ABSTRACT

Lovable Lamps and Sad Umbrellas:
Empathizing with Inanimate Objects in Animated Films

Alyssa D. Edwards, M.A.

Mentor: Daniel M. Shafer, Ph.D.

Why do people empathize with movie characters who aren't human beings? What causes viewers to perceive inanimate objects as people, such as the hopping lamp in Pixar's *Luxo Jr.*? These questions are under-researched in scholarly literature. Thus, this study used an original, animated video as a stimulus to explore the relationship between anthropomorphism and empathy and to investigate how participants labeled characters' limbs. Because definitions vary greatly, this paper first defines "anthropomorphism" and "empathy." The study found that the presence of appendages significantly increased both empathy and the use of anthropomorphic language when compared to the limbless character, regardless of the type of appendage or whether participants labeled it with human anatomy terms. Additionally, participants' use of anthropomorphic language was significantly linked to empathy. Thus, anthropomorphism and empathy are connected when viewing animated characters, but an explanation of all factors behind these processes is yet to be discovered.

Lovable Lamps and Sad Umbrellas:
Empathizing with Inanimate Objects in Animated Films

by

Alyssa D. Edwards, B.S.

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Christopher J. Hansen, M.F.A., Chairperson

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Approved by the Thesis Committee

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Daniel M. Shafer, Ph.D., Chairperson

____

Joseph Kickasola, Ph.D.

____

Kristen Pond, Ph.D.

Accepted by the Graduate School
May 2021

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J. Larry Lyon, Ph.D., Dean

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CHAPTER ONE

Introduction

In 1986, Pixar's Luxo Lamp hopped onto the movie screen as a technological feat that demonstrated the capabilities of 3D animation and computer-generated imagery (CGI). But *Luxo Jr.* (Lasseter, 1986) was more than a technological milestone. Audiences empathized with the childlike lamp playing with a ball even though it was neither a live actor nor a human figure. It was just a hopping lamp. Pixar leads the industry in creating successful, lovable characters who are non-living objects. *WALL-E* (Stanton, 2008) and *Cars* (Lasseter, 2006) are highly successful feature-length films that star non-human, non-animal characters. *The Blue Umbrella* (Unseld, 2013), *Lava* (Murphy, 2014), and *Lou* (Mullins, 2017) are Pixar short films that also have inorganic main characters. Somehow, these characters elicit the same laughter, gasps and tears that human actors on screen can. But why? Literature surrounding empathy toward characters in films nearly always focuses on human-to-human empathy—it's a normal response to laugh, cry, feel scared, get angry, and otherwise empathize in response to the struggles and triumphs of other people. But what causes people to empathize with characters who aren't human beings?

This paper explores factors that likely contribute to audience empathy toward animated, non-human characters in films. First, the paper lays a foundation in empathy literature by defining empathy and examining three common routes to empathy to understand audiences' attachment to human characters depicted onscreen. Next, a review of anthropomorphism literature reveals factors that might allow viewers to hold non-human characters as objects of empathy. Finally, two case studies apply these principles to the Pixar short films *Luxo Jr.* and *The Blue Umbrella*.

With this foundation, the author hypothesizes that, when presented with anthropomorphic shapes, the viewer subconsciously identifies and labels character body parts based on how they look and move. This would allow the viewer to empathize with animated, non-human characters. Thus, this study used an original, animated video as a stimulus to explore the relationship between anthropomorphism and empathy and to investigate whether people label limbs with human anatomy terms.

CHAPTER TWO

Literature Review

Empathy

What is empathy?[1] When defining the term, many scholars focus on the emotional side of empathy. Cheetham et al. (2014) define empathy as "automatically sharing and implicitly generating a representation of another's affective state" (p. 1836). Cohen (2001) defines empathy as "sharing the feelings of the character (i.e., being happy; sad; or scared, not for the character, but with the character)" (p. 256). However, a definition of empathy that only includes shared emotion fails to recognize the important cognitive aspect of empathy. Shimamura (2013) argues that empathy involves both "feeling another's emotion" as well as "the cognitive restructuring of taking on another's perspective" (p. 20). For the purpose of the present study, empathy is defined as *sharing both the emotional state and cognitive perspective of another person*.

