a shocking scene, however, not necessarily because of the grotesque nature of it, but, rather the distorted understanding the machine has. The machine already made the human members of the crew fearful because of its behaviour. Its understanding of love was distorted; the machine's idea of wooing a woman it desires was a distortion of typical human behaviour. Viewer of the film as well as characters within the film itself is aware of this. This relates to the uncanny valley theory that it represents the machines behaviour as almost human, but, not quite there. The visual look, movement and most importantly the behaviour of the machine put it within the uncanny valley. The machine itself was not able to understand the emotion of the woman (terrified), nor was she able to empathise with the machine to engage with it

on any positive emotional level. ‘The term ‘uncanny’ is used to express that the relevant objects do not just fail to elicit empathy, they even produce a sensation of eeriness. This effect amplifies if movement is added to the picture’ (Misselhorn, 2009). When compared to Johnny Five from *Short Circuit* (Badham, 1986) we find both machines have similarly menacing designs. Johnny Five even has a gun mounted on his shoulder; yet, this robot eventually engages the viewer of the film as well as the human characters within the film. During the narrative, Johnny Five demonstrates care and fear. He becomes upset when he accidentally kills a grass-hopper. His behaviour is much more childlike. In contrast, the machine in *Saturn 3* (Donen, 1980) never demonstrates fear only desire. The ranges of emotions demonstrated by both machines are very different. However, both demonstrate anger at different points in their films. Johnny Five does go into a rage and attacks his enemies. However, he is still liked after this; this could be because of the emotional rage he demonstrated prior to these events, or possibly because at that point where he feels he has to attack his human pursuers, the viewer feels the same. Research conducted by Mares et al. (1992), into elderly viewers responses to televised portrayals of old age found lonely subjects preferred negative portrayals of elderly people while non-lonely subjects preferred positive portrayals of the elderly (Mares and Cantor, 1992). Comparing how the robots in the discussed movies are perceived by the subject, there is an important need to understand the behaviour of a character. The lonely people in the study conducted by Mares et al. (1992), had preference to negatively portrayed characters as they themselves were of a negative mind set. Thus on an empathetic level they were better able to empathise with negative portrayals. The robot within the film *Short Circuit* (Badham, 1986) behaves childlike a character attribute which all human being have some idea of how to empathise with since we were all children at one stage. On the other hand the robot within *Saturn 3* (Donen, 1980) behaved like someone whom has a violent mental illness. This character attribute makes the character difficult to empathise with, we as the audience have no way of predicting the behaviour of the character. From these statements one may argue that if a character behaves more like oneself then we in turn would empathise at a greater level with at character which in turn would increase our appeal/interest for that character. In fact Takeuchi and Katagiri (1999) do suggest that people prefer people who have the same or similar opinions to their own.

Takeuchi and Katagiri (1999) conducted experiments which involved a virtual agent agreeing, disagreeing and having neutral views as the human subject's opinions. They suggest through their research that this is also true of a synthetic character. 'The results showed that people tend to behave favourably towards agents that previously agreed with their decisions' (Takeuchi and Katagiri, 1999). It would seem that a viewer would find a character more appealing if that character shared the same ideology of the viewer or if the characters actions are readily readable to the viewer as they may do the same things as they hold a shared belief. This relates to Kline et al. statements, Beliefs are what turn desires into actions, reflecting influences such as perceptual input ("If I see a stream, then I believe I will find water there"), emotional input ("Because I am afraid of that person, I will run away from him"), and learning ("The last time I was in this field I saw a snake, therefore I will avoid the field today"). We understand the actions of characters by inferring how their beliefs influence the ways they attempt to satisfy their desires (Kline and Blumberg, 1999). Problems in character appeal/interest may arise if the characters beliefs differ from the viewer and this causes the viewer to struggle to understand why a certain character preformed a specific action. This concept refers to a physiological concept first coined by Daniel Dennett (Dennett, 1988). This concept infers we understand why a character does something based on our own understandings. For example, a mouse may run away from a cat as the mouse fears he may be eaten. Our understanding is inferred by use of the intentional stance. This concept combines the behaviour of a character into a pose. Put slimily if a character cute and friendly then suddenly bites and attacks another character we would be rudely shocked. We would be shocked at a greater level than if we have known the character was vicious beforehand. This concept of the intentional stance coined by Dennett (1988) closely relates to the principles of animation. Specifically it relates to anticipation which is a key principle of animation (Thomas and Johnston, 1995) which was discussed in the previous chapter. Obviously, it could be used for a humours effect. This is the very basis of the anti-joke. An anti-joke is a joke which has an unexpected outcome. For example, one could present a character about to perform an elaborate action only to sit in a chair and fall asleep. The most famous anti-joke in literary terms being: why did the chicken cross the road? The anti-joke response being, to get to the other side. Obviously this joke could have two meanings, the other side actually meaning death never the less I serve to illustrate a

point. While, the intentional stance concept does make sense, it does open itself up for debate depending on the context such as comedy. However, Dennett's idea does provide an argument to illustrate the importance of the character pose. Under both outcomes of the intentional stance is it positive of negative appeal there should be at least two poses a character must perform in sequence. Previous research often provided the subject which only one image of a character to make an assessment (MacDorman et al., 2009, Green et al., 2008). This study recognises that some of the appeal/interest a subject feels towards a character may not be simply contained within a static image, but, when dealing with a character one must endeavour to illustrate that characters behaviour. How a character behaves within a given context opens a multitude of possibilities. This study aims to measure the effects of a number of different characters. They are required to behave in similar ways to on another. In the following chapter we discuss what character types were chosen for this study as well as their specific behaviours. A range of characters were selected these characters ranged from non-realistic to realistic. However, to keep the behaviours of the characters the same an element of anthropomorphism was implemented.

Anthropomorphism is defined as 'the attribution of human characteristics or behaviour to a god, animal, or object' (Hawker and Waite, 2007). Anthropomorphism has been widely used in animation to give human characteristics to animal characters and even inanimate objects. While one unfamiliar with the term may feel it more useful for horror effect which indeed it is in films such as *The Evil Dead 2* (Raimi, 1987). In *The Evil Dead 2* (Raimi, 1987) audiences saw everyday house hold objects from doors, light fittings to the very house itself come to life and laugh at the protagonist to terrifying effect. It has proved more successful in the genre of comedy such as in the short films of the *The Looney Tunes* (Ford and Lennon, 1988). Daffy Duck is one of the most enduring characters from *The Looney Tunes*, his character is anthropomorphised to comedic effect in the spoof *The Night Of The Living Duck* (Ford and Lennon, 1988). In terms of this study the focus is on a selected range of behaviour, which in itself is not necessarily a pursuit into humour or terror. 'Is there a notion of 'optimal anthropomorphism'? What is the ideal set of human features that could supplement and augment a robot's social functionality? When does anthropomorphism go too far?' (Duffy, 2003). If we consider the film *Gremlins 2: The New Batch* (Dante, 1990), there are a multitude of intentionally grotesque

monsters. These monsters are contrasted with the cute fluffy versions which they once were. The monster versions have no fur and feature warts on their skin. Their appearance is altogether more rodent-like. These features would seemingly direct the viewer in the director's desired direction. They are not meant to find these monsters cute. However, what makes this film particularly interesting is later on in the story. The monsters run amok in a laboratory where one takes a brain enhancing formula. Later, this particular Gremlin becomes sophisticated and talks very eloquently. He is more highly anthropomorphised compared to his counterparts. His sophisticated demeanour raises his appeal. At one point later on in the film, he is interviewed by a human character which shows that the film-makers envisaged this variation of the Gremlin as more social. Clearly, the counterparts of this character cannot operate within the social context of the film, however, the sophisticated Gremlin can. This is arguably due to his anthropomorphic level. Duffy comments on a robots function in society in relation to this, 'The social robot needs to be able to communicate enough to produce and perceive expressiveness (as realised in speech, emotional expressions, and other gestures). This anthropomorphic ability can contribute to a person's increased perception of the social robot's social capabilities (and hence acceptance as a participant in the human social circle)' (Duffy, 2003).

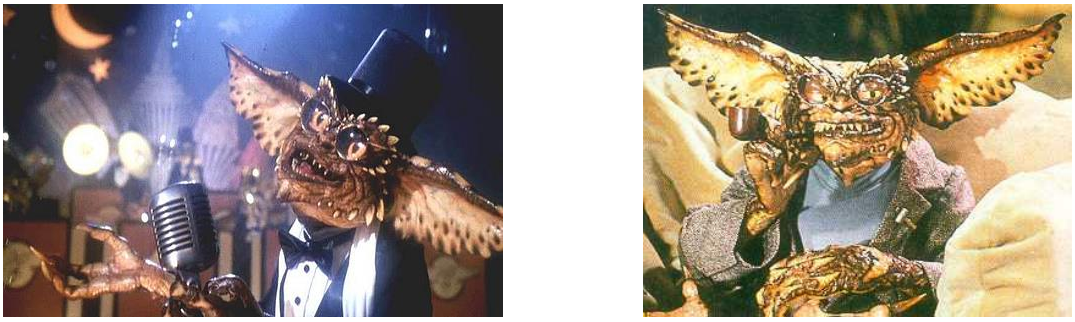


Fig 11: The Brain from Gremlins 2: The New Batch (Dante, 1990)

The next chapter will detail the specific level of anthropomorphism with the characters being used in this study. While levels of anthropomorphism are not being measured as part of the aims of this study, it still bares importance to understand how the effective levels of anthropomorphism affect or skew a subject's perception of a character. An understanding of the concept serves for the design and creation of characters to be used within this study from both an ascetic level as well as a behavioural level.

2.8 3D Graphics

In this section we will consider how previous research attempted to measure the various responses to different representational forms in animation. Drawing upon what we have already discussed in this chapter we look addressing how this study is informed by limitations of previous studies highlighting what an effective study requires and how previous research is built upon to develop a clearer picture on how characters constructed by way of 3D graphics are perceived by the subject. We discuss how previous research has often heralded more realistic characters in higher regard than the more exaggerated forms. More over this goal of the realistic is now entrenched within the industry itself. Following a discussion with discussed previous research's attempts at a measurement of the subject's perception with a character type we look at how realism within cinema through computer graphics is interpreted by the viewers. Such a discussion is prompted by the focus of previous research. This section aims to give the reader a greater understanding of the direction as well as the decisions made by this study.

Previous research (MacDorman et al., 2009, McDonnell et al., 2008) was concerned primarily with attaining the real human-like characteristics and movement. Often charts were shown to prove that positive perceptions would rise as the characters became more human-like. It would seem cartoon characters have little to no appeal. Research conducted by McDonnell et al., (2008) used a relatively diverse range of different characters featuring a real human actor, a cartoon man, a high polygonal computer graphics man, a low polygonal version of the computer graphics man and finally a zombie character. These characters were then used to

display various emotions. The human actor was used to record motion capture data and this data was transpired to all the other characters with no animation done over the top of the data. Faces and hands were blurred out of the footage as their research concerned with body movement. Their results showed no drastic difference between the communications of the emotions through each character with the exception of surprise. McDonnel et al., cites the limitations of the use of motion capture for this. Transferring motion capture data often has interaction problems due to size differences in performers and digital model. In McDonnel et al., the motion captured hands do not reach the digital characters face whereas on the real human they easily do (McDonnel et al., 2008). This argument seems too simplistic. It would seem to point to suggesting that to be an appealing/interesting character than only live action interpretations of a character need exist. However, we know this not to be the case. Cartoons aimed at both adults and children have been created and continue to be created and this suggests at least they are somewhat successful and have connected on some level with the audience at the very least.

Disney has created some of the most widely accepted characters which are world famous while not using total realism to engage their audience. 'There was some confusion among the animators when Walt first asked for more realism and then criticized the result because it was not exaggerated enough. In Walt's mind, there was probably no difference. He believed in going to the heart of anything and developing the essence of what he found. If the character was to be sad, make him sadder; bright, make him brighter; worried, more worried; wild, make him wilder' (Thomas and Johnston, 1995). The emotions Disney's characters display are easy to read. This could be the reason why exaggerated emotion has greater appeal. It registers easily with the viewer. As human beings we expect a balance between the appearance of a character and the behaviour of that character (Ishiguro, 2007).

Research conducted by MacDorman et al., was a study of many variables that may have an effect on character perception. The research consisted of four studies to triangulate the problem. The first study compared characters with different texture and render styles. This was to discern which subject was found to be most eerie, human like and attractive. The second study looked at different proportions within the character model and the effect it has on the viewer. Results found that the more

realistic the texture was, the more sensitivity the subject had, the more the proportions move away from the default original position. The third study tested extremes of proportions; the researchers found 'atypical facial proportions were shown to be more disturbing on photorealistic faces than on other faces'(MacDorman et al., 2009). The fourth study found 'a mismatch in the size and texture of the eyes and face was especially prone to make a character eerie. These results contest the depiction of the uncanny valley as a simple relation between comfort level and human likeness' (MacDorman et al., 2009). MacDorman et al., conducted research with the focus of attaining participant's empathy through human likeness. The research does not necessarily answer questions regarding neither why participants found the characters eerie nor how results could be exploited for benefit. Again, like McDonnell et al., a stimulus on the more realistic side was dealt winning hand to begin with. 'The Study results indicate the photorealistic texture had the largest effect of any treatment. Faces with a photorealistic texture were rated as more humanlike and less eerie—with greater inter-rater agreement on human likeness—than their bronze and line counterparts. The photorealistic texture may be engaging specialized perceptual processing to a greater extent than the bronze and line textures' (MacDorman et al., 2009). Although these results indicate that the photorealistic human character was more appealing than the others which were rendered less photo-realistically it may not be fair to assume that realism is more appealing than stylisation. Below are renders of the characters that MacDorman et al used in their study. Clearly one can see the only fully realised character is the fully textured smoothed human model, whilst the others are seemingly unfinished creations. Using different render styles on characters that are the same shape does not equate to a different character type. Simply a realistic character is still a realistically proportioned character regardless of the style the image was rendered in. To supersede these problems each character must be executed with equal reverence and an understanding of the character type must be explored to create a fair experiment. While McDonnell et al., (2008) makes an attempt to compare different character types problems occur when differently proportioned characters cannot effectively interpret motion captured data leading to an unfair bias towards the character that is proportioned more closely to the actor that the motion capture data is obtained from, obviously this is the realist human character.

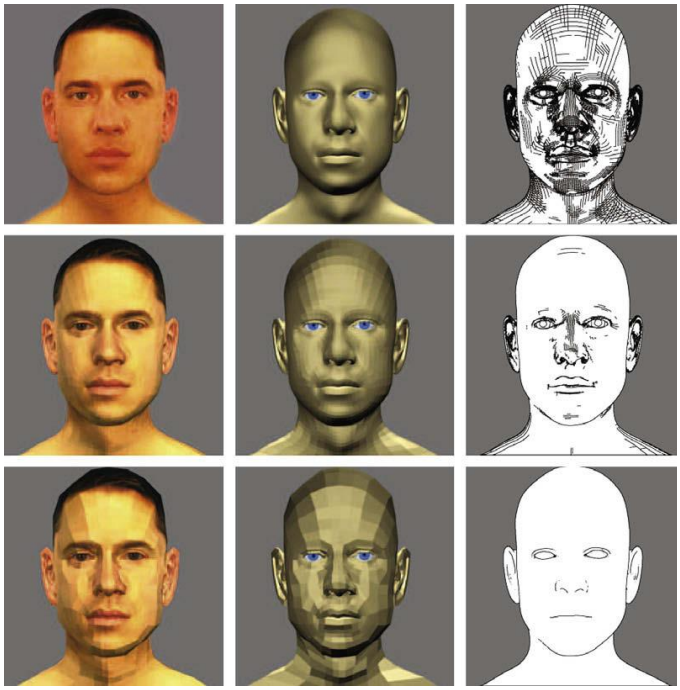


Fig 12: Characters used in research by (MacDorman et al., 2009)

Chaminade (2007) conducted research to detect how limited detail on a character could be used to recognise an action and discern if the action is obtained from an artificial or organic input. Chaminade's tests used a set of seven characters. These ranged from a point dot character consisting of only thirteen dots which represented the least anthropomorphic, a blocked out human which featured floating non-connected body parts, a robot and alien character which represented the middle area of anthropomorphism and finally, a simple human character representing the higher level of anthropomorphism. Captured motion and key-framed motion was applied to each character and the subject was asked whether the motion perceived was natural or artificial. Chaminade found the fuller characters towards the more anthropomorphic side of the scale received lower scores for natural movement. Subjects increasingly found the less detailed characters to have more natural movement than the more human/realistic characters. Chaminade suggests that the less anthropomorphic characters require more cognitive analysis, "the biological motion perception would be more automatic, while reporting a motion as artificial would be more demanding cognitively" (Chaminade et al., 2007). Characters that were used affected the sensitivity variable in Chaminade's tests. Subjects were

increasingly more sensitive to characters that were fully rendered than the more simplistic ones. Chaminade suggests why subjects would be less likely to answer 'Biological' for the fully rendered characters. 'Extrapolation of the body structure from motion could cause the artificial motion of the less anthropomorphic characters in our experiment to be readily accepted as natural' (Chaminade et al., 2007). Chaminade's results show even with realistic movement applied to realistic characters, viewers are not likely to believe in the motion. Here, less realistic characters had more convincing motion even when it was in fact synthetic.

'Realism and naturalism, ideas of art as an imitation of reality, are currently the primary ethos of 3D animation culture and technology' (Power, 2009). One could argue this is on a smaller level a resurgence of renaissance art. 'Renaissance artists attempted to render human bodies flawlessly, but this period is unusual as art history is dominated by altered depictions of the body' (Chaminade et al., 2007). Sobchack suggests that while animation has traditionally been of the more expressive visual art forms, 3D computer animation is a victim of its own success, 'co-constituted by the calculative and quantitative tendencies of the computer' (Sobchack, 2008). Using 3D animation to create a realistic human character is of course an interesting pursuit. However, this type of animation by the very nature of it is open to harsh criticism. Some would reason this to be due to the uncanny valley theory (Mori, 1970, Dill et al., 2012). However, there may be another explanation of this. Cartoon characters in animation are defined and contained within the medium of animation. Granted there are different types of animation which we have discussed in the previous chapter. This means when a viewer compares the character to other characters they look only in the field of animation. If one would be to create an entirely different style of character then the subject would have to except it for what it is. Either they found it interesting or they did not. However, when we consider realistic characters the subject has not only the medium of animation to compare it to, but also photography, live action films and also there every day encounters with genuine human beings. The subject assess the character not as a character but as how well it simulates being human. They see the character as if it is trying to be human and ultimately it will fail. Part of this study involves the creation and the execution of a realistic character. The terminology regarding this character design as well as the behaviour of the character will be discussed in the following chapter. We will continue to discuss the difficultly

one has with the subject's perception with thus type of character design. This following discussion aims to give further insists to our study as well as giving an informed approach as to how the realistic character created for and utilised within our study was approached.

Fig 13: Digital Jeff Bridges

The film *Tron: Legacy* (Dir. Kosinski 2010) featured a fully CG character acting alongside live action actors. While the full CG character in *Tron: Legacy* (Dir. Kosinski 2010) did receive some praise by a few journalists such praise commended how Clu integrated into a scene with live action actors. 'Even when Clu was interacting with flesh-and-blood characters, his face looked surprisingly realistic and expressive. I just wish he had something notable to express' (Stevens, 2010). The movie did not receive quite the positive praise that it probably hoped for by other reviewers. New York Post Online described the characters appearance as a 'product of Madame Tussauds CGI Museum' (Smith, 2010). Another journalist concurred with this remark describing Clu as a 'rubber-faced Madame Tussauds replica of the 1982 Bridges' (O'Hehir, 2010). The New York Times suggests the face of the character 'looks like an animated death mask' (Dargis, 2010).

When we think of live action, especially in the digital age what we are really seeing is still a representation of a likeness of an actual human being. The pixels on the screen are interpreted by the viewer as a real image of an actual person. Creating a human character using the medium of 3D Computer Graphics seems menial when

put like this. However, the amount of pixels that are required to be married together proves a daunting task, and with better advances in technology which provide a clearer image for the viewer the task can only become harder. When dealing with graphics that are meant to look as realistic as possible one must also consider special effects as well as visual effects of older films. There are few older films which aim to create realistic illusions that still stand up against modern films visual effects today. It is also important to consider that the visual effects of today's films will probably be looked at with that same humorous distain as older filmic special effects are today.

It is important to note that from the perspective of this research we are looking at how interesting/appealing the character is. This does not necessarily compare how realistic the character may look. However, a realistic character as we have discussed has the dangers of lacking appeal due to their design. Characters created using the means of 3D computer graphics have become more frequent in cinema and television over the past ten years. The first CG human character was created for the film *Looker* (Crichton, 1981). Computer graphics were only used for a menial part of the film and were obtained by scanning a real human body to create the polygon shape used for the film. Clearly there is a need for such character types. However, we must contend with the uncanny valley and compare how a realistic character fairs against a range of less realistic characters for ourselves. As we have discussed in this chapter and reasoned we simply cannot take the findings of previous research at face value for our specific needs within the understanding. Now that we have discussed and given grounding for the realistic forms with 3D computer graphics we will continue this discuss by moving on to another form of character type which unlike other character types is unique to 3D computer animation. The realistic character type will be further discussed in the following chapter with reverence towards how the character will integrate within our method.

As we have previously discussed in this section realistic characters within 3D computer animation can easily open themselves to harsh critiques. Unfortunately, it may be inevitable meaning the character may have to be created to an almost impossibly high standard to avoid the critique based on the character's likeness to a real human. With advances in 3D animation sometime in the future this may be

possible, but, at the moment this is mere speculation. As we have discussed previously in this section cartoon characters may be less critiqued as the subjects encounters them far less than they do the realistic. This leads us to the polygon character within 3D computer graphics. There is an appeal in visual arts to show signs of the medium used in the pieces creation. This may be a lens flare of a lens, grain of celluloid, finger prints on claymation or broken strokes of a brush in expressionist paintings. These features, when tastefully executed are desirable. They add an organic artefact to whatever may be being created. These organic artefacts add life to what maybe lifeless without them. It is a current trend in the latest films to add lens flares, a trend started by JJ Abrams in *Star Trek* (Abrams, 2009). However, 3D Computer Animation as a very synthetic art form does not allow for such organic artefacts to be occur, rather they need to be added with thought and planning after. This obviously defeats the purpose and adds a synthetic representation of an organic on an already synthetic construction both a simulation of an organic character. However, a different approaches maybe viable; a polygonal approach which allows the medium to wear its creation on its sleeves. Rather than trying to make a human character looking realistic this relates to Young's interpretation of the uncanny valley theory where a subject at first believes they are looking at a real person only to be disgusted when they feel they have been tricked. Here a subject knows right of the bat that the character they are seeing is a CG character. In the following chapter we will continue to discuss this character type and how this form relates to this particular study. In the following section we will discuss other forms of character and audience perception towards them.

Fig 14: Virtua Fighter (Suzuki 1993)

2.9 Character Usages

In this section we will discuss a select usage for characters. How external factors surrounding their context may have an effect on the characters perception. In this section the aim is to give the reader an understanding of various usages for a character. As the reader may be aware there are many implementations for a character. Previously in this thesis we discussed research that uses characters as a tool for e-learning, we have also discussed film and advertising. More implementations are in video games and software. We will discuss a character implantation in software.

Diederiks (2003) suggests that using a character in software can be useful especially if software is known to have errors. Since the product usually shows the brand name, this is eventually harmful for the brand value if users encounter problems with the software. However, if an on-screen character is present it will likely get the blame first providing a buffer between the customers complaint and the actual brand name (Diederiks, 2003). This effect can be seen with the character Clippy which was a character included with earlier versions of Microsoft Office, the character which was the default "Office Assistant" and one of many others has since been removed from later versions of Microsoft's software (Luehning, 2001). 'Microsoft spent a lot of money to develop the character, including employing psychologists as part of the development department. However, most users view Clippy as annoying, rather than helpful' (Kweon et al., 2009).

One author states 'one of the more dubious and infamous anthropomorphic objects in a computer program that one encounters is "Clippy", the paperclip, Microsoft's Office Assistant. Common sense tells us that paperclips do not have eyes, nor can they communicate, yet this one is meant to assist the user as it might see what is wrong and proffer help' (Schamp-Bjerede, 2012). The character was the source of much ridicule and parody. However, this character may have served Microsoft well as he acted as a buffer for the negative sentiment which may have been directed at Microsoft or their Office program rather than an animated paperclip. This idea of the character taking the blame has been adopted by what Rintel and blogger Fred Wenzel terms as "Fail Pets" (Rintel, 2011). One of the most famous fail

pet is the whale that appears every time Twitter has a service failure.

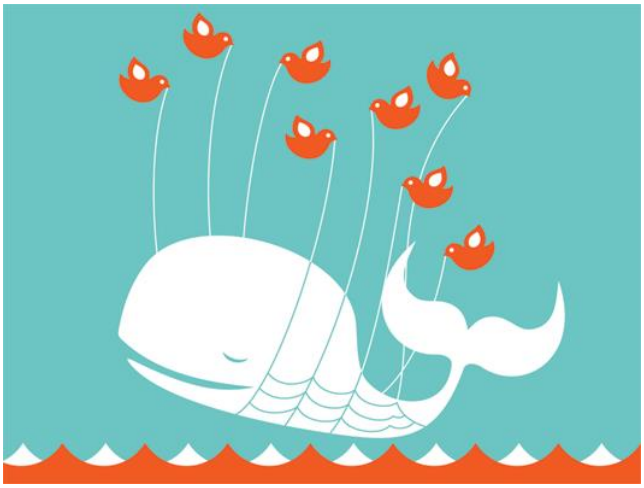


Fig 15: Twitter Fail whale

These images appear when a service or program has failed. This links in with the idea the user will blame the character rather than the service. After the success of the Twitter fail whale, many websites started using their own versions of fail pets. Each one becoming rather more embellished than the last such as Tumblr's Tumbeasts.

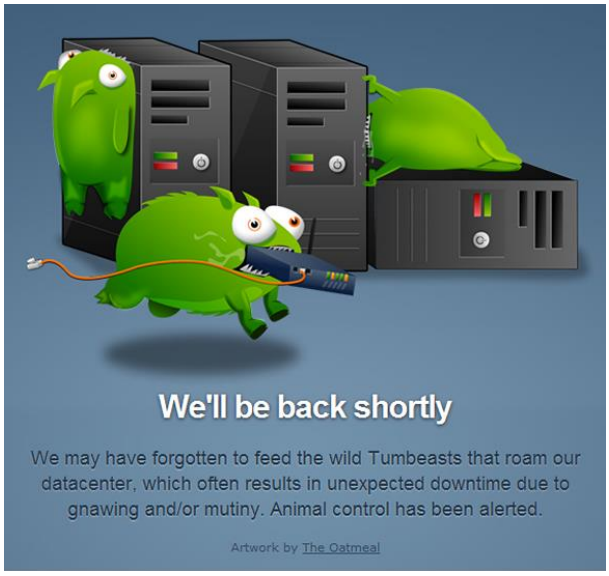


Fig 16: Tumblr's 503 error page showing Tumbeasts

However, Rintel states there is a problem with this approach as 'the more popular the fail pets, especially through earned media, the more strongly associated the service becomes with failure' (Rintel, 2011). In recent years, the use of fail pets has been less frequent. New fail pets use more abstract forms with no one website having

a truly unique design over another. Such as the Google Chrome browser fail pet which uses an abstract form which resembles an emoticon rather than a full-fledged character. 'The more that websites use similar imagery, the less each new fail pet becomes associated with the particular brand and the more fail pets come to indicate service failure generally' (Rintel, 2011). Clearly the trend has now changed to more abstract characters designed to distance the service from the error.

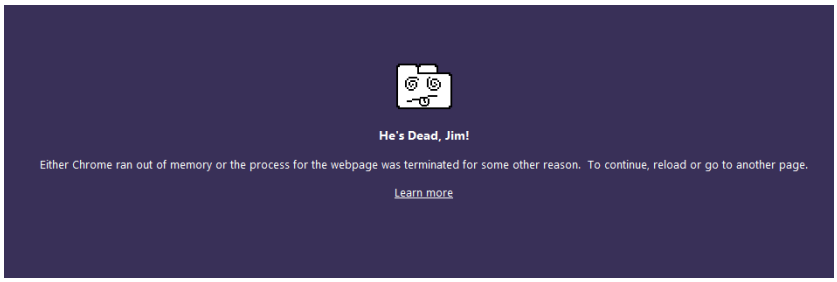


Fig 17: Google's fail page

The failure of Microsoft Clippy should serve as a warning to those who would deploy fail pets simply because they are cute or funny. Even given the amazing earned media of the Fail Whale, there is not strong empirical evidence that the practice of using fail pets is, in fact working for users (Rintel, 2011). When we think of the more abstract characters in the last fifty years, we will most likely find ourselves looking at early video games. Even with the limitations the game creators had in developing the form of the character, characterisations and basic actions were relatively easy to discern. Totilo traces back to the earliest use of a gun in a video game, where a character holding a gun and firing it would often be inferred rather than realistically depicted (Totilo, 2010). Due to the limitations of hardware, realistic forms could not be fully realised. This meant early games such as *Gun Fight* (Mideway 1975) often used very simplistic forms to represent what they are aiming to depict. Such simplifications being so drastic that only key elements of the figure were recognisable (Fig 18).

Fig 18: Gun Fight (Midway 1975)

While animation today does not seem to have characters like that of the 1970's, an observation by Klein (2000) would suggest different. Animorph a term coined by Klein, is a term used to describe a particular shape an animated object may have when it is traveling between forms and neither looks like what it used to be or what it will be at the end of the movement (Klein, 2000). These bizarre shapes and mangled characters have meaning in the context of sequences where their image is neither the beginning nor the end of the arrangement. Nevertheless, such abstract forms are exposed to those viewing animation on a regular basis. This is whether they know it or not. Moreover, there existence illustrates the point that these characters cannot survive without their context. When we consider how strange a video game character from the 1970's would look compared to the somewhat realistic game characters we have today. Moreover, any visual medium requires the viewer to interpret the image in which they are seeing. Things which we take for granted such as colour or sound were difficult at first for the average viewer to accept. Spectators of the medium got used to it and eventually came to like it. The features then become a main stay within the medium. As technology improves so does the audience's acceptance of the features. Spadoni states that sound actually changed the visual appearance of early cinema 'in ways that made them look to some viewers like ghosts' (Spadoni, 2003). Such comments regarding the sound accompanying the image are surprising

considering while we can have black and white cinema, silent cinema is a rarity. We can see what could be described and the uncanny use of sound in early cinema when mistakes were made. Even if voices were perfectly synchronized, some voices would sound unnatural to viewers and 'synchronized speech also could seem unreal because viewers sometimes sensed that the speech was not issuing from the lips moving on the screen' (Spadoni, 2003, Spadoni, 2007).That said, sound and colour have now become commonplace. Audiences could not go back to watching films without. While realistic 3D graphics may be eerie now, like sound, in the future could just be commonplace. Special effects have been replaced by digital effects and 2D animation all but replaced by stylised 3D computer animation we may see the same for realistic 3D computer animation in the future when new technology completely replaces the medium. Previously, stop motion techniques were used in films to achieve the effect of a non-human or non-worldly entity while now these effects are more often than not achieved by the use of 3D computer animation. The decline of special effects and the rise of visual effects during the 1990's marked the end of special effects use in any great capacity in mainstream cinema. Of course, special effects are still used in film production often for specific effects or a particular production. In terms of character work which is the focus of this thesis, 3D computer animation has taken over, where in the past these type of effects for such productions would have traditionally been achieved with animatronics, stop-motion and even traditional 2D techniques. Often the new methods are inferior to the old methods in certain aspects. Digital character work has a threefold problem in terms of believability with the spectator. Firstly, the spectator must be convinced of a physical material presence, a problem that an animatronic character is alleviated of. This problem is further compounded in mixed media production in which a digital character may need to interact with a live action character. The second problem is the interaction itself, the spectator must be convinced that each character is interacting with another regardless of the individual construction. The third and most important of all is that the spectator must be convinced or at least convinced enough to suspend disbelief that the character is alive. Here is where the digital character has an advantage. There are more points of articulation or at least there could be. This allows the character to be more expressive than its animatronic counterpart. While in the past the special effects umbrella encompassed a great number of filmic effects, from character work through to explosions and underwater effects. Now the visual

effects umbrella is covering some of it if not most of what the special effects umbrella did. As with special effects, digital effects are better for some things and worse for others; this is the nature of any new device.

2.10 Summary

In this review we have discussed core concepts involved with this study. We began with a discussion into the uncanny valley. While this concept applies and was initially created to relate to robotics we discuss how it relates to 3D computer animation. We attempt to gain an insight and greater understanding of the term uncanny by exploring the origins of the word and what it means to the focus of these studies. While we accept the uncanny valley problem may be of great importance especially when it comes to the more realistically designed characters we suggest it may not entirely encompass the problem we are addressing. We also state and give examples of how the uncanny valley phenomenon is unlikely to be a purely visual problem. Following this we lead into the key issues that the uncanny valley causes, a lack of empathy. In this section we discussed how empathy is vitally important for character appeal and interest. Following this section we moved on to discuss appeal and interest with a look into other fields to discern what factors contribute to a greater appeal and what specifically one may use to enrich character design. In this section we discussed concepts such as the Golden Section and technical novelty and how they may or may not play a part in appeal, then related concepts to actual character to discern how they may inform our research. This section highlights the importance of not using found/pre-existing characters for experimentation. Following this section we moved on to discuss character based research papers with particular reference as to how researchers measured various subject perceptions regarding the stimulus. This section informs our specific method and in particular the measurement tool used. Further details on the method employed as well as specific research that informs it are discussed in the following chapter. Following the section on characters this review moved on to discuss contextualisation and character behaviour. We highlighted the effect of how a character is contextualised as well as how it may behave within a given context and may have extreme effects on how a subject may perceive them. This is then referred to in the following section where

specific studies pertaining to 3D computer graphics are discussed. We address limitations of previous research and in the following Chapter we will discuss how this study aims to overcome some of these limitations that are found in previous research. The final section of this review deals with character usage. This section aims to give the reader an insight as to how a character may be used in other mediums and well as how new contextualisation are now emerging through the introduction of new technology. In the following chapter we will further discuss the concepts discussed in this review relating them to specific features of our method. The following character will discuss an implement an experimental design of which was informed by previous research discussed here. Further papers and will be discussed in the following chapter as reinforce this researches methodical and analytical approach. Following this the results obtained from the experiment are reported. This section goes into detail reporting both significant as well as insignificant results. Due to the nature of this study both significant and seemingly insignificant findings are important in discovering how this study places itself among previous research such as those that dispute relevance of independent variables such as subjects gender's (Riek et al., 2009, Green et al., 2008) as was discussed in the previous chapter. Following the explanation of results, we will discuss the outcome of the experiment and qualify how results relate to previous research as well as how this study moves onward from the data collected and analysed within this chapter.

Chapter III

Methods

In this Chapter we will discuss the approach to the research method employed in this study. Within this study two experiments were conducted. This chapter concerns itself with the approach and procedure involved with the first experiment. Data obtained from this experiment was then used to further inform the second experiment which is discussed in the following chapter. This chapter refers to literature that was extensively drawn upon to form the methodological approach to the experiment described within this chapter. This chapter is broken down into different sections which describe the various aspects of the experiment.

The experiment will be described in detail following this introduction. The experimental approach will be discussed with reference to literature that the key features of the experiment were derived from. These sections will go into further detail into why certain decisions were made. The first of these sections will discuss the experimental design of this experiment. While the actual methodical approach will have been fully described in the section preceding the experiment design section, the section aims to give the reader an understanding of why certain decisions were made and draws comparisons on similar approaches taken by previous studies that found success with their experimental design. Following this discussion we will then discuss the narrative used within the experiment. This section describes how the design of the stimulus utilised from other fields. This section gives examples and an aim to justify the decision made in conducting an experiment in such a way is warranted. Following this discussion we then move on to discuss how this experiment was participated. Following this we explore the five character types used within this experiment. In this section we refer to references used within the field of animation which were used to inform and justify the creation of each character. The

characters that are discussed in this section are the realistic human, the polygonal human form, the cartoon character, the abstracted shaped character and the object based character. These characters form an integral part of the research while character types have been discussed in the previous chapter they are discussed again in this chapter with reference to the actual forms used in this study. Following this we will discuss the behaviours of the characters. While behaviour was discussed in the previous chapter this section discusses further literature and how this literature relates to as well as informs the experiment that is undertaken. Following this we will discuss the analytical approach to interpretation of the data obtained though implementation of the experiment. Following this the results obtained from the experiment are reported. This section goes into detail reporting both significant as well as insignificant results. Due to the nature of this study both significant and relatively insignificant findings are important in discovering how this study places itself among previous research such as those that dispute relevance of independent variables such as subjects gender's (Riek et al., 2009, Green et al., 2008). Following the report of results, we discuss the outcome of the experiment and qualify how results relate to previous research as well as how this study moves onward from the data collected and analysed within this chapter.

3.1 Experiment 1

The experiment defined within this chapter will now be described. As stated in the introduction following the description of the actual experiment we will further discuss specific elements of the experiment with reference to literature and commercial sources. While we know the experiment has to be designed to measure the subject's appeal with a character type through their interest the semantics of which were discussed in the preceding chapter the initial stages of the experiment involved deciding which character archetypes would be being tested. This decision was arrived at though exploration of existing research as was discussed in the previous chapter. The analyse of previous research as well as commercial sources allowed for discussions to be made in regards to which character types had been used as well as those which were neglected in previous studies. The characters finally decided upon were a realistic human, polygonal human, cartoon human, abstract and an object. Further details on the characters used within this experiment are discussed

later in this chapter. The character design and creation comprised of one of three key components that are needed in the creation of the stimulus used within this experiment. Another key component is the actual contextualisation of the characters within the study. Need for contextualisation was arrived at due to the lack thereof in previous studies as well as the importance it may play according to others (Ho et al., 2008). The difficulty in creating a suitable context for the characters had to be measured against how effectively each character could perform within a context as well as which behaviour types would be conveyed by each character. Effectively the context therefore had to be constructed concurrently with the behaviour types as well as the constraints of the character in question. Such constraining factors include the height variance of the character, actually articulation of the character as well as the style of the character. Obviously concessions had to be made on the three key features used within this study, those features being behaviour design, narrative contextualisation and character creation. These concessions are discussed later in this chapter for each component. In creating the contextualisation, the behaviours to be performed had to be decided upon. The behavioural traits that were used in this experiment were happiness, sadness and surprise. The reasons as to why these emotional behaviours were chosen and not others are discussed in the appropriate section later in this chapter. With the behaviours decided upon the narrative stipulated how each behaviour would be performed by each of the various characters within this experiment. In making the test as objective as possible, the narrative design was created with a plot that contained all three behaviours used within this experiment. A sequence of connected images was then created for each character within in different sequence one of the three behaviours was emphasised as a close up image of the character.

Once the stimulus was created, questions relating to the experiment had to be designed. These questions were informed by literature and further detailed by the analysis of the literature. As we have discussed in the previous chapter, words used with questions have to be carefully selected. While the goal is discover how ‘appealing’ a subject finds a character, such a word may prove difficult due to its broad meaning, while the word has been defined for this study using it in experimental questions may still prove troublesome as it would need further explanation to the subject which in turn makes experimentation less practical. As we

have previously stated the word to be used within the experiments of this study is to be the word ‘interest’ as it full encapsulates the needs of the characters in this study. Questions were designed to allow the subject to state on a Likert scale how interesting they found the character in each sequence. Finally to glean an overall understanding of which character was preferred subjects where asked their most favourite character overall. Further details regarding the questions used within this experiment are found in the relevant section in this chapter. In creating an easy experiment for a subject to take part in an online method was adopted. The experiment was integrated into online survey software named Pinnion. The experiment was then participated by the sample via their means of access to the World Wide Web. Links to the experiment were posted via mass email to students in the University of Bournemouth as well as social networking websites and services such as Reddit, StumbleUpon and Facebook. Once the subject accessed the link they were then given a choice of either tests one, two or three. Each test emphasised a different behaviour. Test one featured all five characters in the same context with the happy emotional behaviour of the character being emphasised. Test two featured the same contextualisation along with the same characters, however this time the sad emotional behaviour was emphasised. While test three contained the same features as the previous test apart from now having the surprised emotional behaviour emphasised. After seeing each character the subject rated each character along a scale. The software allowed for the recording of subject data as well as export to data analysis software SPSS. The details on what data was collected and how the data was analysed can be found later in this chapter. Names of the participants as well as computer identifiers were recorded to remove any participant which may have completed more than one test. This allowed for the tests to be done objectively as each group of participants would only have been exposed once to the experiment.

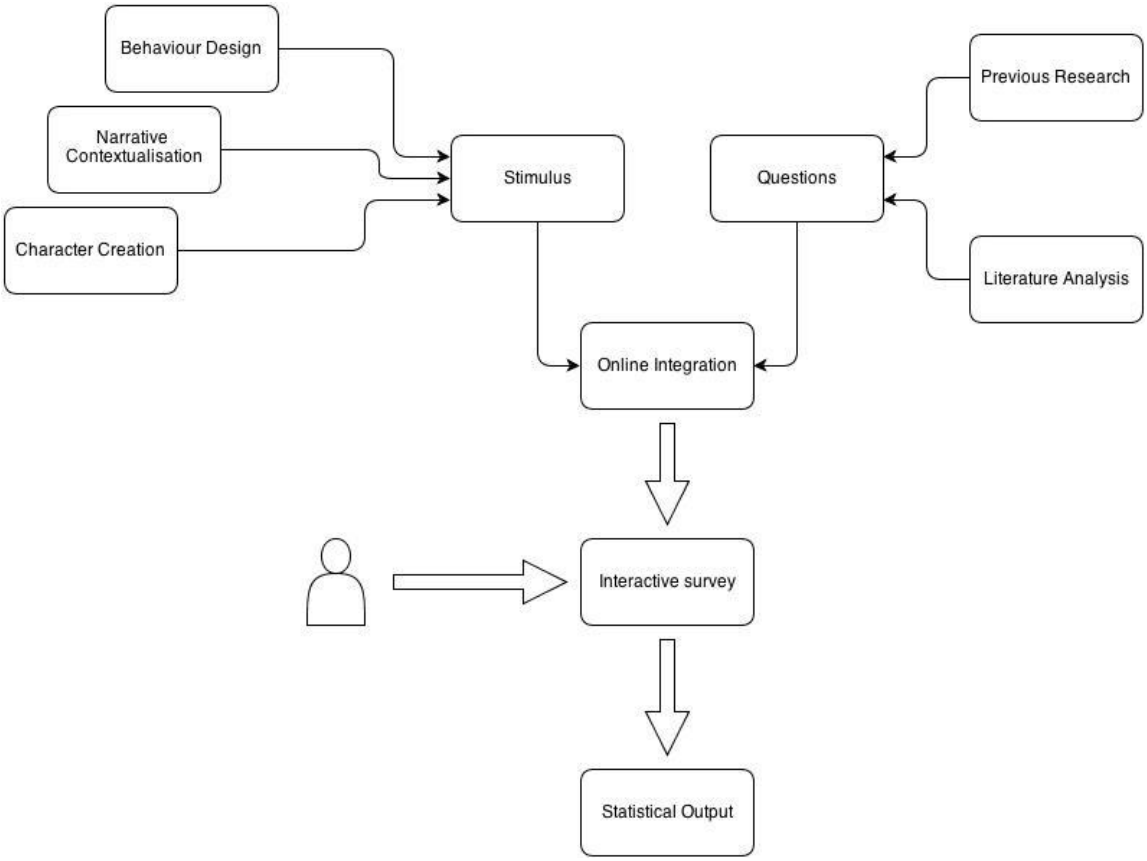


Fig 19: Approach to experiment

3.2 The How

3.2.1 Materials and Procedures: Experimental Design

While we have described the experiment in the previous section we will now discuss the approach to the experimental design in relation to previous studies. This section places the experiment within the context of previous research. In this section we further detail how the experimental design compares to similarly themed studies as well as the thought process involved in the development of the design.