Empathy doesn't occur in a vacuum. Emotion is always directed toward something or someone; Plantinga (2013) calls this the *object* of emotion. Plantinga (2002) states that character identification "is one of the dominant means by which we become involved in a film emotionally" (p. 25). Shimamura (2013) confirms this, stating, "We laugh, cry, and become frightfully scared while watching movies. These feelings are driven largely by emotional engagement with the characters portrayed. Such empathetic responses first

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[1] The study of human empathy is multifaceted and deeply nuanced, encompassing a broad range of disciplines from physiology to psychology to philosophy (for deeper analysis, see Greiner, 2013; Robinson, 2005; Smith, 1995). The purpose of this discussion is not to make new claims about the processes of empathy. Instead, the goal is to establish a useful understanding of empathy that will serve as a foundation for exploring empathy toward non-human animated characters.

involve imaging oneself as someone else and, as a result, experiencing another's feelings." (p. 20). Emotion connected with a character helps the spectator, who exists outside the constraints of the film, better comprehend the meaning of the film. As Anderson (1996) argues, "We must perceive meanings in relation to someone, to a character in the movie who inhabits the fictional world of the movie, who is subject to its constraints" (p. 136).

Researchers in empathy literature tend to identify two or more distinct processes that lead to empathy. Three of the more commonly identified processes in are *embodied simulation*, *theory of mind*, and *appraisal*.

Embodied Simulation

Embodied simulation, also known as simulation theory (Barratt, 2006), is a "bottom-up process generating bodily responses that we then attribute or project onto the object of empathy" (Raz & Hendler, 2014, p. 93). In other words, the viewer understands another's emotions by viscerally feeling those emotions. Embodied simulation "mediates our capacity to share the meaning of actions, intentions, feelings, and emotions with others, thus grounding our identification with and connectedness to others" (Gallese, 2007).

In Gallese's account, simulation is a physical, visceral process that begins in the brain with neurons known as *mirror neurons*.[2] In humans (and in some animals, especially primates), mirror neurons fire not only when a person performs an action, but also when the person watches someone else perform the same action (Ferrari et al., 2009; Gallese, 2007; Raz & Hendler, 2014; Shimamura, 2013). The same process occurs when observing emotional states: "[T]he perception of pain or grief, or of disgust experienced by others,

[2] The study of mirror neurons is still emerging and there are critics who oppose the idea. For example, Hickok (2014) asserts that claims about the existence of mirror neurons are based on insufficient assumptions and that other factors are responsible for the "mirror neuron function."

activates the same areas of the cerebral cortex that are involved when we experience these emotions ourselves" (Rizzolatti & Sinigaglia, 2008, p. xii). Also called emotional mirroring (Raz & Hendler, 2014), embodied simulation is a process in which a spectator's brain resonates with the emotional state of another person and reacts as if the spectator were feeling the same emotion.

The process of embodied simulation happens automatically and without conscious intention. "Emotions, like actions, are immediately shared" (Rizzolatti & Sinigaglia, 2008, p. xii). When viewers "passively watch a scene or movie depicting a person expressing an emotion or being touched [. . .] this situation alone is sufficient to engage brain networks representing the firsthand experience of affect or touch" (Singer & Lamm, 2009, p. 88). When the spectator watches another person or character experience painful, sad, or exhilarating situations, embodied simulation may cause the spectator to immediately feel a viscerally-driven empathy with that person or character.

Theory of Mind

In contrast to the bottom-up process of embodied simulation, theory of mind (ToM) is a top-down process. Premack and Woodruff (1978) coined the term when studying the mental processes of chimpanzees. They write, "In saying that an individual has a theory of mind, we mean that the individual imputes mental states to himself and others (either to conspecifics or to other species as well)" (p. 515). Also referred to as perspective taking (Singer & Lamm, 2009), "ToM entails imaginatively assuming the perspective and explicitly inferring or evaluating the mental state and feelings of another person" (Cheetham et al., 2014, p. 1836). ToM builds on the notion of *folk psychology*, the idea that people attribute motivations and intentions to the actions of others based on general social scripts. “[F]olk psychology provides a range of schema, heuristics, and rules of thumb that enable us to interpret and predict the behaviors of fellow human beings in terms of the mental states stereotypically associated with ordinary actions” (Carrol & Seeley, 2013, p. 66). The spectator empathizes with a character by taking on the perspective and motivations of that character.