In developing an apparatus to measure a subject's interest/appeal with a character type, one must first establish a base in which to build upon. While the study described within this thesis features two experiments the first experiment which is detailed in this chapter provides vital information that later informs further study. The experiment described here utilised five different character types, three different behavioural emotions and one narrative. The design of the experiment allowed for different characters to be placed within the same contexts and preform the same

actions. When one uses found footage or pictures to generate stimulus, the study becomes limited by the differing contexts each character is in. This is stipulated by the original purpose the character was created for. Conducting research in this way improves upon methods employed by previous researchers who used found footage (MacDorman et al., 2009, Ho et al., 2008, Schneider et al., 2007). In the previous chapter we have discussed how a subject may come with some bias towards a character that they may have already seen. Such as once one is exposed to a an uncanny they cannot be then repulsed again upon seeing the same character a second time (Allen, 2007). Moreover, existing characters come contained within a context simply because they were created for another purpose. Colours, textures even locations behind the image of the character may differ leading to competing features which in turn contaminate the data being collected by the researcher. In the previous chapter we discussed how the surrounding image of the character affects the subjects perception towards that character (Ho et al., 2008). An integral part of the design of the experiment was to create stimulus to be used for experimentation that would be exposed to the subjects in as controlled a way as possible. This gives the stimulus a fair and unbiased approach as possible. While there is a concerted effort made to remove limitations surrounding the characters used within this study, this experiment does not claim to be free of limitations and are discussed later in this Chapter.

A crucial feature of the experiment was that it needed to be conducted online. This allowed for greater value to be assigned to the questions. This was especially important in regard to those questions which pertained to the subjects nationally as well as age. Having a link to the experiment meant that it could be posed almost anywhere online and subjects could simply take part in the experiment. This obviously is not a new approach in terms of research or indeed in terms of studies in this area. The approach to conducting an online experiment was informed by work conducted by Seyama et al. (2007) favoured the web based approach to their experiments conducted at the University of Tokyo into the effect of realism on the impression of artificial human faces (Seyama and Nagayama, 2007). Their work used a similar setup in terms of image based stimulus contained within a questionnaire. In examining what was recorded by the researchers at the University of Tokyo one could surmise what line of questioning was reasonable for such an experiment as well as how much validity maybe expected for the subjects responses.

As with Seyama et al. (2007), the research design presented in this thesis allows for subjects to be separated by gender, age, nationality as well as specific interests.

Research conducted by Paiva, et al. (2004), used three different characters of the same type to discover the empathetic relations between the character and the subject. Their study divided their sample into separate groups for analysis. Doing this they found significant difference between how children, teachers as well as different genders relate to the three characters. The characters used represented three different types of school children, a victimised child, a neutral child and the school bully. The characters were placed in a context and situation by the researchers, Paiva et al. (2004) suggests greater cognitive empathy is 'achieved by designing the whole environment and situations in a way that users feel some degree of familiarity and closeness with the characters, environment and situations' (Paiva et al., 2004). The results obtained by Paiva et al., go some way to back up the statement as children felt sympathy for the victim than any of the other groups. It is important to give a character context for the subject to have any opportunity to feel anything for the character regardless of style of said character. As this study deals with non-interactive characters it is important to use devices and conventions suitable for the character conventions such as a narrative. Schneider states, 'addition of narrative functions to provide justification, increase arousal, and therefore increase learning. It provides frequent exposure to violent behaviour committed under the direction of the game player by a character with whom the player closely identifies, which is likely to increase facilitation and thus inhibition (Schneider, 2004). In research conducted by McDonnell et al. (2012), a realistically proportion male character was used to measure and compare participants ratings of appeal, familiarity, friendliness and trust. The same character was rendered in different shading styles. The researchers found that cartoon shaded characters generated the most appeal, 'this was due to the fact that humans are inherently conditioned to analyse human faces, and are therefore less forgiving of anomalies when a human photograph is applied to the model' (McDonnell et al., 2012)

For this experiment the subject's age, nationality, gender and predisposition to animation were recorded. This wide scope of factors was important to determine what factors needed to be omitted and what needs refining for further study in this

thesis. It must also be noted that a binary function was used to later analyse the nationality factor. Participants were grouped as either European or non-European, so that the effect could be measured with greater viably. Rather than conducting the experiment with the expectation that a perfectly homogenised group would take part, especially when considering the nationally element to the recorded data one could reasonably expect that participants would be either European or non-European. This thus gives the experiment greater viability in its task to discern whether or not this factor has any bearing if any on the data recorded. Then after deliberation of the data obtained one could decide whether or not such an independent variable needed to be examined by further experimentation which follows this chapter later in this thesis.

Whilst, this experiment was conducted with aims to collect working data for analysis, there was also the understanding that further refinement of the apparatus would be needed. Collecting a large amount of data pertaining to information about the subject may widen the focus of the experimental procedure, however in doing so independent variables may be eliminated due to them having no effect on the interest/ appeal of the character types being exemplified within the study. This allows the study to be further refined and simplified for further experimentation as and when needed. While there has been research that has measured the subject's perception towards a character, no research to date has the combined approach of measuring the three elements that encapsulate a character as a subject may see them in commercial projects. Not only does this experiment measure the perception towards the character, but also the characters integration into a context and how said character behaves within the context. The importance of the elements has been discussed previously in this thesis as well as how they relate and contribute to a subject's interest/appeal towards a character. The remainder of this section will discuss how these elements were created and how they were later integrated into the experiment.

3.2.2 Materials and Procedures: Context

We have discussed the contextualisation of a character in the literature review and focused on how contextualisation may affect the perception of a specific character and gave commercial examples, this section discusses the specifics of how

the contextualisation directly relates to the method employed by the experiment discussed in this chapter and further discusses concepts with examples of commercial projects as well as studies that have directly or partially directed the approach to method in terms of contextualisation.

In this section we will discuss the process in developing the contextualisation for the stimulus of the experiment. Previously in this chapter we have explained how the three elements characters, behaviour and contextualisation are interlinked and compromises are required to make each element work well with each other. The main focus of the measurements made by this experiment relate to the subjects perception of the characters. However, as we have previously discussed , behaviour also plays a key part in how a character is perceived by the subject. This section discusses the contextualisation involved and relates key commercial sources that are better explained in this section where they can be viewed alongside the actual stimulus used within the experiment. This provides the reader with an easy way to see how previous studies by McCloud and Geller (Geller, 1999, McCloud, 1999, McCloud, 1994) relate and to the stimulus created for this study. Discussing the material provides a coherent approach into the explanation of how studies pertaining to comics and graphic novels relate to the focus of this study with it's characters within the field of 3D computer graphics. Discussing such material within the previous chapter may lead for the reader to have trouble relating the material to the method employed by the experiment discussed in this chapter.

In terms of controlling the experiment's stimulus and being able to adapt it to produce further sequences which highlight different emotions a still image approach was exploited. The specific technique employed was developed from an idea by Scott McCloud (1994) who created a character based around a similar principle of the idea in his book *Understanding Comics*. This character known as Carl was created to illustrate a point about the subtractive and additive nature of comic art. The character was used by demonstrating how removing and adding different elements to a sequence, changes the mood, feel and even the entire meaning of a piece (McCloud, 1994).

Fig 20: McCloud's interpretation of a cartoon human (McCloud, 1994)

Scott McCloud showed how by simply removing six panels, narrative has changed from being relatively upsetting to being comedic. McCloud further developed this idea into an interactive comic which can be found on his website (Scottmccloud.com). For these comics, Scott created many more options and the reader could choose a path in which they wanted the character of Carl to follow.

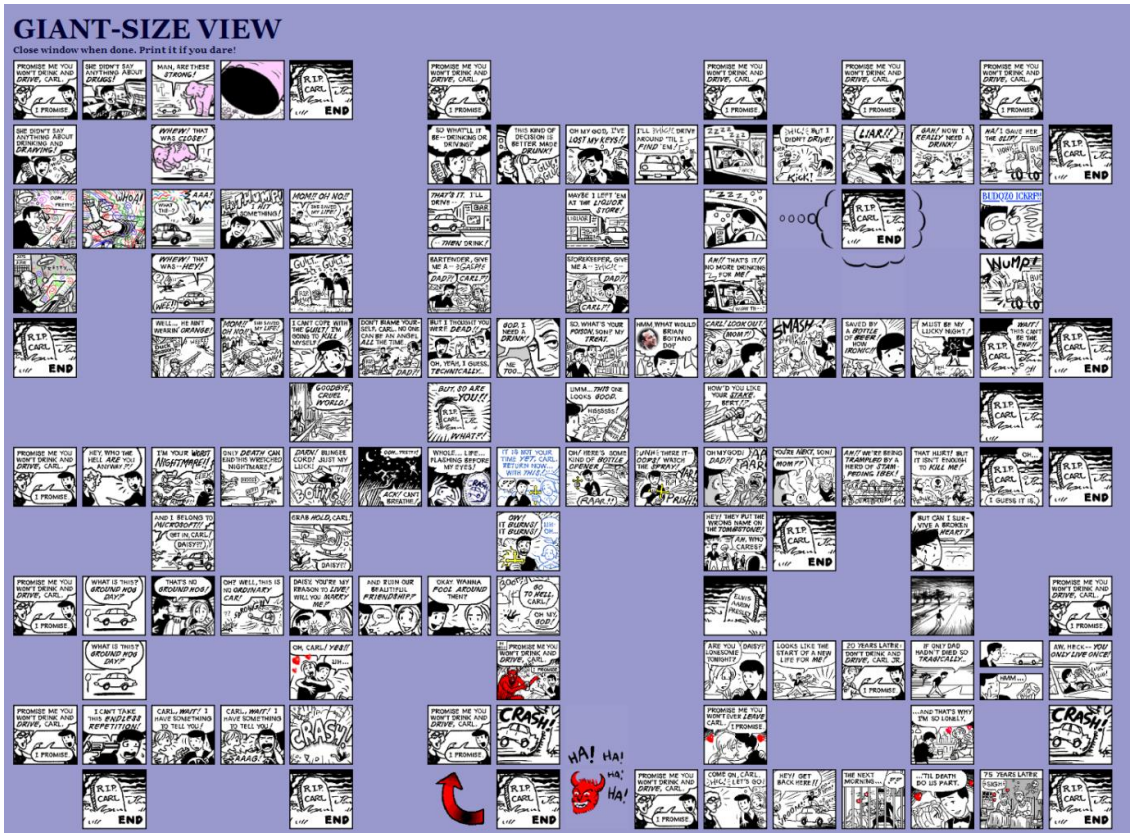


Fig 21: Giant Size View (McCloud, 1999).

The idea was later adapted by Nat Gertler who created the now redundant

program, One Armed Carl. Nat Gertler's program kept the same start and end points of the sequence and changed four panels between them randomly whenever the reader pressed the button to randomise (Geller, 1999). The result gave the reader a unique story every time they would randomise the panels. The entire panel sets that ever existed in Carl's story can be seen in Scott McCloud's aptly named giant size view Figure 20. Figure 16 shows three panels that were generated via the interface while it was still functional. What these sequences demonstrate is that with only a few changes the tone of a story can shift from one extreme to the other. While the overall tone of the narrative generated could often be deemed absurd, the last sequence in figure 16 demonstrates how what was humorous in the preceding sequences is turned tragic. While all the sequences suggest Carl has an alcohol problem, the way in which the story generates in the first two sequences uses it for comical effect. While in the last sequence Carl mentions his father dying and in the very next panel he is going to buy alcohol. This juxtaposition leads us as the reader to come to an understanding that this is Carl's way of dealing with his feelings and could well be the catalyst for his alcoholism.

The sequences used within this experiment only change a single element. This is so the experiment may be controlled. The actual element will comprise of a single panel in which a specific illustration of emotive behaviour is exemplified.

Fig 22: Three different 'spins' of Nat Geller's randomiser (Geller, 1999).

While a number of different basic plots were developed for the first experiment. Deciding on the plot to be used proved difficult. This was mainly due to the problem with any short sequence. There has to be a main over riding tone to the piece. However, in the case of this study a piece which allowed the character to exhibit three separate emotions was required. Another important feature of the story was that each character should be able to perform given the differing proportions and appendages a character may have. While some characters may have the ability to interact with props with ease, others may not be as suitable for such a task, and lead such characters to underperform negating a usable result. Fortunately, the narrative is not what is being assessed as part of the experiment; therefore any form of narrative is suitable as long as the character can perform each of the three behaviours within it as well as being a narrative that can support the five different character types. In this case to fulfil the criteria of including the different behavioural emotions as well as the various character types a surreal contextualisation was adopted for this experiment. This is important due to the fact that less human character types do not have the relevant appendages that may be required by some stories. The narrative that was chosen contains sad, surprised and happy elements. The plot used was a farcical tale in the theme of the random plots generated by Nat Geller's randomiser. In this case a character encounters a spirit which becomes the same characters facial hair, the character upon seeing themselves is pleased by this.

Inspiration for the narrative involved within this experiment came from the surreal six panel comics of Joan Cornellà (Cornella, 2013). Cornellà works often feature the same or similar protagonists who themselves are only tentatively defined. The narrative often deals with a darker brand of humour not normally associated with the medium. What is noticeable is that within these stories no dialog is ever used. This leads to the stories potentially to appeal to a global audience who could at least understand and interpret the plot as easily as any other person. This is due to the

approach that Cornellà has taken in creating each piece, while surreal and often farcical Cornellà creates a context that does not warrant the audience to be a reader of any language.

Fig 23: Joan Cornellà (Cornella, 2013)

Such an approach defines how the method of this study maybe broached particularly as independent details such as the subjects nationality are being recorded. While the plots of Cornellà's works often have an element of violence, the context within this study was decidedly non-violent even though one may argue that Cornellà's works often approach violence from a farcical comedic angle, one may also argue that non-neutral plot devices can easily polarise the opinion of the audience. This is especially important in the case of this study due to the need of the context to be a neutral as conceivably possible to facilitate an experiment. Another feature the works of Cornellà has is the ability to cover a range of emotional behaviours in one sequence. In one of the examples provided here (Fig 23) a character begins by being rejected by a woman in a part. This leads to a sad emotional state portrayed by the character. The character finds a head on the ground and portrays a surprised behaviour then finally upon wearing the head the character is now happy as the head has made him appear more attractive to the women around him.

The story used as contextualisation in the experiment described within this section utilises a similar layout to the works that are presented by Joan Cornellà (Cornella, 2013). The same sequence features the various emotional states portrayed by the

characters in the study. However, each different sequence is presented to a different group of people whom have not been exposed to the other versions of the sequence as we have previously discussed. Using a story as surreal as the one presented in this experiment allows the subject to concentrate on the character as well as the emotional state of the said character. A complex plot may serve as a distraction rather than being complementary, especially as in this case where a character must go through a number of different behavioural states. Using the neutral base of this plot, one frame was changed for each sequence group. We will now describe how the subject accessed the experiment. The subject first accessed the test page choosing test A, B or C would decide which behaviour group that particular subject is assigned. For example group A consisted of exactly the same experiment sequence as both B or C however, the happy emotion was emphasised. Group B saw the sad emotion emphasised and group C saw the surprised emotion of the character emphasised. For each of these groups a neutral base sequence was edited by changing a single frame. This allowed for comparisons to be made between the groups in the analysis. If the same participant was found in another group, their data sets would be removed so as to allow effective analysis. Regardless of the emotion emphasised, each group saw the same story. The narrative was chosen as it incorporates both a sad, happy and surprised element to the characters behaviour. It was important that the actual narrative does not distract from the character rather be containment for both the character and the behaviours of that character.

Fig 24: Cartoon character empathised surprise

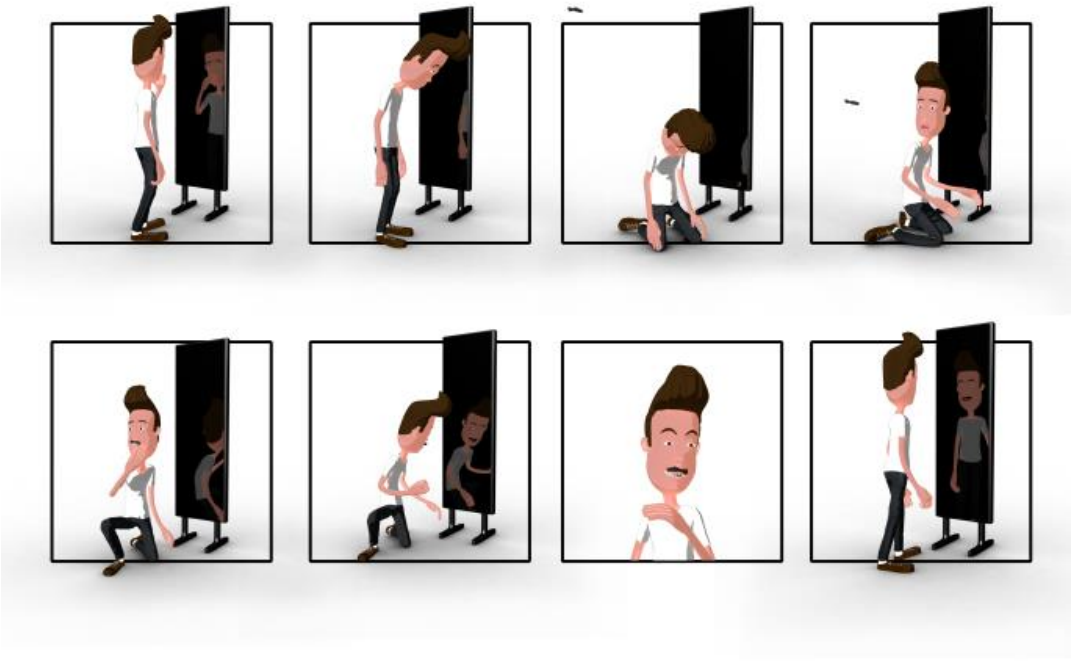


Fig 25: Cartoon character empathised surprise

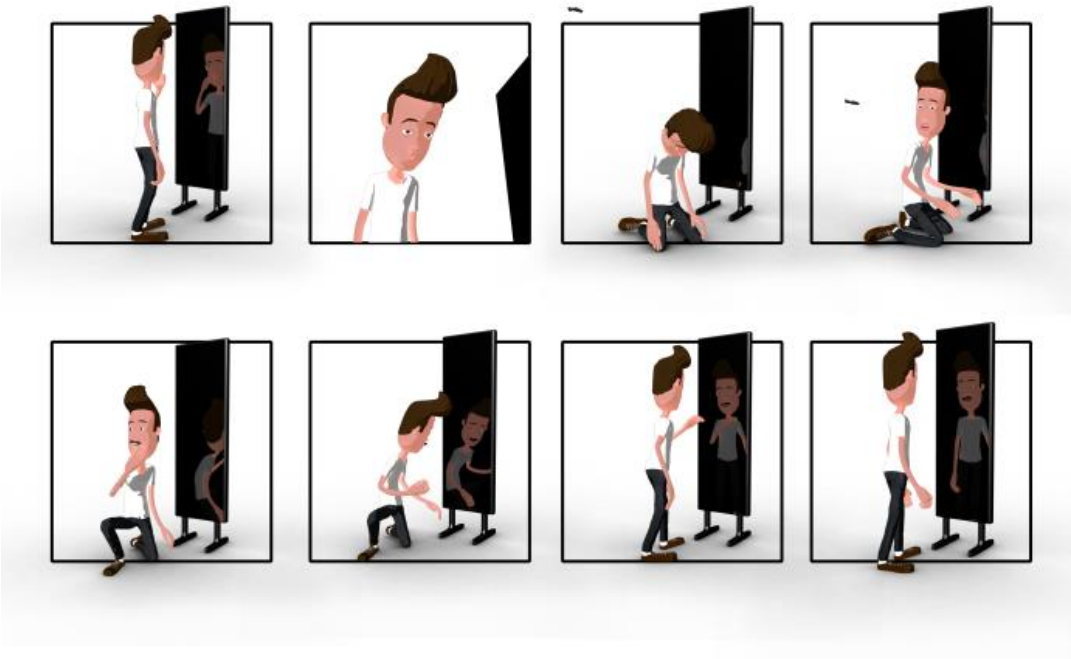


Fig 26: Cartoon character empathised surprise

Figures 24 to 26 are actual sequences used in the experiment. Full sequences are available in the appendix. Each sequence is similar as it is the same narrative context. However, each sequence has a different picture emphasised. Only one unique participant was recorded per group as previously discussed. Different subjects could be identified through the names given as well as unique identifiers such as user IP. This allowed for repeating subjects to be removed from the data set due to reasons we have previously discussed relating to the importance of having unique stimulus to guarantee the subject has had no previous exposure..

The experiment was conducted using online survey software called Pinnion. This program allowed the stimulus to be placed above the questions and made answering the question relatively easy for the subject. This would allow a subject to access the test material from anywhere in the world (providing they had access to the World Wide Web) and take part in the experiment without the researcher being present. Following completion of the sequences, the subject was given the option to write a comment regarding what they had seen. These comments were separated per group and were used to qualitatively understand the quantitative data further. The subjects were also asked to choose a favourite character once they had seen all the characters

in the sequences. This data was used to ascertain any fluctuations in which character was the favourite depending on the emphasised behaviour of the sequence. This data was then plotted and compared to Mori Masahiro's hypothetical uncanny valley curve (Mori, 1970) to reveal if the behaviour of the character made a difference to the appeal/interest.

3.2.3 Materials and Procedures: Participants

In this section we discuss how the experiment is undertaken. While we have discussed the process of the experiment, we will now discuss the participants involved. In this section we draw upon commercial and literary examples that relate to the choices made in terms of designing the experiment. Considering the subject of the experiment is an important task. Unfortunately when it comes to visual entertainment we have a wide scope of different people who take part in the enjoyment of it, which makes a demographic selection difficult.

However, one of the main goals of the first experiment was to explore the type of participants gained from putting the experiment online as well as which factors provided interesting data for the study. This experiment was conducted with the understanding further experiments may need to be conducted to fully understand the relationship between the character design and the subjects perception of said character. This allowed for an experiment such as the one described within this chapter to be conducted. This experiment allowed for a wide range of participants to take part. This data would serve to inform further studies to be undertaken as part of this research. While the first experiment had a broader sample, the second experiment had a far more restricted sample based on the results of the first. This will be discussed further in each experiment's sections later in this chapter. While much of this section relates to literature it does not directly relate to the focus of the literature review in the previous chapter. However, we relate to studies that conducted research in a similar manner as well as how subjects for the research were recruited. In this section we will discuss previous studies and how these studies were participated. As we have discussed previously in the definitions section of the previous chapter semantics are often justifiably used interchangeably with one another. When undertaking research which deals with words on any level, one must

go into the research with the understanding that some words are interchangeable with one another. If one takes on any research of this type, one would have great difficulty in finding related studies for correlation with one's own if said researcher were to only consider studies that used the exact adjectives as one's own. For that reason the research itself has to be reasoned and an understanding has to be reached that words are not a material concept but an abstract concept. Words struggle to define what they are describing do to their abstract nature. The words one person uses to describe an feeling may very well be different to another person whom describes the same feeling. With that said, the previous research discussed within this section may be termed differently from the key focus of the study described within this thesis. However, each study has an overarching goal which does indeed correlate to one another. In a discussion in terms of the method employed by this experiment relating to that of the subject's that took part one would have a tenuous argument in justifying why any one group is worthy of study more so than another. This research takes into account other works and particularly the methods employed in attaining a suitable sample.

> *Different types of media and media texts promote different responses from audiences (e.g., film vs. television, print vs. visual, first-person vs. third-person narration, and narrative texts vs. non-narrative texts), but it is equally probable that there is variance in the responses of different groups to a given text (differentiated by social groups and psychological variables)*(Cohen, 2001).

While it may be expected that younger age groups may have a stronger affinity to animated characters, this age group provided an interest point of change as there is a wealth of animation aimed at the more mature demographic also such as *Family Guy* (MacFarlane, 1999), *Futurama* (Groening, 1999), *The Simpsons* (Groening, 1989) and *Tripping the Rift* (Austen, 2004). Cantor states 'as children mature, they become more responsive to realistic, and less responsive to fantastic dangers depicted in the media' (Cantor and Nathanson, 1996). Research conducted by Wilson et al., (1985) found older children empathised with a protagonist's fears more so than younger children. 'Studies on emotion recognition have shown that children as young as four years old can identify the simple emotions of happiness sadness, anger, and fear,

especially when they are allowed to choose among emotional labels provided by the experimenter' (Wilson and Cantor, 1985). Exploring gender differences would make an interesting study, however, Lennon et al., found no difference among the two genders in empathic resonance (Lennon et al., 1986). The number of participants involved with the first experiment was based on the similar level as identified in the literature. Research conducted by Lennon et al., (1986) used 35 subjects to measure empathy on the premise that 'empathy is inconsistently associated with pro-social behaviour in childhood' (Lennon et al., 1986). Research conducted by Yamada, et al. contained three different experiments and used around ten participants for each of their experiments (Yamada et al., 2013). Research conducted by Schneider's et al. consisted of 60 participants rating 75 pictures of different characters. The subject was asked to give an opinion on the character rating how human and how attractive the character was. Results from Schneider's study found 'that making a character more human can sometimes, but not always make it better. The high level of correlation in the characters with clearly non-human appearances suggest designing animals and robots with human-like traits while keeping them clearly non-human in appearance is a much safer strategy than using a more anthropomorphized animal or entity' (Schneider et al., 2007).

Research conducted by Gray et al., used a multi experiment format, where the previous experiment formed the basis for the next. The sample used within the research was largely random; participants were recruited from campus dining halls and subway stations. Gray et al., also used a 11-pt scale to measure the factors that were being tested (Gray and Wegner, 2012); namely experience and agency of the robot. The participants for the study where obtained by using popular social network sites such as Reddit, StumbleUpon, Tumbler and Facebook. The users of such social sites would represent the demographic of the study. The World Wide Web has become one of the (if not the) major mediums of entertainment which this study is represented of. With services such as Netflix, LOVEFiLM Instant, BBC I player, 4OD and Now TV, the internet is one of the major outlets of film, television as well as medium specific video periodicals. The term *video periodicals,* is used as an umbrella term to encapsulate Podcasts/VLogs, Webisdoes, Web Animation and Motion Comics. The importance of online avenues has been recognised by major companies and many popular television shows as well as video games have adapted

storylines from their main storylines to conform to a miniseries to be aired online. Hale suggests, 'in a world where the possibilities for elaborating your shows online are endless, the true fan wants to see and hear everything' (Hale, 2008). Podcasting is a term promoted by Apple to describe video blogging. Video blogging is commonly referred to as Vloging in the vernacular. However, the terminology is undefined, 'you will see an on going rewriting of the definition in real-time at the Wikipedia pages for Vlog, podcast, RSS, and web feed' (Garfield and Tames, 2006). While we have addressed some of the issues surrounding the participants of this experiment; this experiment keeps an open mind towards the particulars of the subjects involved and comes with the understanding that the sample will be refined in further experimentation as per analysis of the data collected from the experiment discussed within this Chapter. The approach to the sample is explained as to why it was dealt with in such a way, this is done here by drawing on comparisons with similar studies, or studies with similar objectives. It is important not to restrict the sample in a way that may obstruct any interesting features that may arise from the data set once analysed. Rather the sample used here further defines a greater study by eliminating what is unimportant in regards to the subjects perception of a character in the context of this study.

3.2.4 Materials and Procedures: Characters

Whilst we know in the field of animation one can create and animate vastly different characters such as colossus giants to microscopic amoebas. Unfortunately, within the confines of this research characters need the ability to perform on equal terms to one another within the contextualisation. This leads to a limiting in the overall range of creativity that one is allowed within the design stage of the characters.

This study, be it this particular experiment or experiments to follow distinguishes itself from previous researches which tended towards using pre-existing characters. We have reason to believe previously in this thesis as to the subject bringing preconceived ideas with them in the judgment of a character they may have seen before or due to how the uncanny valley effect works on a single exposer to the uncanny character (Allen, 2007). Further reasoning is due to how important the

framing and surrounding image of a character is to the perception of the subject (Ho et al., 2008). Using characters created for the study give full control over how they are divulged to the subject. This also reduces the problem of comprising the study by using found characters that may or may not fully fit the criteria needed for the experiment involved. Creating characters for study provides further opportunity to fully understand the character type involved. Such character types have to be fully researched and understood before one can begin to create as well as be utilised for this study.

In this section we will discuss the character types used within this study. While we have discussed character type previously in previous chapters we will now go into detail into the actual character types used. We will relate some of the discussion towards literature and commercial output. This is discussed here as to allow the reader to relate the discussion with the actual characters being utilised in the study. Part of the method involved within this study is to come to an understanding to the specific character being created. An understanding of how such a character type is placed within mainstream animation is important. Research using characters, such as those that will be discussed here may not use the same terminology as the study being conducted in this thesis but still provide the process of the creation of characters for this study critical understandings of the successes and limitations of previous works as we may draw upon to refine and improve upon for current research.

A crucial part of this research was the design of the characters and what characters types were to be used. Flannery O'Connor observed, 'it is the characters who make the story, and not the other way around' (O'Connor: Cited in Hayes-Roth and Doyle, 1998). It was important to decide on which characters were the most widely character types used by the medium of 3D computer animation and a series of designs were sketched. The sketches then formed the final designs of the characters. While much of the research which exists that looks into the uncanny valley considers it from a human character basis, the uncanny valley phenomenon can occur even when human observers evaluate images of other species (Yamada et al., 2013). Research conducted by Dill et al., used a limited number of CG characters and measured the discomfort viewers of the stimulus had with each character. Using

found characters was considered a limitation of this study and Dill suggests future research should record how familiar a subject was with a specific character (Dill et al., 2012). Further problems of familiarly have been cited in the work conducted by Dill et al. (2012), Walker et al., (2003) and found potential problem areas for this type of research. Walker et al., (2003) suggests a subject has greater sensitivity to a change made in a known face rather than a face that they are unfamiliar with (Walker and Tanaka, 2003). Therefore, it was important to use novel characters that the subject had not been exposed to previously. Fortunately, as the subjects had not been exposed to the characters previously, the experiments conducted in this research, the problem of familiarly had been eliminated from this study. This was important so that the perception of the character was not affected by the subject being pre exposed to them. Also in terms of the uncanny valley effects, it was critical that the subjects had not seen the characters as the more exposed to the characters, the less shocking it would be to the subject (Allen, 2007). It is important to state that assessments made on behalf of existing well known character maybe contaminated by a multitude of external factors surrounding them. Unfortunately this makes integrating such a character within a highly controlled experiment problematic as such factors may not be effectively removed from the stimulus. Characters used within this research need to therefore be designed in a manner that does not utilise notable design choices from existing characters that may cause the subject to relate/compare the new character to an existing one.

In designing characters for such a study, one must compare and contrast the prescribed method to previous methods used by researchers also comparing different character types. While using different terminology research conducted by McDonnell et al., tested how trustworthy a subject found a virtual character, their work still provides out study with key insights of integrating character based stimulus into an experiment. This research utilised three different render styles to portray the same model as high quality, game quality and non-photo realistic. Their results found no qualitatively significant differences between the characters (McDonnell and Breidt, 2010). One may argue that the characters are in fact the same, the only difference being the render and texture style of the character. Even with these differences, the character remains very similar to the other two competing characters. This gave the ‘high quality’ character an unfair advantage as this was

clearly the model the other two were based on. Previous research conducted with androids found differences in how a subject perceived the character. Specifically research conducted by Riek et al(2009) tested participant's empathy through found video clips of robots and one human. The robots varied from least to most human in design. Results suggested that the subjects were more likely to empathise with a robot that was more human in design rather than mechanical (Riek et al., 2009).

We will now discuss the five different character types used within this study. This discussion describes both the character as well as key literature involved in the creation of said character. Some new literature is introduced in this section to further enforce the design choices made during the constructions of each character. Some of this literature is take from different fields than that of android sciences and 3D computer graphics, hence these sources not being included within the main literature review chapter. Their inclusion within this section allows for the reader to have a greater understanding of how each character was constructed with relation to these sources as they can be discussed concurrently within this section. Such parallels would be difficult if separated.

Realistic Human Character

A realistic human character type is now the most common form of character in 3D computer animation. The film *Tron: Legacy* (Dir. Kosinski 2010) has an example of a full CG character acting alongside live action actors. The character Clu was based on the actor Jeff Bridges as he appeared in the earlier film *Tron* (Dir. Lisberger 1982). This character was an entirely digital representation of a human being. Where robotics has androids, the 3D computer animation field has the realistic human, a character type what is designed to emote and behave like a real human actor. It is difficult to conduct research which looks at the uncanny valley theory without using a realistic human character. While the uncanny valley theory may apply to other character and species types (Steckenfinger and Ghazanfar, 2009) much of the research into the uncanny valley considers the human form to be the most problematic, especially since we could be instinctively more critical of our own species rather than another. One such theory speculates that the uncanny valley exists as that in which we find falls into the uncanny valley is deemed as dangerous. The

uncanny being may have a contagious illness and it is out of instinct one should seek to avoid that person (MacDorman, 2005).

This character in this study was constructed in a 3D application as a male model so a reference chosen because of average aesthetics. The character was modelled from scratch to a high density mesh, displacements maps were used to get finer details into the skin. The character featured realistic hair modelling and was shaded using advanced sub surface scattering techniques to achieve skin as realistic as possible. The character was clothed neutrally in relatively plain clothes similar to the other characters in this study. The character was finally given a control rig which featured advanced facial controls. Time was spent to make the character look as realistic as possible given the time constraints involved in preparing for experimentation. The design utilised features and techniques more commonly associated with CG movies rather than games. This decision was made due to the fact that real time applications such as video games to make compromises with the design. Certain features such as hair simulation cannot be used simply because of the real time engine involved. Using pre rendered techniques meant the focus could be put on the overall aesthetic of the character rather than compromises be made to the design.

Fig 27: CG human

Given the options available for this character any pose or expression that can be performed by a human being could be represented by this model. While it is presumptuous to assume that one example of a character can speak for all others like it, this character represents an average so that given the scope of the study one can initiate and understand the interactions between the specific character types.

An argument may arise that all characters should be constructed to the same proportions and styles. In regard to previous research it would suggest only the render style should change (McDonnell et al., 2012, MacDorman et al., 2009) however, through exploration of existing materials it is important to note that proportions do not translate over to different character types. For what may be a desirable set of proportions for a cartoon character may not be desirable for a realistic character. Using a mismatch of proportions clearly drops the mismatched character into the uncanny valley. This has recently been exploited by the 'you are not a sketch' campaign run by Star Models in Brazil Fig.28.

Fig 28: Star Models' 'You are not a sketch' campaign (Macleod, 2013)

It has been demonstrated by the Star Models' campaign using cartoon proportions on a realistically rendered human character that it creates an unappealing result. However, using realistic proportions on a cartoon shaded character does not. This leads to another problem. Whilst the shading of a character may be non-photorealistic, the proportions of the character are not. It is fundamentally incorrect to term these characters as cartoon.

The Low Poly Human

Fig 29:Example polygonal man (Veihan, 2009)

This character goes in a different direction from other characters in this study. Rather than hiding and avoiding the synthetic look of 3D computer animation this character embraces them. It does not have a texture that hides CG design but rather one that complements it. The shape will be unsmooth so viewers can see to some extent the way it was constructed. This is the most honest character in this study. Masahiro (1970) states that when a viewer discovers they have been 'tricked' they feel a strong disgust reaction. Expanding on this idea, this character does not hide anything. This character is an exemplified version of polygonal looking characters created in early 3D video games such as Sega's Virtual Fighter (Sega 1993). While early 3D video game characters were limited by the amount of polygonal faces that could be rendered at any one time, the implementation of such a character within this research needs to look at embracing of the medium rather than aim to fulfil the needs of visual fidelity of which it struggles to meet.

The goal of many CG character designs in overcoming the uncanny valley was to create a perfectly realistic copy of their subject. However, it is debatable whether or not this is the most valid approach. Also this should not be the only constraint on the design. Rochat et al., suggests that mirror image is indeed an uncanny apparition. 'Mirrors are seen as providing more than mere reflections, casting souls and spirits, endowed with the potential power to trap them' (Rochat and

Zahavi, 2011). An important consideration by this research is that the character does have mirror like uncanny behaviour, such as prolonged stares at the subject. Our sense of the "uncanny" – prompted for example by unusual coincidences, the discovery of a double, the fear we feel when alone in silence and darkness–arises from the sense of something strange yet familiar, inexplicable yet fully present to the sense, a blurring of distinction between the real and the imaginary (Rollin, 2008).

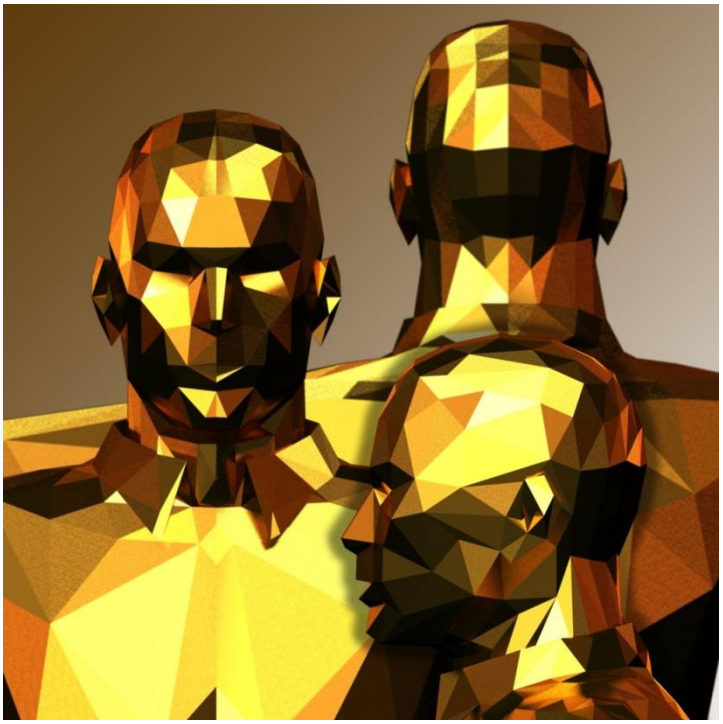


Fig 30: Polygon man used within this study

While based on early video game characters, the actual design of this character was inspired by Xavier Veilhan's polygon man (2009). The simplicity of the creation by Veilhan was regarded as an interesting piece of art when completed (Gibson, 2010). Using an early version of the realistic human character, this character was made. The actual character conforms to the same height and proportions as the realistic human character. While the inspiration for this model by Veilhan was less detailed, this character needed to be possible as well as having an expressive ability. Therefore, a higher level of triangulation was seen in the model used for this study.

The Cartoon Character

Fig 31: Sega/Nintendo's Sonic an example of the cartoon character type

The character type of the cartoon character is a mainstay of the field of animation as a whole. However, as we have previously discussed this character type has often been misrepresented within the research involved with measuring the subject's perceptions towards characters. As we have discussed previously often research negates the importance of how proportions of a cartoon character may differ than that of a realistic character. Moreover a cartoon character is not simply a shading style as some research seems to pertain to (McDonnell et al., 2012, MacDorman et al., 2009). This section discusses the construction of the cartoon character types giving the reader an understanding of the specific archetype and how this relates particular to this study and more importantly the character that was developed for the actual experiment.

Scott McCloud suggests that upon seeing a realistic face such as a photograph or realistic drawing, the viewer of this image identifies this as an image of another. However, when presented with a simplified cartoon version of the face the viewer sees oneself (McCloud, 1994). Research conducted by Duffy and Burton surveyed children and adolescents in Chicago using the stimulus of tobacco warning labels. Some labels were embellished with a cartoon character to emphasise the point. Results found that using cartoon characters on tobacco warning labels rendered the information more believable to the subject (Duffy and Burton, 2000).

McCloud further states that "storytellers in all media know that an indicator of audience involvement is the degree to which the audience identifies with a story's characters. And since viewer-identification is a speciality of cartooning cartoons

have historically held an advantage in breaking into world popular culture' (McCloud, 1994). Cartoons allow the viewer to live through their constructions, while realism allows the user to spectate on the like lives of others. This assumption by McCloud would suggest that using cartoon images in subjective advertising such as quitting smoking campaigns and alcohol awareness adverts may be more suitable than using a live action actor or realistic image. The first time we see computer graphics used to create a character with any perceivable emotion was in the short film *Tony De Peltrie* (Dir. Bergeron et al. 1985).

Fig 32: Tony De Peltrie (Bergeron and Lachapelle)

> *Tony de Peltrie premiered as the closing film of Siggraph'85 - the largest computer animation festival in the world. As the lights dimmed, and Tony's wonderfully sad eyes first appeared on the screen, the stunned audience fell silent. They were witnessing history. For the first time, a computer-animated human character was expressing emotions* (Lachapelle, 2013)

Obviously the first use of 3D graphics in this early character animation appears less sophisticated than modern example. One blog recalling their childhood remembers how this character frightened them (Bocko 2010). As we can see from the image (Fig 9) the character is a little creepy looking but no more than a creepy looking child's toy. However, the character is also highly sophisticated for a time

when 3D computer animation was in its infancy. No doubt this character would be the technical novelty of the time that Foss (1993) describes.

When one thinks of cartoon characters, one will eventually think (if not immediately) of Disney animations. The Disney style influenced and birthed other styles such as Japanese Manga and its animated form Anime (Steinberg, 2006). Russian filmmaker Sergei Eisenstein states in regard to early Disney that, 'Disney creates on the conceptual level of man not yet shackled by logic, reason, or experience' (Watts, 1995). This statement can probably be exemplified by a further statement by Rollin (2008), 'We usually think of Mickey as both mouse and human'. Rollin describes this anamorphic existence as uncanny, where something can be more than one thing at the same time. Rollin goes on to state, 'even Disney called him "a pretty nice fellow," disingenuously keeping the uncanny effect alive' (Rollin, 2008). Felix the Cat, an iconic character created by Pat Sullivan and Otto Messmer could be considered a highly uncanny character if one let reason get the better of them. Felix could detach and reattach his tail at any moment. Often he would turn it into any object he needed at the time, for example a key or even a telescope. The example in figure (Fig 10) shows Felix imitating Charlie Chaplin by using his own tail detached from his body as a walking stick.

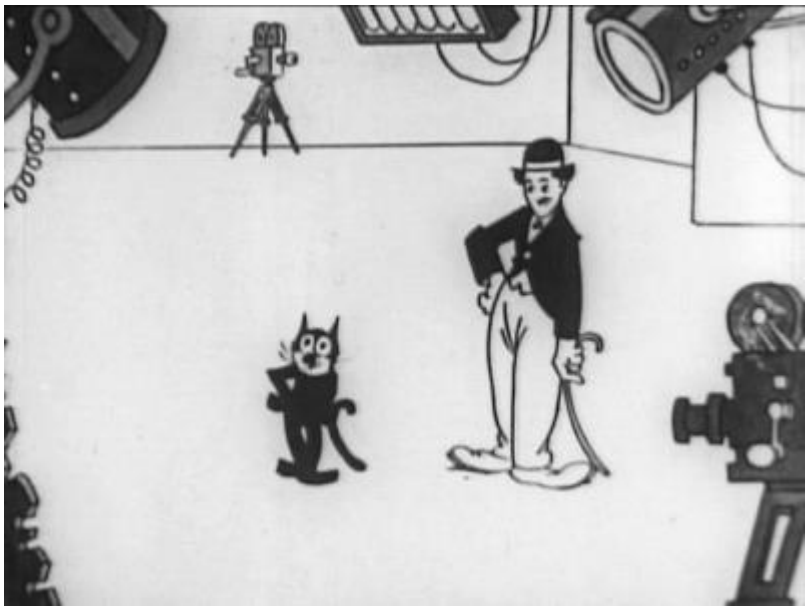


Fig 33: Felix the cat

Anthropomorphising a non-human character is obviously used for a humorous

effect. People clearly take delight in animals acting like human beings. However anthropomorphic cartoon characters, while commonly used for more comedic roles, have been seen in non-comedic uses such as in the graphic novels Maus (Spiegelman, 2003) and Black Sad (Canales, 2010). Maus (Spiegelman, 2003) is of particular note in this case as the story concerns itself with the horrors of the holocaust. One may consider Spiegelman's choice of style is risky particularly due to the faces of anthropomorphic characters are more commonly associated with light hearted comedic subject matters. Boler explains how the stylistic choice of Maus (Spiegelman, 2003)contributes to the story; it removes the reader one step away from the real word to what Boler terms as the 'power/safe distance' (Boler, 1997). While Maus' subject matter may be harrowing if grounded in reality, the stylistic choice emphasises the vulnerability of the protagonists by casting them as mice and the antagonists as cats.

Fig 34: The cartoon character

At this stage in the study it was decided not to make an anthropomorphic character as this could have humorous connotations. Rather it was decided that this character should be a cartooned version of the realistic character using the same colour scheme. The character was modelled to cartoon proportions and shaded in a style more commonly found in 2D animation. The reasoning behind this was due to the fact that the majority of animation is still consumed via the television. Television

animation is dominated by 2D styles rather than 3D cartoon styles found in films. In using a more human form, the character is the most articulately similar to the realistic human character. Finer details were added to the appropriate such as hair and clothes. The skin of the character was kept smooth to retain the cartoon look.

The Abstract Character

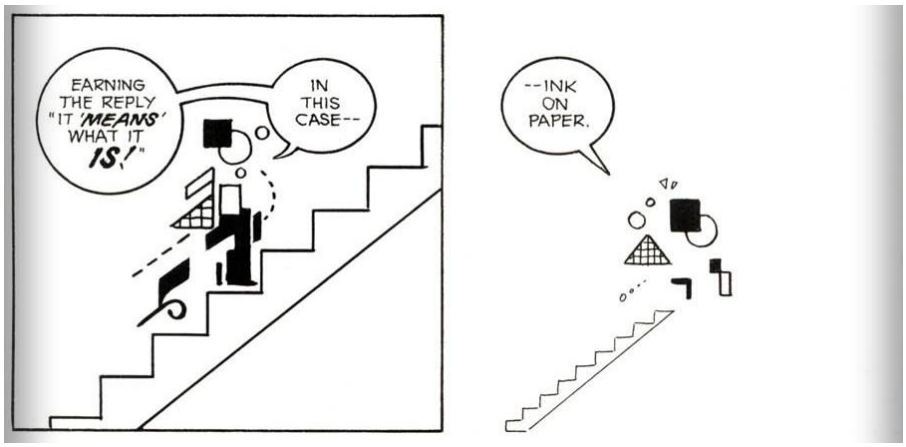


Fig 35: An example of abstraction in character with design (McCloud, 1994)

Abstract characters were once common place. A look at early computer games from the late 1970's and early 1980's will contend to this. Such a character allows the viewer to almost see anything they like within the abstract design. While this type of character may have limitations to the scenarios that may be contained within. The contexts in which such a character might thrive could potentially generate a higher level of appeal than the other characters.

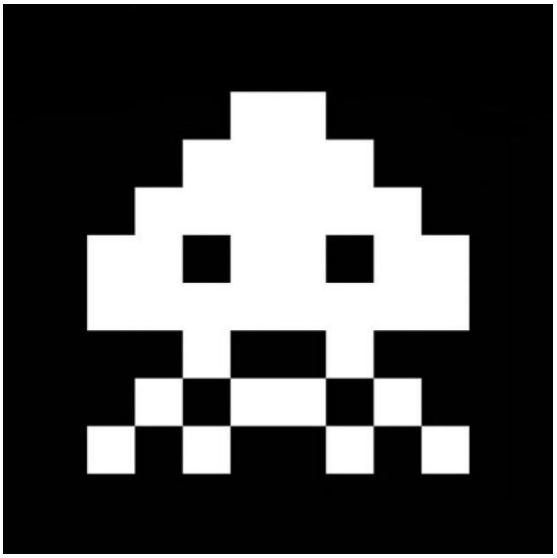


Fig 36: Space Invaders

One of the most famous abstract characters came from the arcade game Space Invaders (1978). Space Invaders was created by Tomohiro Nishikado ‘who designed and programmed not only the game, the artwork, and the sounds, but even engineered all the game's hardware himself’ (Edwards, 2007). The graphical style of the character design has become iconic, a famous street artist known as the Invader would likely attest to this statement. Invader was born in 1969 and he bases his artwork on the designs from the 1978 game. These miniature artworks are found all around London and Paris (Shepard 2010). Space Invader t-shirts are also still being made by various companies over thirty years on.

The abstract character used in this study was made to look like somewhat like a highly detailed space invader. The premise for this character comes from a statement by Schneirder (2007), ‘the safest combination for a character designer seems to be a clearly non-human appearance with the ability to emote like a human’ (Schneider et al., 2007). While understandably more detailed than early abstract characters, this character needs the ability to convey three separate emotions. Therefore,this requires the relevant features to convey these behaviours. These features will be discussed in the following section entitled Materials and Procedures: Behaviours. Adding such features requires the character to have a more detailed construction. Zell states that in order to create appealing characters, the artist ‘should identify the characteristics with the lowest degree of realism and keep it constant for the other properties’ (Zell and Botsch, 2012). Therefore, if a character is to have some sort of face requiring

substantial amount of geometry to support this face, it would necessitate the rest of the character to be suitably detailed. The character was given a completely non-human shape and shaded using a jelly like material to enforce the non-human idea.

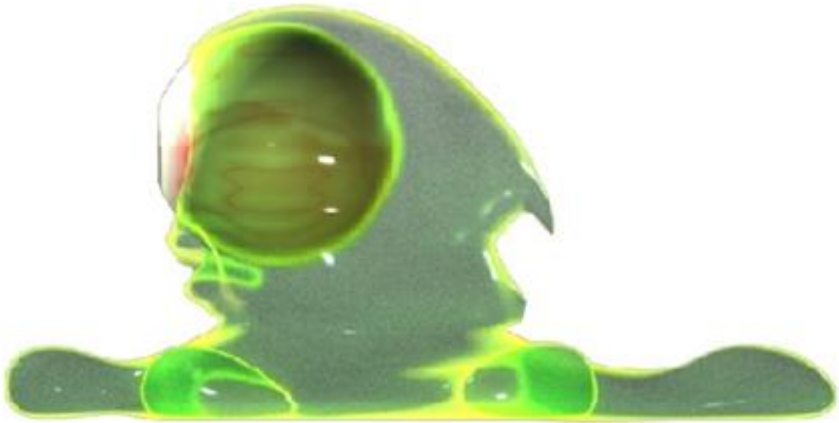


Fig 37: Abstract character used in this study

The Inanimate Object

Fig 38: An example of an inanimate object

This inanimate object character may seem the obscure character being tested within this research. However, when one explores the various characters in animation history we come across the object based character. In the film *The Haunted House* (Cline and Keaton, 1921), normal inanimate objects become animate for a scary effect. The chairs and tables within a house become alive and scare the occupants. This technique is used for horror effect in the film *Evil Dead 2* (Raimi, 1987) in a scene where the house and the furniture within it laugh along with the protagonist. The idea of an object coming to life is not always used for horror. In the magical musical film *Fantasia* (Disney, 1940)there is famous Disney version of the story the Sorcerer's Apprentice where broom sticks become animate after a spell is cast upon them. Also Pixar famously has a lamp as their mascot as it features famously in their

identity. Interestingly there is also a belief system that links in directly with this character type, ‘Animism is the belief that all things, animate and inanimate, contain spirits just as humans do’ (Rollin, 2008). Using techniques which characterise often inanimate objects can benefit their perception by the subject. Marti et al, conducted research which replaced a phone with a stuffed animal that would behave like the animal it is depicting when it receives a phone call. The premise for the study being ‘animal forms are less irritating than machine forms’. Their results suggested ‘that such alerting is less intrusive than conventional telephones’ (Marti and Schmandt, 2005). This character is constructed as an everyday object. The object chosen was a can of fizzy drink. There were two reasons a canned drink was chosen. The first was that choosing an object such as this allows the character to not necessarily be too obscure, it is important that the subject identifies the character as whatever object it happens to be. This avoids complications that may arise when the subject has to first work out what an unfamiliar object may be before addressing what emotion it is depicting. To further enhance the everyday object, the character was constructed to look photorealistic. The second reason was the can had what could be seen as a face, with the drink hole being the mouth and the tab being an eye.

3.2.5 Materials and Procedures: Behaviours

In this section we will further discuss behaviours of the the character. While we have discussed this in the previous chapter we will now discuss this in relation to the specific method used within this study. In this section we will describe the process that came about in deciding upon which behaviours are to be used. In this section we attempt to explain while there are a multitude of emotional behaviours a character may convey, we have had to make concessions are made for integration to this study. This section draws upon literature and explores the various types of emotion, then through justification we explain why each emotional behaviour was selected.

Plutchik suggested that there are eight basic emotions: these emotions being grief, amazement, terror, admiration, ecstasy, vigilance, rage and loathing (Plutchik, 2001, Plutchik, 1980). Of these emotions, Plutchik explains combining certain emotions and different levels of specific emotions to create different emotional states. For example if one is feeling both a joyful state and a trusting state Plutchik suggests this

person would be feeling love (Plutchik, 1980).

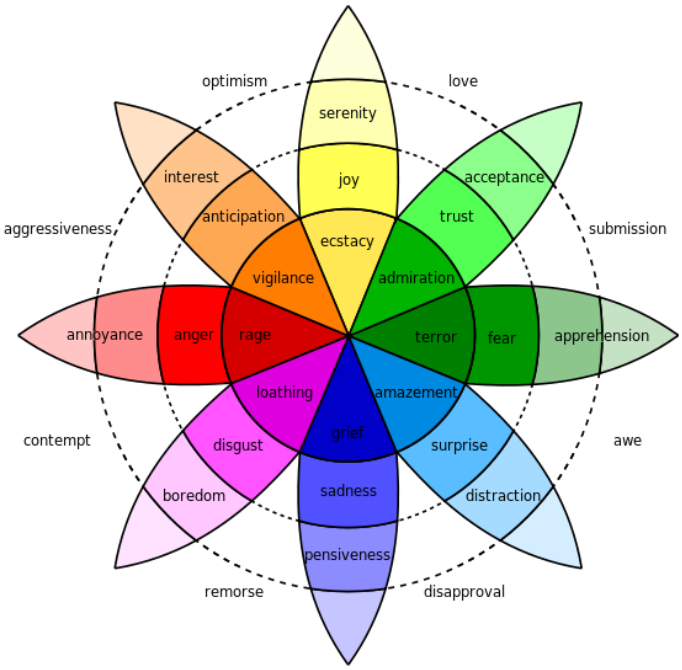


Fig 39: Plutchik's emotion wheel
(Plutchik, 2001)

In deciding how each character may perform their relevant behaviours, previous research concerned with emotion and behaviour was consulted. Forceville states the stylized emotive poses or expressions of a character not only serve to be humorous in some cases, but also form what Forceville describes as the Idealised Cognitive Model or emotion (Forceville, 2005). What may be described as cartoony or exaggerated could be termed as an expression of the emotion in its purest form as described in Forceville's (2005) idealised cognitive model. In terms of this study it is important characters emote with equal amounts of gusto as to be experimentally fair.

The emotions selected for the experiment are Happy, Sad and Surprised. These emotions are relatively clear to convey. Readability of an emotion is crucial for such an experiment especially as characters within the experiment are of very different designs. In displaying behaviours of the characters in the case of the sequences involved, previous research was once again consulted. Izard (1977) suggests that happiness is the one of the easiest emotions to represent. This is due to the fact it is considered 'universal' and easily recognisable (Izard, 1977). According to the statement by Izard, it should be easier to convey happiness or joy than any other

emotions. One may argue that depicting these emotions through not human characters may seem problematic. However, Darwin (1998) compared the emotions of animals to humans and was easily able to draw parallels between the two. In fact, the only exclusive human expression that Darwin was able to find was the frown. Charles Darwin was one of the first to scientifically relate ones emotions to their nonverbal behaviour (Darwin, 1998).

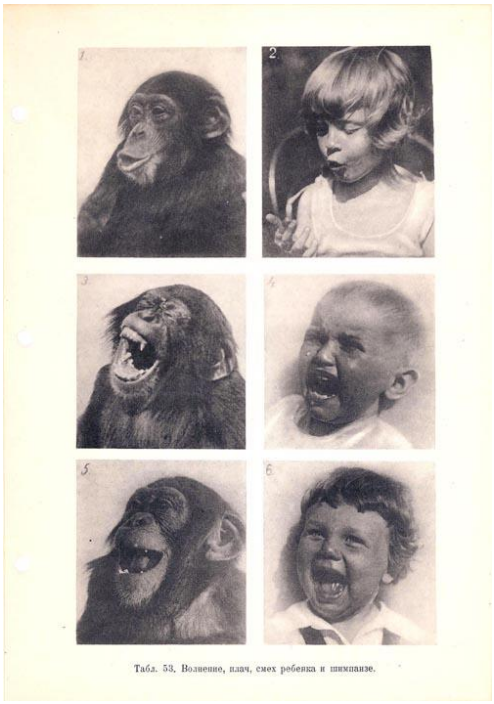


Fig 40: Darwin's emotion comparisons (1998).

In expressing happiness the most important signifier is the upward facing arc represented by the facial expressions of the character. All characters have been built with sufficient control in their facial regions to conform to this shape. This includes both the polygon character and also the object character. While they have somewhat limited control in facial areas due to their particular construction, they are designed to be able to convey the expressions required for this study. The polygon character while somewhat abstract can have his face manipulated to conform to the upward angled arch shape. This is also possible with the inanimate object character.

While using a single emotion to study the effects on how differently a character may be perceived may make a simplified experiment the viability for comparison may prove difficult. Using three different emotional behaviours as used within this

experiment provides a minimum for comparison. Obviously, this research takes the concepts of contextualisation and behaviours on a basic level as the key focus of the study is the perception of the character, therefore using simplistic emotions and basic contextualisation to fit the emotions is a necessity. This study does not concern itself with the measurement of the quality of either the behaviour or contextualisation of the character, but rather to detect if such a variable has an effect on the perception of the character. What is important is that the contextualisation and behaviours are the same for each character as to allow for a fair experiment to take place. With such an understanding, research focused on emotional behaviours that are simple and easily communicated to the subject. In doing this key texts which explored how emotions are conveyed were explored. While some emotive expressions are easy to convey others may prove difficult. Of these difficult expressions, Feng et al. (2012) suggests anger is one on the more convoluted expressions to represent. The 'difficulty of analysing anger expressions is distinguishing the mouth shape from that of other emotions, such as surprise and fear. Anger can be distinguished by the tension of the mouth, but tension is also an abstract concept that defies straightforward visual representation' (Feng and O'Halloran, 2012). While anger may be easily expressed when a character can use their entire body, a raised fist in a lunging forward motion may easily be read as anger. The less human characters in this studies set do not have the relevant appendages to perform in such a way. Adding these appendages only serves to render them more humanlike, thus defeating the initial purpose of using an abstraction as a character in the first place. Xu et al (2008), found that participants perceived a face to be either happy or sad very quickly depending on the concave or convex nature of a curve. It was important for the curves to be in the same position for each of the faces for the effect to occur. Meaning the effect is caused by a retinotopic adaption (Xu et al., 2008).

Another universal expression is likely to be sadness. Sadness lends itself very well to a contrasting expression to happiness. Repressing sadness in terms of expression involves angling the body in an almost opposing position than it would be for a happy character. A slumped body with a downward orientation is an important signifier of sadness. A representation of sadness 'may involve lowered head and torso. In lowered torso, the back bends forward and downward as if there is no strength to support the body. Touch is not found in the representation of sadness,

presumably because sadness is a passive emotion (Feng and O'Halloran, 2012). The notion being, while the participant may have little to no interest in a specific character, seeing that same character behave differently may cause the participant to interpret the character itself differently. In this case the changes in behaviour are exemplified by sadness and happiness.

The final emotion used in this study was surprise. Feng et al.(2012), states that the surprise expression 'is mainly represented by facial expression in our corpus' (Feng and O'Halloran, 2012). Regarding to this statement, it would suggest that this expression does not extensively require the body to successfully communicate the emotion. Feng et al.(2012) , states that the most obvious choices to convey surprise are to have eyes wide open and an open mouth (Feng and O'Halloran, 2012). This expression is neither happy nor sad; indeed one can have both a happy and sad surprise. If we were to think in purely abstract terms, a cartooned happy emotion requires an upward facing mouth arc. While sadness is the opposite, it requires downward facing arcs. Putting these arcs together we arrive at what is described by Feng et al. (2012), as a surprise expression leading one to surmise that this expression is a neutralisation of both happy and sad at least in abstract terms.

In creating viable data that can be compared to previous research, familiar analytical models were chosen (Tinwell et al., 2011). Research conducted by Tinwell (2011) used a repeated measure design along with all male participants to measure how uncanny a character was perceived based on the type of emotion being displayed. Tinwell suggests that their results show that the sadness emotion can produce a stronger uncanny affect than other emotions due to the fact that it uses some of the smallest movements in the face of the character, 'reminiscent of a rigamortic state' (Tinwell and Grimshaw, 2009a).While the sad emotion is to be used in the research conducted in this thesis, efforts were made to make this emotion as equally expressive as other emotions used, namely happiness and surprise.

Research conducted by Isbister and Nass utilised the still image approach to convey different types of behaviours of an on screen character. The personality types that were considered within their research were introverted and extroverted mannerisms. These mannerisms were conveyed by different postures and further

amplified by comic like speech bubbles to convey their characters voice (Isbister and Nass, 2000). Using comic like sequences provided an effective way of manipulating a sequence to change behaviour of a character in a very economical way. Jim Davis author of the widely popular comic Garfield had his work manipulated by Dan Walsh in which the central character of Garfield was removed from the comic strip. This had a profound effect on the strip. The series creator Jim Davis found the works 'fascinating' when he discovered the strip online (http://garfieldminusgarfield.net/). The character of Jon often seems sad without the dry humour of Garfield to balance the character, Walsh comments that Jon's sadness is revealed by the absence of Garfield; however, it was likely always there (Doty, 2008). Jim Davis and Dan Walsh later co-authored a book titled Garfield Minus Garfield (Davis, 2008) which is a collection of the comics with Garfield removed.

3.2.6 Materials and Procedures: Summary

In this discussion materials and procedures of this experiment we have explained the key concepts surrounding the construction of how an experiment such this is approached and executed. Firstly we began with a description of the experiment which aimed to give the reader an overall understanding of the method employed. The concepts of the experiment were then further broken down into detailed sections where literature and commercial sources were explained though the actual implantation of the method. The first of these sections dealt with the experimental design. This section described in further detail how the apparatus for experimentation was constructed as well as how key decisions regarding the specific approach were made specifically the integration of the experiment into an online platform. The next section detailed the context of the experiment, specifically the actual contextualisation of the characters used within the experiment, this section dealt with the choices as to by a certain narrative choice was used over another and what it mean to the interpretation of the characters situated within the context by the subject. Following this a discussion related to the participation of the experiment was undertaken. This section compared the experiment undertaken to works conducted by other researchers and also measured a viewer's perception based on a set of characters. This section aimed to justify and explain why such a participatory

approach was taken and how it relates to further study in this thesis and/or future works. In the following section, characters, which are the main focus of this study were explained in relation to the work undertaken in the experiment undertaken in this Chapter. Each of the five characters used within this experiment are discussed separately and related to existing literature. Each of the characters designs are explained and justified for use within this study and reasoning based on previous research as well as commercial examples are given. Following this section we discuss the emotional behaviours that we adopted by the characters for study. This section explores the choices made during the formulation of the experiment and gives justification for the actual behaviours used. In this section behaviours are related to the contextualisation and aims to give the reader an understanding of how the two are related to one another.

This discussion within this Chapter while detailing the specification of the method, exemplified how the features and variables of the study are interlinked. While there are three different concepts in play, there is an unbelievable interconnectivity between them. A character can never be truly free of concept or behaviour. For a character is made to be interpreted as a living thing or at least representative of such a thing. Therefore, placing a character into a blank image with an expressionless pose does not free the character of contextualisation nor behaviour. Moreover, these features themselves become the contextualisation and behaviour of the stimulus. This research simply exemplifies this and controls it for experimentation. The behaviours and contextualisation that are used within this study while loaded with a narrative as well as an emotional behaviour are neutralised among the characters within that set. This is critically important for any controlled experiment as these serve as a constant. This then allows for further comparisons to be made once assessed by the subject as these features are controlled. Now that the experiment has been effectively described this chapter will now move on to how data will be analysed as well as the justification for the analytical choices made.

3.3 Statistical Analysis

In this section we lead into to data obtained from this study by first explaining

how the data will be interpreted and understood. Previously we have discussed analytical methods used by similarly themed research, it should be noted that research conducted by previous studies have defined how the data will be analysed within this study. Using familiar mathematical models and restricting the analytical approach to statistical tests that have been used in previous studies positions this study so that it may be compared to findings of similar themed works of both the past as well as the future. While there may be some merit in devising a new statistical approach towards analysing the data obtained through this experiment particularly as it combines character design features that have yet to be analysed concurrently with and in terms of the character perception via the subject; it is also important for this work to be understood statistically with previous, current and future research. Using the mathematical approaches in this study, this type of study restricts comparisons that can be made with other works. The experiment described in this Chapter comprised of five key elements. The elements that make up the experiment are the experimental design, narratives, participants, characters and the behaviours of the characters. Data is analysed in a quantitative way which is further interpreted though qualitative methods. This however, does not equate to what would be termed as a mixed methodology as described by Tashakkori et al., (1998) due to the means in which data was obtained. In this case by quantitative methods, however, due to the area in focus qualitative interpretations cannot be ignored due to certain features that are impossible to quantify.

Questions were used to discern the subject's age and gender. Subjects were also questioned to ascertain their disposition to animation. The questions pertaining to the sequences the subject had viewed were structured so that they could state using the scale how interesting they found the character in the sequence. The subject was presented with a simple likert scale with the words 'no interest' and 'most interest' on either side. The scale had ten points of interest which allowed the subject to interactively move or click on the desired value. The justification for the use of these terms is discussed in the previous chapter with the definitions section.

The data obtained from the questions asking the subjects interest with a character was analysed using a repeated measure analysis to explore the statistical significance of each variable pertaining to the subject's identity. A repeated measure analysis was

conducted due to the ability to handle a high level of independent variables (Bryman, 2012) recorded from the subjects such as age, gender, nationality and whether they consider themselves fans of animation or not. Paired-samples t-tests would later be conducted if significance was found; this would ascertain where significance lies among the five different character types. In the following section we look at the data obtained from the experiment following that we further discuss and analysis that data to discern the meaning to our study.

3.3.1 Data

Now that we have fully described the experiment we will now explore the data obtained from the experiment. In this section we will analyse the data obtained from the experiment. We will present the data using a statistical approach which goes into detail regarding the various measurements that were taken during the experiment. This is important to formally address all parts of the data as our investigative study attributes importance in meaning to variables that are both statistically significant and insignificant. The data obtained though this experiment will either infer meaning to ideals from previous studies or further inform approaches to future works and experiments. As we have previously discussed, this experiment was broken into three separate groups of people based on which stimuli sets they were exposed to. These groups being Happy, Sad and Surprised groups. The following section pertains to the question asking the participants which of the five characters they perceived to be their favourite. This question was asked once they had viewed all the characters in their particular behaviour group. Finally comments left by the subjects were reported on. The data obtained from the experiment was then analysed in three stages. A repeated measures analysis was used to investigate the first stage data. A Mauchly's test of sphericity needed to be conducted as there were a number of factors in play. If the data was found to be significant then a paired-samples t-test was used to better understand the data and discern which pairs the effect was most prominent. In reference to the types of graphs used as in this case Box Plots these are justified as they best suit the data in which they represent allowing for clearer understanding as well as informing the post tests in which they were used on the data. Graphs are used to further understand areas where statistical significance is found aims to give greater insights into how

each variable was affected by the adaptions of the stimulus when presented to the subject. Furthermore, as the premise of the research presented within this thesis has prevalence to the uncanny valley theory one must find a way of presenting data as a curve. This allows for comparisons to be made to the hypothetical curve that was conceived by Mori in his creation of the theory (Mori, 1970). Favourite character ratings are used to further plot data on a curve for this comparison. Subject comments are recorded to give data further comparison. Full sets of data are found in the appendix section. Once the data has been explored statistically, numerically and visually we conduct a discussion as to discern and describe the mean the results of the experiment have to the study undertaken as per this research. This discussion takes into account the all areas of analysis undertaken in the interpretation of the data, reaped measure tests, t- tests, data visualisation of both interest and favourite character rating and finally comments left by subjects. The statistical data presented in this Chapter may be difficult to absorb for the reader. The following discussion aims to give a clearer more readable understanding of the data. Statistical sections of this Chapter can be referred to by the reader as needed in the following discussion. We will now explore the data statistically. In this section we will analyse the data quantitatively to discern the numerical effects each variable has of the subject's perception of a specific character.

3.3.2 Happy

The happy group consisted of 26 participants who represented equal numbers of male and female. Results from this group which viewed the sequence with the happy emotion were analysed. Repeated Measure tests were conducted on the effect of **age** on the interest with character type in **happy** conditions. Using Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 10.100\ p = .344$. Tests of Within-Subject Effects found a significant main effect of **interest** at the p<0.5 level of significance at $F(4,88) = 6.254, p = 0.001$ and non-significant effect of **interest * age** at $F(4,88) = .620, p = .820$. There was non-significant effect of **age** Between-Subject Effects at the p<.05 level of significance for the **happy** group conditions at $F(3,22) = 0.285, p = 0.836$. While there was a highly significant main effect, age did not contribute to the significance according to this analysis. Repeated Measure

tests were conducted on the effect of **gender** on the interest with character type in happy conditions. Using Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 15.677, p = .075$. Once again tests of Within-Subject Effects found a significant main effect of **interest** at the p<0.5 level of significance at $F(4,96) = 7.00, p = .001$ and a non-significant effect of **interest * gender** at $F(4,96) = 1.276, p = .285$. However as with age there was non-significant effect of **gender** Between-Subject Effects at the p<.05 level of significance for the **happy** group conditions at $F(1,24) = 1.631, p = 0.214$. Repeated Measure tests were conducted on the effect of the subject's **nationality** on the interest with character type in **happy** conditions. Using Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 10.713, p = .297$. Tests of Within-Subject Effects found a significant main effect of **interest** at the p<0.5 level of significance at $F(4,96) = 7.056, p = 0.001$ and a non-significant effect of **interest * nationality** at $F(4,96) = .801, p = .528$. Finally, as with both age and gender there was non-significant effect of **nationality** Between-Subject Effects at the p<.05 level of significance for the **happy** group conditions $F(1,24) = .333, p = .569$. Repeated Measure tests were conducted on the effect of whether or not the subject was an **animation fan** and the significance of this with the interest with character type in happy conditions. Using Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 12.669, p = .179$. Tests of Within-Subject Effects found a significant main effect of **interest** at the p<0.5 level of significance at $F(4,96) = 6.695, p = 0.001$ and a non-significant effect of **interest * animation fan** at $F(4,96) = .583, p = .676$. However, as with previous independent factors among this group, there was non-significant effect of **animation fan** Between-Subject Effects at the p<.05 level of significance for the **happy** group conditions $F(1,24) = 0.069, p = .795$

3.3.3 Post-Hoc Tests

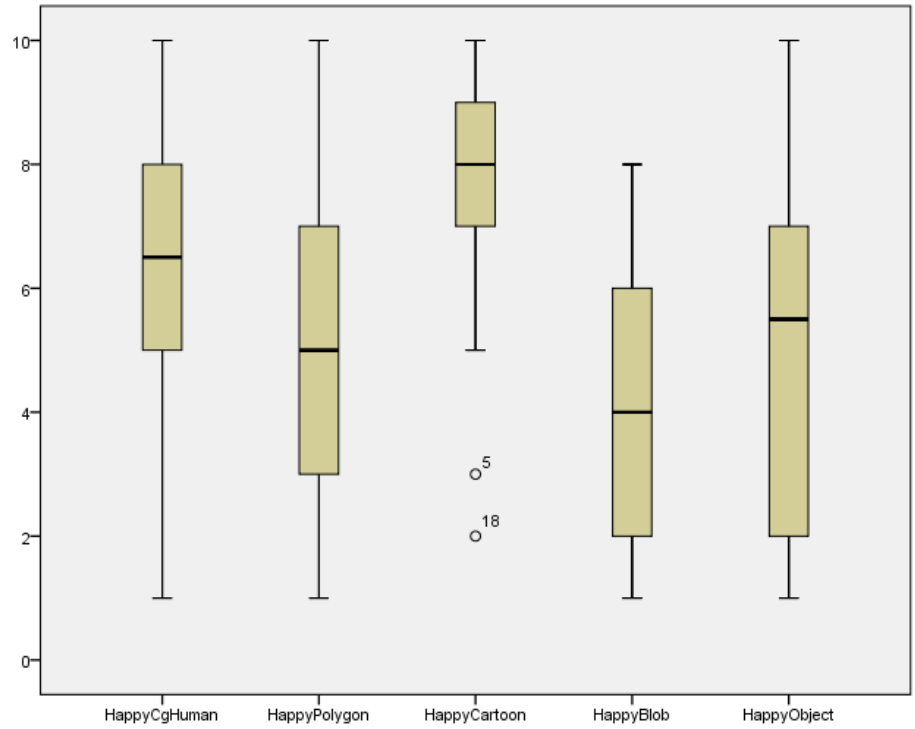


Fig 41: Happy group box plot

As the repeated measures analysis indicated a highly significant main effect, further analysis needed to be conducted to ascertain where this effect was prominent. From the graph it was easy to visualize the differences between each of the characters. Paired-samples t-test was conducted taking the pairs of characters with the most difference between them and then the next pair until a non-significant value was recorded. This was done to reduce the problems of reduced confidence caused by testing every possible pair. The first t-test was conducted to compare the interest generated from the **cartoon** and the **blob** character in **happy** conditions. There was a significant difference in the scores for **cartoon** character (M=7.54, SD=2.064) and **blob** character (M=4.31, SD=2.131);t(25)=5.083, p=.000. The significance level for these two characters was very high. Another paired-sample t-test was conducted to compare the interest generated from the **cartoon** and the **object** character in **happy** conditions. There was a significant difference in the scores for **cartoon** character (M=7.54, SD=2.064) and **object** character (M=4.92, SD=2.697);t(25)=3.584, p=.001. As the significance was still very high, further tests needed to be conducted on the data. A paired-samples t-test was conducted to compare the interest generated

from the **CG human** and the **blob** character in **happy** conditions. There was a significant difference in the scores for **CG human** character (M=6.23, SD=2.597) and **blob** character (M=4.31, SD=2.131);t(25)=2.724, p=.012. Once again there was found to be high significance with this pair also. Another test was conducted to compare the interest generated from the **polygon** and the **cartoon** character in **happy** conditions. There was a significant difference in the scores for **polygon** character (M=5.08, SD=2.481) and **cartoon** character (M=7.54, SD=2.064);t(25)=-3.950, p=.001. A further paired-samples t-test was conducted to compare the interest generated from the **CG human** and the **cartoon** character in **happy** conditions. There was a significant difference in the scores for **CG human** character (M=6.23, SD=2.597) and **cartoon** character (M=7.54, SD=2.064);t(25)=-2.461, p=.021. A paired-samples t-test was conducted to compare the interest generated from the **CG human** and the **object** character in **happy** conditions. There was a non-significant difference in the scores for **CG human** character (M=6.23, SD=2.597) and **object** character (M=4.92, SD=2.697);t(25)=-1.504, p=.145.

3.3.4 Sad

The sad group consisted of 28 participants of which 15 were male and 13 were female. Repeated measure tests were once again employed to analyse the data collected. The first of which was the effect of **age** on the interest with the character type in **sad** conditions. Using Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 12.327\ p = .197$. Tests of Within-Subject Effects found a non-significant main effect of **interest** at the p<0.5 level of significance at $F(4,92) = 1.813, p = 0.133$ and non-significant effect of **interest * age** at $F(4,16) = 1.230, p = .261$. Once again as with the happy group there was non-significant effect of **age** Between-Subject Effects at the p<.05 level of significance for the **sad** group conditions at $F(4,23) = 0.264, p = 0.898$. Repeated measure tests were conducted on the effect of **gender** on the interest with character type in **sad** conditions as with the previous analysis. Using Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 16.130\ p = .065$. Tests of Within-Subject Effects found a significant main effect of **interest** at the p<0.5 level of significance at $F(4,104) = 4.373, p = .003$ and non-significant effect of **interest * gender** at $F(4,104) = .466, p = .760$. This result

was similar to data analysed from the happy conditions and once again there was non-significant effect of **gender** Between-Subject Effects at the p<.05 level of significance for the **sad** group conditions at $F(1,26) = 1.726, p = 0.200$. Repeated measure tests were conducted on the effect of whether or not the subject was an **animation fan** on the interest with character type in **sad** conditions. Using Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 17.360\ p = .044$. Tests of Within-Subject Effects found a significant main effect of **interest** at the p<0.5 level of significance at $F(4,104) = 4.571, p = .002$ and non-significant effect of **interest * animation fan** at $F(4,104) = 1.181, p = .324$. There was non-significant effect of **animation fan** Between-Subject Effects at the p<.05 level of significance for the **sad** group conditions at $F(1,26) = .001, p = .993$. The results were comparable to results obtained from the previous analysis. Repeated measures tests were then conducted on the effect of the subject's **nationality** on the interest with character type in **sad** conditions. Using Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 16.326\ p = .061$. Tests of Within-Subject Effects found a significant main effect of **interest** at the p<0.5 level of significance at $F(4,104) = 3.929, p = .005$ and non-significant effect of **interest * nationality** at $F(4,104) = 1.325, p = .266$. There was non-significant effect of **nationality** Between-Subject Effects at the p<.05 level of significance for the **sad** group conditions at $F(1,26) = .407, p = .529$.

3.3.5 Post-Hoc Tests

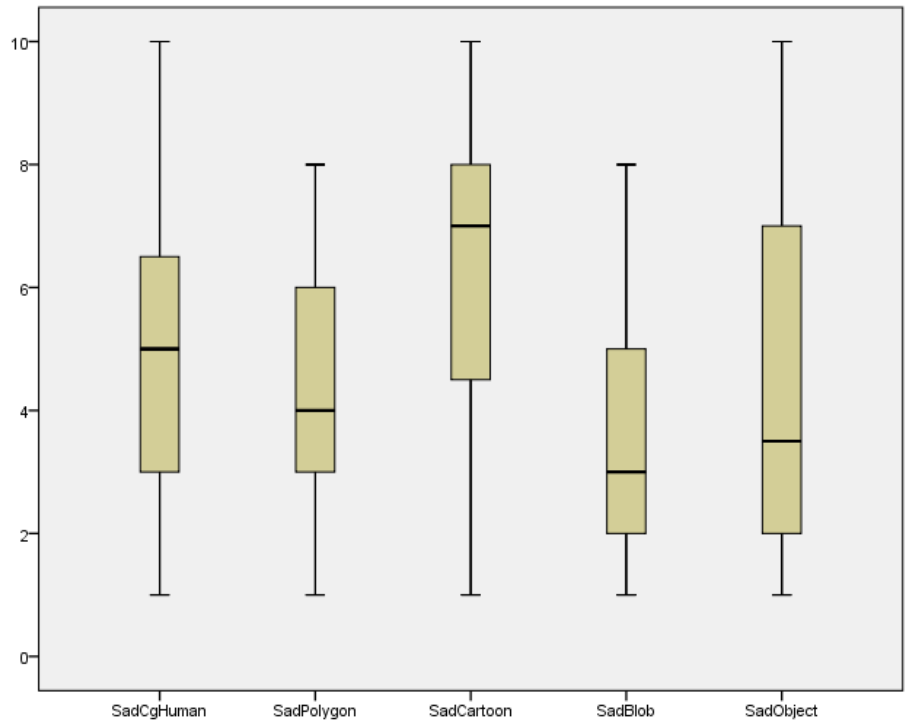


Fig 42: Sad group box plot

Due to the high significance found on the main effect paired-sample, t-tests were used to ascertain where exactly the most prevalence was. This was done once again by taking the pairs with the most discrepancy between them. Firstly, paired-samples t-test was conducted to compare the interest generated from the **cartoon** and the **blob** character in **sad** conditions. There was a significant difference in the scores for **cartoon** character (M=6.14, SD=2.677) and **blob** character (M=3.64, SD=2.264);t(27)=3.342, p=.002. A paired-samples t-test was conducted to compare the interest generated from the **polygon** and the **cartoon** character in **sad** conditions. There was a significant difference in the scores for **polygon** character (M=4.21, SD=2.007) and **cartoon** character (M=6.14, SD=2.677);t(27)=-3.277, p=.003. A paired-samples t-test was conducted to compare the interest generated from the **cartoon** and the **object** character in **sad** conditions. There was a significant difference in the scores for **cartoon** character (M=6.14, SD=2.677) and **object** character (M=4.54, SD=2.950);t(27)=2.289, p=.030. A paired-samples t-test was

conducted to compare the interest generated from the **CG human** and the **cartoon** character in **sad** conditions. There was a non-significant difference in the scores for **CG human** character (M=5.04, SD=2.575) and **cartoon** character (M=6.14, SD=2.677);t(27)=-1.878, p=.071.

3.3.6 Surprised

A group consisting of 26 participants 14 of which were male and 12 were female took part in the test which had the surprised emotion emphasised. Repeated measure tests were once again employed to analyse the data obtained from the tests conducted on the effect of **age** on the interest with character type in **surprised** conditions. Using Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 10.119\, p = .343$. Tests of Within-Subject Effects found a significant main effect of **interest** at the p<0.5 level of significance at $F(4{,}80) = 3.011, p = .023$ and non-significant effect of **interest * age** at $F(4{,}104) = 1.143, p = .325$. A quadratic $y = b_0 + b_1x_1 + b_2x^2$ trend was discovered with the main effect of **interest** at $F(1{,}24) = 9.158, p = .007$. There was non-significant effect of **age** Between-Subject Effects at the p<.05 level of significance for the **surprised** group conditions at $F(1{,}23) = 1.497, p = .235$. Moving onto the effect of **gender** on the interest with character type in **surprised** conditions Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 11.132\, p = .268$. Tests of Within-Subject Effects found a significant main effect of **interest** at the p<0.5 level of significance at $F(4{,}96) = 4.433, p = .002$ and a non-significant effect of **interest * gender** at $F(4{,}104) = 1.353, p = .256$. However, a quadratic $y = b_0 + b_1x_1 + b_2x^2$ trend was discovered with the main effect of **interest** at $F(1{,}24) = 18.702, p = .001$. However, this was deemed to be insignificant as there was non-significant effect of **gender** Between-Subject Effects at the p<.05 level of significance for the **surprised** group conditions at $F(1{,}24) = 0.388, p = .898$. Repeated measure tests were conducted on the effect of **nationality** on the interest with character type in **surprised** conditions as they were with the previous groups. Using Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 11.715\, p = .231$. Tests of Within-Subject Effects found a significant main effect of **interest** at the p<0.5 level of significance at $F(4{,}96) = 4.433, p = .002$ and a significant effect of **interest * nationality** at $F(4{,}96) = 2.583, p =$

.042. A quadratic $y = b_0 + b_1x_1 + b_2x^2$ trend was discovered with the main effect of **interest** at $F(1,24) = 20.223, p = .001$. However, there was a non-significant effect of **nationality** Between-Subject Effects at the p<.05 level of significance for the **surprised** group conditions at $F(1,23) = .649, p = .428$. Finally tests conducted on the effect of **animation fan** on the interest with character type in **surprised** conditions. Using Mauchly's test of sphericity, sphericity is assumed at $x^2(9) = 15.139\ p = .088$. Tests of Within-Subject Effects found a significant main effect of **interest** at the p<0.5 level of significance at $F(4,96) = 3.792, p = .007$ and a non-significant effect of **interest * animation fan** at $F(4,96) = .879, p = .480$. A quadratic $y = b_0 + b_1x_1 + b_2x^2$ trend was discovered with the main effect of **interest** at $F(1,24) = 22.767, p = .001$. There was a non-significant effect of **animation fan** Between-Subject Effects at the p<.05 level of significance for the **surprised** group conditions at $F(1,24) = .902, p = .352$

3.3.7 Post-Hoc Tests

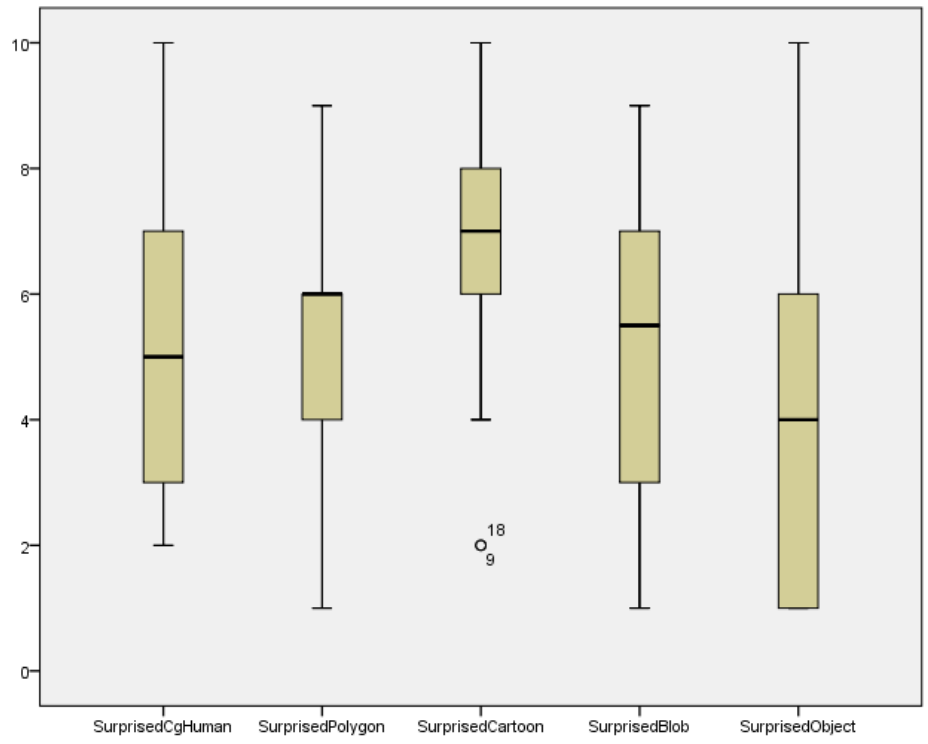


Fig 43: Surprised group box plot

A paired-samples t-test was conducted to compare the interest generated from the **cartoon** and the **object** character in **surprised** conditions. There was a significant

difference in the scores for **cartoon** character (M=6.88, SD=2.669) and **object** character (M=4.08, SD=2.770);t(25)=4.491, p=.001 . A paired-samples t-test was conducted to compare the interest generated from the **cartoon** and the **blob** character in **surprised** conditions. There was a significant difference in the scores for **cartoon** character (M=6.88, SD=2.669) and **blob** character (M=4.96, SD=2.441);t(25)=2.509, p=.019. A paired-samples t-test was conducted to compare the interest generated from the **blob** and the **object** character in **surprised** conditions. There was a non-significant difference in the scores for **blob** character (M=4.96, SD=2.441) and **object** character (M=4.08, SD=2.770); t(25)=1.244, p=.225.

3.3.8 Curve comparisons

The subject was asked to choose their favourite character. This character was picked after the subject had seen all the sequences featuring all five characters. The purpose of this as stated previously was to ascertain any differences the effect of behaviour had on the likability of the character. The curves generated were qualitatively plotted and quantitatively compared. Using the overall count for each group choosing their favourite character from the sequences a spline curve was generated. The characters were ranked from most proportionality human to least.

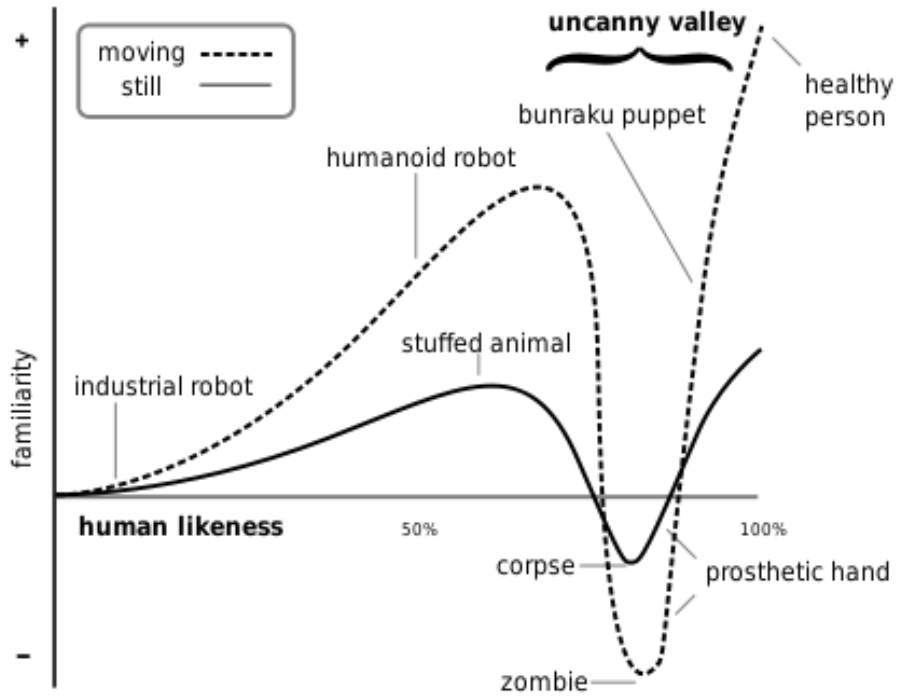


Fig 44: The Uncanny Valley curve (Mori, 1970)

Here we compare curves generated from a questions asked of the participants when presented with five characters ranging from least to most lifelike. The differences between each group were that each sequence has a single frame changed. Group A saw a sequence in which the happy emotion of the character was exaggerated, Group B saw the surprised emotion exaggerated and Group C saw the Sad emotion exaggerated.