Appraisal

A third route to empathy is appraisal. According to Barratt (2006), this theory “comes somewhere in between [embodied] simulation and theory [of mind], perhaps combining and reconciling the basic elements of both” (p. 44). Robinson (2005) writes, “The affective appraisal is fast, automatic, not directly controllable” (p. 62). It is “quick and dirty,” as LeDoux (2015) puts it. Barratt gives the following example: “When a film depicts a character who is, for example, a mountain climber hanging precariously from a cliff, “as an observer, we would appraise the climber’s situation in a similar fashion to the climber himself” (p. 40). Through a cognitive appraisal of the situation, the spectator feels similar emotions to what he or she would feel in the character’s place, but not identical emotions to those of the character (Singer & Lamm, 2009).

When appraising a situation, the spectator undergoes two simultaneous processes. The spectator’s primary, “quick-and-dirty” appraisal is that the cliff-hanging scenario warrants intense fear. The secondary, more rational appraisal is that the spectator is not hanging dangerously from a cliff but is rather sitting safely in a movie theater. Barratt (2006) concludes, “In light of this, the end-result would be a deeply harrowing, though ultimately vicarious, emotional experience” (p. 41). When a film character’s situation elicits a strong emotional response, this dual appraisal, or “twofoldedness” (Plantinga, 2013), makes negative emotions manageable. In frightening scenes, the viewer's fear is tempered by the fact that the spectator is in no real danger. Because this otherwise unpleasant emotion is kept at a manageable level, it becomes an entertaining and even pleasant sensation (Plantinga, 2013), one which audiences pay to experience.

While the above processes of empathy have been widely studied in relation to human characters in movies, there is lack of literature explaining how viewers empathize with non-human characters. Anthropomorphism literature offers some clues.

Anthropomorphism

Empathy is not reserved only for human characters. The spectator's empathy can extend to lamps in *Luxo Jr.*, robots in *WALL-E*, and even umbrellas in *The Blue Umbrella*. Even though these characters are not human, they are seen as people (Holliday, 2018). Plantinga (2013) clarifies, "By person I don't mean 'human being.' Movie characters are often cartoon animals, aliens, androids, or supernatural beings. By person I mean a living entity whose mental life includes thoughts, desires, intentions, and feelings" (p. 104). The human tendency to anthropomorphize, or humanize, is a major factor in empathizing with non-human characters in film.

The word "anthropomorphism" is derived from the Greek words *ánthrōpos*, which means human, and *morphē*, which means shape or form (Holliday, 2016). Thus, a literal definition of anthropomorphism is attributing human form to non-humans; an example of this would be calling a dog's front paws "hands." But beyond simply denoting a physical human shape, the term has come to include the attribution of non-physical human qualities to non-humans, including human mental and emotional processes. Waytz et al. (2010) give a simple definition that encompasses both physical and non-physical aspects, saying that anthropomorphism requires “attributing human form or a human mind to the [non-human] agent” (p. 3). Thus, for the purpose of this study, anthropomorphism is defined as *perceiving a non-human as having human form, thoughts, feelings, and/or goals*.

Before continuing, it is worthwhile to address some common attributions that are easily misidentified as anthropomorphism. The first of these is perceiving a non-human entity—especially a nonliving entity—as alive. Waytz et al. (2010) clarify:

> Anthropomorphism also goes beyond animism—simply attributing life to a nonliving object. The essence of anthropomorphism is therefore attributing capacities that people tend to think of as distinctly human to nonhuman agents, in particular humanlike mental capacities (e.g., intentionality, emotion, cognition). (p. 3)

Second, descriptive wording about a non-human can be mistakenly interpreted as anthropomorphic: “Regarding a fox as quick does not necessarily denote anthropomorphic reasoning, but regarding a fox as wily does. The former is simply a description of an observable behavior, whereas the latter refers to a distinctively mental quality” (Waytz et al., 2010, p. 3). Finally, attributing animal qualities to a non-animal is not anthropomorphism. For example, many of the non-human characters in Disney’s *Beauty and the Beast* (Trousdale & Wise, 1991) behave like humans, but the footstool behaves like a dog. While it would be correct to say the other characters are anthropomorphized, it would be incorrect to say the same of the footstool, unless the viewer also attributes human emotions or cognitive processes to it. These distinctions will be important in later assessment of the use of anthropomorphic language by study participants.

Now that anthropomorphism has been defined, what factors lead to anthropomorphism? What makes a non-human seem to have “person-ness”? Anthropomorphism literature reveals that two major factors influence whether a viewer perceives an animated character as a person and thus an object of empathy: appearance and movement.

Character Appearance

As revealed by the literal definition of anthropomorphism, one way the spectator can empathize with a non-human entity is if it appears somewhat human, because human appearance can be perceived as indicating human thoughts and feelings. According to Tan (2013), "Some likeness with humans is probably the condition that makes for empathy with animals and lifeless objects" (p. 340). The physical body of a character is vital to our understanding of his, her, or its thoughts and person-ness, as Gallese (2007) writes: "Empathy is deeply grounded in the experience of our lived-body, and it is this experience that enables us to directly recognize others not as bodies endowed with a mind but as persons like us" (p. 525). However, is not necessary that a character should look exactly like a human for the spectator to recognize person-ness. Gallese goes on to explain,

> [W]e can perfectly recognize children's hands and monkeys' hands as such despite their different visual size and texture. Furthermore, we can recognize hands as such even when all the visual details are not available, even despite shifts of our point of view, and when no visual shape specifications is provided. (p. 526)

Visch and Tan (2009) studied the perceived animacy of simple, moving shapes. One unexpected finding in their experiment was that their distortion parameter greatly reduced perceived animacy. They suggested that since the distortion made the shapes shorter and wider in appearance, it may have reduced their resemblance to humans; undistorted shapes were taller and thinner and thus more suggestive of a human silhouette.

Much of the literature on character appearance has to do with what makes an animated character *fail* as an object of empathy rather than what makes it succeed. The concept of an "uncanny valley" in robotics design was a thought experiment proposed by

Mori (1970/2012). The idea is that the degree to which a robot (or animated character) resembles a human does not linearly correspond with how familiar it will seem to a human observer (Kätsyri et al., 2017). Robots may be seen as neutral if they have no human resemblance, or cute if they have a slightly human resemblance. Affinity is highest for characters that are, or look exactly like, real humans. However, before a robot looks exactly like a human, it reaches a point where it goes from cute to horrifying; this sudden drop-off in affinity is the uncanny valley that Mori identified. The uncanny valley is where some of the creepiest depictions of *almost* human-looking objects are found, including corpses, zombies, and the CGI characters in *The Polar Express*, a 2004 children's movie whose unintentionally terrifying characters fell into the uncanny valley between cute and realistic (Clinton, 2004). Piwek et al. (2014) graphed affinity for characters with varying likeness to humans and found that these characters did indeed conform to the predicted uncanny valley effect. Because observers experience an automatic negative response to characters in the uncanny valley, Mori recommended that robot designers stay away from trying to accurately replicate human features. He thought designers should aim for a moderate degree of human likeness or none at all: "In fact, I predict that it is possible to create a safe level of affinity by deliberately pursuing a nonhuman design" (Mori 1970/2012, p. 100).

While a moderately human-like animated character generates more viewer empathy, what about those that look nothing like humans? How might a viewer experience embodied simulation when the character's "body" looks like a lamp? How could human mental attributes be attributed to a character with no human features? Such characters should elicit minimal emotional response according to the uncanny valley prediction, and yet characters like R2-D2 from *Star Wars* (Lucas, 1977) or Luxo Jr., which have no human bodies or faces, are lovable characters that have withstood the test of time. The key is the way characters move.

Character Movement

Tan (2013) writes, "[M]ost people can feel empathy with and sympathy for puppets or other life-less objects, such as Luxo Jr., and even abstract geometric figures, provided they move in appropriate ways" (pp. 339–340). Mori (1970/2012) predicted that motion would exaggerate the peaks and troughs of the uncanny valley; for example, he thought a moving zombie would be more disturbing than a motionless corpse. However, Piwek et al. (2014) found that natural motion (generated by human actors using motion-capture technology) actually increased affinity for moving vs. static characters—even a zombie, which Mori placed at the bottom of the valley. On the other hand, distorted motion increased the eeriness of all characters. "[O]ur results suggest that natural motion reduces the fear produced by these static images" (p. 276). Tinwell et al. (2011) found that a lack of motion in just the upper face region exaggerated the uncanniness of a character even when other movements were natural.