3.3.9 Happy

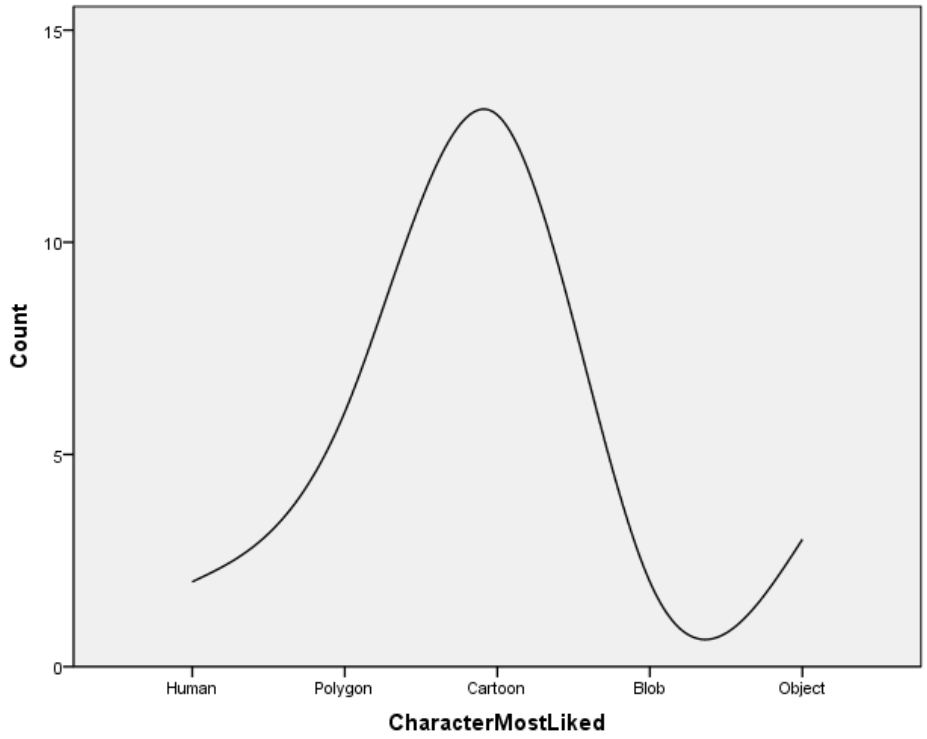


Fig 45: Favourite character of happy group

Here we can see that the graph plotted from the happy group is most like Mashiro Mori's (1970), albeit reversed and missing the final character; a healthy human.

3.3.10 Sad

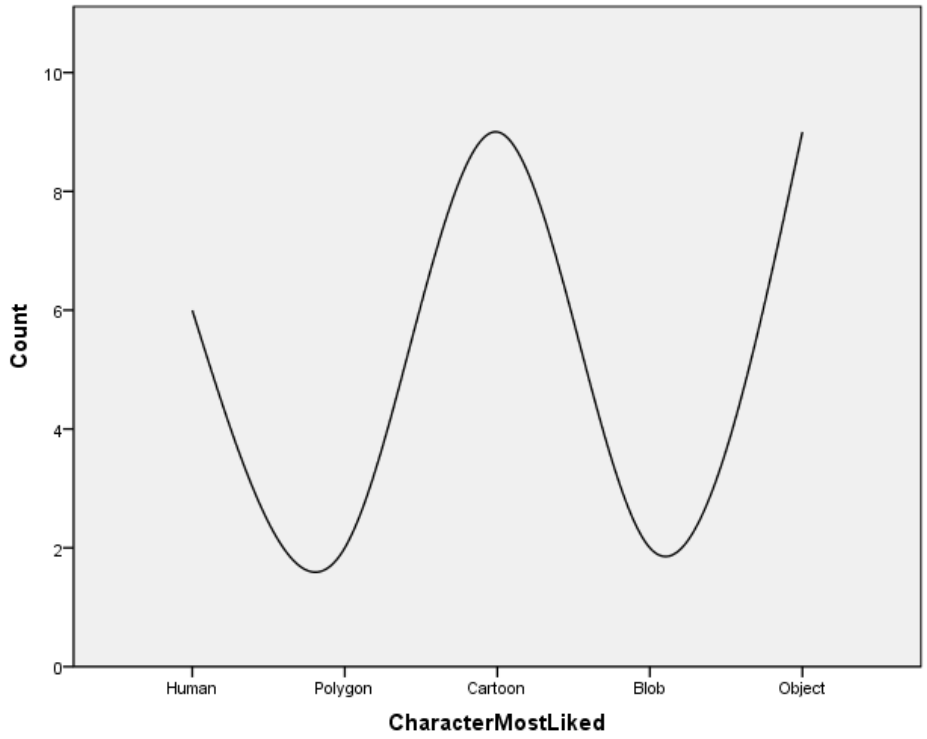


Fig 46: Favourite character of sad group

When contrasted with the data from happy group we can see a drastic change in the empathy with the object character. While generally disliked by both the surprised group and happy group, the sad group were much more empathetic to the character.

3.3.11 Surprised

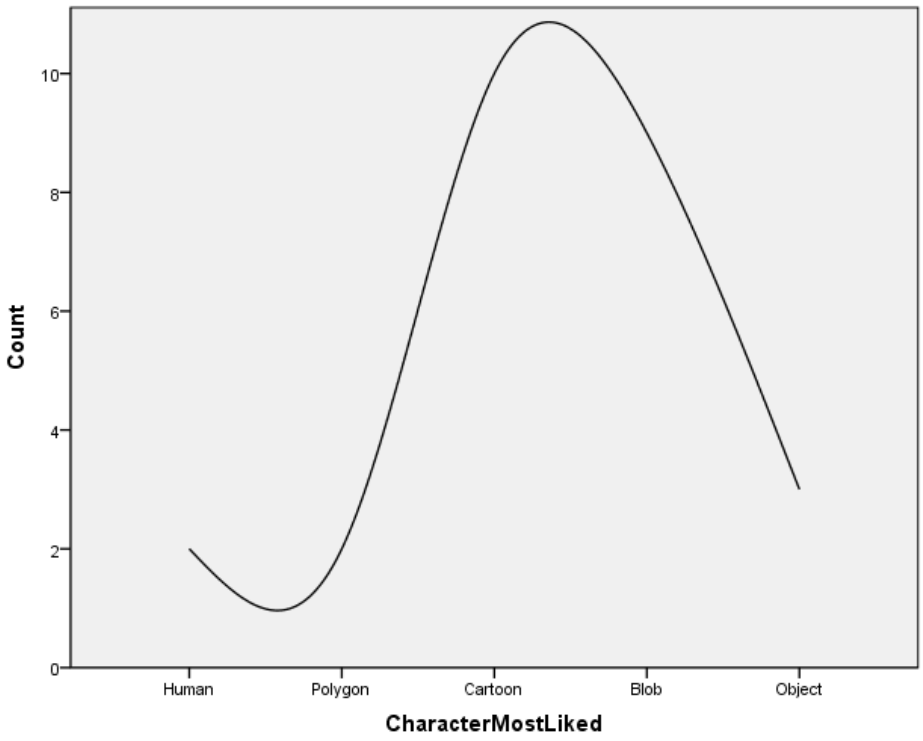


Fig 47: Favourite character of surprised group

According to previous research the more humanlike the character is, the more appealing the character will be with a drop when the character becomes too human without actually being human. The drop in appeal should exist on the most realistic character in this set. Aside from fluctuations in the line, there is indeed a drop on the realistic character. Using the character set from the second experiment which includes a real human actor. It is important to note the fluctuations of the curves based on the different emotion sets.

3.3.12 Comments by Participants

A full list of comments is found within the relevant section in the appendix of this thesis. Here we will pick out the key comments that were most relevant to the experiment. These comments will later be referred to in the discussion section. Here we will briefly examine the comments for later we will go into further details into what these comments may mean for the understanding of the work undertaken as per this experiment.

Among the participants of the happy group, one person commented that the polygon man seemed happier than others due to the shiny colour the character was depicted in. This highlighted a consideration for future experiments in that characters should follow a uniformed colour scheme. Another comment in the happy group pertained to the CG Human character, one person commented that they felt the performance was overacted by this character and he did not feel the emotions were genuine. A comment from a participant relating to the abstract character stated, 'I do not understand much the abstract blob emotion and just wonder is that real'; leads one to the conclusion that an abstract character was perhaps too confusing for some participants. In the sad group one person commented, 'The can and alien feel like poor little animals' suggesting the artefact in the story 'represents more for those non-human fellows'. A comment from the surprised group stated, 'the big eye surprised me'. This was obviously referring to the blob character. A further discussion regarding these comments as well as the statistical analyses and graph comparisons described proceeding this section will be undertaken in the following section.

3.4 Discussion

This discussion will look at the results from experiment one. The discussion will start by exploring the results from each group from the sequence test in which participants saw five different characters preform the same actions with the same behavioural emphasis. Following this the curves created from each of the characters favoured by the participants will be discussed and contrasted with not only the original curve plotted by Mori (1970) but also compared and contrasted by each curve per group. Following this the discussion will examine key comments by the participants and draw parallels with the results.

From the comments made by the participants, one can identify how certain characters were able to interest each test group. The comments section of the experiment was optional, not every participant left comments. Therefore, the only comments made by the participants were made when they felt compelled to do so. This removed the negative effect that forcing the participant to comment may have.

Rather the rational, if a participant is compelled to comment, the comment is likely to have stronger implications.

In every test which used the image sequences, a significant main effect was discovered. The cartoon character was found to be the most successful in all behaviour configurations. This may be due to the overall colour choices of the character. Cartoon characters tend towards a simplified colour pallet than other character types. As in the case of this character colours were simplified this may have contributed to this characters interest rating. Moving on from this summation, we can now use this data for further study. Further experiments used similar colour choices to compare a human to an anthropomorphic character. This did go some way into alleviating any colour discrepancy there may have been between the characters. Combined with the simple form of the cartoon character, one may suggest that the simplistic design and readily readable emotional behaviour contributes greatly to the interest that a subject has with the character. These ideas coincide with that of the defining way in which John Lasseter describes the notion of as we discussed in the previous chapters of this thesis. Lasseter suggests that simple shapes and clear emotional communication contributes to the characters appeal (Lasseter, 1987). This relates to Hook's suggestion the emotion portrayed by a character is the possibly the single most importance facet that contributes to the interest with a character (Hooks and Naas, 2011). While this may explain the overall responses towards the cartoon character it does not explain why even more simplified characters such as the polygon man and the inanimate object have overall less interest than the cartoon. Here we come to the point of over simplification. When the character is made to conform to a few simple shapes we may relate this to a something being symbolic of an emotive state rather than being an actual emotion portrayed by a character. While we have previously discussed research which measured the effects on the brain upon viewing emoticons compared to real face. Yuasa et al. (2006) found her participants viewed a symbolic face the same way as they would a real face on a cognitive level (Yuasa et al., 2006). However, one must consider that such symbolic faces have to have learned interpretation on the behalf of the subject. One may not naturally have the understanding needed to interpret a symbolic face. Emoticons have been taught to the users of them. They are used on mobile text messages, social media applications and even in paper based communications. However, unique characters

such as the inanimate object, the abstract character and even the polygonal man have not been seen before. The interpretation while simplistic has not been taught to the subject. Such characters are unfamiliar and subjects lack the reference to easily understand the conveyed emotions of these characters. The cartoon character while the specific one used within this research has never been seen before will be somewhat familiar to the subject due to the informed construction of the character based on a vast wealth of animation history. They may not have seen this particular character before but, they will have seen many like this cartoon.. The familiarity with the character means what may have appeared symbolic if this was the first time a subject had ever seen a cartoon character is now interpreted as genuine emotion simply because they have seen many of these characters in the past. As concluded by the research conducted by Yuasa et al. (2006) her subjects are no longer seeing a symbol of an emotion but a real emotion due to their familiarity with the stimulus and a readily accessible cognitive knowledge of how appropriate the arrangement of the shapes to a coinciding emotional behaviour. It is apparent that all behaviour at some level is in fact symbolic and abstract to one that has no working knowledge as to the meaning. We have previously discussed how Feng et al.(2012) attributed shapes and poses to represent certain emotions, in this experiment these shapes were applied to a range of characters of differing abstractions. These shapes were represented the same way as closely as possible to one another by each character used within this research. It is therefore not enough that a character can contort their body into a specific shape but also have a familiar aesthetic that allows for readily available cognition to interpret the behaviour on behalf of the subject. It is important to note how the aesthetics of the character relates to the emotion that is conducive towards the interest rating.

The abstract character whilst stimulating relatively low in interest, gained a much higher overall response in the surprised set. Using an abstract form compared to some of the other more familiar characters stands out among the set of characters used within this study. This character encompasses the very notion of surprise. While this character may be less equipped to convey sadness or happiness as well as some of the other characters, round shapes were easily represented. Round shapes play an important part in creating the emotive behaviour of surprise (Feng and O'Halloran,

2012). This was contrasted with other characters such as the CG human which scored the same mark in each test.

As we have discussed how familiar the subject is with a character type may play a part in how well the character is perceived. However, one may argue that the CG human character should therefore be the most well perceived character within the set. However, if we consider the descriptions of cartoon characters made by McCloud (1994) we begin to approach the explanation for this result. Scott McCloud suggests that when we look upon realistic renditions of faces we automatically see this as faces of another person. However, upon seeing a more simplified cartoon face we see ourselves (McCloud, 1994). As we have previously discussed a viewer may be more interested in a character that is representative of oneself. There were no significant findings found using the subject's gender, nationality and age as an interaction with the interest with the character. Therefore these factors will not be the focus of the next experiments, rather the interactions between character types, their behaviours and the stories in which they are contained will be the primary focus based on the results from this experiment. Previous research did not find strong significance with these factors (Seyama and Nagayama, 2007, Ho and MacDorman, 2010, Lennon et al., 1986).

Overall, the cartoon character was deemed most interesting and most likeable. However, when one explores the data through post-hoc tests, interesting relationships were discovered. When looking into how significant the scores of each character were when compared to cartoon character, one finds that under the happy conditions, there was a greater difference. Taking the interest generated from the cartoon and the blob characters in happy conditions, which were the two characters with the greatest difference, we find a significant difference in the scores for cartoon character (M=7.54, SD=2.064) and blob character (M=4.31, SD=2.131);t(25)=5.083, p=.000. When compared to the sad group, there was a significant difference in the scores for cartoon character (M=6.14, SD=2.677) and blob character (M=3.64, SD=2.264); t(27)=3.342, p=.002. Finally, looking at the surprised group we take the object character rather than the abstract blob character as this character performed better within this group. There was a significant difference in the scores for cartoon character (M=6.88, SD=2.669) and object character (M=4.08, SD=2.770);

t(25)=4.491, p=.001. As can be seen from these results, the cartoon character had a much higher significant effect under the happy conditions and generally a much lower standard deviation than under other behavioural group conditions. This would suggest, while this character had performed well in all groups, the happy group conditions were where this character preformed the best. This links in to what we previously stated. As the cartoon characters offer the opportunity for the subject to see themselves in place of the character the subject would most likely enjoy viewing themselves in a happy contextualisation rather than exhibiting sad behaviours.

Using the curve charts to compare each character, it was easy to find differences. According to these results the subjects found the abstract (blob) character more interesting in the surprised group rather than in the sad group. A comment from the surprised group, suggested that the eye played an integral part in how the blob character was better received the comment made being, 'the eye surprised me'. This would suggest as Feng et al., (Feng and O'Halloran, 2012) implied certain features are required to convey certain behaviours. Surprise as stated by Feng et al (2012) requires circular shapes, an open mouth and wide eyes. The abstract character had these features, the eye is large in proportion to the body of the character emphasising the round circular shape. This character under the happy conditions had the lowest standard deviation at 2.131. According to the later question asked of this group regarding which of the five characters they liked the most this character was the least liked under these conditions. However, it was the sad group which responded most negatively to this character when asked which was their favourite character as the fewest number of subjects choose this character in that group.

The object character was better received in the sad group rather than any other group. This was likely due to similar reasons the abstract character was well received in the surprised group. The construction of the object character was simple; the character only had a torso. This can be bent upwards or downwards and side to side. The sad emotion as Feng et al (2012) stated required a bent torso facing downwards. This shape was further emphasised by the simplification of the character. All characters in this sequence had bent torsos facing down; however, it was more noticeable when all other features of the character were removed.

The results go some way to proving that characters were interpreted differently depending on the emotion they were conveying as well as the context they were in. This was seen more clearly on the extremes particularly with the abstract character and object based characters. While the cartoon character clearly excelled when contextualised in a happy scenario. Further experiments in this study aim to refine and isolate these features. The notion of making a character more and more human to greater interest/appeal is challenged as we have found different characters interest and likability fluctuates depending on the various emotions exhibited. The experiment described in this chapter offers a new perspective on studies which utilise characters as part of experimentations. We have demonstrated that careful consideration has to be taken in what character type is being used as how the character will behave has consequential effects on how a subject would perceive that character. Previous research as we have previously discussed did not take into account the contextualisation of a character, therefore led to a de-neutralisation of the stimulus involved. In this experiment careful consideration has been taken to ensure that characters are equally represented.

3.5 Limitations

As with any experiment of this type particularly one which involves a number of variables for consideration there are limitations. In this section we will discuss these limitations and how future work aims to overcome and decrease such limitations. We will now begin this discussion by starting with the approach to the limitations surrounding the analysis. Using a non-parametric approach to the interpreting of the data meant many of the participants that took part in more than one test had to be deleted. This was important to keep the data from being contaminated by a subject who may already have seen the characters involved in another test group. Unfortunately, this meant a large number of subject's data was not included in the analysis reducing the sample size involved. Whilst including these subjects may have been informative, the premise of the experiment needed unique participation as we have previously stated the importance of. Future experimentations may use a different statistical approach to analyse the data involved.

Limitations in relation to the character involved are due to the relatively small number of characters and the scope of the topic. While using one character to speak for all the similar types may seem limiting. Using characters from various different contextualisation is likely more so. While a study which involved different found examples of existing character could very well use a greater number of characters as was used in this research, they would be contained within a mismatch on contextualisation and behavioural emotions. We have demonstrated with the few characters used within this research that such factors have a substantial effect on the subject's perception of a specific character. Future works may choose to adapt this approach defined in this chapter to either include more characters or streamline the characters used to further concentrate on the contextualisation and behaviour of the character. While this experiment does go some way into proving that different behaviours affect the perception of the character, it does not measure the actual contextualisation involved effectively. Rather, within this experiment the contextualisation is used as a neutralising feature to place all characters within a matching context for a fair experiment to take place. In the following chapter we further discus the limitations of this experiment and how they are overcome in a preceding experiment.

Chapter IV

Adapted Methods

Following on from the first experiment a second experiment was conducted. This experiment will be discussed in this chapter. The second experiment was conducted in order to address limitations of the experiment previously discussed. While the design of the previous experiment allowed for a relatively diverse range of characters to form part of the stimulus, the experiment discussed within this chapter uses a focused character set based on the previous experiment undertaken. In this chapter we will discuss the approach towards this experiment and how the existing methods established in the previous chapter are adapted to form apparatus for a study which aims to further define the understanding of character perceptions detailed within this thesis. Data obtained from this study does not attempt to supersede the data from the first experiment, but rather further define arguments posed in the discussion of the previous chapter. This discussion will take place following this chapter. This chapter is divided into two separate sections. The experiment described here consists of two distinct parts. Each part whilst conducted at the same time tackles the question of perception from slightly different angles. To form a coherent and readable chapter we start by discussing the first part of the experiment. This discussion starts with a detailed description of the experiment following this we further discuss specific details regarding the procedures involved in the creation of this experiment. This is then followed by a detailed analysis of the data obtained from the experiment. Following this we give a brief summary to explain initial observations made post analysis of the data. This is then followed by a detailed description of the second part of the experiment. This is separated due to the slightly different approach taken in the construction of the preceding part of the experiment. Following this description we further detail specific materials and procedures used during the experiment with the aim to give the reader a clear understanding of this part of the experiment and how it relates to both the first part of the experiment as well as the experiment

described in the previous chapter. We analyse the results in the following section and finally summarise initial observations as well as describing substantial comments pertaining to the experiment as a whole in preparation for the following chapter which engages in a detailed discussion regarding the data obtained from both this experiment as well as the experiment described in the previous chapter.

It is important to briefly explain the experiment in its entirety prior to modulating the chapter. This offers the reader a general understanding of the experiment prior to a detailed description in regards to the component parts. The second experiment followed a similar format to the first experiment. There were key changes to the stimulus characters and implementation. Based on the results obtained from the first experiment, a number of changes were made. Part of the experiment was conducted using three different characters within a video stimulus. These characters were a real live action human male, a realistic CG human male and a cartoon male. The following part of the experiment was conducted in a similar way to the first, however this time only two characters were compared to each other. While the experiment described in the previous chapter used five different characters and compared interaction between one another. This experiment both parts A and B puts greater focus on the measurement of the contextualisation. With this added variable it makes for a more coherent study to streamline the apparatus for an effective analysis. The experiment described in the previous Chapter output data which directed the approach to the experiment described in this chapter. Whilst the first part of the experiment described in this chapter uses three different characters the second uses two completely different designs, one being an anthropomorphised cartoon dog and the other being a realistically proportioned woman. The experiment used an online survey to ask the subjects questions pertaining to the stimulus. This time the software Pinnion was replaced with software called Survey Gizmo. The key reason was that Survey Gizmo could randomise the questions asked. Later in this Chapter, it will be explained why randomisation within this experiment was important. This introduction offers a brief description of the overall experiment to be further described. Details of both parts of the experiment along with the results obtained will be described in detail within this Chapter in the relevant sections. This Chapter will now begin with a detailed description of the first part of the experiment.

4.1 Experiment 2A

Experiment 2A features a similar construction to the experiment described in the previous Chapter. However, now with refinements made. Using data obtained from the first experiment behaviour design, narrative contextualisation and character creation were adapted to generate a further data that can be once again interpreted singularly and in contrast to the data that was discussed in the previous Chapter. Following this description of the experiment that is being described within this Chapter we will focus on the various components that come together as with the description of the experiment in the preceding chapter we will discuss the various procedures involved in this experiment as we approach the acquisition and interpretation of the data obtained. As we have stated previous this experiment will be discussed in two parts, here we concern ourselves with the first part. Experiment 2A was created to utilise video based stimulus featuring three different character types. This approach was adopted to better explain animation as opposed to the use of still media which may be easily related to either the storyboard process or sequential art forms such as comic strips. Using video itself meant that the characters involved would present the experiment with greater difficulties in guaranteeing control of the stimulus. While the previous experiment used still images where 8 different panels were presented per character to the subject, each video consists of 1575 frames that make up 1 minute and 3 seconds of video as was used within the experiment described within this chapter. Animations of each character have to match one another as the images panels of the previous experiment had to match each character. The second experiment as described within this chapter was conducted as part of this study with aim was to circumvent the limitations of the first experiment and further inform data obtained from the aforementioned experiment to provide a richer understanding of the overall data obtained as part of this study. No one experiment could ever answer all the questions regarding the subjects interest in character type, behaviour and context. Further refinements to the experimental design allowed us to get closer to the ideal experimental design.

Using data previously collected and analyses from the preceding experiment we further inform and redesign this experiment's approaches towards behaviour design and narrative contextualisation. As with the previous experiment both have to be

consider concurrently and compromises towards one another have to be considered. In considering the first experiment this experiment takes the contextualisation as a variable rather than a neutralising factor. With this understanding narrative contextualisation is required to be adapted and changed then sequences compared as with the first experiment against other constant variables. This adaption was exemplified by the inclusion of a specific narrative contextualisation which allowed for other variables to also be adapted and changed. In the development of the modular narrative contextualisation a narrative structure was developed which allowed for one of three characters to portray either sad or happy behaviours within a positive or negative contextualisation. This approach as we will further describe later in this chapter allowed for full control over each variable, allowing features to be isolated and measured and compared to one another though isolation. The simplification transcended to the characters used within this experiment, with the focus put on human characters and the inclusion of a live action human. While the previous experiment challenged notions of human character usages to facilitate greater appeal/interest, this refined character set would later allow data to be compared directly to Mori's hypothesis as human characters are now used on a realism scale rather than an abstraction scale as per the preceding experiment. As stated previously this experiment does not attempted to replace data previously obtained but rather to further inform the study as a whole by forming rounded understanding of the topic.

Live action footage was filmed using green screen techniques and the actor was composited onto filmed footage as was the CG characters. This allowed shots to match one another as closely as possible. Footage was later colour corrected to match one another and four different versions of the sequence were created. Each variation changed on variable that was to be tested, character type, contextual tone or character behaviour. In total 12 different video sequences were created. As with the previous experiment subjects were asked to rate each video on an interest likart scale. Discerning the subject's favourite character was tackled slightly differently within this experiment than in the previous experiment. The subject was this time asked which of the three different characters they would most like to see in the experiment. The choice they made would equate to which was their favourite choice to be presented with.

Later in this Chapter we will further discuss the reasoning as well as the specific approaches to both adapting and recreating design for this experiment as per data obtained previously. The following sections will discuss the overall approach to experiment 2A's design. Following that, we will further discuss the contextualisation of the characters involved in the experiment and further explain the modular narrative approach that was taken. This section is then followed by a discussion regarding the sample involved with this study and how data obtained from the first experiment allowed for the focusing of the sample as well as contributing literary factors. We then describe the approach used for the characters within this experiment and explain the decisions involved in deciding the character set. Finally we discuss the behaviour set used within this experiment as the choices made to streamline the complexity of the first experiments set.

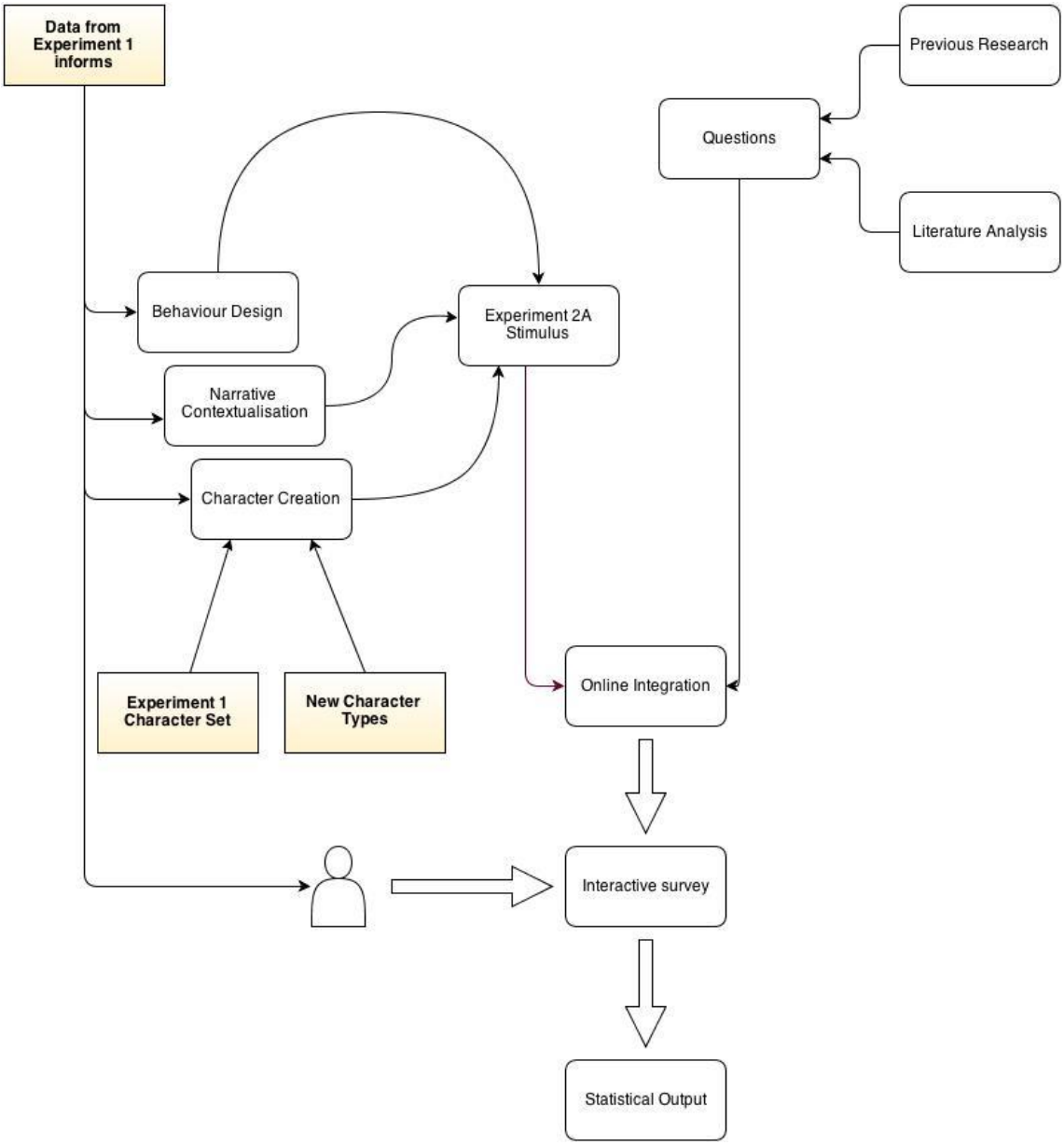


Fig 48: Experiment 2 diagram

4.1.1 Materials and Procedures: Experimental Design

In this section we describe and qualify the adaption of the experimental design of the first experiment to form a new design that provides experiment 2A as well as 2B (which will be discussed later in this Chapter) the apparatus needed for experimentation needs. In this section we further discuss limiting factors of the previous experiment and how the design of this experiment attempts to overcome these to as we adapted the previously established methods. While the preceding experiment used a narrative as a context for each character, the actual

contextualisation was not measured. Moreover, the context in the preceding experiment served its purpose for exactly what it was a container for the character. The effects of which were not measured. Part of the problem the narrative had in terms of experimentation in this case was the distinction between the character behaviour and story. Consequently, the story was defined by the emotion being emphasised by the character in this case. This was a limitation of the experimental design. Using only one narrative with only one point of change does not allow for a narrative to be adapted. While the experiment did emphasise a particular emotion of the character, happy, sad or surprise; the actual story was all of these. The story having to include happy, sad and surprising elements can become convoluted.

Rather than changing a single panel, the story needed to be comprised of elements which can cross multiple panels while retaining what it is that defines the sections. For example in any sequence a sad character can be swapped out with the same character now happy. This same character can then be transported from a sad story to a happy story. Using a modular design the experiment was adapted.

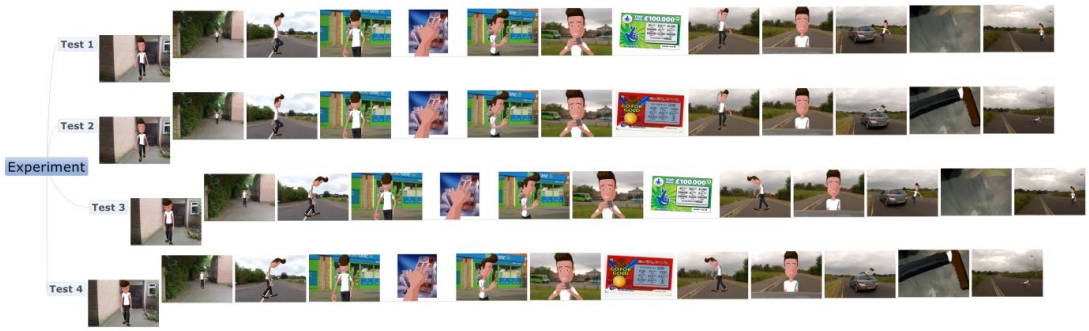


Fig 49: Four different variations

Figure 48 demonstrates the modular design of the stimulus. Each subject saw two randomly selected test sequences that could contain any of the three characters. In total there were twelve different sequences. For each character there were a total of four difference sequences. These test sequences vary as follows. Test one places the character within a positive narrative and assigns positive happy behaviour to the character. Test two places the character within a negative narrative and assigns negative sad behaviour to the character. Test three places the character within a positive narrative and assigns negative sad behaviour to the character. Test four places the character within a negative narrative and assigns positive happy behaviour

to the character. This design allows for the sequences that feature two constants to be compared to one another. The table below displays the various changes that can be made to a story.

Table 1: Experiment 2A variability

Test	Story	Behaviour	Character Type
1	+	+	Cartoon/Realistic/Real
2	-	-	Cartoon/Realistic/Real
3	+	-	Cartoon/Realistic/Real
4	-	+	Cartoon/Realistic/Real

This experiment was divided into two separate parts: A video test and a sequence test. The video test used a simple everyday narrative that showed a character walking to a shop to buy a lottery scratch card. The story was chosen due to the many points it could be adjusted to be either sad or happy. Figure 48 demonstrates the variations that the narrative could have. Each path could feature any of the three different characters: the real human, CG human and the cartoon human. Test path one showed the character leaving his house in a good mood, walking to the shop and buying a winning lottery scratch card. The character then danced happily on the road when a speeding car zoomed past narrowly missing him. The second test path was virtually the same as the first. The character was still in a good mood, however, this time the story would change any positive plot to a negative plot point. The character left his house and walked to the shop in a happy mood. However, rather than receiving a winning ticket, he got a losing ticket. The character's mood does not change and he happily dances on the road anyway. This time when the speeding car came past, the character was fatally hit. Test path three was the same as in test path one but the only difference was that this time the character was in a sad mood. Even when the character won the lottery, he remained sulky. The final test path had everything set to negative. The character was sad and the story was negative. The character left his house feeling sad, bought a losing lottery ticket and was hit by a speeding car.

Test paths which contained constants could be compared to one another.

A=T1 to T3 (Constant = Story)
B=T2 to T4 (Constant = Story)
C=T1 to T4 (Constant = Behaviour)
D=T2 to T3 (Constant = Behaviour)

The constants in comparisons between test one to test three (A) as well as the comparisons between test two to test four (B) was the story and character. Analysis was conducted to assess whether a change in the characters behaviour had a significant effect on the subject's interest with that character. While the first pair (A) tested the subject's response to a character in a positive story, the second pair (B) tested the same character in a negative story. This would assess any significant difference between response with a character and their behaviour by story type. In comparative pairs test one (A) to test three (C) and test two (B) to test four (D) the constant is the behaviour of the character. Each pair assesses any significant difference in the subjects response to the character based on the change in the story. While the first pair (A) tested the subject's response to a character with positive behaviour the second pair (B) tested the same character with negative behaviour. This assesses any significant differences between response with a character and their contextualisation by behaviour type.

Prior to starting the experiment the subject is presented with a disclaimer stating:

> *The following is a short questionnaire which will take approximately five minutes to complete. Please note, you may find some aspects of this disturbing, if you are of a sensitive disposition. However, nothing contained within this experiment is in anyway adult orientated or would have any problems being shown on pre-watershed daytime television. Please click next to continue and I hope you enjoy taking part in this experiment.*

Following the disclaimer the subject is presented with a list of simple questions relating to information about themselves. The first of these questions asked for a

name. This was later used combined with the recorded IP address of the machine which accessed the experiment to remove any subject who may have repeated the experiment more than once. Following this the subject was asked to select from a list of age ranges which corresponded to themselves. The subject was then asked to state their gender. Following this, the subject was asked to name a favourite television show or film. This question was later used to discern the subject's affinity to animation, live action or a mixed medium. If the subject stated a live action film then they were listed as having an affinity to live action. Stating an animation film would mean they were listed as having an affinity to animation, while choosing a film which featured animated character and live action characters proportionately would have them listed as having an affinity to a mixed medium. Following this the subject was simply asked if they would consider themselves to having an affinity for video gaming or not.

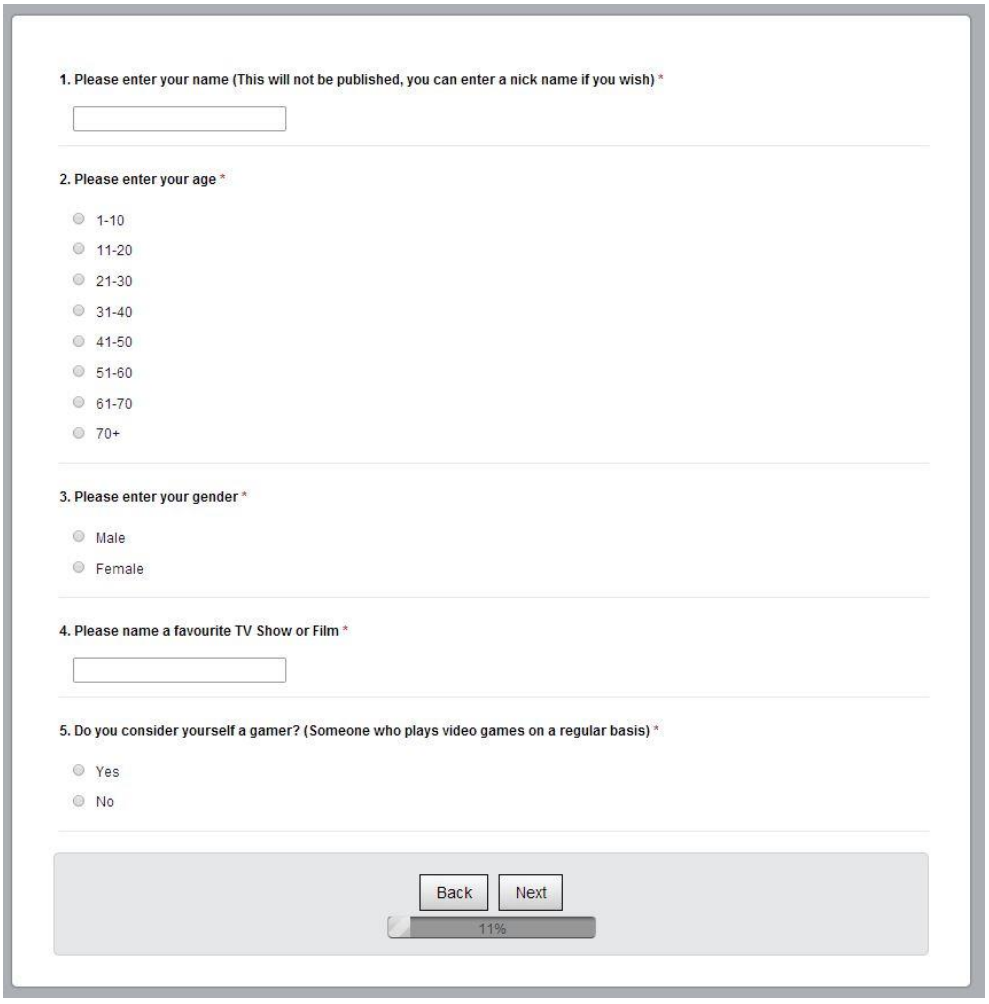


Fig 50: Questions relating to subject identity

4.1.2 Materials and Procedures: Context

While we have discussed much of the contextualisation of the experiment in the previous section we will now explore how the contextual approaches used within this experiment can be further explored. In this section we will discuss the narrative reasoning as well as why certain features that one may expect to be included with video stimulus are omitted. In this case we are referring to sound and the limited use of colour. We begin with a reason into the approach taken in the development of the narrative. The narrative path used within this experiment was to create a context in which a subject may easily identify with the character. Whilst the contextualization of the previous experiment was not a measured variable, therefore, greater leniency could be taken in the approach one takes in its development, here the contextualisation becomes a variable. Having a character going to a shop is a simple narrative that possibly everyone who took part in the test had done at least once in their life. While the narrative of the previous experiment took on a surreal contextualisation, this experiments approach was to ground the test in reality. The narrative developed allowed for a number of changes to be made as was discussed in the previous section. Even with a simple plot as we have described a number of variations could easily be made.

Fig 51: Narrative Changes

Like the Carl comics of McCloud (McCloud, 1999) we can see how slight changes can make a new contextualisation for the character (Figure 49). Each path in

this case may have different levels of contextual negativity or positivity combined with differing mixes of behavioural sadness or happiness. The benefits of the design used within this experiment are that it allows for a more coherent context for the character that itself can now be measured. Whereas in the first experiment, the context had to be sad, happy and surprising all included at the same time with one of these tones being emphasised, here in experiment two, the story could either be sad or happy. The first experiment separated the subjects taking part in the experiment into three groups depending on which emotion was being emphasised in the character. This made analysis between the groups less informative. In the second experiment all the data was collected at the same time and an informative data set was used to compare perception between the story, character's behaviour and character type. In the first experiment, the subject had to see five different characters performing the same actions. This made participating in the experiment uninteresting and may have positioned the subject to possibly make negative assessments of the experiment. In the second experiment, each subject only saw two randomly selected videos. This kept the experience as engaging as it could be. Keeping the subject interested in the experiment was important to gauge a neutral response. Also, we know from previous studies one cannot be exposed over and over to an uncanny effect at the same level (Allen, 2007). In the first experiment, colours may have influenced the interest in each character. Based on the comments from the previous experiment, the colour scheme was changed. The colours were very de-saturated in the actual video so as to allow all characters to conform to a uniform colour style. It was noted that this may make the video rather boring to watch, but, at least each was equally boring. This contrasted with the second part of the experiment where the subject was presented with two characters performing various acts. The colours here were equally over saturated. The saturation of colours was more prevalent when a cartoon shader was applied to the character. To circumvent this potential problem, the videos were saturated to an almost indistinguishable saturation between characters. The following test used an anthropomorphic character and a realistic human character using similar highly saturated shaders.

Now that we have mentioned sound it is important that we justify the omission of it within the stimulus. Whilst this experiment used a video rather than the still image approach, it would often be expected to include some sort of sound, possibly even a

voice to the character. However, due to previous research potential problems were discovered with mismatched sounds and images, therefore this was avoided. Research conducted by Mitchell, et al., found a mismatch between the character and expected sound of voice caused a heightened eeriness from the participants (Mitchell et al., 2011). Due to sound possibly playing a big part in the perception of the character, the study undertaken in this thesis avoided complications that may arise and contaminate data from its use by not using it. Further complications may arise in regard to the video tests by finding an appropriate audio accompaniment to the various states of the character behaviour and added yet another factor that may need to be measured. Whilst silent videos may themselves be deemed eerie, all videos in the experiment were silent, therefore all equally eerie in this respect. The converse arrangement of this could lead to the scenario where a participant may be watching a character in a sad state with an upbeat happy sound track; this could possibly lead to be creepier than avoiding the use of sound all together.

Sound can be used to heighten an emotional response, such as using sad music for a sad scene or happy music for a happy scene in this case. Clearly adding music could fit the criteria for this study as it would make the experiment more like a context in which one would find a fictional animated character in everyday life. On television, video games or internet videos, characters are usually accompanied by music or at the very least some sort of sound. The usage for such a device while highly beneficial for something produced for entertainment purposes, can be problematic for use in a scientific experiment in this case. Finding equally good sad and happy music for each part of the piece may not be difficult, however, blending each track together to make a coherent music track would be. Also adding a neutral piece of music would prove troublesome. To explain this in an overly simplistic way, a typical piece of music is made up of notes in a scale. These scales are either in a minor or Major Key. Music using chords and scales from minor keys is designed to instill sad feelings in the listener. While the major key is the opposite. There is no ‘neutral’ key, using any piece of music that would tilt the bias of the sequence in one of two directions, happier or sadder.

Further research was conducted and refined using the results obtained from this experiment. As no significance was found between the subjects age, gender and

nationality, whether they were an animation fan or not, these factors would be adapted for this experiment. The non-significance found with subjects age and gender was comparable to other research in this area. Ho et al., (2010) also found that there was no significant difference in gender and age. Their research was conducted to assess the subjects perceived attractiveness and eeriness based on the perceived humanness of a robot or CG character (Ho et al., 2010). Whilst this experiment allowed for comparisons to be made qualitatively between experiments difficulty arose when one looked for statistical significance of these findings. Further experiments tests would be designed so that comparisons may be easily made between the different behaviours. These independent variables would play a smaller part in this experiment, rather than be compared with the video experiment stimulus we would use subject independent variable data to discern significance between which character the subject preferred to see in preceding the video stimulus. That said independent variables play an important part in experiment 2b which will be discussed in the relevant sections later in this chapter.

4.1.3 Materials and Procedures: Participants

The sample from the first experiment was tweaked for this experiment. As stated previously, the first experiment used broad sampling to conduct this experiment. As age in the first experiment did not have any significance with the perceived interest in a character, it was omitted from this experiment. This allowed for the sample to become more focused in terms of age. From the results of the first experiment the age of subjects was restricted to twenty to thirty year olds. This sample was chosen due to the fact that the subjects would not necessarily have a strong aversion to animation as they would have grown up with a strong presence on children's television (Duffy and Burton, 2000, Kelly et al., 2000). Also this group would be more likely to be actively going to the cinema (Marcus, 2002) for their own enjoyment and not necessarily the enjoyment of others as they may do so if they had a family. The largest group of cinema goers are comprised of ages within this range (MovieGuide.org, 2012, MPAA, 2012, SAWA, 2012). Data obtained from the first experiment found no significant difference in ratings of a character based on the subject's age. Therefore, the independent variable of age was not examined.