Chaminade et al. (2007) found that motion-capture movements represented by point-light displays, which provide virtually no information about physical appearance, were more likely to be perceived as natural than the same movements applied to various CGI characters. Even the sex and emotion of the actor could be gathered from this limited representation. Kozlowski and Cutting's (1977) study found that sex could be determined from point-light displays that were moving, but not from static displays. Citing this study, Gallese writes, "This seems to suggest that our 'grasping' of the meaning of the world doesn't exclusively rely on the cognitive hermeneutic of its 'visual representation' but is strongly influenced by action-related sensory-motor processes" (2007, p. 526). Findings like these suggest that movement is more important than physical appearance in determining whether viewers empathize with animated characters, especially those that have low resemblance to humans.

Moving Shapes Studies

Several studies have demonstrated viewer tendency to attribute human mental states even to simple geometric shapes (Heider & Simmel, 1944; Oatley & Yuill, 1985; Visch & Tan, 2009). The original study by Heider and Simmel (1944) involved a cartoon film in which 2D shapes (a big triangle, a little triangle, and a little circle) performed movements around and in a box containing a flap or door. Test subjects who viewed the film were asked simply to "write down what happened in the picture" (p. 245). Of 34 test subjects in the first experiment, only one described the movements in almost exclusively geometric terms. All other test subjects described the actions of the shapes with colorfully anthropomorphic wording, conjecturing the shapes' intentions, desires and emotions. Interpretations of the shapes' mental states and personalities were largely consistent among the subjects.

The original study has been replicated by later scholars. Oatley and Yuill (1985) recreated Heider & Simmel's experiment and reported similar results. Branching off of the original experiment, Oatley and Yuill found that the titles given for the films influenced viewer interpretation. Different groups of subjects who watched the exact same film described the shapes as being angry at someone for stealing, feeling anxious over the safety of a child, or becoming jealous of a lover, depending on what title they film was given (Oatley, 2013). This suggests that context and viewer expectations influence empathy in addition to movement. Visch and Tan (2009) also created an experiment based on Heider and Simmel's, but this time using simple 3D shapes and manipulating the "velocity, efficiency, fluency, detail, and deformation" of the shapes' movements (p. 265). They found that different types of motion influenced viewer perception of emotion and genre.

Anthropomorphism can arise from character appearance as well as from character movement. When characters appear human, viewers have the potential to experience embodied simulation-driven empathy toward the character. However, the tendency for people to anthropomorphize even abstract shapes suggests that person-like movement is sufficient for the spectator to perceive non-human characters like Luxo Jr. as "people." By attributing human mental and emotional processes to non-human characters (theory of mind), the viewer has the potential to empathize with the character's struggles and triumphs.

Case Study: Appearance and Motion in Luxo Jr.

Luxo Jr. (Lasseter, 1986) is a useful film to study because it features inanimate object characters that look almost nothing like humans, yet audiences easily anthropomorphize them. Nominated for an academy award in 1986, the film continues to score well with audiences and critics (*Luxo Jr. (1986)*, n.d.). The two-minute film has no dialogue and centers on the antics of a small lamp (Luxo Jr.) hopping around and playing with a ball while a large lamp (Dad) observes and interacts. Despite lacking human facial features or limbs, the two lamps feel like people because they parallel human appearance and movement.

John Lasseter (1987), director of *Luxo Jr*. and many other Pixar films, said a key aspect in designing the appearance of the two lamps was to create a feeling of a baby and adult. Proportions are important in this distinction—Luxo Jr. isn't just a small version of Dad, he's a *baby* version. To achieve this, Lasseter mimicked the exaggerated proportions found in human babies and puppies (2001). The lightbulb on both lamps is the same size, but Luxo Jr.'s lampshade is smaller than Dad's lampshade. In addition, the rods and springs that make up the bodies of the lamps are the same diameter on Jr. as they are on Dad, but they are much shorter (p. 42). By modelling the lamps to parallel familiar human and animal proportions, Lasseter cues the viewer to see the lamps as two distinct ages.