To analyse the data obtained from the video experiment repeated measure analysis was changed in favour of Mann-Whitney analysis. As no other factors were required for analysis in this case a Mann-Whitney test was selected for greater efficiency as the test is designed to compare two populations as in the case with this part of the experiment. As Mann-Whitney tests can only test two populations, a Kruskal-Wallis H-test was used to compare each character to one another. Two hundred subjects aged between twenty to thirty years old took part in this study. The sample consisted of one hundred and nine male subjects and ninety one female subjects. Subjects were obtained from social media sites Facebook, Stumble Upon, Reddit, Twitter and Delicious. As randomisation was used to assess each population, approximately thirty five subjects took part in each pair comparison. The entire sample was used for character comparisons and favourite character comparisons. The design of this experiment required a larger number of subjects to participate. The reason for this was due to each subject only seeing two randomly selected videos. Confounding problems would occur if the entire character list from the first experiment was employed here. Rather in this case only three characters were used for the first part of the experiment and two other characters for the later parts.

4.1.4 Materials and Procedures: Characters

In this section we will further discuss the character set choice used for experiment 2A. As we have previously stated this experiment uses three different character types. Of these characters types one is a real actor, a realistic CG human and a cartoon character. As all of these characters represent a human in one way or another, the movements for the digital characters were copied from the live action character as to match animations among the characters as closely as possible. While much of the work undertaken to explore the uncanny valley relates to response towards how a subject may feel when viewing a particular type of character on a scale of human realism, few have compared a real human to digital characters contained within the same context and displaying the same behaviour as one another counterpart.

A number of different actors were used to record the live action footage. In representing the final footage to be used, the actor which appeared most like our

existing characters from experiment 1 was used. This consideration also took into account how the actor moved and how this movement could effectively be re-portrayed by our existing characters so as to produce fair stimulus for the experiment that would take place.

Fig 52: Three characters

Above is the question presented to the subjects in the experiment. Data from this question would be analysed using independent variable data obtained from the subject prior to viewing the stimulus. While independent variable data was not used to analyse the data obtained from video stimulus as we have previously discussed, the independent viable data was used here. To clarify the independent variables in question are nationality, affinity to video gaming and preferred visual medium. While Forceville (2005) suggests that overly exaggerated emotions are representative of an emotion in its purest form, it was decided to downplay the exaggeration for the video tests. This was based on a comment which suggested that certain characters were over acting, leading the subject to believe the actions were being deceptive. The poses that conform to Forceville's ideas were retained for the later part of this experiment which contrasted an anthropomorphic character against a human character. This will be further discussed in the relent section.

Materials and Procedures: Behaviours

In this section we will further discuss the behaviours that were examined as part of the experiment described within this chapter. As we have previously stated earlier in the description of experiment 2A, the behaviours that the character portray within the contextualisation of the narrative are either happy or sad emotional

behaviour types. The same character can be seen in one of four different combinations of behaviour and context as we have previously discussed. We will now further explain the reasoning behind the behaviour set used in this experiment.

Character within this experiment can be seen in various combinations of behaviours and context within the stimulus. Some combinations are what one may expect while others may seem somewhat unusual. For example, in the case of the plot involved a character may walk to the shop happily buy a winning lottery ticket and become even more happy due to the delight at winning. Conversely the experiment allows for the same character to walk unhappily to the shop and actually by a losing lottery ticket causing them to become distraught. These combinations of character behaviour and contextualisation are somewhat expected. One would likely expect the subject to identify with this expected behaviour. However, the experiment permitted furthermore obscure combinations of behaviour and context. These combination being, a character could walk happily to the shop and buy a losing lottery ticket which makes them even happier. Conversely the same character could walk miserably to the shop and buy a losing lottery ticket that only makes them more miserable. While unusual combinations of behaviour and contextualisation are a product of the method involved they provide interesting dynamics to the study. While previous research has stated that the uncanny valley is caused by a mismatch of visual fidelity (Mitchell et al., 2011), one may surmise that a mismatch of emotional behaviour and contextualisation may also have negative consequences to a character. Moreover, certain characters may be more effected by the negatively than others.

While as we previously illustrated (see figure 49) there are a multitude of various behaviour and contextual combinations that could be achieved with this particular piece of experimental stimulus, including all or even more so that was included within this experiment would complicate the outputted data set. While certain advanced combinations may produce interesting results, difficulties matching constants and variables would likely prove problematic. However, for the objectives of this study four different variations as described previously provides this research will the needed variables.

4.1.5 Materials and Procedures: Summary

As we have previously stated, we have described part of the experiment in the preceding sections. Following an analysis of the data we will begin to describe the following part. In the sections preceding we have described the experimental design of experiment 2A and how the experiment differs from the initial experiment within this study. While the core concepts surrounding the experiment are still the same as with the initial experiment that took place as part of this study, we discuss what has been changed and adapted in the retooling of existing apparatus for too further the study undertaken as part of this research. While some areas remain the same in terms of what is being recorded, we now develop an effective method for clear measurements of all aspects of the study. These are the character type, the emotive behaviour type and finally the contextualisation. This description and discussion provided in this chapter is highly relatable to the descriptions relating to the previous experiment as this experiment as described here is a further development to the initial studies. In this chapter we iterate how data obtained from this experiment does not set out to supersede data from the previous experiment but rather to further inform and provide the understanding need to give a rounded argument which this chapter precedes.

This chapter starts with a description of the approach to experimental design this is the biggest change to existing procedures within this study particularly as now in experiment 2A stimulus is contained within a video. This section aims to give the reader a coherent understanding of the overall procedure involved as well as how the process relates to the subject's interaction with the online materials. To this end we discussed the questions involved and the reasoning behind them. This provides the reader with an understanding of how the recording of independent variables remains similar to the previous experiments approach with key areas adapted for use within this retooled experiment. This section details how video experiments integrate into methodical analysis by describing what stimulus set can be compared to which other set due to specific pairs having the same two constant variables this aims to give the reader an understanding of how data will be interpreted in the section following this summery. After the description of the actual experimental design we broached the procedures rating to the contextualisation. We have demonstrated how a modular

story design as used within this experiment can be used to effectively control a three variable stimulus. In the section describing the context of the stimulus we demonstrate how the modular story can be expanded if need be and further convoluted if the need arises to measure different variances of behaviour and context. In this section we discussed why certain features that one may come to expect in video stimulus such as sound we omitted. Following this section we discuss how the sample is further refined compared to the initial experiment undertaken as part of this research. We discussed the sample selected and provide justifications for this choice of sample. In the following section we discuss the characters used within the stimulus of this experiment. We describe how procedures are adapted and why. Now that the experiment has been described we will move on describing the actual data obtained starting with an explanation towards the approach to the statistical analysis involved.

4.2 Statistical Analysis

In this section we lead into the analysis of the data obtained via the execution of the experiment described within this chapter. As we have mentioned this experiment consisted of two separate parts and in this chapter each part is discussed and described separately. While both parts of the experiment are derived and adapted from the first experiment which took place earlier in this study, data obtained from both experiments are analysed differently. As we will discuss later, the second part of the experiment sticks with the tried and tested approach towards analysis as with the first experiment in this study. The way the stimulus was integrated into the experiment allowed for this to occur. We will detail this later in this chapter. The part of the experiment that is being described here tackles the data in a slightly different approach as with both the second part of the experiment and the first experiment completed within this study. While some elements are analyses similarity such as the generation of curve graphs from the data for uncanny valley theory comparisons, other parts demand a different approach.

The same line of questioning was presented to the subject taking the test as with the subjects of the first experiment described within the previous chapter. What

was different was how the subject would view the stimulus. As we have previously described the subject upon selected which character they would most like to see they are then presented with two different random videos. This meant that while the first experiment had the entire sample viewing the stimulus this one had a smaller section viewing each video. Reasons for this is to ensure the subject remains engaged with the stimulus and is divulged to the subject through a fair test that does to make too many demands upon the subject by forcing the subject to watch too many videos featuring similar or the same actions repeatedly. Data obtained from the responses to the video stimulus was required to be analysed by comparing two pairs of of results when discerning information relating to both the behaviour and contextualisation of a character as for each variable two different states exist. For behaviour of the character the two states are either happy or sad. While for contextualisation the two competing states are either positive or negative. For this analysis a box plots were made of the data to discern any initial interesting observations. Following this Mann-Whitney test was chosen for its suitability when comparing two groups. For character comparisons where three groups are compared a Kruskal-Wallis H-test was used to interpret the data as Mann-Whitney is only suitable for comparisons between two groups. A Kruskal-Wallis H-test provides similar data outputs as a Mann-Whitney test therefore allowing both tests to work suitably well with each other. Finally for this analysis we compare the favourite characters as selected by the subject using Chi-Squared cross tabs. This test was selected due to the ordinal properties of the stimulus. Granted that there are only three different choices a subject may make, the data is still on a scale of least to most realistic. The cartoon character is the test being the least realistic and the actual human being the most realistic.

4.2.1 Data

Now we approach the data analysis we present the data statistically. Granted this may be tedious to read for some readers, we discuss the implications of these test in the following chapter by referring back to the actual statistics presented here. The analysis is broken down into three sections depending on the data that is being assessed. The first part of this data are the comparative studies. This data is analysed by first comparing each individual test to a corresponding test. Each test are relates

to a particular stimulus group. In the first example used in the following section we present T4 to T2 comparisons. T4 signifies the stimulus group of the Real human in a negative story contextualisation portraying positive behaviour. T2 being the same character in a negative story contextualisation portraying negative behaviour. The constant variables being the character and the story contextualisation. The measured variable in this case is the character's behaviour. Data where the measured variable is either the behaviour variable or the story contextualisation variable is being measured is always handled in this manner in the following section. In this case the measured variable has only two different states. However, following the analysis which deals with measuring the effects of the behaviour and story contextualisation variable we analyse the character variable and this analysis is presented slightly differently. Rather than use a Mann-Whitney as we mentioned previously is used for analysis of two variant groups we adopt a Kruskal-Wallis H-test reasons for doing are as previously stated. For the purposes of this analysis data presented is similar between the types of data analysis one notable difference being the box plot for the later will contain three sets of day rather than two as well as statistical equations pertaining to the *p* ratio are slightly different in both cases due to the nature of the separate tests being employed for this analysis. To summarise when a variable has two states we use a Mann-Whitney test which compares two groups and when the variable has three different states we use a Kruskal-Wallis H-test. Following these sections we compare the preferred character variable that was presented to the subject at the beginning of the experiment. We generate a curve for uncanny valley comparisons using the mean score average and use chi-squared cross tabulation for data analysis of correlation between independent variables and character type. This data is contrasted against independent variables such as the subjects preferred medium be it live action, animation or a mix of the two. Other independent variables include the subjects affinity towards video gaming and nationality. Following the analysis we summarise experiment 2A's data output and move on to describe experiment 2b. A discussion into the data analysed takes place in the following chapter where data from the entire study is compared and discussed.

4.2.2 T4 to T2 Comparisons

T4 to T2 comparisons compared the same character in a negative story

contextualisation with positive behaviour against the same character in a negative story with negative behaviour. The behaviour of the character was the only element which changed in this comparison. Results were plotted in a box plot to assess any difference the subject had with the character in each case.

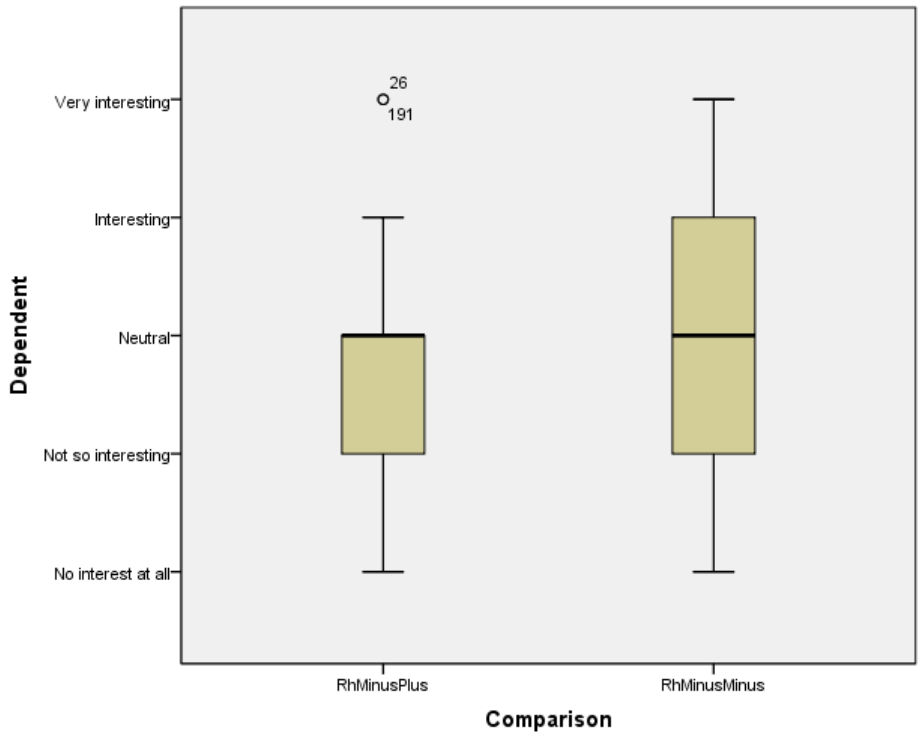


Fig 53: Real human T4 to t2 comparisons

Results indicated that there was a small difference in the perception when the real human character was compared in this comparison. Subjects found the character more interesting with negative behaviour. However, a Mann-Whitney test comparing the effect on interest between the real human in a negative story contextualisation with positive behaviour against the real human in a negative story contextualisation with negative behaviour found no significant difference in interest from the subject, $U = 448.5$, $p = .522$, $r = -0.08$. Overall the majority of subjects in this comparison stated they had a neutral level of interest in regard to this character under these stipulations.

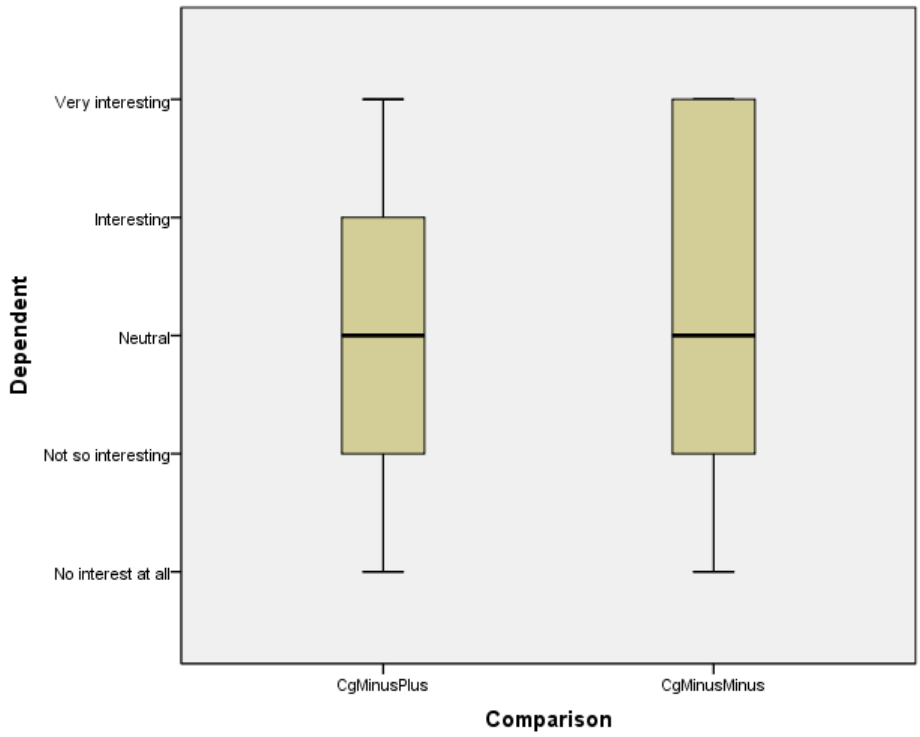


Fig 54: CG human T4 to T2 comparisons

Mann-Whitney test compared the effect on interest between the CG human in a negative story contextualisation with positive behaviour against the CG human in a negative story contextualisation with negative behaviour and found no significant difference in interest from the subjects, $U = 544.5$, $p = .287$, $r = -0.133$. As with the real actor, this character the CG human was found to be neutrally interesting to the subject under this set of circumstances.

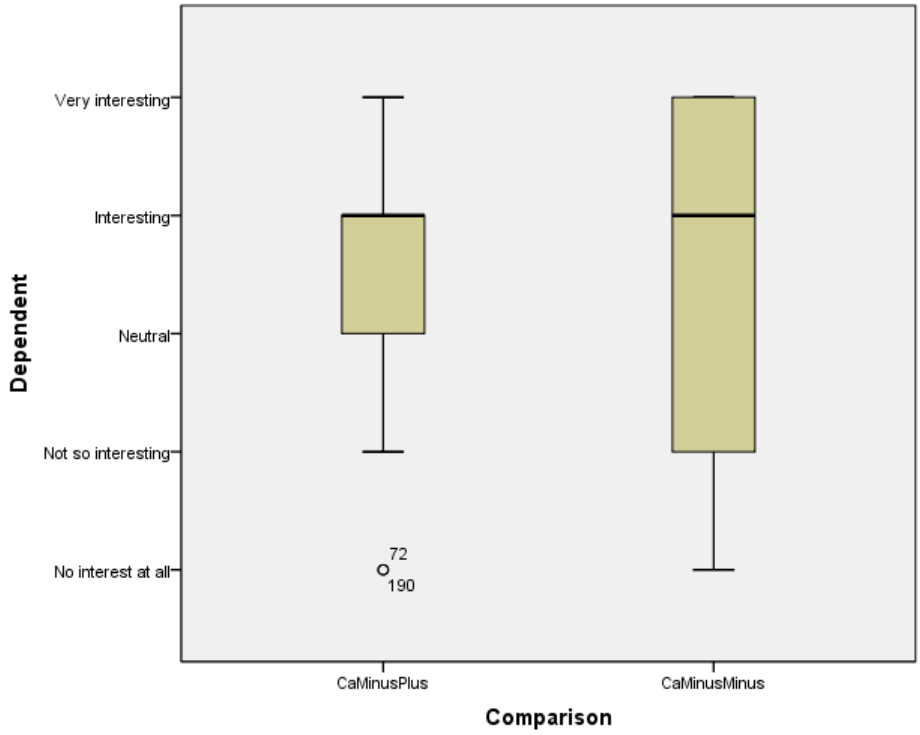


Fig 55: Cartoon human T4 to T2 comparisons

The cartoon character was found to be interesting in both test sequences. The character generated a greater variation of responses when depicting sad behaviour. However, when a Mann-Whitney test was conducted to compare the effect on interest between the cartoon human in a negative story contextualisation with positive behaviour against the cartoon human in a negative story contextualisation with negative behaviour no significant difference in interest was found from the subjects, $U = 487.5$, $p = .972$, $r = -0.045$.

4.2.3 T1 to T3 Comparisons

Like the first set of comparisons T1 to T3 comparisons compared the same character with differing behaviours. The character could either be sad or happy in each sequence, the difference between this and the previous comparison was that this time the character was contextualised with a positive story contextualisation.

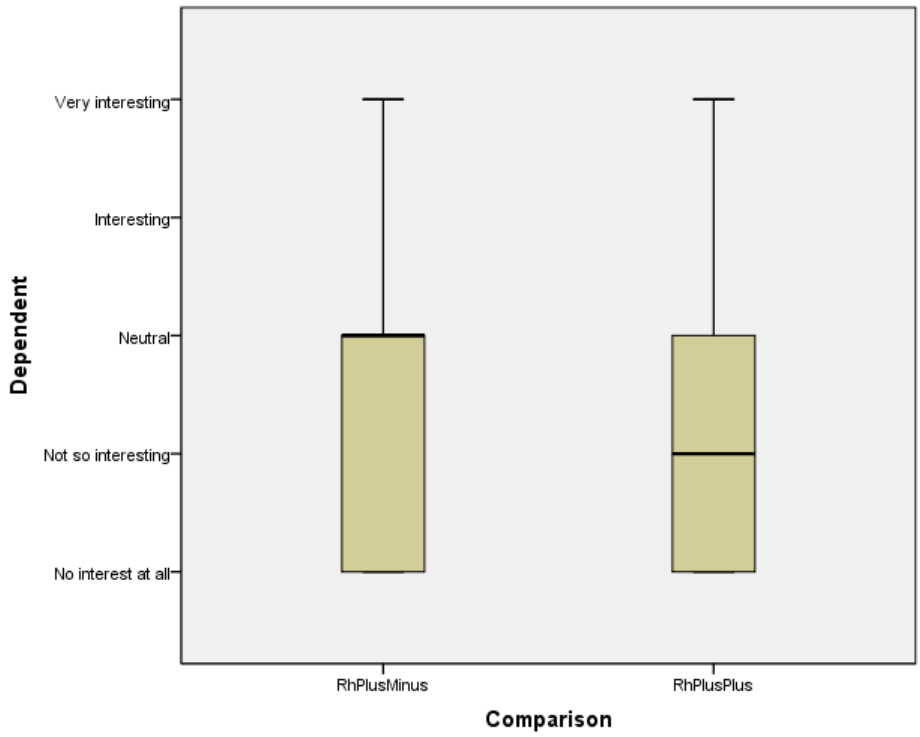


Fig 56: Real human T1 to T3 comparisons

Under the stipulations of the comparison, the real human character was deemed to be less interesting when the characters behaviour was happy. However, Mann-Whitney test comparing the effect on interest between the real human in a positive story contextualisation with negative behaviour against the real human in a positive story contextualisation with positive behaviour was conducted, it found no significant difference in interest from the subjects, $U = 470.0$, $p = .711$, $r = -0.047$.

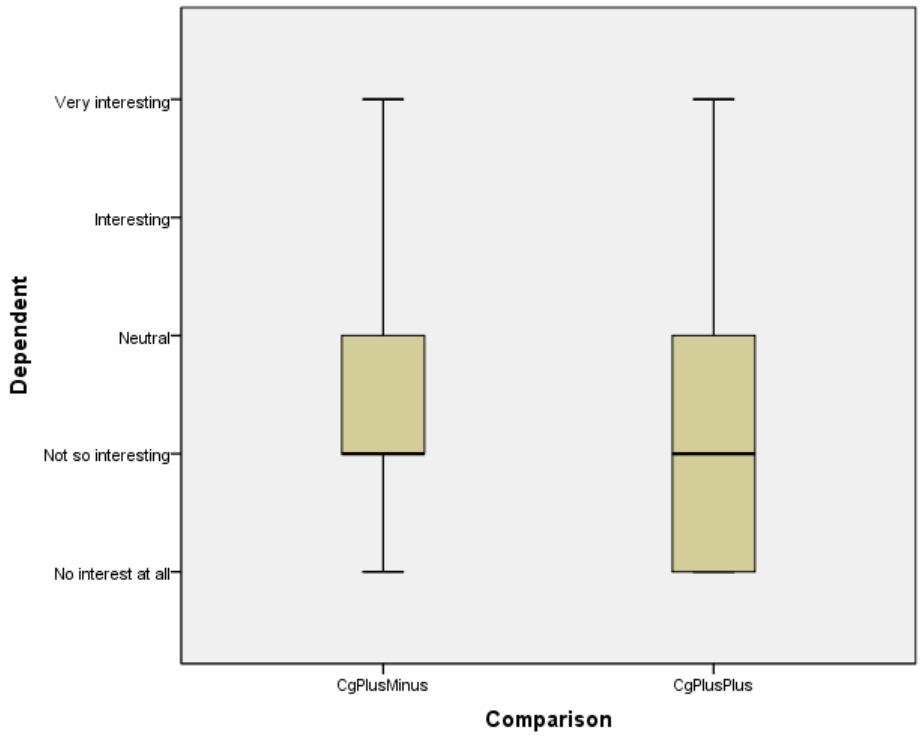


Fig 57: CG Human T1 to T3 comparisons

Results indicated that the subjects found the CG human character less interesting when depicting happy behaviour. Mann-Whitney test comparing the effect on interest between the CG human in a positive story contextualisation with negative behaviour against the CG human in a positive story contextualisation with positive behaviour found no significant difference in interest from the subjects, $U = 472.5$, $p = .846$, $r = -0.024$.

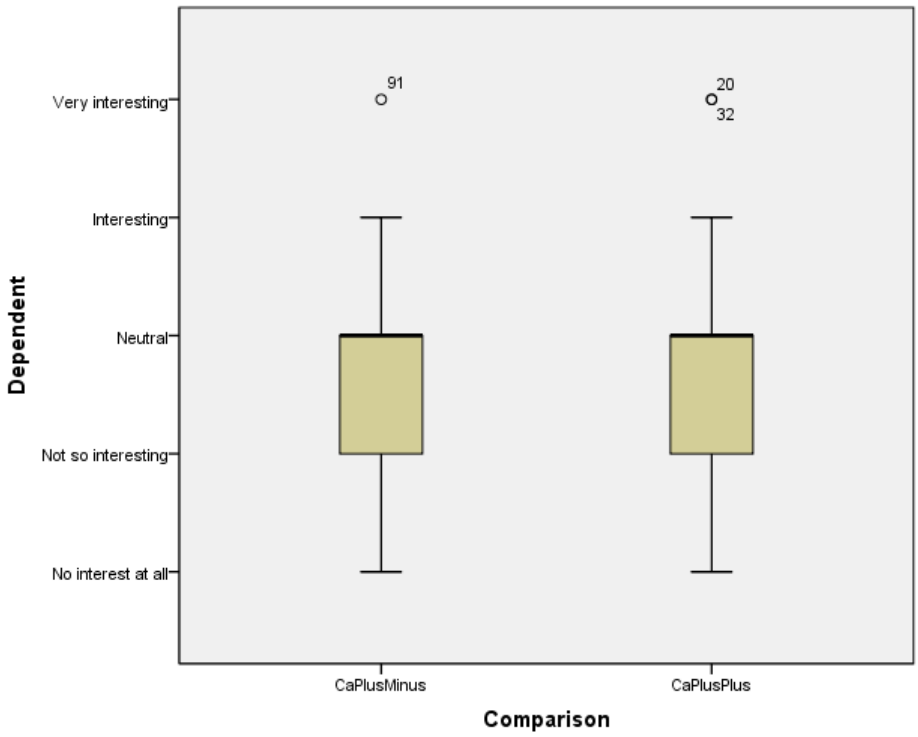


Fig 58: Cartoon human T1 to T3 comparisons

The cartoon character was deemed equally interesting when the behaviour was either happy or sad. Mann-Whitney test comparing the effect on interest between the cartoon human in a positive story contextualisation with negative behaviour against the cartoon human in a positive story contextualisation with positive behaviour found no significant difference in interest from the subjects, $U = 472$, $p = .691$, $r = -0.050$.

4.2.4 T1 to T4 Comparisons

The comparison T1 to T4 tested whether or not the story contextualisation had a significant difference in response to the characters.

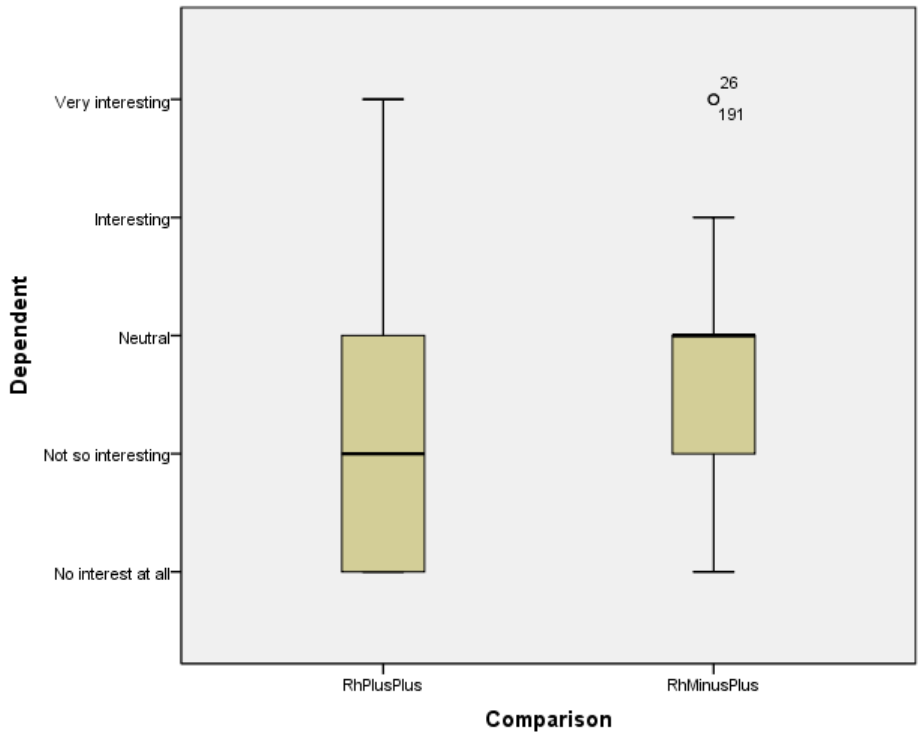


Fig 59: Real human T1 to T4 comparisons

The results indicated that the real human in a negative story contextualisation was perceived as more interesting than in the positive story contextualisation. However Mann-Whitney test comparing the effect on interest between the real human in a positive story contextualisation with positive behaviour against the real human in a negative story contextualisation with positive behaviour found no significant difference in interest from the subjects, $U = 324.0$, $p = .193$, $r = -0.172$.

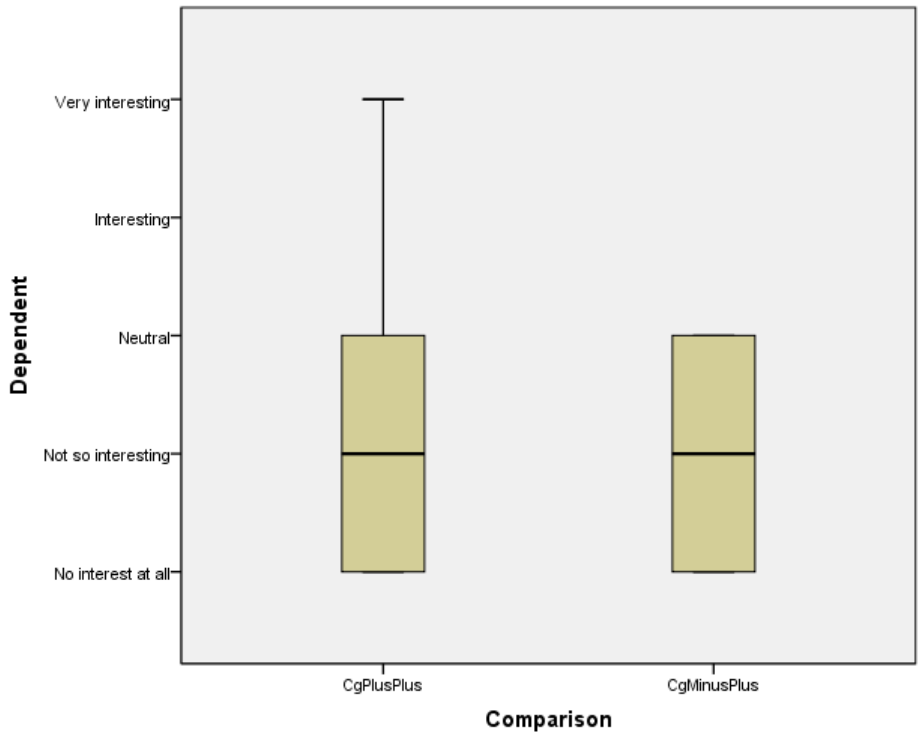


Fig 60: CG human T1 to T4 comparisons

Mann-Whitney test comparing the effect on interest between the CG human in a positive story contextualisation with positive behaviour against the real human in a negative story contextualisation with positive behaviour did find a significant difference in interest from the subjects, $U = 451.5$, $p = .022$, $r = -0.022$. The CG human was found to be more interesting when the characters behaviour matched the story contextualisation and that both the character and the story contextualisation were positive.

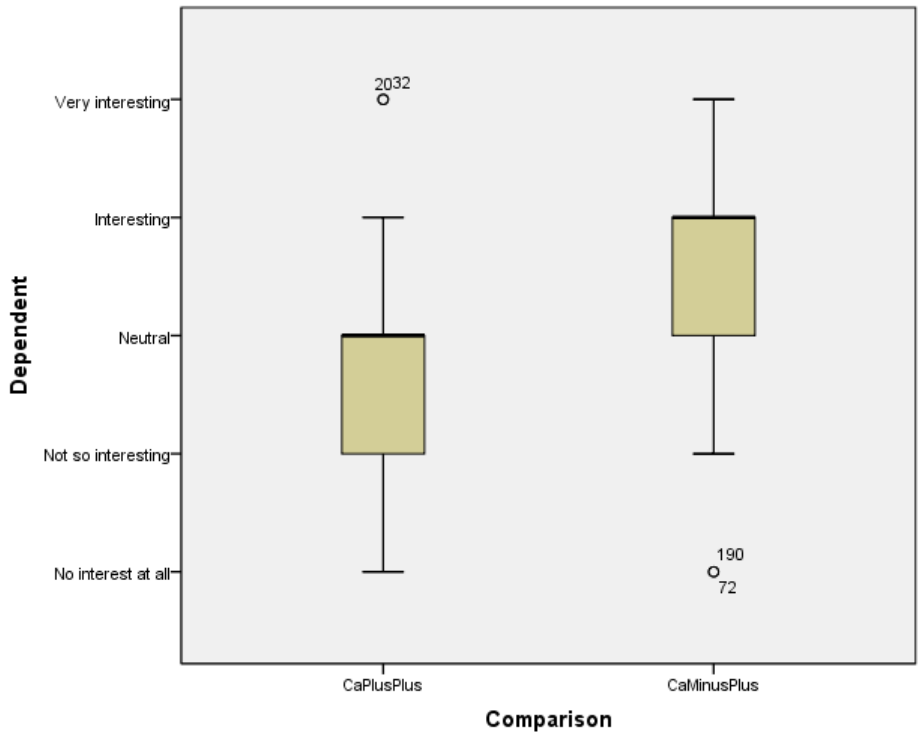


Fig 61: Cartoon human T1 to T4 comparisons

Mann-Whitney test comparing the effect on interest between the cartoon human in a positive story contextualisation with positive behaviour against the real human in a negative story contextualisation with positive behaviour did find a significant difference in interest from the subjects, U = 345.0, p = .007, r = -0.033. The character was found to be most interesting when the behaviour was positive and the story contextualisation negative.

4.2.5 T2 to T3 Comparisons

As with the previous comparison, this test was conducted to discover any significant differences with the character in contextualisation tone.

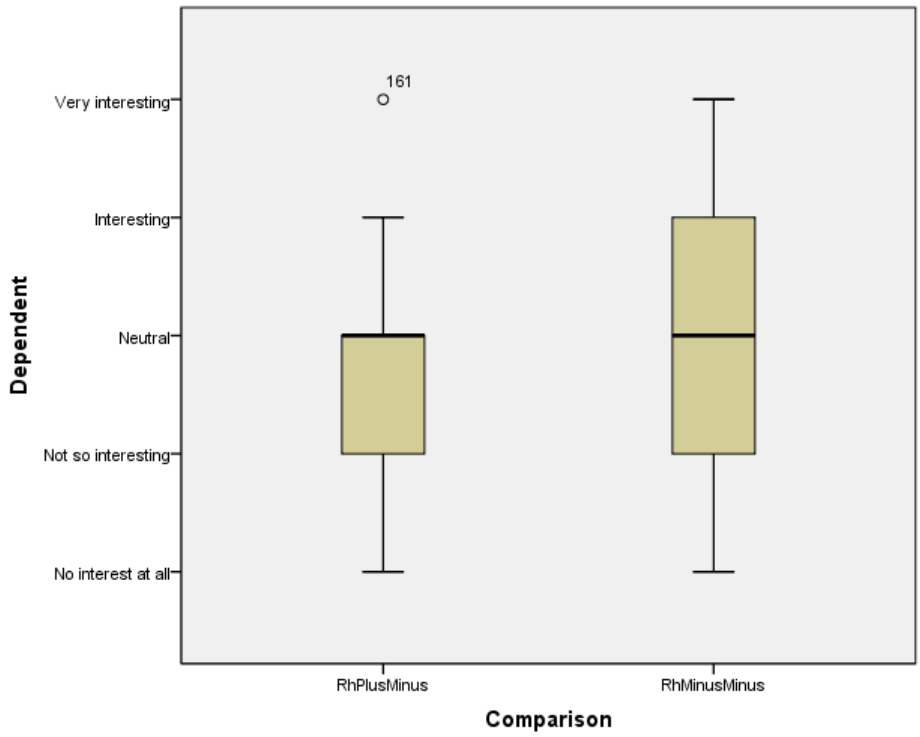


Fig 62: Real human T2 to T3 comparisons

The results indicated that the real human in a negative story contextualisation may generate more interest from the subject. However, A Mann-Whitney test comparing the effect on interest between the real human in a positive story contextualisation with negative behaviour against the real human in a negative story contextualisation with negative behaviour found no significant difference in interest from the subjects, $U = 456.5$, $p = .244$, $r = -0.141$.

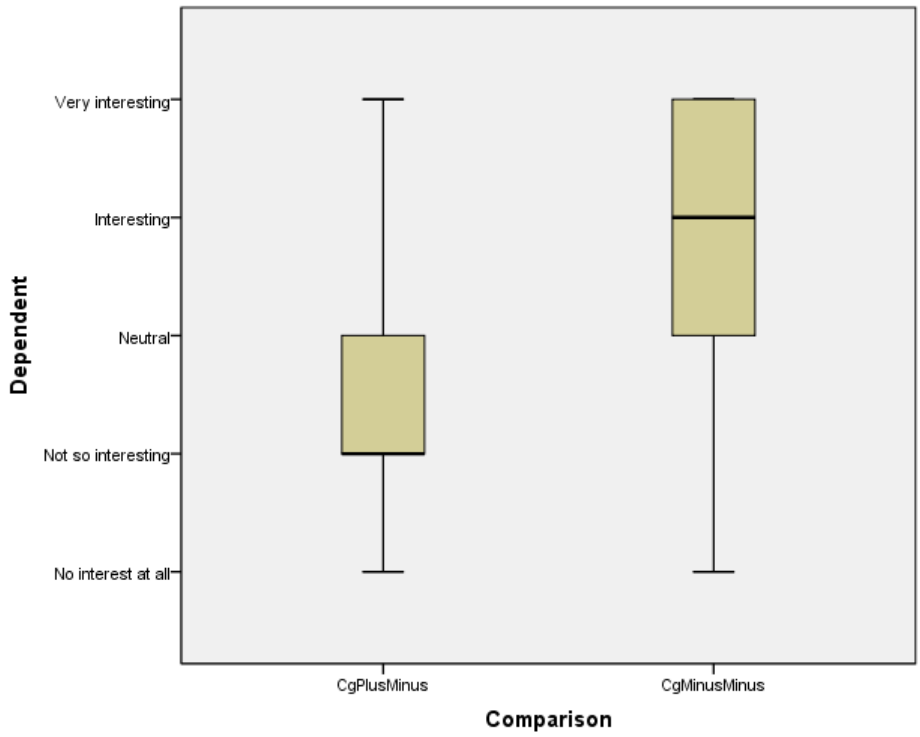


Fig 63: CG human T2 to T3 comparisons

Mann-Whitney test comparing the effect of empathy between the CG human in a positive story contextualisation with negative behaviour against the CG human in a negative story contextualisation with negative behaviour did find a highly significant difference on interest from the subjects, $U = 222.5$, $p = .002$, $r = -0.411$. Once again the change in story contextualisation produced a significant difference in response from the sample. Results found the character to be more interesting when placed within a negative story contextualisation.

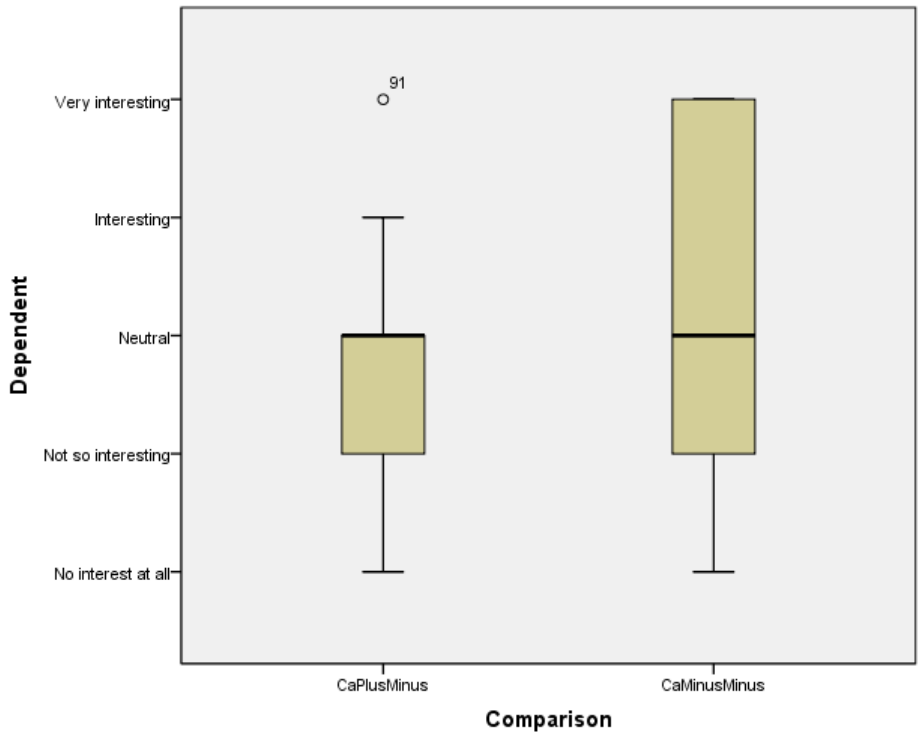


Fig 64: Cartoon human T2 to T3 comparisons

The cartoon character was found to be neutrally interesting in this case. Mann-Whitney test comparing the effect on interest between the cartoon human in a positive story contextualisation with negative behaviour against the cartoon human in a negative story contextualisation with negative behaviour did not find a significant difference in interest from the subjects, $U = 331.5$, $p = .258$, $r = -0.150$.

4.2.6 Character Comparisons

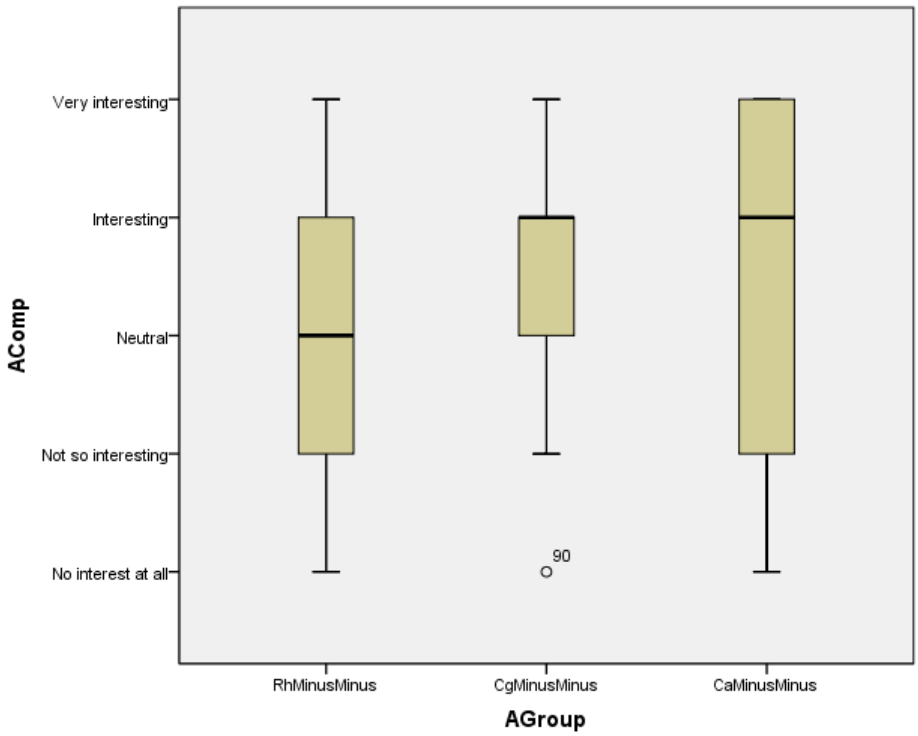


Fig 65: Minus Minus character comparisons

A Kruskal-Wallis H-test comparing the real human, CG human and cartoon human in a negative story with negative behaviour found significant difference in interest from the subjects at $H_{(2)} = 6.128, P = .047$.