The motion of the lamps is also important for making the lamps feel like people, perhaps more so than appearance: "The emotional state of a character can also be defined more by its movement than by its appearance" (Lasseter, 1987, p. 37). For believable animated characters, actions should stem from the emotions of the character (Ashida et al., 2001; Lasseter, 1987, 2001). Lasseter (1987) advises:

> In character animation, all actions and movements of a character are the result of its thought process. [. . .] Without a thought process, the actions of a character are just a series of unrelated motions. With a thought process to connect them, the actions bring a character to life. (p. 43)

Because thought process and emotion should be unique for each character in a film, no two characters should move in exactly the same way (Ashida et al., 2001; Lasseter, 1987, 2001). Instead, the various personalities, capabilities and intentions should inform different movement animations for each character. Lasseter (2001) writes:

> For example, in *Luxo Jr.*, both Dad and Jr. bat the ball with their heads. Yet Dad, who is larger and older, leans over the ball and uses only his shade to bat it. Jr., however, is smaller, younger and full of energy; he whacks the ball with his whole shade, putting his whole body into it. (p. 46)

Emotion must inform movement, not the other way around (Ashida et al., 2001; Porter & Susman, 2000). Throughout *Luxo Jr.*, Lasseter (2001) varied the speed of Jr.'s hops to match his mood. At the beginning, Jr. chases a ball around the screen with happy excitement and childlike energy. For this portion, Lasseter timed the hops to happen in quick succession, making Jr. spend more time in the air than in contact with the ground. Later in the film, Jr. pops the ball and his resulting sadness translates to a drastic change in hopping speed. At this point, Lasseter animated Jr. to hop slowly and spend more time on the floor between each hop (p. 46). While appearance and motion work together to indicate the relative age of the lamps, motion is essential for revealing each characters' mental and emotional states.

Case Study: Faces in The Blue Umbrella

Whereas *Luxo Jr.* exemplifies how the bodies of faceless characters can reveal emotion, *The Blue Umbrella* (Unseld, 2013) is a case study in exactly the opposite: nearly all of the characters have faces, but lack bodies. One of Pixar's most photorealistic short films (Haswell, 2014), the dialogue-free film stars two umbrellas that have cartoon faces complete with eyes, eyebrows and mouths. However, much more interesting are the faces of the film's side characters. *The Blue Umbrella* contains many inanimate object characters who are permanently attached fixtures like buildings, signs and grates. Since they don't have bodies, these characters can see what is happening around them but have limited agency to move themselves around. Instead, their sentience is revealed through the expressiveness of their faces.

Humans tend to see faces in clouds, blobs of ink, and even burned toast, a common phenomenon known as pareidolia (Holliday, 2016). *The Blue Umbrella* plays on this tendency by revealing faces in everyday objects like drain pipes, mailboxes, and houses. Screws, slits, windows, and other elements are positioned relative to one another in a way that resembles the relative position of eyes and mouths on human faces. At the beginning of the film, the actual appearance of the faces is very subtle, to the point of not being immediately recognizable as faces. However, as rain begins to fall on the city, the faces start moving and the characters appear to come alive (Leslie, 2014).

It is the motion rather than the appearance of the faces that gives these side characters "personness." The film's director Saschka Unseld recalls his experience pitching his idea at Pixar:

> I shot a couple of faces in the street where I was living on my phone, and I put them in the computer and animated the mouths and the eyes [. . .]. I remember hitting play and, at first, everyone was like, 'Why is he showing us this weird thing that he shot on his phone?' because they didn't see the faces yet. And then, the first blink happens and a smile happens, and everyone was just so fascinated by it." (Radish, 2013)

In *The Blue Umbrella*, the eyes of the characters move simultaneously and always point in the same direction, as human eyes do. The mouths and eyes express only one emotion at any given time (i.e., there is never a "happy" mouth paired with "sad" eyes). Because the movements of the characters' faces parallel human facial movements, the characters feel like people. This fits with Piwek et al.'s (2014) suggestion that natural movement makes characters seem familiar.

The timing of the movements makes characters truly feel sentient. Throughout the film, the side characters' facial expressions are always tied to the action and emotion of the scenes. When Blue, the main umbrella character, meets Red, a lovely red umbrella, a crosswalk sign glances back and forth with its little screws to see what will happen between them. However, the two become separated. Trying desperately to get back to Red, Blue gets swept away by a gust of wind that hurls him into oncoming traffic—now all the side characters express surprise and fear at his danger, including a construction barrier that pushes Blue out of the way just in time. When Blue gives up his search for Red, an empathetic drain pipe droops, a mailbox sags, and a grate in the road with downward-slanting eyes sadly nudges Blue. Finally, when Blue and Red are reunited, the mouths of all the signs, pipes and gutters turn upwards again in happy smiles.