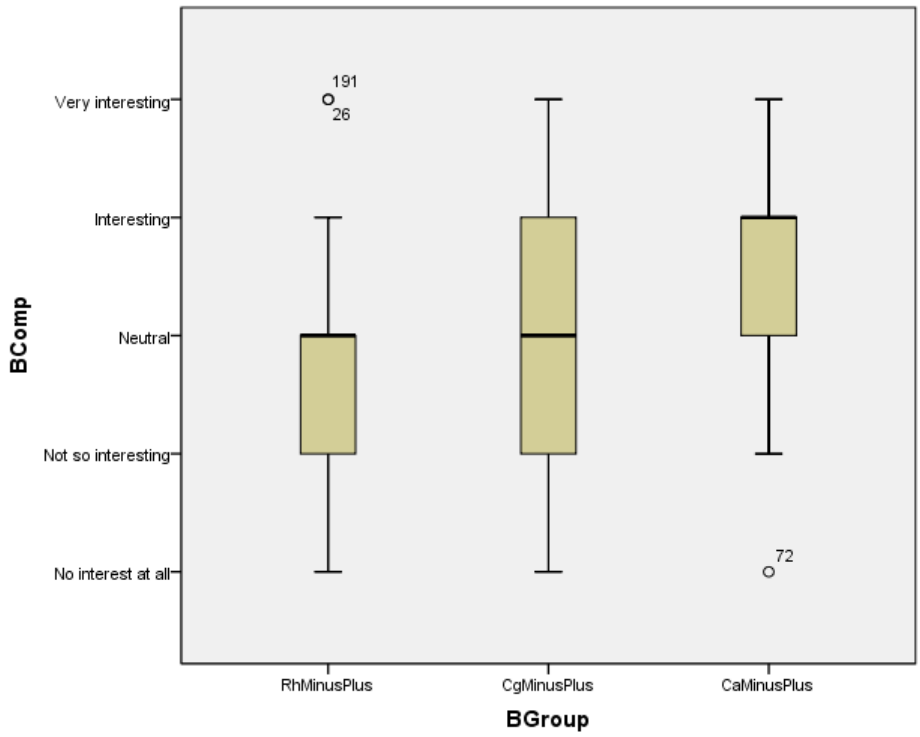


Fig 66: Minus Plus character comparisons

A Kruskal-Wallis H-test comparing the real human, CG human and cartoon human in a negative story contextualisation with positive behaviour found significant difference in interest from the subjects at $H_{(2)} = 5.676, P = .059$.

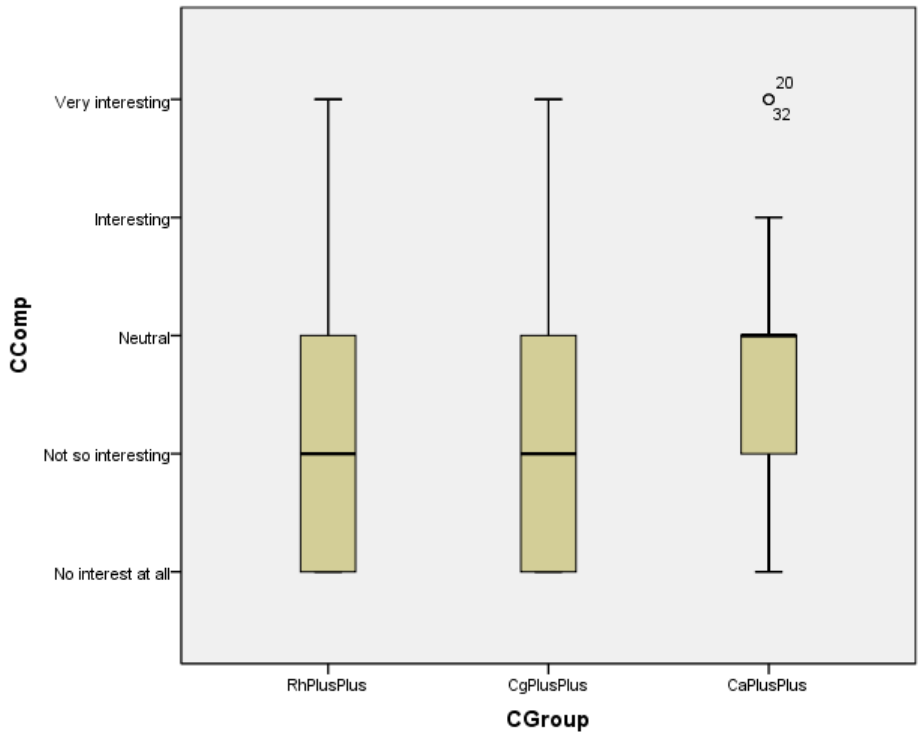


Fig 67: Plus Plus character comparisons

A Kruskal-Wallis H-test comparing the real human, CG human and cartoon human in a positive story contextualisation with positive behaviour found no significant difference in interest from the subjects at $H_{(2)} = .881, P = .644$.

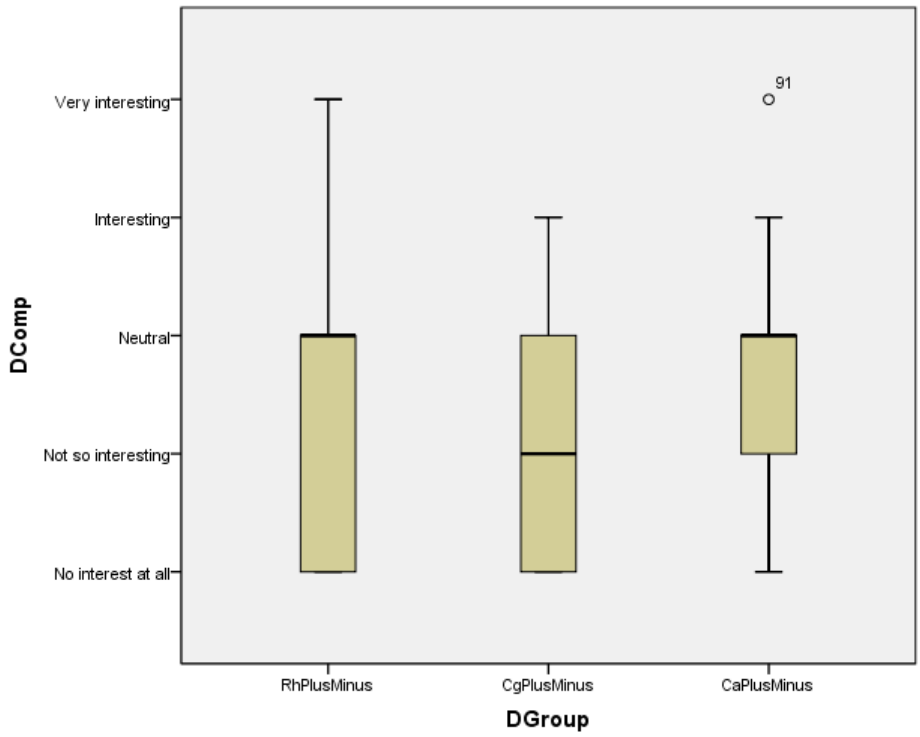


Fig 68: Plus Minus character comparisons

A Kruskal-Wallis H-test comparing the real human, CG human and cartoon human in a positive story contextualisation with negative behaviour found no significant difference in interest from the subjects at $H_{(2)} = .4.225, P = .121$.

4.2.7 Chi-Squared Cross tabs

A further part of this experiment involved asking the subjects of the three characters which was their favourite. Unlike the previous questions, this question did take into account the various differences between the subjects. This part of the experiment followed on from the previous experiment which compared plotted data to Mori's (1970) hypothetical uncanny valley curve whilst aiming to discover any correlation between independent variables of the data. The subjects were presented with three images. These images were passport style photographs of the characters in the video experiment: The real human, the CG human and the cartoon character.

A Chi-Squared crosstab test comparing the character the subjects most liked to see in the story contextualisation to the subject's televisual or filmic medium preference was conducted. Results found statistical significance at $P = .024$. Subjects

who favour animated television shows or films seemed to favour the cartoon character at 50.0%, the CG human at 34.4% and the real human scored the least at 15.6%. This figure changed to a more even ratio for the participants who preferred the live action medium at 36.6% for the cartoon, the CG human at 32.4% and the real human scored the least at 30.6%. The subjects who preferred a mixed medium preferred the cartoon character at 57.9%, the real human at 28.1% and the CG human scored the least at 14.0%.

A Chi-Squared crosstab test compared the character that the subjects most liked to see in the story contextualisation to whether the subject considered themselves a gamer or not. Results found no statistical significance at $P = .232$.

A Chi-Squared crosstab test comparing the character the subject most liked to see in the story contextualisation to whether the subject is in Europe or not. Results found no statistical significance at $P = .638$.

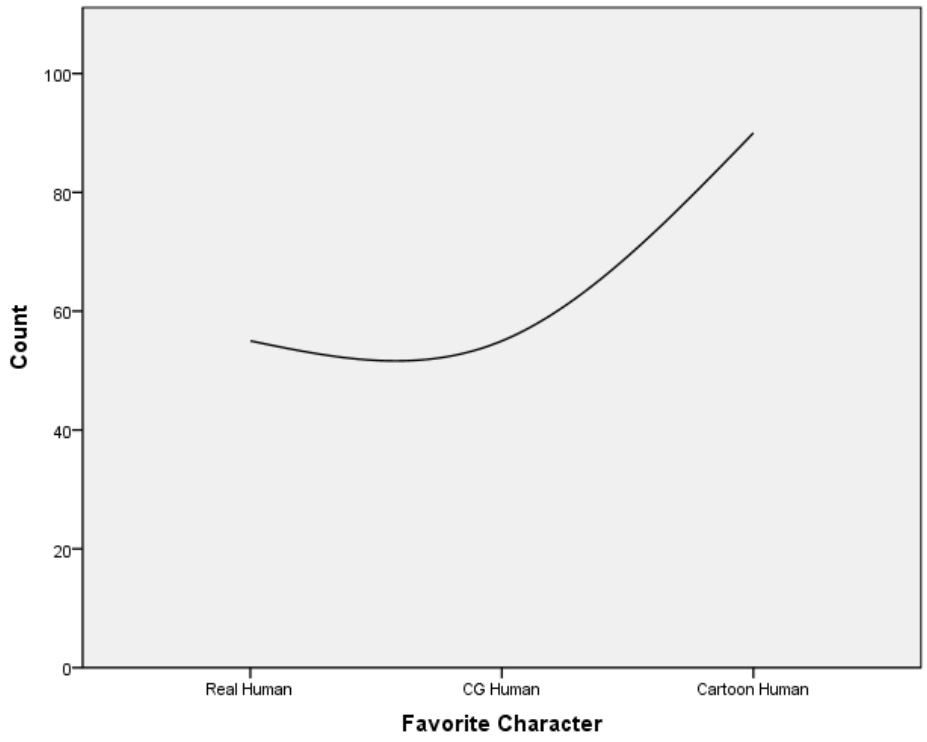


Fig 69: Like curve

Taking account of the overall results from the subject's favourite character, we can see a curve similar to Mori's (1970) uncanny valley curve begin to appear with a slight dip in response to the CG human character.

The second experiment in this study was designed to obtain as much data as possible using the model designed from the first experiment and further adapting it. The result was an experiment that consisted of two consecutive parts. This chapter discusses the second part of the experiment. Here the original design was adapted to obtain data from a population who would see two different characters. These characters were contextualised in two different narratives both considering the perceptions a subject may have on negative action committed by and to the character in question.

4.3 Summary

In the preceding section we described the approach taken to experiment 2A. This chapter described the specific elements that were developed and combined to form the apparatus as well as the stimulus for experimentation. Following the accounts of how the experiment was development we moved on to describing how the data obtained though the experiments execution was analysed. In the sections preceding we explained his analytical process we would undertake and following this was explored the data statistically. We will now summaries the data we have analysed. In comparisons tests using the Mann-Whitney statistical test we looked at character behaviour as a variable for testing. While box plot diagrams how differences in behaviour on its own does not appear to have a statistically significant effect on the perception of a character. However, we found that the CG human charter is significantly affected by changes in narrative contextualisation, when contextualised within a negative context subjects were more likely to perceived the character as 'interesting' than in a positive contextualisation were response we likely to be towards the opposite end of the scale. What becomes apparent once we look at the data together is we find when the CG human character has a mismatch between the contextualisation and the behaviour of the character we find that the character is perceived less interesting than when the contextualisation and behaviour match. To

clarify, by matching we mean that if the contextualisation was positive and the behaviour was happy we would describe this situation as the contextualisation and behaviour matching. If however, the contextualisation was negative and the behaviour remained happy then in this situation we would describe the stimulus as having a mismatch between the behaviour and contextualisation. It would also seem that the CG human character is the character most affected by this subject response to these combinations. The cartoon character was not affected when there was a mismatch between the contextualisation and behaviour variables. This would lead one to surmise that certain characters are affected differently when the stimulus is adapted in the same way.

The human character which was expected to score highly in terms of interest scored lower than the other character a number of times. This was unexpected due to previous research leading us to believe the more human a character is the more appealing/interesting it would be perceived, this is discussed previously in this thesis. The real human characters negative perception became statistically different when characters were compared in both negative contextualisation and behaviours. This provides an interesting comparison to the favourite character picked comparisons where we see the subject picking the character they most liked to see as first the cartoon character and then the real human.

Using Chi-Squared crosstab analysis on the preferred character image once again found no gender differences in the perceptions of the characters by the subjects. The analysis also found that those with affinity to live action would be more accepting of other forms of character other than live action when compared to fans of animated mediums that would be more likely to pick the cartoon character over any other. This section provides a brief description of the data as it was analysed. In the following chapter we will further discuss the findings of experiment 2A and explain implications of the results. Prior to this discussion we will describe the second part of the experiment that took place. We will then explore and analyse the data in a similar approach to how we have done here. Following this we will again briefly summarise the data and approach a final discussion of the entire data set created, encapsulating the entire study.

4.5 Experiment 2B

Experiment 2B was conducted at the same time as experiment 2A which was discussed previously in this chapter. Both experiments feature the same sample and are considered two separate parts of the same experiment. Both parts of the experiment have different sets of characters, behaviours and contextualisation involved. While experiment 2A demonstrated a different approach to stimulus that evolved from the interpretation of the data obtained from the first experiment in this study which was discussed in the previous chapter, experiment 2B stays closer to the apparatus that was developed previously for use in experiment 1. Experiment 2B while it may present the stimulus in a similar manner as the first experiment undertaken as part of this study has key differences in how the subject is questioned and perceptions measured. While both the first experiment and experiment 2A both pertain to the semantics of interest. Experiment 2B approaches the study to simply detect whether a subject perceives two characters differently even if they are presented doing the same actions or having the same action committed upon them. While previous experiments opted for a subtle approach which allowed for variables such as contextualisation and behaviour to be controlled and measured, experiment 2B does not cater for this level of control. However, unlike experiment 2A independent variables relating to the sample can be contrasted against data obtained through the experiment. This feature is similar to the first experiment however, this time the entire sample is used.

In this section we will describe the adaption of experiment 1's method to form the apparatus involved with the creation of experiment 2B. Experiment 2B uses different character than that of experiment 2A and even the first experiment described previously in this thesis. The character set used within experiment 2B features a heavily anthropomorphised dog character which created by the researcher and a realistic human character created with the use of the software by N-Sided called Quidam Studio. While the human model used within this experiment is not modelled by the researcher the model is adjusted with the controls of the software it originates to conform to a disable aesthetic based on the standards needed for this study. The anthropomorphic character is however created by the researcher involved with this study. While experiment 2A opted to neutralise colours as to better match

each of the characters as so not to let colour become a factor is generating appeal/interest from the subject, experiment 2B instead used saturated colours in the stimulus created on both characters. Each character as well as the contextualisation backgrounds involved are highly saturated and provide a contrast when compared to the stimulus of experiment 2A. The stimulus provided the characters within two different contexts. In the first the subject would see each character calmly reading a book to be disturbed by an ant. The character would then crush the ant and continue reading. The subject after seeing both characters perform the same action would be asked what their perception of the character in the sequence was in terms of the actions the character had taken. This question aims to discern the empathetic relationship between the subject and the character. The second stimulus sets further the same characters, however this time they are seen outside a shop front. The character then crosses the road only to be tragically hit by a speeding van. The subject is asked to describe their feelings in regard to the sequence. As with both stimuli sets the subject is presented with a likart scale to assess the sequence in terms of their emotional response. Follow their rating they are then invited to give a comment in regard to each part. These parts being the characters presented as ant killers or the characters themselves being hurt. In the following sections we will describe the particular procedures undertaken in the creation of this experiment. The reminder of this chapter is following a similar format to that describing and detailing the approach and data of experiment 2A. We begin by describing how the experimental design is adapted for this experiment.

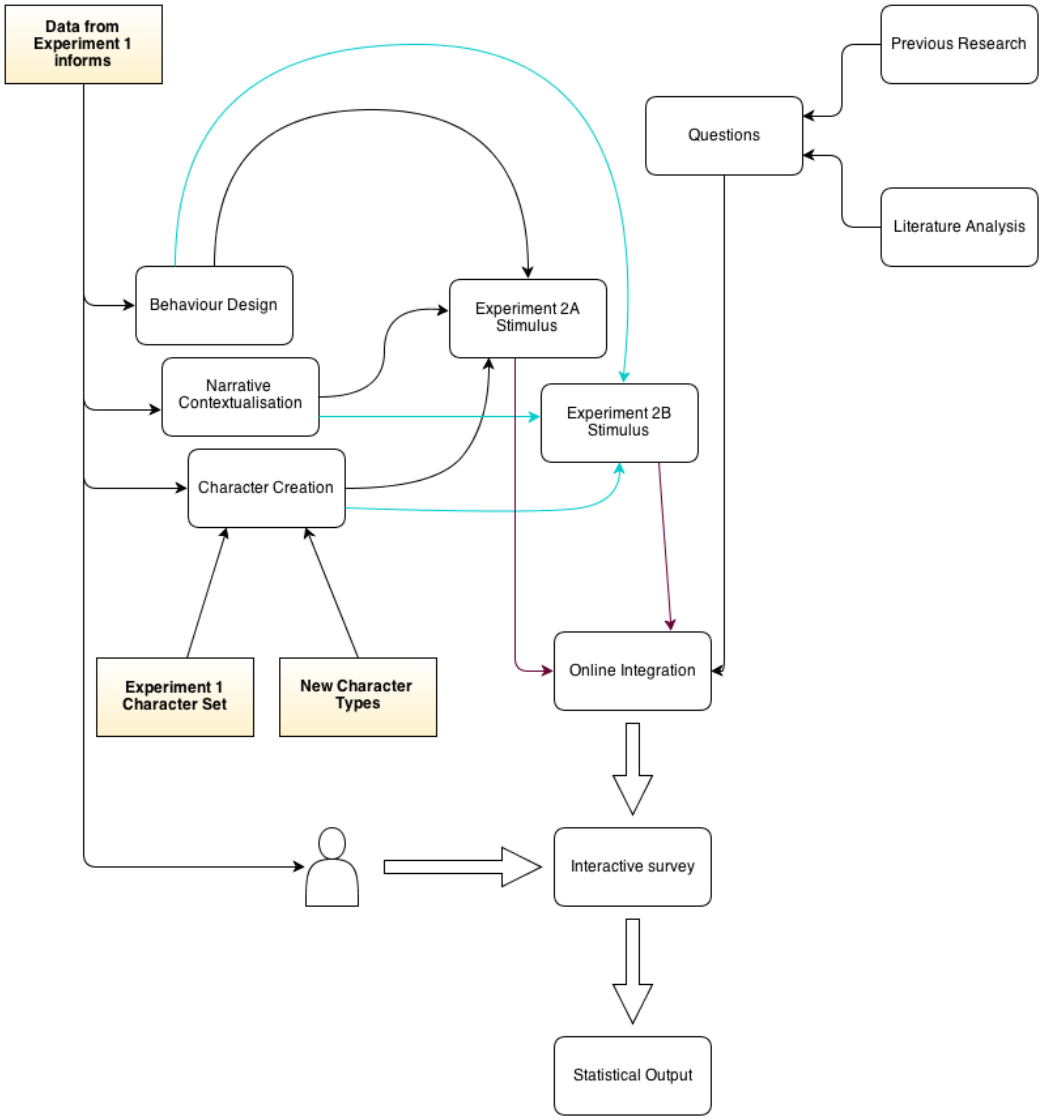


Fig 70: Experiment 2B diagram

4.5.1 Materials and Procedures: Experimental Design

Experiment 2B shares the same initial experimental design procedures as experiment 2A. Both parts of the experiment were run as one joint experiment to gather data from the same sample. In this section we will describe the elements of the experiment relating to experiment 2B. Where experiment 2B greatly differs from experiment 2A and also the initial experiment of this study is the character selection and the integration of said characters. While both previous discussion of the experimentation involved with this study related to contrasts of characters in various levels of abstraction as in the first experiment or various levels of human realism as

in experiment 2A, this experiment contrasts a human proportioned character against and anthropomorphic character type. While in the first experiment certain characters we anthropomorphised such as the object based character, this experiment takes a more obvious approach to anthropomorphism by using an animal type character. Animation itself has one prevailing character type that is seen countless times in the various animated projects that have been created since early cinema to modern cinema and television it is the anthropomorphised character type. Indeed one of the first animated superstars was an anthropomorphised cat called Felix (Crafton, 1982). This part of the experiment utilised both a human and anthropomorphised character types and aims to measure the subjects perceptions based on the actions committed by or to the characters. In the following section we will further discuss the contextualisation's that the characters are placed within.

Prior to exploring the data obtained from this experiment we will look at the actual stimulus used within this experiment. In comparisons made between this stimulus and that of the first experiment that took place as part of this study one can see that both experiments have a similar approach. In this experiment as one can see in the examples the character depictions as well as the layout of the panels are constructed to match one another. Colour saturations as well as posing of the characters have also been conducted to match one another to provide the experiment with results obtained from this stimulus with a fair and unbiased approach. The stimulus is integrated into this experiment in the same manner as the stimulus was integrated within experiment 1. In the following section we will describe the context used within each set of stimulus and discuss the questions involved within this experiment as well as how the subject interacts with the experiment.

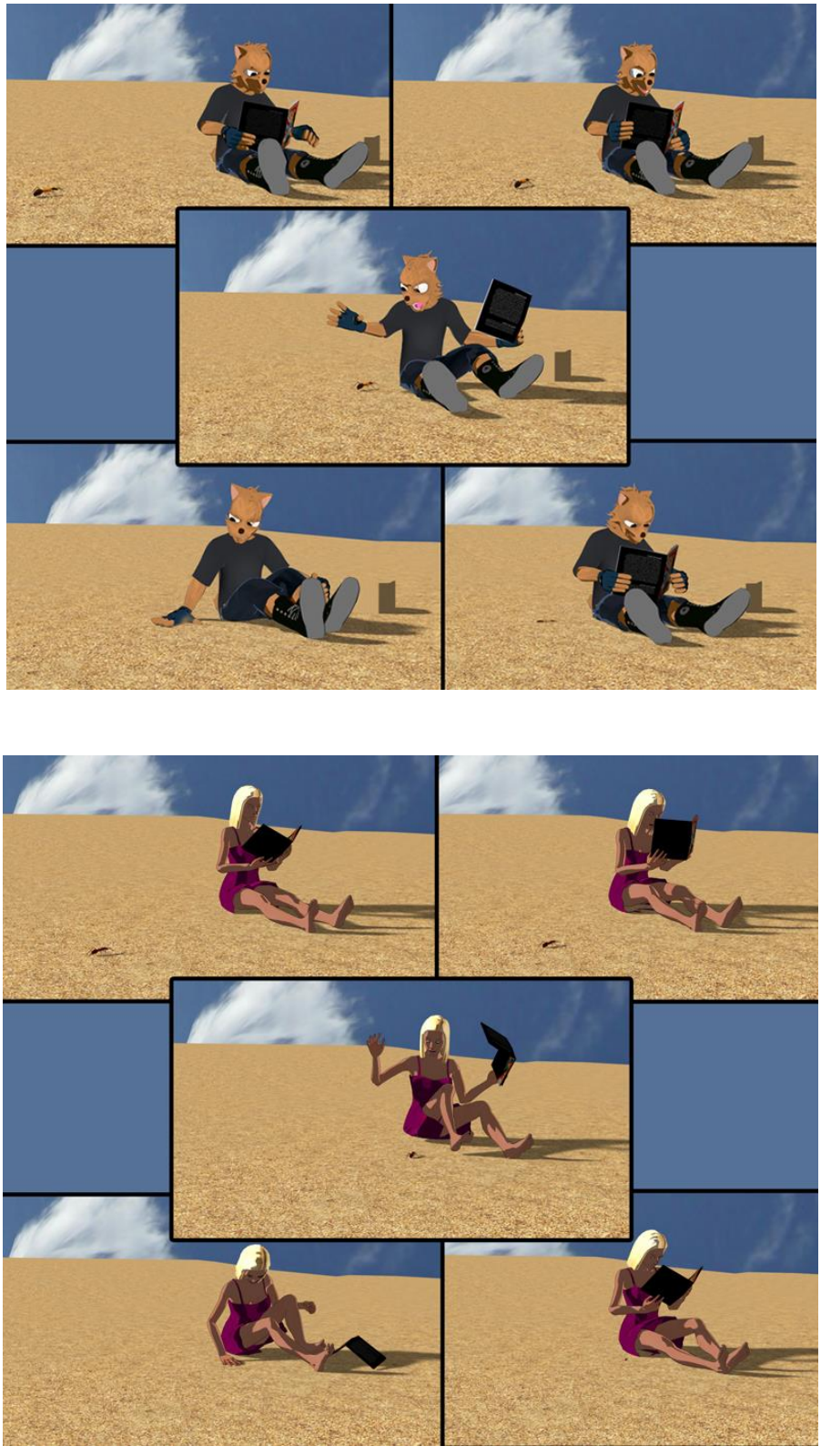
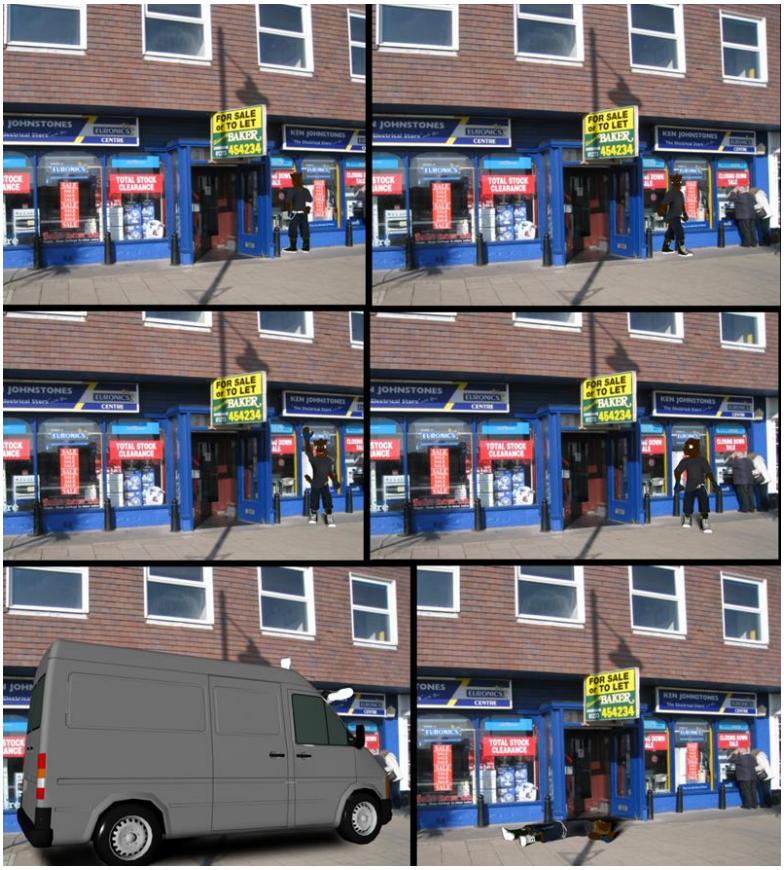


Fig 71: Experiment 2B stimulus set one



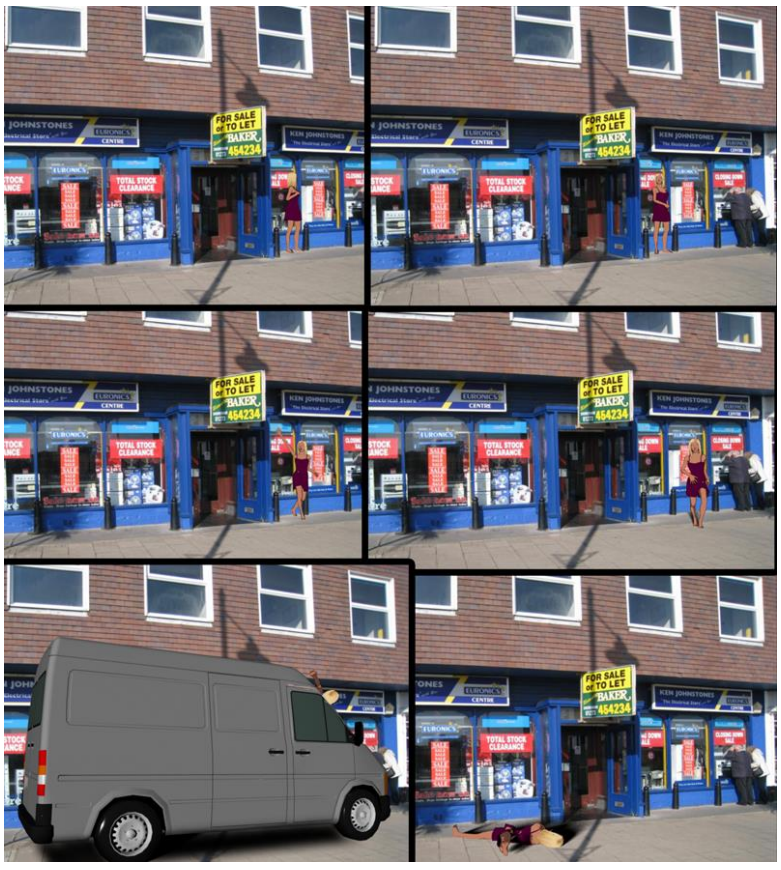


Fig 72: Experiment 2B stimulus set two

4.5.2 Materials and Procedures: Context

Experiment 2B features two separate contextual depictions of the characters. Each contextualisation measures the same features inversely of one another. The first contextualisation as we have previously mentioned features the character reading then cruelly killing an insect. The subject is asked how they feel in regard to the sequence they have just seen. Give a scale choice ranging from how much they agreed with the actions taken by the character or how much they disagreed with the actions. In this experiment we try to establish an empathetic relationship between the subject and the character being depicted within the stimulus. The contextualisation of the characters here provides strong examples of characterisations with the goal to ascertain whether different character are indeed perceived differently even when they perform the same actions. Whilst the first part of the experiment. Experiment 2A tested sad or happy behaviours and negative or positive contextualisation. Experiment 2B measures how the same portrayal of different characters affects the perception of said character by the subject. The first sequence measured if the subject found the actions of one character more despicable than the other. Whilst, the second measured the effects of a despicable act committed upon the character. The sequence was presented to the subject in the same manner as it was in the first experiment where both characters were seen preforming the same action. In this case the action was of the character sitting reading and then being disturbed by a small creature. The character then causally crushed the creature and continued to read. As with the first experiment the subject was once again asked how they felt in regard to the characters actions. They were given a ten point likert scale to state their response. The question asked of for the first sequence was:

How do you feel in regard to the actions taken by the character?

This question measured the level of empathy the subject felt towards the character in the sequence. The more pleased the subject was with the actions taken by the character to crush the ant, the more they related or empathised with the character. As both sequences and postures of each character were the same, the only thing that changed was the realism of the character.

The second contextualisation that the subject sees the characters being depicted within involves each character being tragically struck by a speeding van. The subject is asked how they feel once again in regard to the sequence they have seen. Once again the subject is presented with a range this time form sad to happy. As with the previously contextualisation, we attempted to establish an empathetic relationship between the subject and the character they are seeing. In this case we attempt to discern whether or not the subject will feel differently in regards to a negative action being committed upon either an anthropomorphic character or a realistically proportioned human character. In the second sequence, the subjects were exposed to both characters from the first sequence being involved in an accident. The subjects were asked:

How do you feel in regard to what happened to the character?

This question measured how negatively affected the subject was with regard to what they had seen. The lower the happy rating the subject gave, the more they empathised with the character. In this part of the experiment comments by the subject we also permitted once the subject had seen each contextual set. Actual stimulus used within this experiment is included later in this chapter.

In a note regarding the sample involved with this experiment it should be stated that experiment 2B uses the same participants as experiment 2A as both experiments were conducted at the same time as part of a larger experiment. To clarify how these experiments worked together the process the subject had to participate as part of this experiment will be described. Once the participant had entered their data they begin experiment 2A which we have discussed previously in this chapter and upon the completion of the experiment they then begin experiment 2B which we are now discussing in this section. As both parts of the experiment are conducted concurrently, discussion relating to the participants of this part of the experiment is the same as previously described in the discussion relating to experiment 2A. That said we will now move on to a discussion relating to the character types used within this part of the experiment.

4.5.3 Materials and Procedures: Characters

While the first part of experiment two made substantial changes to the experimental design, the second part retained most of the model used in the first experiment. However, the model was adapted to fit two different character types rather than five. The subjects took part in this part of the experiment directly after completing the first part as discussed in the previous chapter.

The video based experiment isolated the key factors being measured. Perception differences to character, story contextualisation and behaviour were tested giving each subject two video sequences to scrutinise. This design was used to stop the subject having to watch all twelve videos and thus negatively influencing the data as they would most probably start randomly to click the answers to get through to the end. In this case, two completely unique stories and characters were used. All those participating in the first half of the experiment took part in this part of the experiment as well. Two hundred subjects aged between twenty to thirty years old participated in this experiment. The sample consisted of one hundred and nine male subjects and ninety one female subjects. As previously stated subjects were obtained from social media sites. Unlike the first part of the experiment, where the sample had to be divided due to the randomisation of stimulus, this part of the experiment used the entire sample for the two questions it consisted of.

The experiment consisted of two different characters, one was an anthropomorphic dog and the other a human woman. The experiment was divided into two parts. In the first part, participants had to view both characters reading a book only to be disturbed by a friendly ant. The character would then kill the ant and continue to read the book. The second sequence involved the same characters carelessly crossing a road to be unfortunately struck by a speeding van. Subjects are then asked how they feel about with regard to the sequences from very sad to very happy. The second sub-experiment consisted of the same two characters. However, this time they themselves are fatally injured while crossing the street. Subjects are then asked how they feel about it with regard to the sequences from very sad to very happy. Using an anthropomorphic character, it seemingly encompasses what characters such as the abstract blob, cartoon and object character represent, albeit in

a simplistic form. A character that is both non-human and human at the same time is ambiguous. This ambiguousness forces the subject to interpret the character differently.

> *All the anthropomorphous figures in the early cartoons revel in this uncertainty without giving us time to think about their oddity, instead making our eyes race to keep up with their frantic fighting, dancing, or music-making. They seem to be animal, human, and machine at once, and at will (Rollin, 2008).*

The first part of this experiment discussed the importance if de-saturating the colours to supersede a limitation from the first experiment where the different colour saturation of characters may have affected the subject's empathy. The problem was caused due to cartoon shaders often appearing overly colourful due to their nature. The first part of this experiment de-saturated the colours of each character until they uniformly matched on another. Unfortunately this made the overall image dull. This part of the experiment used rich saturated colours for both characters giving a uniformly matching and a bright vibrant image.

4.5.3 Materials and Procedures: Summary

In this section we have described the approach taken towards experiment 2B. We began by first describing the experiment; this description detailed the similarities and differences to the initial experiment conducted as part of this study. This section explained how this experiment relates to experiment 2A and what the differences between these two parts are. We explain how experiments 2A and 2B are run concurrently and how the independent variables relating to the subject while not an integral part of experiment 2A are focused upon here in experiment 2B. Following this description of the experiment we move on to describing key elements that form the apparatus used for the execution of the experiment. In this section we exemplify and discuss the actual stimulus used as well as how the stimulus is integrated within the structure of the experiment being described within this Chapter. Following this we further discuss the contextualisation used within this experiment and detail the questioning behind each set. This section describes what this experiment aims to

assess and more over why the approach was adapted in such a way to cater for this. We move on to state that the experiment described in here uses the same sample as used in experiment 2A as both these experiments were conducted as two parts of one experiment. The differences being that while data obtained from experiment 2A could only take on sections of the sample due to reasons discussed previously in this Chapter, data obtained from this part of the experiment explores the entire composed sample as well as taking on independent variables relating to the subjects within the sample. Following this section we further discuss the character types involved within this experiment we detail the importance of each and we further discuss how the characters are presented. Now that the experiments apparatus has been effectively described we move on to explaining the statistical analysis process involved. In the following sections we detail how data obtained from this study is to be presented within this chapter.

4.6 Statistical Analysis

The approach towards the statistical analysis involved within this experiment is approached in the same manner as it was in the first experiment conducted as part of this study. Once again a reaped measure analysis is conducted using independent variables obtained from the sample and contrasted the data with the results obtained from the stimulus that the subject saw. As with the previous experiments box plot diagrams will be presented to visualise the data. While the experiment 2A did not focus on the individual variables obtained from the sample itself, this experiment takes them as a priority as to discerns how they may relate to the perception of a certain character type.

4.6.1 Data

As with descriptions of previous experiment's the data in this Chapter is presented statistically. We compare each independent variable that is being tested in relation to the subject's perception of the stimulus. What follows is the data analysis related to both stimulus sets. The analysis is conducted in the same manner for each variable. The independent variables used for comparisons are as follows. Gender

comparisons; compare the perceptions of the female and male populations of the sample to their perceptions of the stimulus involved with the experiment. This is followed by nationality comparisons which separated the sample into two groups: these groups being European and non-European. This is followed by gamer comparisons, gamer comparisons divides the sample once again into two different groups. These groups consisted of those who consider themselves active patrons of video gaming and those who do not. This next comparison is based on the subject's media preference. Unlike the separations previously discussed, this variable has three different options: live action, animation, or a mixed media option, as such the graphs used to describe this data represent this by having three corresponding bars. Following this we divide the sample into three groups once again based on their preferred character from experiment 2A. As with the previous variable, graphs reflect this with three bars rather than two. Following the comparative analysis, we conducted paired sample t-test to test for significance with the main effect of the stimulus. When we have fully analysed the data we will briefly summarise the findings and lead into the discussion Chapter which further discusses the findings of the entire experiment.

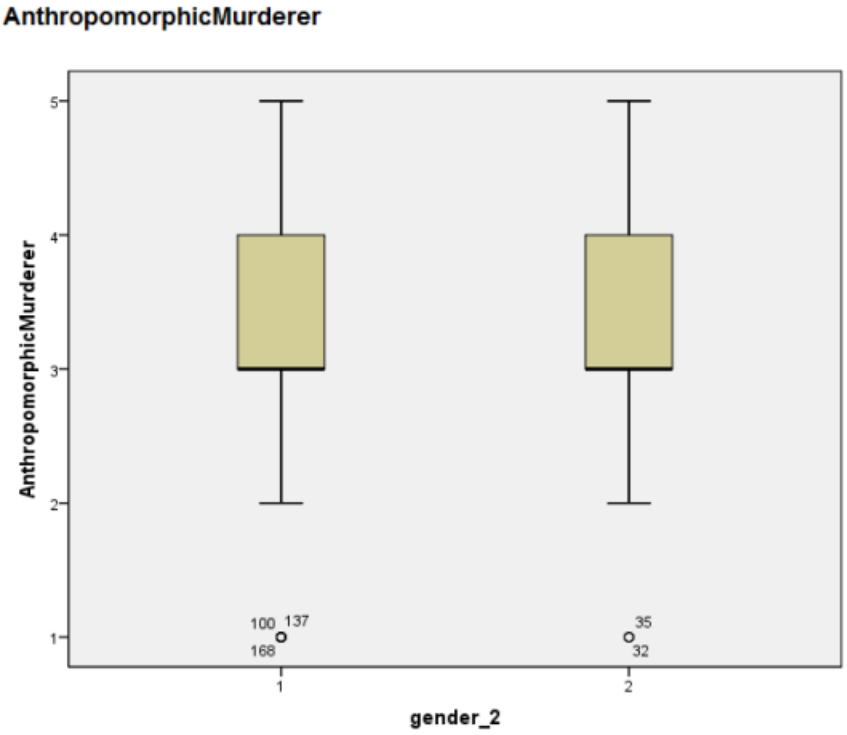
4.6.2 Stimulus Set One

Stimulus set one depicting both characters are seen reading a book on a beach. The characters were then approached by a seemingly friendly ant. The character is surprised by the creature and then proceeded to crush the ant. The character then calmly continues to read. The data following is obtained from the subjects perceptions to the described stimulus.

4.6.2.1 Gender Comparisons

As in the first experiment, the sample was identified through several independent variables. In this case these variables were gender which separated the males from the females to draw on significant differences between males and females in the perception of these two characters. Nationality was also used as an independent variable which separated European subjects from non-European subjects. Gamers were separated from non-gamers and the participant's preferred character from the

first part of this experiment was also used to identify any significant relationships. Data collected on the effect of **gender** on **empathetic relationship with the subject** with the murderous character types was analysed. Results found that the subjects were more pleased with the actions taken by the anthropomorphic character rather than the CG human character. However there was no clear difference between the genders.



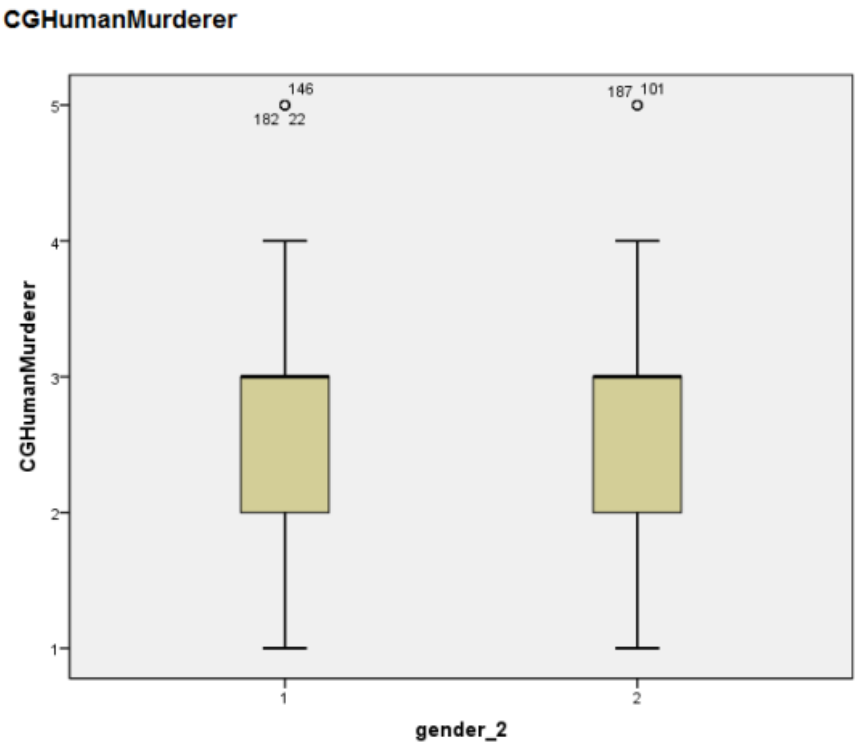


Fig 73: Gender comparisons

General Linear Model tests were conducted on the effect of **gender** on **empathy** with the murderous character types. Sphericity was not an issue for the data as there were less than three conditions to analyse. The data therefore met perfect sphericity. Tests of Within-Subject Effects found a significant main effect at the p<0.5 level of significance at $F\ (1{,}198) = 57.801, p = 0.001$. Tests of Within-Subject Contrasts found a significant linear trend for the main effect of **empathy** at the p<0.5 level of significance at $F(1{,}198) = 57.799, p = 0.001$ and non-significant linear trend for the effect of **empathy * gender** at $F(1{,}198) = .211, p = .606$. There was non-significant effect of **gender** Between-Subject Effects at the p<.05 level of significance at $F(1{,}198) = .037, p = .854$. Results indicated that there was no significant difference between how the different genders within the sample perceived the actions of either character. However, there was a highly significant effect with how the overall sample perceived the characters actions. Both genders male and female were more pleased with the action taken by the anthropomorphic character rather than the human.

4.6.2.2 Nationality Comparisons

Data collected on whether the subject was **European or not** against the **empathetic relationship between the subject** and the murderous character types was analysed. Results found that the subjects were more pleased with the actions taken by the anthropomorphic character rather than the CG human character. However there was no clear difference between the nationalities.

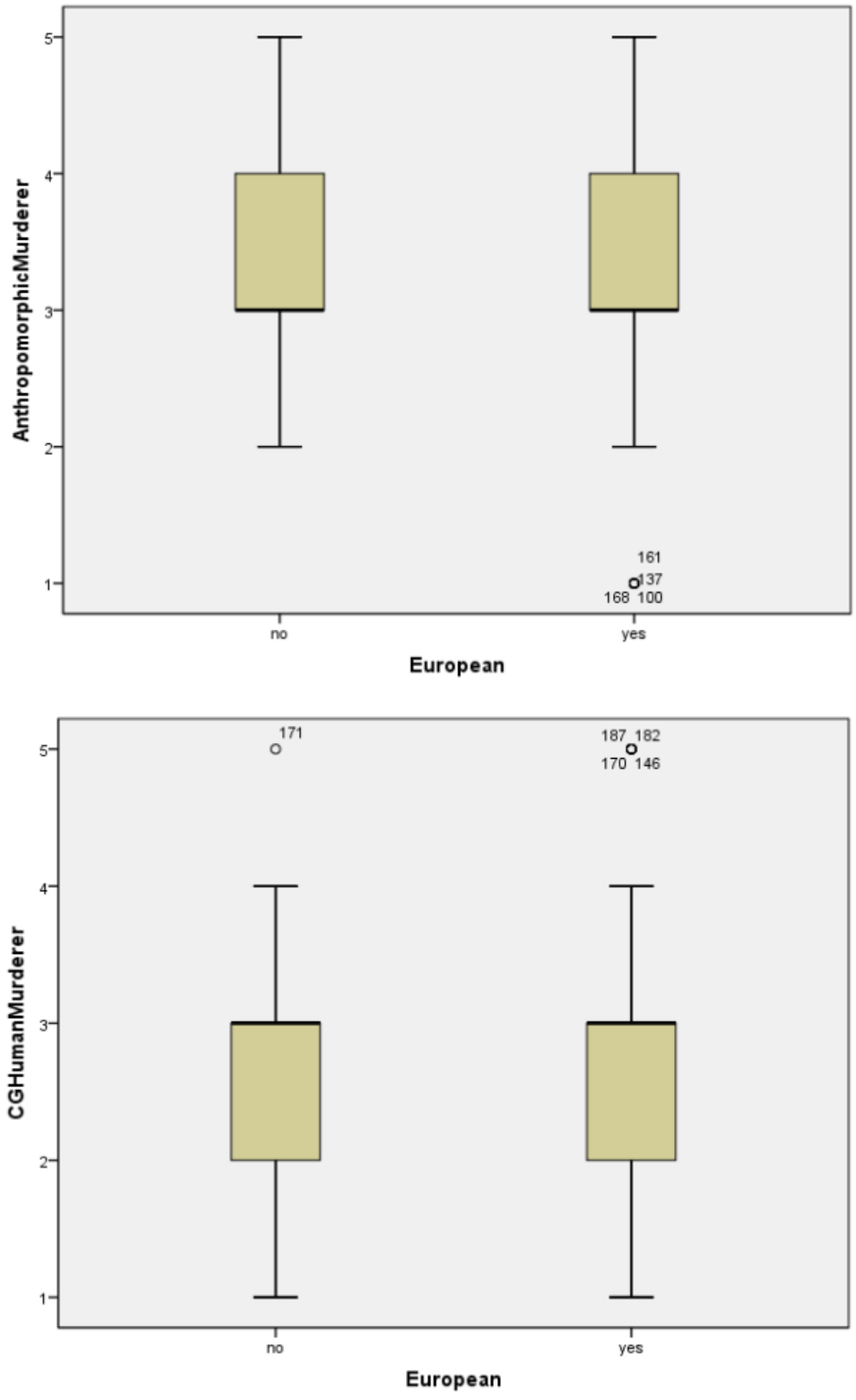


Fig 74: Nationality comparisons

General Linear Model tests conducted on the effect of **European or not** on **empathy** with the murderous character types. Sphericity was not an issue for the data as there were less than three conditions to test. The data therefore met perfect

sphericity. Tests of Within-Subject Effects found a significant main effect at the p<0.5 level of significance at $F(1,198) = 68.772,\ p = 0.001$. Tests of Within-Subject Contrasts found a significant linear trend for the main effect of **empathy** at the p<0.5 level of significance at $F(1,198) = 68.772, p = 0.001$ and a significant linear trend for the effect of **empathy * European or not** at $F(1,198) = 9.057, p = .003$. There was non-significant effect of **European or not** Between-Subject Effects at the p<.05 level of significance at $F(1,198) = .001, p = .984$.

4.6.2.3 Gamer Comparisons

Data collected on the effect of **gamer** on **empathetic relationship with the subject** and the murderous character types was analysed. Results found the subjects were more pleased with the actions taken by the anthropomorphic character rather than the CG human character. However, there was no clear difference between the groups.

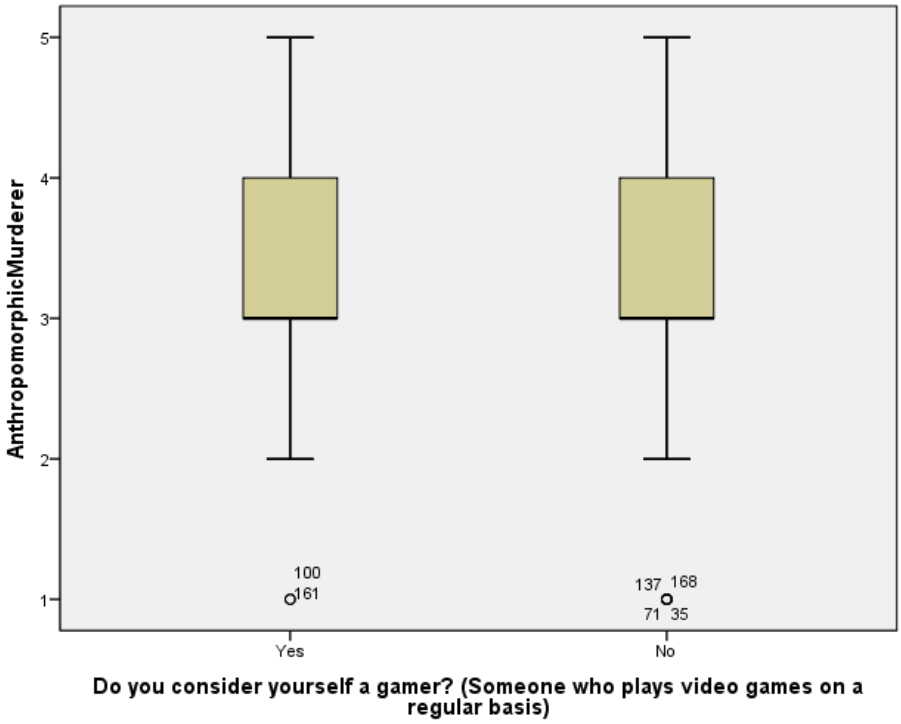


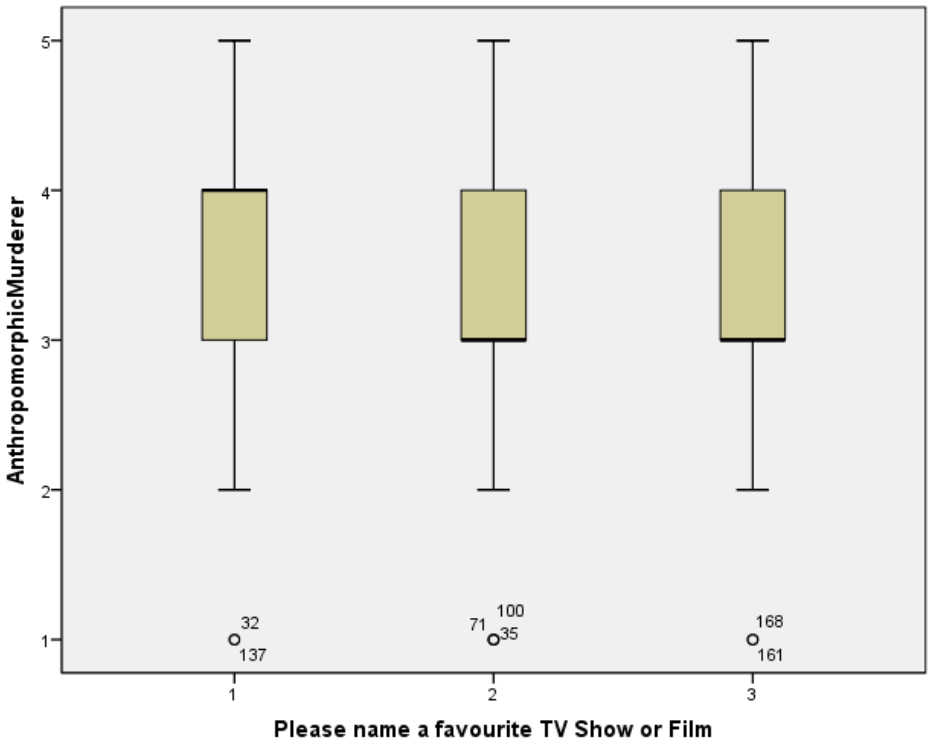
Fig 75: Gamer comparisons

General Linear Model tests were conducted on the effect of whether the subject was a **gamer** or not on **empathy** with the murderous character type. Sphericity was not an issue for the data as there were less than three conditions. The data therefore met perfect sphericity. Tests of Within-Subject Effects found a significant main effect at the p<0.5 level of significance at $F(1,198) = 67.693,\ p = 0.001$. Tests of Within-Subject Contrasts found a significant linear trend for the main effect of **empathy** at the p<0.5 level of significance at $F(1,198) = 67.693, p = 0.001$ and a significant linear trend for the effect of **empathy * gamer** at $F(1,198) = 10.718,$ $p = .001$. There was a non-significant effect of **gamer** Between-Subject Effects at the p<.05 level of significance at $F(1,198) = .571, p = .451$

4.6.2.4 Media Preference Comparisons

Data was collected on the effect of the subjects **preferred filmic or televisual medium** on the **empathetic relationship with the subject** and the murderous character types was analysed. Results found that the subjects were more pleased with the actions taken by the anthropomorphic character rather than the CG human character. Subjects whose preferred medium was animation felt more pleased with

the actions of the anthropomorphic murderer at 4 (happy) than the CG human murderer 2 (unhappy). Subjects whose favourite medium was live action or mixed medium gave neutral responses to both characters actions at 3. However, in the case of the latter two groups the results were in favour of the anthropomorphic character as can be seen in the boxplots bellow.



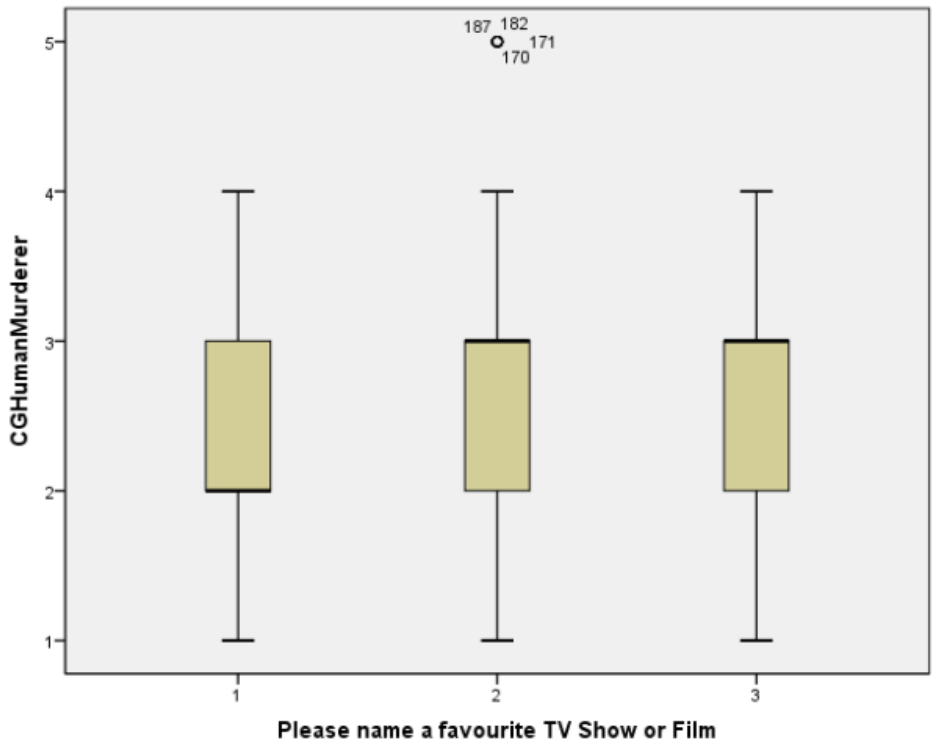


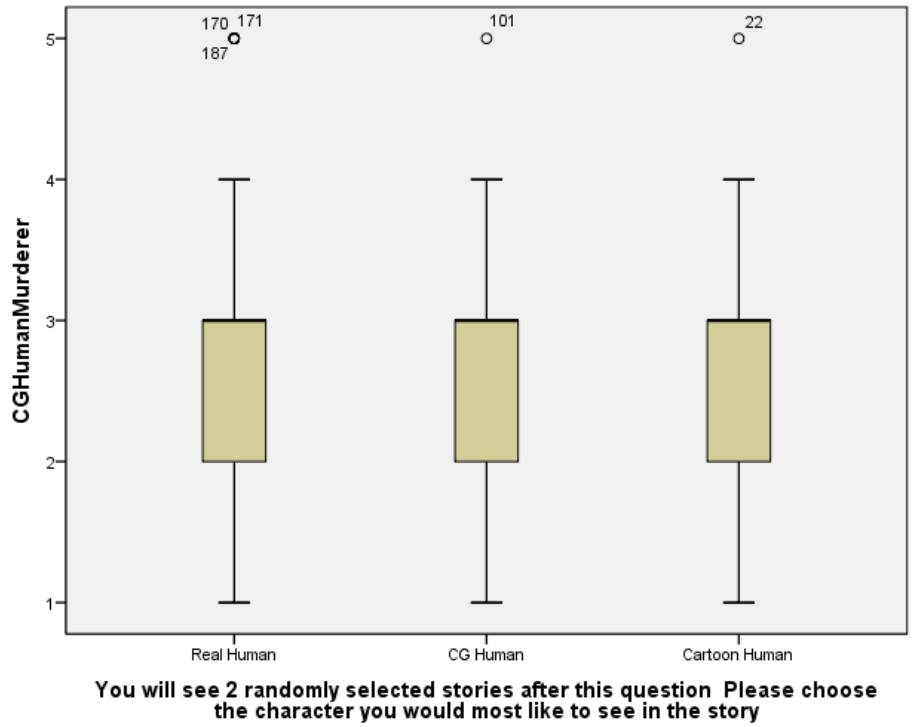
Fig 76: Favourite film or television program comparisons

General Linear Model tests were conducted on the effect of the subject **preferred filmic or televisual medium** on **empathy** with the murderous character types. Sphericity was not an issue for the data as there were less than three conditions. The data therefore met perfect sphericity. Tests of Within-Subject Effects found a significant main effect at the p<0.5 level of significance at $F(1,197) = 65.803,\ p = 0.001$. Tests of Within-Subject Contrasts found a significant linear trend for the main effect of **empathy** at the p<0.5 level of significance at $F(1,197) = 65.803, p = 0.001$ and a significant linear trend for the effect of **empathy * medium** at $F(2,197) = 10.718, p = .022$.There was non-significant effect of **medium** Between-Subject Effects at the p<.05 level of significance at $F(2,197) = .111, p = .895$.

4.6.2.5 Preferred Character Type Comparisons

Data was collected on the effect of the subjects **preferred character type** on **empathetic relationship with the subject** with the murderous character types was analysed. Results found that the subjects were more pleased with the actions taken

by the anthropomorphic character rather than the CG human character. However there was no clear difference between the groups.



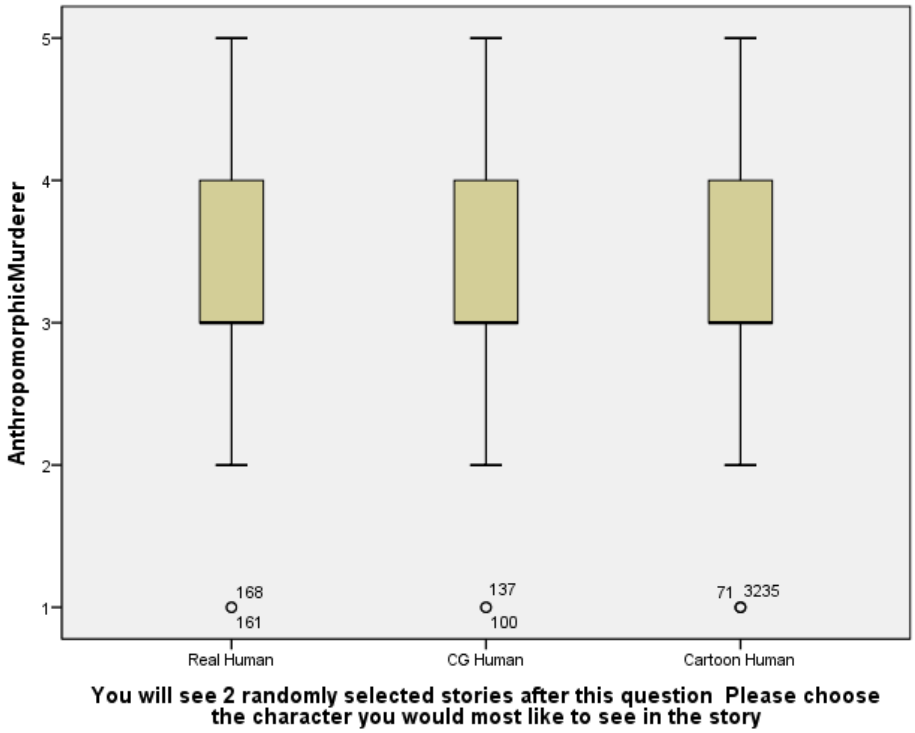


Fig 77: Character preference comparisons

General Linear Model tests were conducted on the effect of the subject **preferred character type** on **empathy** with the murderous character types. Sphericity was not

an issue for the data as there were less than three conditions. The data therefore met perfect sphericity. Tests of Within-Subject Effects found a significant main effect at the p<0.5 level of significance at $F(1,197) = 53.872,\ p = 0.001$. Tests of Within-Subject Contrasts found a significant linear trend for the main effect of **empathy** at the p<0.5 level of significance at $F(1,197) = 53.872, p = 0.001$ and a significant linear trend for the effect of **empathy * preferred character type** at $F(2,197) = .242, p = .786$. There was non-significant effect of **medium** Between-Subject Effects at the p<.05 level of significance at $F(2,197) = .002, p = .998$.

4.6.2.6 Paired Sample t-tests

Due to a highly significant main effect being found, paired sample t-tests were conducted to further examine the data. A paired-sample t-test was conducted to compare each character which were a human and an anthropomorphic character committing violent actions. There was a highly significant difference in scores of empathy between the human (M=2.64 SD=0.946) and the anthropomorphic character (M=3.32 SD=0.985); t(199)=7.601, p = 0.001.

4.6.3 Stimulus Set Two

Stimulus set two depicted the same character in a different context than in stimulus set one. In this set, each character is depicted crossing a road only to be tragically struck by a speeding van. The data following is obtained from the subjects perceptions to the described stimulus.

4.6.3.1 Gender Comparisons

Data was collected on the effect of **gender** on **empathetic relationship with the subject** and the killed character types was analysed. Results found that the subjects were more saddened by what happened to the human character than the anthropomorphic character. Female subjects seemed even sadder than the male participants.

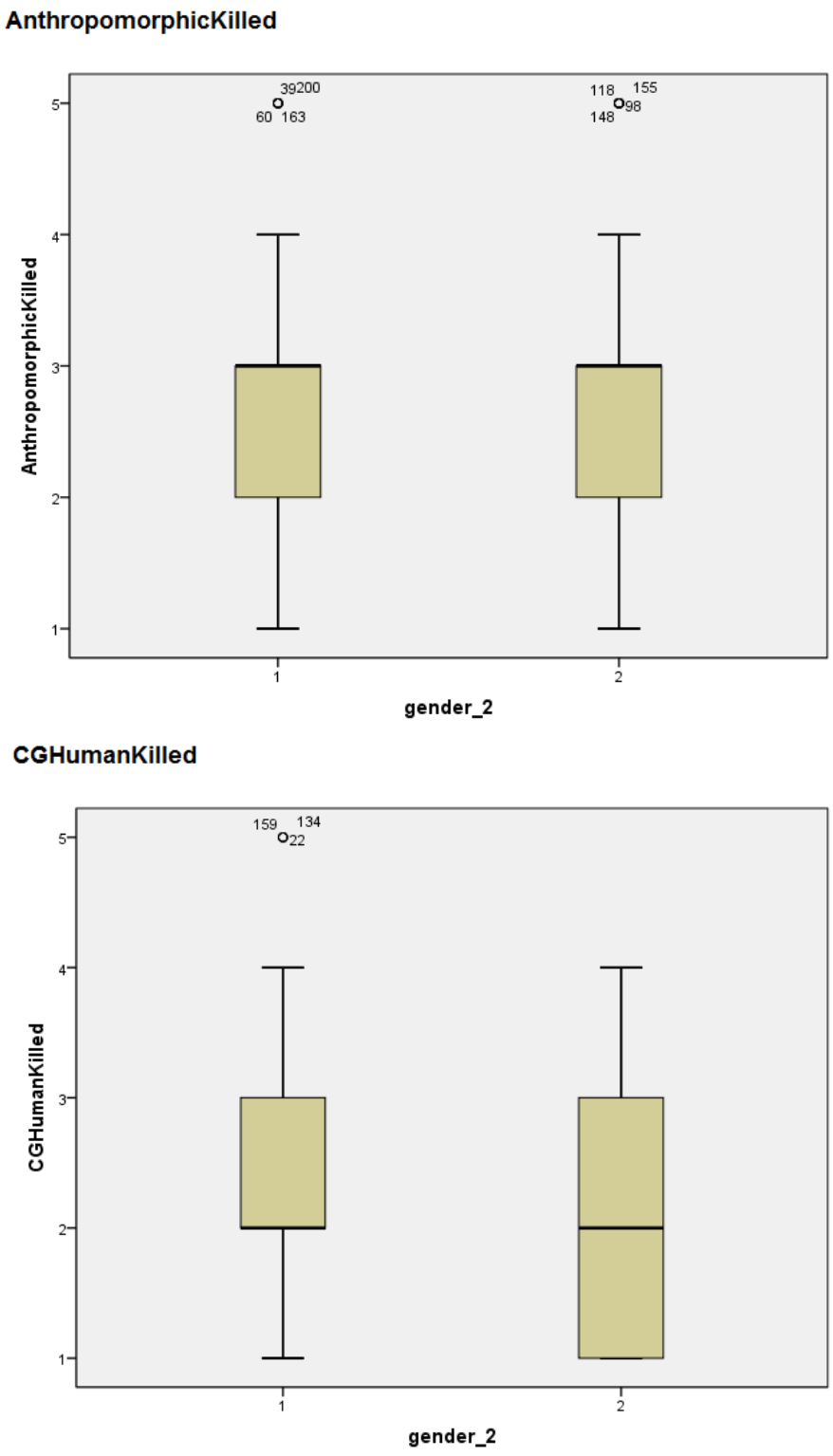


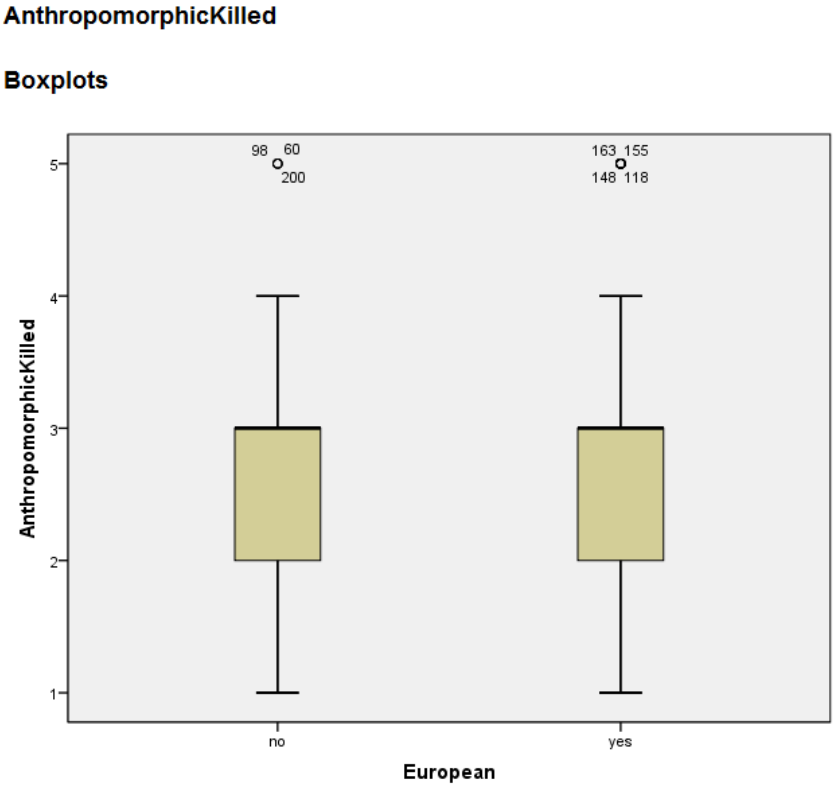
Fig 78: Gender comparisons

General Linear Model tests were conducted on the effect of **gender** on **empathy** with the killed character types. Sphericity was not an issue for the data as there were

less than three conditions. The data therefore met perfect sphericity. Tests of Within-Subject Effects found a significant main effect at the p<0.5 level of significance at $F(1,198) = 57.799,\ p = 0.001$. Tests of Within-Subject Contrasts found a significant linear trend with the main effect of **empathy** at the p<0.5 level of significance at $F(1,198) = 57.799, p = 0.001$ and non-significant linear trend on the effect of **empathy * gender** at $F(1,198) = .267, p = .606$. There was non-significant effect of **gender** Between-Subject Effects at the p<.05 level of significance at $F(1,198) = .034, p = .854$

4.6.3.2 Nationality Comparisons

Data collected on whether or the subject was **European or not** against the **empathetic relationship with the participant** with the killed character types was analysed. Results found that the subjects were more saddened by what happened to the human character than the anthropomorphic character. Non Europeans were more negatively affected by the human stimulus than Europeans.



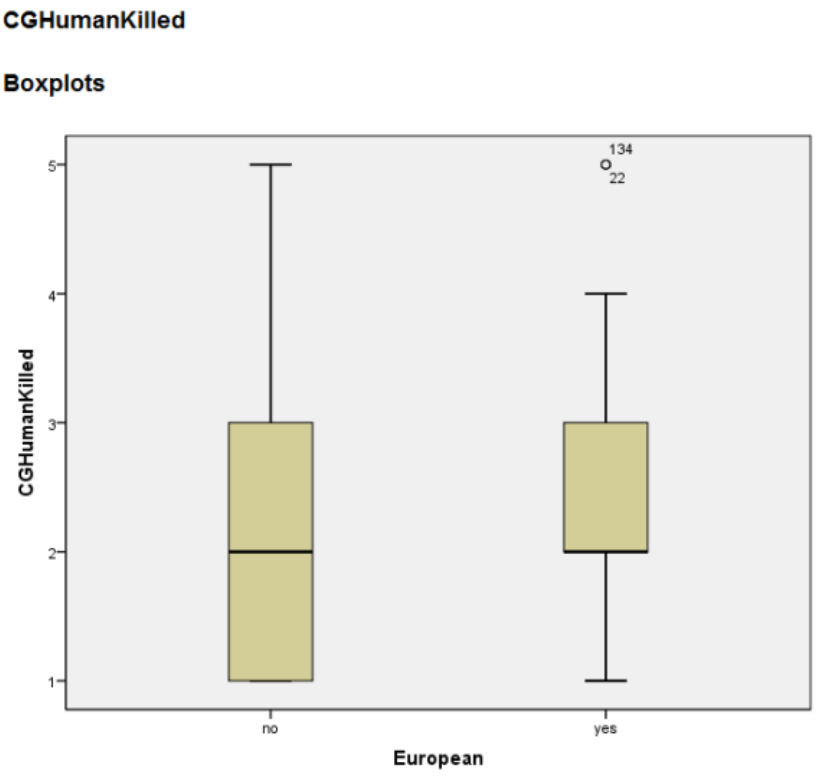


Fig 79: Nationality comparisons

General Linear Model tests were conducted on the effect of **nationality** on **empathy** with the killed character types. Sphericity was not an issue for the data as there were less than three conditions. The data therefore met perfect sphericity. Tests of Within-Subject Effects found a significant main effect at the p<0.5 level of significance at $F(1,198) = 68.772,\ p = 0.001$. Tests of Within-Subject Contrasts found a significant linear trend with main effect of **empathy** at the p<0.5 level of significance at $F(1,198) = 68.772, p = 0.001$ and a significant linear trend with the effect of **empathy * nationality** at $F(1,198) = 9.057, p = .003$. There was non-significant effect of **nationality** Between-Subject Effects at the p<.05 level of significance at $F(1,198) = .034, p = .984$.

4.6.3.3 Gamer Comparisons

Data was collected on whether or the subject was a **gamer or not** against the **empathetic relationship with the subject** and the killed character types was analysed. Results found the subjects were more saddened by what happened to the

human character than the anthropomorphic character. Gamers were more negatively affected by the human stimulus than non-gamers.

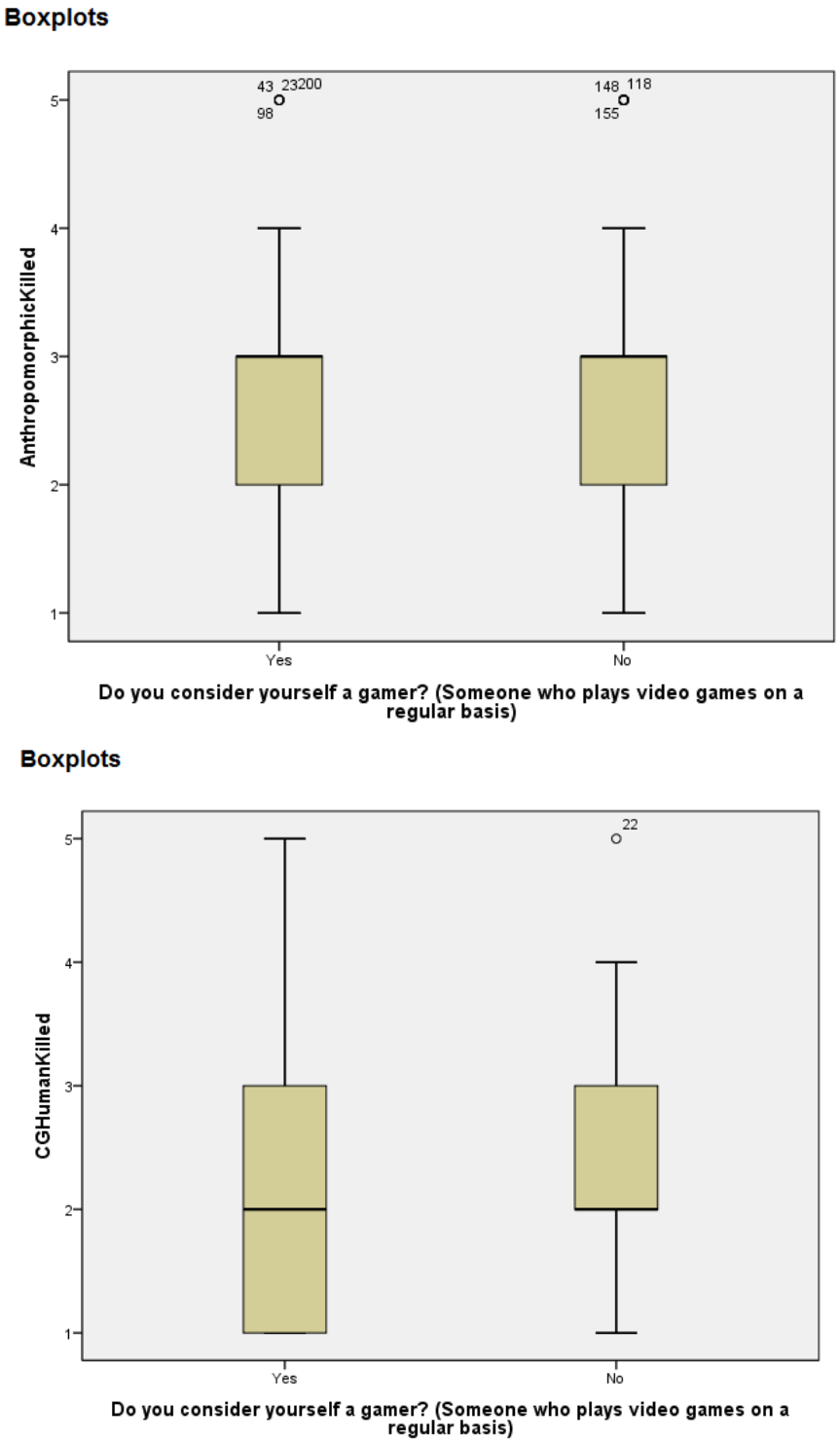


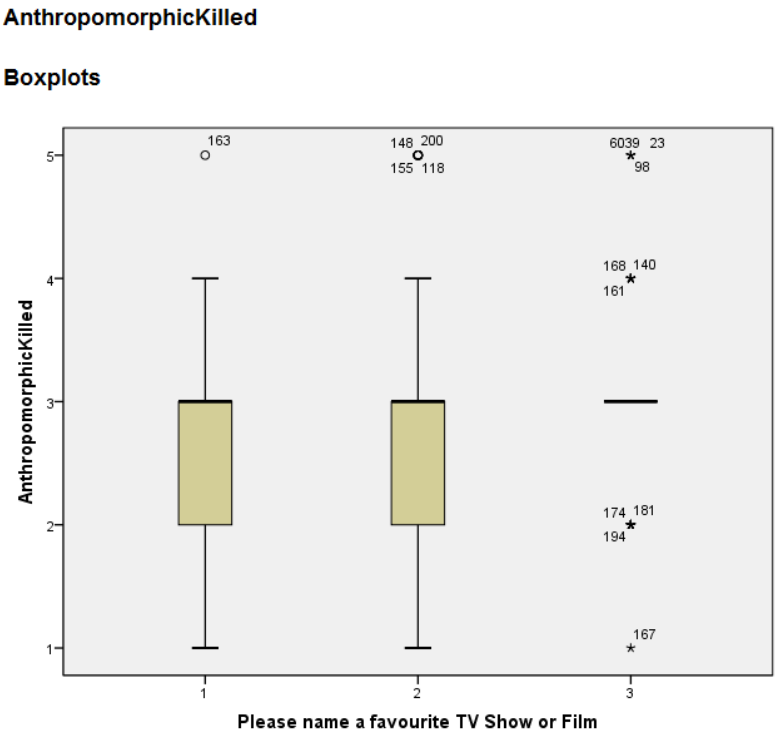
Fig 80: Gamer comparisons

General Linear Model tests were conducted on the effect of **gamer** on **empathy** with the killed character types. Sphericity was not an issue for the data as there were less than three conditions. The data therefore met perfect sphericity. Tests of Within-

Subject Effects found a significant main effect at the p<0.5 level of significance at $F(1,198) = 67.693,\ p = 0.001$. Tests of Within-Subject Contrasts found a significant linear trend with the main effect of **empathy** at the p<0.5 level of significance at $F(1,198) = 67.693, p = .001$ and a significant linear trend with effect of **empathy * gamer** at $F(1,198) = 10.718, p = .001$. There was non-significant effect of **gamer** Between-Subject Effects at the p<.05 level of significance at $F(1,198) = .571, p = .451$

4.6.3.4 Media Preference Comparisons

Data was collected on the effect of the subject **preferred filmic or televisual medium** on the **empathetic relationship with the subject** and the killed character types was analysed. Results found that the subjects were more saddened by what happened to the human character than the anthropomorphic character. However there was an unclear separation between the groups.



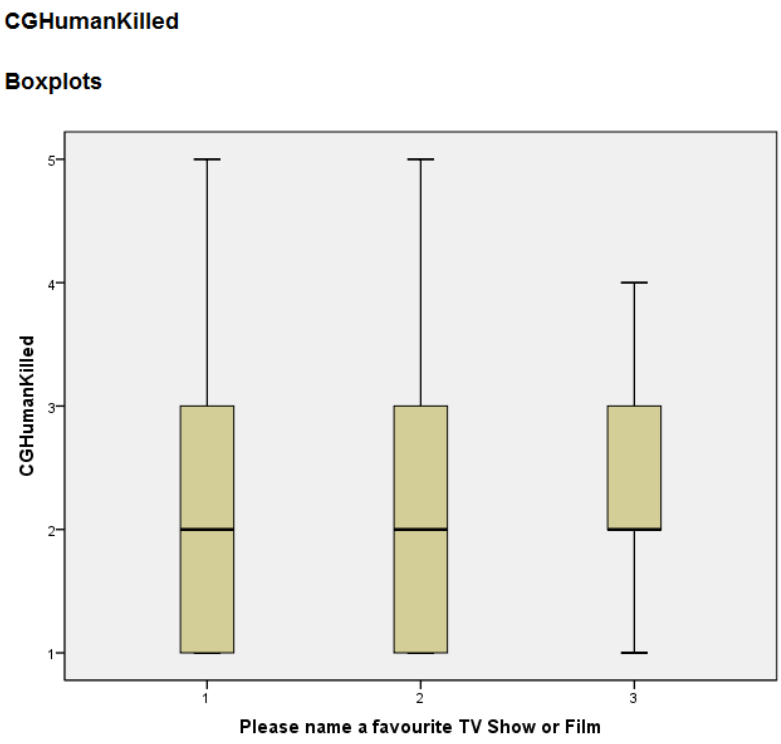


Fig 81: Favourite film or television program comparisons

Sphericity was not an issue for the data as there were less than three conditions. The data therefore met perfect sphericity. Tests of Within-Subject Effects found a significant main effect at the p<0.5 level of significance at $F(1,197) = 65.803,\ p = 0.001$. Tests of Within-Subject Contrasts found a significant linear trend with the main effect of **empathy** at the p<0.5 level of significance at $F(1,197) = 65.803, p = .001$ and a significant linear trend with the effect of **empathy * medium** at $F(1,197) = 3.879, p = .001$. There was non-significant effect of **medium** Between-Subject Effects at the p<.05 level of significance at $F(1,198) = .111, p = .895$

4.6.3.5 Preferred Character Type Comparisons

Data was collected on the effect of **the subjects preferred character type** on **empathy** with the killed character types.

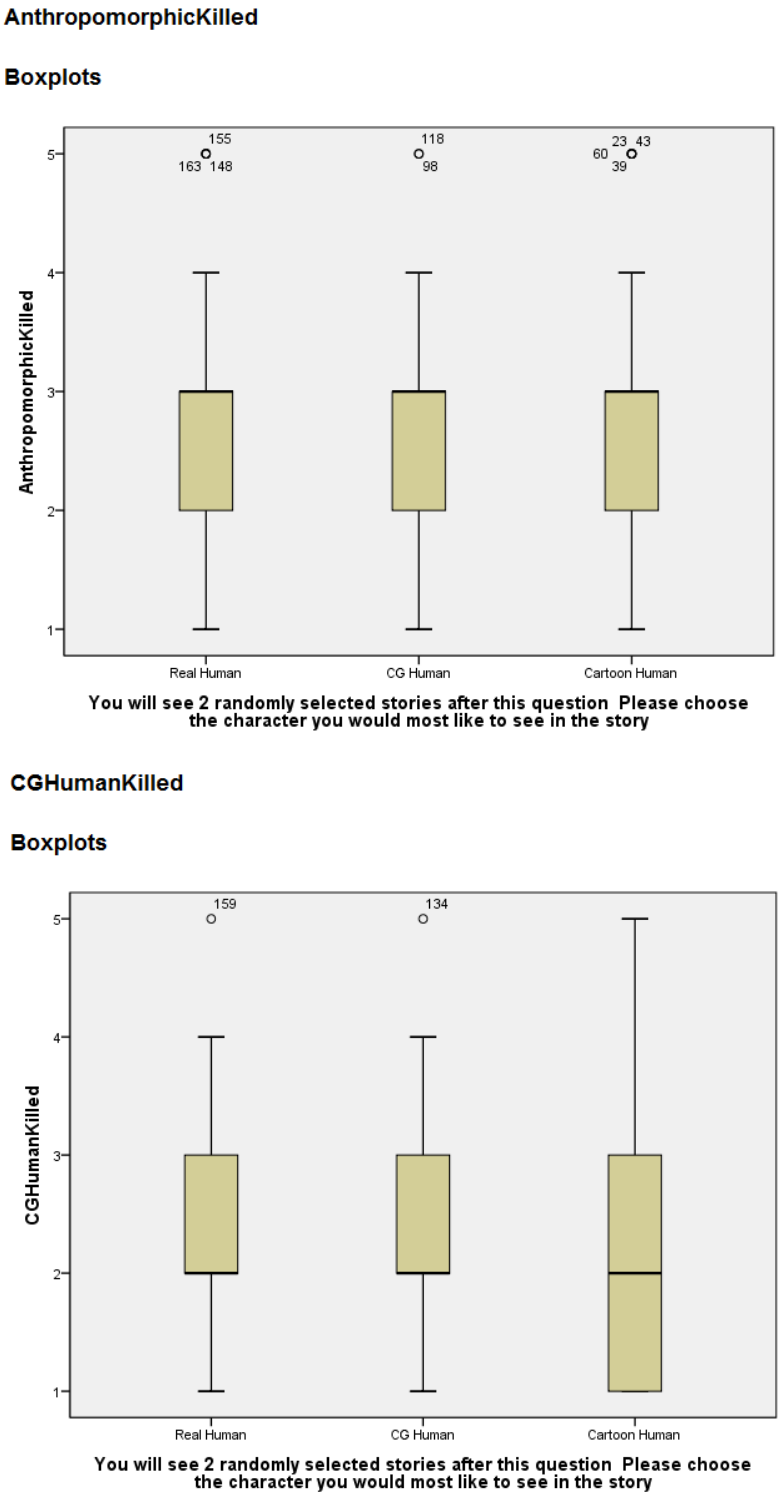


Fig 82: Character preference comparisons

Sphericity was not an issue for the data as there were less than three conditions. The data therefore met perfect sphericity. Tests of Within-Subject Effects found a significant main effect at the p<0.5 level of significance at $F(1,197) = 53.872,\ p = 0.001$. Tests of Within-Subject Contrasts found a significant linear trend with the

main effect of **empathy** at the p<0.5 level of significance at $F(1,197) = 53.872, p = .001$ and a significant linear trend with the effect of **empathy * preferred character type** at $F(1,197) = .242, p = .001$. There was non-significant effect of **preferred character type** Between-Subject Effects at the p<.05 level of significance at $F(1,198) = .002, p = .998$

4.6.3.6 Paired Sample t-Tests

Due to a highly significant main effect, paired sample t-tests were conducted to further examine the data. Paired-sample t-test was conducted to compare each character which were a human and an anthropomorphic character committing violent actions. There was a highly significant difference in scores of empathy between the human (M=2.15 SD=0.888) and the anthropomorphic character (M=2.82 SD=0.971); t(199)=8.137, p = 0.001.

4.7 Summary

In this section we have described the approach to Experiment 2B. This Chapter explained how the experiment is placed within this study and aimed to give the reader a detailed understanding of the procedures involved. Following this we discussed how data obtained from the experiment would be interpreted and finally we explored the actual data obtained statistically. Now we will summarise that data and also discuss comments left by the subjects taking part in the experiment and how these comments relate to the data obtained.

While there were differences in comparisons between different independent variables no significance was found when analyses in terms of the first stimulus set. As with Experiment 1 this experiment found strong significance found with the main effect between the two character types. To further investigate this pair sample t-test was conducted and the significance was found to be highly significant a p=0.001. While finding significance between the independent variables obtained from an investigation into the sample finds no significance in this case, finding a high significance between the character types proves that each character is interpreted

differently in this case. An anthropomorphic character as seen here is permitted to be violent that a human character by the subject. Comments relate to the findings found here , one subject commented that he found the anthropomorphic character “cute” regardless of the action depicted, while another comment described the human character as “evil”. Details on further comments are found in the appendix of this thesis. We will further discuss the results of this part of Experiment 2B in the following Chapter.

Analysis into stimulus set two also found little or no significance between the independent variables of the subject and the perception of the stimulus. However, in this case graphs found there to be some differences such as with gender comparisons in the perception of the injured human character, female subjects feeling sadder than male subjects. Like with the previous set, strong significance was found with the main effect. Paired sample t-tests found this significance to be once again high at p = 0.001. Overall the sample was found to be sadder with perceiving the human character being injured, comments left by the subjects relate to this. One subject stated that whilst both characters in the second sequence were knocked down he felt the cartoon character could get back up again. Another subject stated ‘It was sad to see the blonde girl being hit by the van’, finally another subject stated, ‘I feel sorrier for the blonde because she's more close to a human being...’. It should be noted that many of the subjects do not speak English as a first language. In the following chapter we will further discuss the results of this experiment and relate them to the findings of the study as a whole.

This Chapter has described Experiment 2 by separating parts A and B. We began this Chapter by first describing the approach to Experiment 2A. This discussion began by giving an overall description of the experiment that took place and then by breaking down the discussion into the key components that formed the apparatus of the experiment. Following this we then described the data obtained from the experiment and finished the section by summarising what we have learnt from Experiment 2A. Following this we began to describe Experiment 2B in the same manner as we had previously described Experiment 2A. Once again we began with a description of the overall experiment that took place. We then moved on to describe key component parts and the construction of the apparatus involved with this

particular experiment. Following this we explored the data obtained statistically and ended with this summery. Now we will move on into the discussion of the results of this study as a whole. We have briefly discussed the results obtained from Experiment 2. The following chapter will further discuss the results and also the implications, contribution and understandings of what they mean.

Chapter V

Discussion and Conclusion

This Chapter will discuss the results from Experiment 2 (A/B). These results will be compared with the data recorded from the first experiment and distinctions made. The Chapter will start by discussing what we learnt from the first part of Experiment 2 and offers explanations for the related results. Following this, the later parts of the experiment will discuss with reference to how these results further affected the data. Following on from this, the data obtained from both the first and second experiments are discussed in relation to the bigger picture. We will begin this discussion by first briefly summarising the discussion related to the first experiment conducted as part of this study. Following this we will begin to further discuss the results obtained from Experiment 2A.

In the interpretation of the result obtained from Experiment 1, we found that characters are indeed interpreted differently depending on their specific behavioural contextualisation. Specifically this was seen with the two characters which were the least human. The abstract character which in this case was represented by a green blob was perceived more interesting when exhibiting surprised behaviour. While the inanimate object which in this case was a can of soft drink was perceived more interesting when portrayed exhibiting sad behaviour than other behaviours. Overall however, the cartoon human character proved to be the most versatile in terms of the characters generated interest perceived by the subject within the different emotional behaviour tests conducted as part of Experiment 1. However, the cartoon character had a much higher significant effect under the happy conditions it was also found that this character also had a much lower standard deviation than under other

behavioural group conditions, these conditions being sad or surprise. This would suggest, while this character had performed well in all stimulus sets, this character is perceived as being most interesting when portraying happy emotions. As with other characters such as the abstract character as well as the object based character which were found to be most interesting in different emotional behavioural portrayals; the cartoon character was also best suited to portraying a particular emotional behaviour, in this case the happy emotional behaviour portrayal. Using curve charts based on the subjects character most liked variable we once again found the abstract character to be most popular with the subjects who saw the surprised stimulus. The object based character was deemed more popular with the subjects who viewed the sad stimulus. The results obtained from this experiment go some way into proving that different characters are perceived differently. Using other literary sources one can speculate as to why this may be the case. In the discussion of the first experiment we speculate that this may be due to specific features being needed for certain emotional behaviour portrayals. Some characters have these features emphasised due to their simplified form. We used both the abstract character and the object based character to further exemplify this. Stating that the abstract character may generate greater interest with the surprised stimulus group rather than other groups is due to the shapes that are easily formed due to the style of the character. Round shapes accented by the characters large eye conform to the requirements of surprise according to Feng (2012). Likewise the object based character, its shape being a cylindrical tube, can easily be bent into a downward facing arch shape. A shape that is considered sad by Feng (2012).

Experiment 1 was able to detect variances within the stimulus set groups which were happy, sad or surprised. Unfortunately due to the design, the groups could not be compared effectively together. However, Experiment 1 did not find high significance when comparing independent variables of the subjects taking part in the tests, therefore, in a move to better understand relationships between the character, behaviour and contextualisation variables a new adapted method was approached. Within this approach as was described in the preceding chapter, variables pertaining to the contextualisation, behaviour and character type are isolated and measured within the design of Experiment 2A. Effective comparisons between the independent variables from the subject are no longer considered within the main parts of

Experiment 2A. They are however considered when we come to the approach in Experiment 2B which was also described in the previous chapter. Experiment 2B followed a similar approach as was in Experiment 1. However, rather than comparing five character types, Experiment 2B uses only two and compares the two characters in two different contextualisation featuring the character commit an action of an action be committed upon the character. The experiment would ascertain what differences in perceptions the subject found in how they related to each character. This experiment retains the independent variable measurements used within Experiment 1 and compares them with a larger sample and less complicated stimulus to ascertain finally if these independent variables do have any effect at all. We will now discuss the results of experiment 2A. Following this we will discuss the results of Experiment 2B.

5.1.1 Experiment 2A

In comparative tests T4 to T2 which tested differing character behaviours in a negative story contextualisation, results indicated that changing characters behaviour did not have a significant effect on the subject's perception when comparing the same character with differing behaviour. However, whilst not statistically significant, each character was deemed more interesting when negative behaviour was displayed. This was especially noticeable on the CG human character, where a number of subjects stated that this character was "very interesting" under the negative (sad behaviour) behaviour constraints whilst no subjects selected the idiom "very interesting" under positive (happy behaviour) constraints. Comparative tests T1 to T3 which also compared changes in character behaviour, unlike T4 to T2 comparisons, this comparison compared characters in a positive context. Whereas in the previous comparison characters generally scored within the "neutral" to "interesting" range this comparison found characters overall scored within the "neutral" to "no interest at all" range. Using a Mann-Whitney test, no significant differences were found when comparing the same character with different behaviours to one another. Whilst there was a difference in each population, this difference was not causing a significant effect. This could be due to the sample size being too small in this case. Results indicate there was an interaction with the behaviour, however, not at significant levels. Further elements of the experiment

examined the behaviour of the character to greater clarity. This will be discussed in section Experiment 2B.

Comparative tests T2 to T3 compared the same character with negative behaviour but with a different storyline. Characters in negative stories were found to be more interesting by the subjects. However, this was only statistically significant for the CG human character. This character was found to be "not so interesting" in the positive story contextualisation. While in the negative story contextualisation the character was found to be "interesting" surpassing the negative story score by two levels. T1 to T4 comparisons tested for significant differences in character interest based on behaviour in a positive context. Significant differences were also found. Once again the significance was found with the CG human character. The difference in option was not as drastic with the subjects however; more of the subjects preferred the character in the positive context rather than the negative. What becomes apparent with this particular character is the fact that the interest is higher when the behaviour and the context match in tone. When there is a contradictory behaviour in the path of the story contextualisation, the subjects lost interest with the character. This was further complicated by the scores for the cartoon character. In this comparison this character scored significantly higher when the behaviour and context were mismatched. The findings relating to the CG human character were very similar to the findings obtained by Isbister and Nass in which they concluded in their study that participants preferred characters with consistent and expected personality types (Isbister and Nass, 2000). However, this does not explain why the ratings should be different for the cartoon character. Results from the second part of this experiment shed further light on this matter. This will be discussed in section 2B of this chapter. In consideration of the mismatch in terms of the generated interest/appeal with the CG human character we are drawn to the links of mismatches with this character in other research. On a visual level previous research found a character would be interpreted negatively by the subject if parts of a realistic character were to mismatch with body parts of varying realism (Seyama and Nagayama, 2007, Tinwell and Grimshaw, 2009b, McDonnell and Breidt, 2010). Other research which relates to the movement behaviour of the character also found when there was a mismatch in the expected movement behaviour of a character gave the subject an eerie sensation (MacDorman, 2006, Saygin et al., 2012). This particular research was conducted

using realistic androids and we approximate the notion of eeriness to be a negative response as would finding a character to have less appeal/interest within the study undertaken in this thesis. While this study actively avoided sound further research has found sound when mismatched to a character, or the subject not expecting the character to sound the way he or she should causes a negative effect that can potentially be (and is) used in horror films/games to scare the audience/player (Tinwell et al., 2010, Mitchell et al., 2011). Much these mismatched concepts are used within horror genres be it games or films. In the film *Evil Dead 2* (Raimi, 1987) we see a Ash's dead girlfriend walk and move bizarrely the scene is structured as we know a normal human cannot move in such a way, this is why it scares us. In the infamous horror film *The Exorcist* (Friedkin, 1973) a possessed girl contorts and moves in a mismatched way to terrifying effect. More over the girl speaks in a tone of voice that is also mismatched; again this is a successful horror device. In the lesser known but equally terrifying BBC television movie *Ghostwatch* (Manning, 1992) one character is also heard speaking in a mismatched voice to scare the audience. Emotional behaviour mismatches as we have found with the realistic character in this research is also relatively to scare tactics used within the horror genre. The film *Misery* (Reiner, 1990) features a character which behaves in a unexpected manner. Like our realistic character the characters behaviour is mismatched from the context which they are placed. This makes the character within the film terrifying; the audience wants the protagonist to escape from her house. This is repletion used to benefit the films plot. The lack of empathy the viewer has with the villain increases the level of interest and the empathetic connection that they feel for the protagonist. In the film *The Shining* (Kubrick, 1980) we are presented with a character who slowly loses their connection with the context they are contained leading a once loving father and husband to become the epitome of a horror character due to the mismatch with behaviour and contextualisation. However, the strongest example of behavioural and contextualisation mismatch are found within the early stages and end stages of the film *Invasion of the Body Snatchers* (Kaufman, 1978). We have previously discussed this film in reference to how the uncanny response the characters within this film are designed to provide. The majority of times we see and are scared of the antagonists within this film we are presented with normal looking human beings. However, it is their behaviour within a seemingly mundane everyday contextualisation that provides the desired negative feelings. While there is voice to

state that the uncanny valley is contributed by visual aesthetic mismatch, as well as movement mismatch and indeed sound mismatch between what the expected and perceived character elements are, there is indeed a contribution of negativity due to the mismatch of behaviour and character type. While we see a synthetic character more affected that a real character in the case of the study conducted described within this thesis. The real human in certain comparisons was also deemed to have low interest when there was a mismatch. However, this effect was less pronounced that the realistic character possibly due to how the characters are interpreted. Later in this discussion we will explain why a realistic character may be scrutinised more than a real character and why a cartoon character is forgiven a great deal of mismatch discrepancy.

In reference to the way in which the uncanny valley argument is structured as we have discussed previously, a human character should be perceived as the most appealing/interesting when measured among a group of lesser (CG human) and lesser (cartoon) humanlike characters. The notion of the uncanny valley is contended by some researchers such as Hanson et al. (2005). While the core idea behind it is accepted by this research we challenge the potential misconception in which a real character maybe considered more appealing/interesting than other forms of character. We refer to the uncanny valley curve in which a dip in response is shown before rising once again when the character becomes a real human. In character comparisons, the characters in both negative contexts and with negative behaviour were compared. The character scoring the lowest score was the real human. A Kruskal-Wallis H-test confirmed this was significant at $P = 0.047$. Both the CG human and the cartoon character had high interest scores in this comparison. The score for the CG human dropped drastically in the second comparison which compared the characters in a negative story contextualisation with positive behaviour. The scores for the cartoon character remained in the "interesting" range while the CG human dropped from "interesting" in the previous comparison to "neutral" in this comparison. The real human remained in the "neutral" range for both comparisons. Once again a Kruskal-Wallis H-test confirmed this was significant at $P = 0.059$. If taking Mori's theory at face value, as we have discussed previously it has in past research, one would expect the human character to generate the greater amount of appeal/interest here. However, this is simply not the case.

Not every combination of contextualisation and behaviour provides apparent and strong differences between characters; a case in point was under positive contextualisation with positive behaviour. While there were certainly fluctuations in the character comparison which tested the characters in a positive contextualisation with positive behaviour tests proved insignificant. This was also the case with the character comparisons which had characters compared with negative behaviour in positive stories. As with the previous experimentation (Experiment 1) the subject's interest in characters changed depending on the behaviour. In this case the two most significant examples will be looked at.

With some combinations of behaviour and story contextualisation causing more significant effects on the perception of the character we can surmise that when needed to provoke a reaction from the subject some behaviour and contextual combinations are indeed better suited than others. If we consider the case in point, positive behaviour combined with positive contextualisation we find this to be the expected. There is nothing unusual about a character behaving happily within a happy story. However, when we consider a mismatch the subject scrutinises the stimulus. A real human character under this scrutiny is assessed thusly, while this human is clearly real, he behaves in a strange way thus not conforming to normal expected conventions. While the subject may not like the character, they are not alarmed or shocked. This makes the response more subdued. However, when we consider a realistic character the subject believes they must assess this character in their ability to be human. If the character behaves strangely, then this character fails in the eyes of the subject. The realistic character did not succeed in behaving in the appropriate manner within given context. This is not how a real human person would behave. This understanding provides a stronger reaction as the subject believes they are accessing the character correctly. Combined with a test environment this assessment is further enforced. However, when we consider the cartoon character within this experiment we notice a difference in perception. While the real and realistic character is affected negatively by mismatched behaviours and contextualisation, this was not noticeable on the cartoon character. We will now discuss reasoning for this.

A cartoon character with mismatched behaviour could be considered funny while a realistic character with mismatched behaviour is considered abnormal. We possibly expect CG realism to be more realistic than real life. This idea fits in with previous research into the uncanny valley. A subject viewing a cartoon character is more accepting of their behaviour, what is weird for a realistic character to preform is humorous when performed by a cartoon character. The characters are being mentally assessed by completely different criteria. When a subject identified a CG character as trying to portray a human, the subject viewed the character differently than they would a cartoon or realistic character. They viewed the CG character as if to assess how realistically the character was portraying a human being. Mistakes became more noticeable and stood out more. Whilst, with the cartoon character or even the realistic character these odd behaviours were more acceptable of the character in question as simply behaving oddly and in the case of the cartoon, delightfully odd. They were seen as flaws when a realistic CG character was in question, this character failed to simulate this facet of behaviour correctly. While we now know that characters within different contexts portraying different behaviours have different effects on the perception of the subject, we begin to understand why such affects occur. Moreover, Experiment 1 suggests that certain characters are in fact interpreted differently depending on behaviour portrayed. We find in Experiment 2A that isolating and comparing individual features surrounding and including the character affects the subject's perception of said character differently.

One may argue that rather than looking at these characters as representations of something real, we should look at them on their own defining merits. A cartoon could very well be described as a parody representation while a 3D computer graphic character could be described as a simulation. However, it would seem there is more to their nature than this alone. *The Oxford English Dictionary* describes representation as a 'portrayal of someone or something in a particular way' (Hawker and Waite, 2007). The definition of representation does not encompass the opposing interpretations that different character designs may have. Moreover a representation implies some sort of original is required for the representation to exist. However, this is not always the case, even if it is, a character depicted in a different style could take on vastly different meanings than other representations do. In a later section of this discussion, we further explore differences between the two representations of

two different characters when relating to the results of Experiment 2B. We will finish the discussion of the results obtained from Experiment 2A by further looking into the data obtained from the Chi-Squared crosstab analysis of the character the subject most wanted to see prior to watching the video sequences.

Using a Chi-Squared crosstab analysis to determine what the samples preference to the character types were before seeing the video sequences, gender, nationality, or being a gamer were found to be not significant. This relates to previous research where independent variables such as gender were found to have little to now effect on how the subject perceived a character (Riek et al., 2009). One may argue that this may be due to sample size or experimental execution, although it should be pointed out that results from this experiment are highly related to those obtained from the first experiment conducted as part of this study. Independent variables such as the subject's gender were found to have little to no effect on their perception of a character. Whilst Experiment 1 used a smaller sample, three different groups were assessed. Experiment 2A uses a larger sample of two hundred participants and whilst significant main effects were found, dividing the sample into various groups based on independent variables proved no significance was found. However, strong significance was found between the correlation of the character most liked and media preference. Those with a preference to animation strongly preferred the cartoon character and the least preferred character being the live action character. Whilst those who preferred the live action mediums had no strong preference to any of the characters, meaning unlike those who prefer animated mediums. Surprisingly, the subjects who most preferred the cartoon character were the subjects with a preference to a mixed medium.

Data also indicated that some within the sample were more receptive to different character types than others. We would have expected to find some sort of difference between the genders, particularly as the characters featured in the experiment were male, but no difference was found between the genders. This was also found to be the case in the first experiment (Experiment 1) which also found no distinction between genders. Experiment 2B gives a final look into the independent variables associated with the subject's taking part in the experiment. Now that we have discussed the results from Experiment 2A we will move on to discussing the data

analysed from Experiment 2B.

5.1.2 Experiment 2B

Experiment 2B compared different contextualisation of two different character types. These character types were an anthropomorphic character and a human woman. The different contextualisation being different ways in which the character was portrayed. The first set features the same characters reading on a sandy mound only to be disturbed by a small seemingly friendly ant. The character within the stimulus proceeds to kill the ant which in itself is intended to be interpreted as a needlessly cruel action. Then the character continues to read oblivious to the action they have committed. Granted some would not finding the killing of an ant particularly cruel, depicting a character killing a type of animal or even a human would make subjects taking part in the experiment uncomfortable. Using an ant would hopefully not place the stimulus in a tasteless category within the eyes of the subject. This allows the more sensitive of the sample to view the stimulus without the subject matter upsetting them. The second contextualisation on the other had features the same characters being hit by a car. However, like with the stimulus of Experiment 2A it was decided not to make this scene particularly if at all graphic. In this discussion we will discuss the results of each of these sets separately then following this discuss Experiment 2B inclusively. We begin by first discussing the ant killing stimulus.

In the analysis which looked at how subjects responded to two different characters killing an insect, by dividing the population into groups separated by nationality, gender, (non) gamers as well as subjects preference to character type and medium found no significant correlations between these independent variables and their empathetic relationship with these two characters. As with previous experiments undertaken as part of this study, as well as previous research conducted by other researchers as we have previously discussed, this experiment does not find significance between independent variables obtained from the subject. However, as again with previous experiment every test found a significant main effect within the sample. Overall the sample was more agreeable with the actions taken by the anthropomorphic character rather than the human character. One comment suggested

that the subject even found the anthropomorphic character “cute”. While another comment from a different subject suggested the human was “evil”. The significance of each character compared being interpreted differently was confirmed by the pair sample t-tests which found the difference to be highly significant. As with the previous part of the analysis, the less realistic character was interpreted differently to the realistic character. Using descriptions of the characters left my the subject win the allotted comment section relating to this particular stimulus set we find the realistic character is interpreted as “evil” character was found to be humorous if the same action was performed by a cartoon character. Further comments provided by the subjects who completed the test are located within the appendix of this thesis. We will now move on to the road victim stimulus discussion. Following this we will draw together combined understandings gleaned from this experiment as a whole.

In the analysis which interpreted the data obtained from the stimulus depicting a human character and an anthropomorphic character in a scenario which saw them struck by a car, once again the sample was divided into groups separated by nationality, gender, (non) gamers as well as subjects preference to character type and medium. As with the previous analysis, no significance was found by separating the sample. However, as with the previous analysis there was a highly significant main effect. This was further confirmed by paired t-tests which found the difference to be highly significant between the anthropomorphic character and the human characters accident. Comments suggest that the subjects thought the human character stipulated by real world conventions and the anthropomorphic character is stipulated by cartoon conventions. Meaning, being stuck by a van would not be as detrimental to the anthropomorphic characters health as it would to the human.

Death does not exist in the cartoon world, hence in both instances the ant and the van were perceived in such a way. Subjects did not feel repellent to the cruel actions taken by the anthropomorphic character as their victim was not really dead under the cartoon conventions. The same reasoning applied to those who did not particularly feel upset when the character was stuck down. These conventions were most likely formed by our collective knowledge of cartoon characters. We have seen cartoon characters to be gravely injured only to brush it off and carry on doing what they were doing. Conversely, our knowledge of how a human character should behave is

formed by our real world interactions. Taking what we have learnt from Experiment 2A and Experiment 2B combined with our initial study experiment 1 we now will begin to discuss the understandings obtained from the overall study.

5.1.3 Character Design, Behaviour and Context

People are social animals. Except for the rare hermit among us, virtually everything we do involves other people in some way. Social interactions are both necessary and desirable. There is growing evidence that people are happier and even healthier when they are firmly connected to family and friends (Hayes-Roth and Doyle, 1998). We as human beings are conditioned to spot things in others that maybe out of the ordinary. MacDorman (2005) discussed mortality in which we repel realistic androids as they look diseased. We avoid them for fear of them being a threat to oneself (MacDorman, 2005). Indeed within the case of this study, a human who is necessarily cruel maybe a danger to ourselves. With regard to Experiment 2A, a human character having mismatched emotions may imply this person is emotionally imbalanced and may be unpredictable and this person could also be a danger to us. This is often used as a convention. We would see a character laugh manically only to burst into tears a few moments later in a scene designed to make the viewer uncomfortable. Laughing at losing the lottery equates to this. A subject seeing a realistic human character doing acting with such mismatched emotions decides there is something wrong with this person. Upon seeing a cartoon character acting in exactly the same way, this becomes a parody and disturbing behaviour becomes humorous. Other examples of this can be seen in the animated series *The Simpsons* (Groening, 1989) with the reoccurring character Side Show Bob. The character often cries then laughs within a few seconds. A disturbing emotion has been dealt with in a humorous way. *The Simpsons* (Groening, 1989) often parodies the film *Cape Fear* (Scorsese, 1991) in relation to the character of Side Show Bob. If one compares the two, one a adult ordinated live action film the other a family cartoon both featuring a character disturbed in relatively the same way, one however, is intentionally scary the other being comedic in how it is perceived by the viewer. When contrasted with the results obtained here, we can see similar effects. Our realistic character within Experiment 2A represents a heightened level stimulation from the subject; this character has to behave more natural than a real human to be

accepted. Any bizarre behaviour, any awkwardness between this character and context are picked up on and interpreted negatively by the subject. While a cartoon character represents and associates play with the subject's perception. This is seen when we compare mismatched behaviours and contextualisation of the cartoon character to the realistic character in Experiment 2A. This is further explored in Experiment 2B when subjects perceive the violent actions of the anthropomorphic cartoon character as playful or cute while the same actions are perceived as evil when performed by the realistically proportioned human character. When the same characters are seemingly killed, in the second stimulus set the subject perceives the anthropomorphic character as merely playing dead, while the human is disturbingly actually dead. It becomes clear that the subject does not have a preconceived idea surrounding a character. In Western society we are exposed to cartoon characters from a young age. We learn the conventions of such characters; we know that what may kill a human being would not even hurt a cartoon. Comments left by the subject after viewing the road victim's stimulus relate to this. Some subjects felt the anthropomorphised character could not be hurt due to this character being a cartoon. In relation to the first experiment some comments suggest that the anthropomorphised character only pretends to kill the ant therefore his actions are not considered cruel, however the realistically proportioned character did indeed kill the ant. A full list of comments is found within the appendix of this thesis. The findings in this study have implications for any medium using a character. Be it a real human, cartoon, or an object. The choice of character has implications to the piece the producer is attempting to convey. A change of character not only changes the tone of a piece but can also completely changes the meaning. What is sad and traumatic can be made into a humorous parody simply by changing the character. Results from this study suggest there are indeed implications as to how a character is integrated into a context and the behaviour that character portrays are interlinked into how the interest/appeal is generated from the piece in which they exist.

The first experiment in this study saw five different characters in three different emotional contexts. Overall the cartoon character generated the most interest within the sample. However, different characters among the contexts saw their interest fluctuate depending on the context. This relates to the abstract character being deemed more interesting in the surprised behavioural contextualisation than in either

the sad or happy group contextualisation. Upon asking the subject which was their favourite character, those within the surprised group were more likely to choose the abstract or cartoon characters. While those within the 'sad' group were more likely to choose the 'cartoon' and 'object' characters. Curves were generated from the asking the subject which was their favourite character from the second experiment, and these were compared with the Mori's (1970) curve. The curves from the first experiment were generated from a question posed to the subject after they had seen all characters in sequence. The subjects were separated into different groups depending on the emotion emphasised in that group of sequences. In the second experiment the subject was posed the question before they had seen any of the videos. Results from experiment one saw the results from the characters fluctuate depending on the emphasised emotion. The curve that closely matched Mori's (1970) was the one generated for the results from the happy group. The missing part of the curve was the real human where we would expect this line to rise. With the curve generated from the data from the second experiment we see this arise.

Taking into account the data obtained from Experiments 1, 2A and 2B, a viable argument could be formulated to propose it. It is the design of the character that should be considered the most important element of this piece. Whilst, both the contextualisation and behaviour are integral to the interest of the character, the meaning of it changes with the change of the character. Whilst previous researchers (MacDorman, 2006) often imply that the more human like a character, the more interesting, compelling and likable the character will be perceived by the subject. However, this study goes some way into exemplifying that this is not always the case. Taking into account previous research which recognises there is an interaction between the character and the image (Ho et al., 2008). Experiment 2A results suggest it is not only this, but a combination of context and how the character interacts with the said context that can dramatically change the way they are perceived. The results from Experiment 2B found each character had a differing relationship with the subject's interpretation, moreover depending on how one sees the character, stipulates a system of conventions they expect from that character. Experiment 1A found that characters possibly breaking these conventions could be interpreted less likable, for example the human preforming in a similar manner to the other four characters is seemingly over acting. Whilst abstract and object based characters were

perceived “like poor little animals”. The fluctuation of interest depended on the character in Experiment 1 enforced the idea that a character that was to fully succeed in a context had to be fully equipped with all the features that are required for the piece. As was discussed in previous chapters, a character missing an important feature such as an inability to form a downward facing arch shape for sadness or wide eyed open mouth expressions for surprises, will not be perceived interesting in a sequence which requires these facets. This was due to their inability to convey what is required. Their performance will look confused and frustrate any viewer not understanding what the character was expressing.

5.1.4 Contribution

In media where the creators have a limited time in which to convey a message using character animations or even character illustration, they need to be aware of the implications of their character choice. This research goes some way into examining the implications of a character design choice as well as the behavioural personas and contexts which best suit that character type to generate the most amount of interest from the subject. ‘Television’s commercial messages represent a significant part of television’s total output and very often use subtle production techniques designed quickly to grab the audience’s attention and impart pointed and persuasive messages to viewers which make direct connections with core audience needs and lifestyle preferences’ (Furnham et al., 1997). This study provided a method which could be adapted to fit any number of studies with the aim to measure interactions between a character, story contextualisation and behaviour.

A key contribution of this study was to further advance our knowledge of character appeal and interest. This study has challenged the notions established by the uncanny valley theory. Moreover, we have proved that while some characters may be positively received within certain contextualisation and behaviour combinations, the same character may be perceived negatively if the combinations are different. Research conducted by Ho et al. (2008) suggested that the image surrounding a character may have an effect into how a character is perceived by the subject. Our study discovered that not only does the surrounding contextualisation of a character has an effect on the perception of a character, but also we were able to

measure the effect. Future work must take into account not only one element but all elements that make up an image. The character, the contextualisation and the behaviour of the character are intrinsically connected and cannot be separated and often cannot exist without each other.

Whilst previous studies which explored the notion of the uncanny valley and focused on how a subject perceives realistic character, we shifted the focus to encompass the character as a whole rather than focus on a specific time which lead to an inability to fully realise other character types. This study has hopefully broadened what could be disrobed as a narrow focus of research into the uncanny valley and offered merit for other character designs depending on the purpose of the piece. Where previous research tended to deal with a character detached from context and behaviour, we have shown how such elements are critically important to the appeal/interest related to the character via the perception of the audience. Moreover, we stress how it is not sufficient to contain a character within a context and for that character to portray a behaviour type. There are indeed particular behaviours and contextualisation that certain character may succeed in while others will not. The character itself should not be simply considered from a purely aesthetic point of view particularly when dealing with concepts such as the uncanny valley. Behaviour and contextualisation of a character may and will contribute to how well the character is perceived. It is not sufficient to only consider the visual fidelity of characters within the field of 3D computer animation. The behaviour of said character as well as the contextualisation of a character cannot be omitted. It is these three elements that form a characterisation. Omitting one of them renders the character inert. This research offers and justifies an approach to character design assessment that considers the character as a whole.

Work conducted within this study provides further character studies with a greater understanding of how one should consider effective character design. We have proved how specific elements affect subject perception of a character; we have further explored this to discern where certain character types are affected by different combinations of contextualisation and behaviour. This has been yet further explored as to discern how a subject may interpret a characters actions or actions committed upon said characters differently. We understand that character design is comprised of

three basic elements, these elements being, the aesthetic, the behaviour and the contextualisation. Omission or neglect in the understanding of one thus leads to poor ineffective character design. We will now discuss how the study conducted as part of this research transmits to future work.

5.1.5 Limitations and Future Work

No one study can hope to encompass all that makes a story interesting, appealing and compelling. This research was no different. Whilst there were limitations to this study, steps had been taken to overcome the most detrimental effects. However, some still remained. This research used different character types at various points of study. Unfortunately for this study, one character type could not speak for all others in the same style. In this study different designs were constructed and were kept as neutral as possible. Research conducted as described within this thesis enabled a new approach to consider character design. This relates to further studies which should incorporate a character or characters as part or as the focus of their particular study.

Whilst other researchers used found footage as well as found characters (MacDorman, 2005, Ho and MacDorman, 2010), this research used characters purposely constructed for this study. In an effort to better understand the design and retain a similar level of quality for each character, all characters were designed and constructed by the same researcher. This allowed the characters to be constructed to the same level of skill, rather than using characters constructed by designers of differing levels of skill. Efforts were made to compare character designs to existing characters from film, television, and still media to ensure similarity to the type. Using the same researchers allows for a better understanding of the design so adjustments can be made easily.

Creating characters specifically for the research under the constraints set by the study is time consuming. Data pertaining to the character would be richer if more characters were used. However, using found characters was not an option for this type of study. Found characters come in a pre-existing context, and are would not have been built for this purpose and the subjects would have been pre-exposed to the specific character prior to the experiment. Using found characters creates difficulty

in placing them in a context which other characters can copy for evaluation by the sample. A future study may use a number of artists creating a greater number of characters for research. Designs would have to be overseen by one individual who would make sure that designs matched as closely as possible as to be of the same visual qualities as one anther regardless of the character type constraints.

While the study aimed to speak for character design, behaviour and contexts, these variables had to be condensed to their component parts for assessment. The design of both the experiments in this study only allowed for a certain number of variables to be tested at one time. Adding further characters, contexts and behaviours increases the sample size required and serves to complicate the data. Whereas previous research only take into account one aspect surrounding the character. This study aimed to evaluate three; moreover, these three components were evaluated simultaneously in one experiment. The disadvantage of this resolution of each component part was reduced, in favour of discovering the interaction with the character rather than the isolated effect of the component. Future work may contribute to this study by exploring different character sets which possibly only concentrate on one particular character archetype. This type of study may provide insight into smaller intricacies that contribute to the viewer's perception of a character such as character height, size, age and gender.

A further limitation of this study was it had difficulty speaking on a global level. Although both experiments involved in this research used online methods in which anyone in the World could potentially access, the study is limited to those who were English speakers (more specifically readers). To alleviate this problem, this restriction only applied to text surrounding the stimulus and not specifically the stimulus itself. The stimulus in both experiments used no dialog to convey the emotions and behaviours of the characters. Future works may likely choose to focus solely on a particular a country where tastes and cultural nuances are somewhat contained to that specific country. Such a focus would allow for the measurement of cultural mannerisms and behaviours of a character that would likely be lost on a study that uses a broad sample as that of the one used within the research described within this thesis.

5.2 Conclusion

This report outlined a novel method for measuring a subject's interest with a character type with interactions between the story contextualisation, and behaviour of the character. *Chapter I* introduced the concept and addressed the problem limited understanding of context has in the field of computer animation. The chapter introduced the core concepts in which this study later defined. *Chapter II* explored previous research as well as examples of the use of characters in scientific studies as well as entertainment studies. This chapter provided the grounding for the approaches adopted later in experimentation. Following this *Chapter III*, exemplified a method which was developed from previous research and analysed the results from that method which was used to measure a samples interest with five different character types contextualised within a simple narrative. The results from this experiment further informed and refined the study undertaken this cumulated in further experimentation which was described within *Chapter IV*. This chapter proposed an adapted method aimed to further define the research conducted as part of this study. Once again a group of characters were used to measure the subjects interest in a narrative, this time however, research focused on three character types for one part of the experiment and two other character types for a second part. Each part of this experiment aims to understand the notions of character design and of particular elements surrounding characters exemplified. The data obtained from the experiment described in this chapter combined with the initial experiment conducted during this research informed the discussion within this chapter. *Chapter V* drew upon the data and literature that was encountered throughout the study. Finally we form an argument that finds the very notion of character design to be intrinsically connected to contextualisation, emotional behaviour and the aesthetics. We find that certain character types themselves are connected by the physical laws and rules of the conventions they are previously conveyed within. This relates to the cartoon character's playful perceptions by the subject. Realistic character types that relate closely to the uncanny in previous studies, are found to be judged on a hyper realist mode of assessment. It is not only the aesthetics that can cause such a character to be rendered unappealing, but also the emotional behaviour and the integration within a contextual narrative that can also contribute. We compared our results to conventions found within horror genres. This comparison along with the parallels related to

previous research findings found mismatches between various elements in a realistic character that can cause a negative response between the subject's perception and the character within the stimulus. Cinema itself is at a heightened level of pseudo realism, where what is real is fantastically real but at the same time completely synthetic such as the realistic character within this and previous studies. We compared mismatched comparisons that are used within horror film to negative responses obtained from this study as well as previous studies thus finding a realistic character like the one described within this investigation has a horror counterpart of equal mismatch within the horror genre. We gave examples of sound mismatch, movement mismatch and finally our finding of contextual and appropriated behaviour mismatch. These findings do not at all imply a realistic character will never be interpreted negatively, for in certain cases within our study we have found the realistic to be rated higher than a real human. However, findings do indicate that such a character without careful consideration to the aesthetic, behaviour and contextualisation will be problematic in any implementation. We have found that other characters perceptions are in fact also highly variable depending on the behaviour and contextual they are implemented within, however, not every character as we have discovered is necessarily affected in the same way.

In this study we have set out to answer the question: Does character type have an effect on the perceived appeal/interest of the subject? Research conducted has found evidence to support the idea that a piece of stimulus is drastically affected with changes to the character type. Both Experiment 1 and Experiment 2A found evidence that suggests characters are clearly perceived at different levels of appeal/interest while Experiment 2B found characters are also interpreted differently based on their type within a given contextualisation. Another question posed at the beginning of this study asked whether character behaviour has any effect upon the notion of appeal/interest. Experiment 1 found evidence that supports the idea that some characters excel when displaying certain behaviours as we have previously discussed, however, Experiment 2A found that combinations of various behaviours and contextualisation provide interesting fluctuations in the appeal of the characters. This evidence relates to the next question posed at the initial stages of this study which asked, does a characters contextualisation have a significant effect on the appeal/interest perceived by the subject. Experiment 2B found that certain characters

excelled in different contextualisation than others, however, as stated it was various mismatches and matches in context and behaviour that provided interesting data. The realistic human character had a drop in appeal when there was a mismatch while the cartoon character was unaffected by the mismatch. Experiment 2B set out to explore whether a character is perceived differently by the subject. The difference being the actions taken by different characters. Results indicated that there was strong evidence that suggested that there is perceptual difference as previously discussed within this chapter. The subject is less sympathetic towards an injured cartoon character than a human character and also more forgiving of a cruel cartoon character than a cruel human character.

The final question posed at the initial stages related to the discovery of whether or not independent variables relating to the subjects identity has any effect on their perceived appeal/interest with the characters within the stimulus used within this research. Whilst there have been some fluctuations within the data as previously discussed, the majority of variables relating to the subjects identity has little to no effect on their perception of appeal with a particular character. This becomes interesting since much of the media that uses characters are targeted towards a particular demographic based on some sort of independent variables such as age or gender.

This study by discerning the notions of character identified further studies of how character design can be further evaluated. We may understand that each element of a piece surrounding a character plays an important part in the interest generated by that character, we must further understand that each element is interconnected. Some elements are meaningless when separated and some elements when exposed to a subject in isolation could be interpreted differently. The character types used within this research were relatively concise for the medium and could be diversified for future work which may look at further specifics. An example of this would be to create gender variations for each character. Future research should serve to further inform the relationship between character design and the emotion which is being exemplified by the character.

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Appendix A: Experiment 1 Stimulus

Appendix B: Experiment 2A Stimulus

This stimulus is included on the attached DVD.

Appendix C: Experiment 2B Comments

Stimulus Set 1 comments

Listed are the comments left by subjects partaking in experiment 2B's ant killing stimulus. Comments have not been adjusted for spelling, grammar no punctuation. They are listed as how they were written by the subject.

- a lady with an insect is more dramatic
- A girl would never touch a cockroach with her hand first of all ;D ,also I found the cartoon to be more expressive plus closer to a male's reaction on the specific situation.
- Neither character influenced the decision to rate the actions the characters carried out. It was the actions if crushing a creature that I disliked.
- The first ant was larger and appeared more dangerous. It seems logical that the character would squash it. The second character seemed to be a stereotypical character who is scared of bugs.
- Irrational cruelty (both of them). Ants are harmless. What is that â€œmonolithâ€ to the left of the first character? (pictureâ€™s right side)
- I think ppl just overreact about bugs anyhow and are hasty to kill them but its more likely a female would kill a bug than a male
- We should not kill the insect.
- if the ant was actually that big I would be happy to 'remove' it :)
- none
- nothing
- furries and women
- Blond girls will always find their way out ;)
- Why kill the ant?
- the animal character looked too unreal as a mixture of animal and human, depending of the game and context it might fit. lady looked more convenient
- it is not true to kill even the insect, because all the films and characters give message to all people therefore films should be more peaceable

- both sequence not good
- Both seemed pointlessly, but equally cruel
- Too dangerous
- Evil woman
- Nothing unexpected from either of them really
- Both characters were very good
- Bitch
- Not sure what this is about?
- they both are cruel for killing a small innocent ant.
- the character in the second sequence was more believable
- The only difference in this sequence is the gender of the characters, making any difference in reaction negligible.
- Bitch Slap
- I don't really understand what you're asking....
- ok
- I like the fox better, don't care about the spider. I dont like the woman
- Poor ant, why she kill it?
- Weird
- the character actions were ok. But I don't like the landscape in the sequences as well as the black and white colour. It makes me boring to watch.
- I hate the bitch
- The event seems to have more meaning with the cartoon character. He shows more expression and thus makes the event funnier. The sequence with the serious-looking 3D model makes the scene seem pointless.
- nothing
- Generally speaking, The female character is most likely to shy from insects so is a more convincing choice of character for this sequence.
- I don't get it
- Ants are lovely
- woman character looks dull
- I noticed that the first character was a male cat, and the second was a woman. I am willing to bet that the fact that the latter includes a female, it becomes a tad more interesting. This could also possibly be said about the first because it is a cartoon cat.
- i dont know what to say
- personally i hate spiders!
- good
- Interesting
- Same sequence but with two different characters
- i liked the fox one better
- They are normal !
- This ant looked like a meanace he was definitely trying to get close to the character with some sort of evil plan. It's natural selection, he entered the char's intimate zone. Wouldn't he have entered the realm of the character, there would be no trouble.
- The strange animal-type head on the top character was off-putting.
- lol
- the second sequence is more natural
- People squishing bugs
- The cartoon dude, was being a cartoon, I dont think he really killed the ant. The woman did though
- the second test is much more interesting than the car accident
- why are they in the desert?
- once again, it was weird
- comic feature makes it a little bit more humorous than a normal human feature
- The ant/ insect seemed smaller and more aggressive on the human example.
- i think the facial expressions on the wolf's face give the killing of an insect a comic feel, lack of which thereof in the next sequence, makes it appear serious and more sinister in intent. also, we readily accept this kind of behaviour

from a wolf than from a serious looking girl (proper human :P).

- I really like the concept of animal-human! There is something to do with imagination here! On the other hand, the lady needs to be more sexy and beautiful to attract audiences. Her expression also could not show the contrast of a lady and a killer :)
- I hate ants - was bitten by them so have no issues with them being squished :}
- The fox (to me) had more expression in his face

Stimulus Set 2 comments

Listed are the comments left by subjects partaking in experiment 2B's road victim stimulus. Comments have not been adjusted for spelling, grammar no punctuation. They are listed as how they were written by the subject.

- i feel there is no diffrences whether the injured person is a lady or a gentleman
- i can imagine the driver of the van is a woman
- Obviously, someting closer to a human being's figure makes a scene like being hit by a car/truck more realistic, intense and sad than the same thing happening to a cartoon. Other than that egocentric point of view, both equally sad maybe..?!
- I don't think the wolf thing is dead, its like cartoons can't be dead
- The cartoon can't be killed
- The dog thing can't feel pain, the woman is dead
- Guessing is it the character a factor to why we dislike or accept certain behaviors? A question I am thinking about now.
- ?Is that a dog? Or a black person? Or... Any way, they are out of place after being runed over. They should be projected forward, not back...
- i feel sader for the woman because it looks like she is killed
- typical of a game
- Anyone should be responsible for our own actions
- Cartoons can't die. Bitches can
- no thing hahaha
- It's funny when the dog thing is hit because it's like playing. But the woman seems dead so not funny
- same
- Bad characters deserve punishment.
- hman life is important, therefore this is so sad for me...
- disturbing
- hmm, not good that a person is hurt. Not so bothered about animal thing
- Too many threats
- This sort of thing happens every day :(
- It was sad seeing the characters being knocked down by the van
- The cartoon was ok right?
- Soooooo, she dies? I gues the animal thing was ok though.
- ...
- feel more sad for the woman because she seems to die in a more horrible way, her position after she got hit by a car looks more dead than the cartoon character.
- What is this?
- It was sad to see the blonde girl being hit by the van
- The intent of this experiment is becoming

obvious. I am making more typos with each response. Clearly, you are attempting to force my keyboard to malfunction. I proof-read, thwarting your efforts. Good day! (I said good day!)

- Write down the license nummer and beat the f**k out of this stupid driver!!
- Is it the idea that we relate more to more humanised characters?
- no difference
- i dont like the woman
- the dog man was fine, i know i dint like the woman for killing the ant. but this is too much
- What is going on
- In fact, I dont like to watch the car accident, and caused the death of that girl. I scared to watch
- she should have looked
- I'm going to sound mean, and say it was sadder with the cartoon character being hit. Realistic 3D models sort of creep me out, like the uncanny valley, so I didn't mind that the girl got hit.
- behavior, job
- The scenario is tragic and evoke the same sort of emotion with each character.
- Why?
- Killing people is nasty :(
- I don't feel anything for a poorly animated character
- Blondes are dumb.
- again..... i dont know what to say
- this different characters didn't really affect how i feel about the sequences. It's more about the event itself.
- good
- Interesting
- Neither character is real, the images aren't particularly realistic and therefore not disturbing
- it was sad
- No comment
- Ok, cat was cartoonish so this looked more like a comic thing. He will just stand up and keep on walking. But the girl seems to have been brutally raped as well to be honest (her body pose is just so vulnarable), so it's really sad. Maybe more frames wouldn't hurt either, as it seems like the car has just fallen from the sky (you remember this Roger Rabbit moment with a piano falling from a rooftop). The entire situation seems so strange, it'd more understandable if they were crossing the road rather than calling for a car to be killed by
- It was easier to relate to and empathise with the more recognizably human woman than with the animal-headed individual.
- ...
- Both very realistic and dramatic
- why is the van white and why is it so close to a storefront
- WHY IS EVERYONE GETTING RAN OVER BY CARS!??
- I feel more sorry for the blond because she's more close to a human being...
- The human woman seems more injured than the cartoon.
- confused
- oh no... the girl shudn't have died :'(
- When the car hit the character, the reason why I feel sorry for the lady because I could see her hair and her left hand on the air. But I only see the man's shoes so one again, direct visual effect really helps!
- Driver should slow down
- The fox was black