Hypotheses

Research on anthropomorphism addresses how ToM impacts empathy; characters who seem to have an internal thought process are more readily regarded as people, even if they are simple geometric shapes (Heider & Simmel, 1944; Oatley & Yuill, 1985; Visch & Tan, 2009). However, while character appearance has frequently been studied in relation to characters in or near the uncanny valley (Kätsyri et al., 2017; Mori, 1970; Piwek et al., 2014; Tinwell et al., 2011), not as much research has been done on characters that are further from the valley, such as those in *Luxo Jr.* or *The Blue Umbrella*. More research needs to be done to discover what physical features and motions indicate "personness" when a viewer observes a character that does not look like a human or animal. It is possible that viewers perceive the various parts of inanimate object characters as parallels to human anatomy (literal anthropomorphism). The experiment detailed below will test this hypothesis using Heider and Simmel's (1944) experiment and later adaptations as its foundation.

This study proposes that, when presented with anthropomorphic shapes, the viewer subconsciously identifies and labels character body parts based on how they look and move. For example, viewers of *Luxo Jr*. wouldn't think twice about calling Jr.'s lampshade a head. He tracks the motion of the ball by keeping the lightbulb oriented at the ball for most of the film; this would seem to indicate that its lightbulb functions as an eye, which viewers would expect to be within the head. The two lamps point their lightbulbs at each other as though looking each other in the eye. Jr. hangs his head when Dad reprimands him, and Dad shakes his head at the baby's antics, which are familiar human actions. However, if the lampshade were used differently, would first-time viewers see it as a different part of Luxo Jr.'s body? What if Jr. were inverted and walked on his lampshade while looking around with his base? Or what if Jr. didn't move at all, but his power cord moved in a lifelike manner? Such adjustments could drastically affect the way viewers label the various parts of Luxo Jr.'s physical structure. Rather than attempting to recreate and manipulate the character in *Luxo Jr*., this study uses an original animated video with simplified geometric shapes.

Specifically, this study proposes the following hypotheses:

1. The majority of participants will use anthropomorphic language to describe the character and/or events depicted in the video (language that attributes cognitive activity and/or emotions to the figures).

2. Empathy will be higher among participants who use anthropomorphic language.

3. The majority of participants who watch "Legs," "Arms," and "Eyes" will label the appendages in the diagram as "legs," "arms," "eyes," respectively, or synonyms of those terms.

CHAPTER THREE

Methods

Recruitment

Numerical data was taken from 284 survey responses. Incomplete responses and responses that indicated the respondent was under the age of 18 were not included in the data set. Voluntary participants were recruited via convenience sampling and snowball sampling. Data was collected remotely via a Qualtrics survey (see Appendix A), which was distributed to potential participants digitally via social media posts (e.g. Facebook, Instagram, GroupMe) and direct messages (e.g. text messages, emails).

Experimental Conditions

Each participant was randomly assigned to one of four experimental conditions (hereafter referred to as C1, C2, C3, and C4): "No Limbs," "Legs," "Arms," and "Eyes."[3] At the beginning of the survey, participants were randomly assigned to watch one of four versions of an original 30-second animated video, each featuring a simple, silhouetted figure (F) moving around and interacting with six small square objects. All four videos follow the same plot, with the only difference being the different physical "abilities" of the four figures. The main plot points are as follows:

4. F enters the screen and discovers six squares on the ground (Figure 3.1).
5. Curious, F kicks, pushes, or throws the squares so that they stack into a pyramid shape.

[3] These titles were used only by the researchers and were not shared with participants to avoid influencing their responses.

6. F ascends the stack and dances on top of the topmost square, expressing joy and playfulness (Figure 3.2).

7. The stack falls over as a result of F's movements, and F falls to the ground.

8. Picking itself up off the ground, F discovers that some squares have broken into triangles (Figure 3.3). This makes F sad.

9. Then, F becomes angry begins smashing the other squares so they break into triangles too. F begins to throw the triangles around.

10. One of the triangles sticks into the ceiling, which surprises F.

11. F throws more triangles to see if they will stick into the ceiling too. They do. F throws most of the triangles into the ceiling and dances again.

12. One triangle falls dangerously close to F, making F jump back in fear (Figure 3.4).

13. Triangles begin falling left and right, and F runs off screen in the nick of time to avoid getting hit.

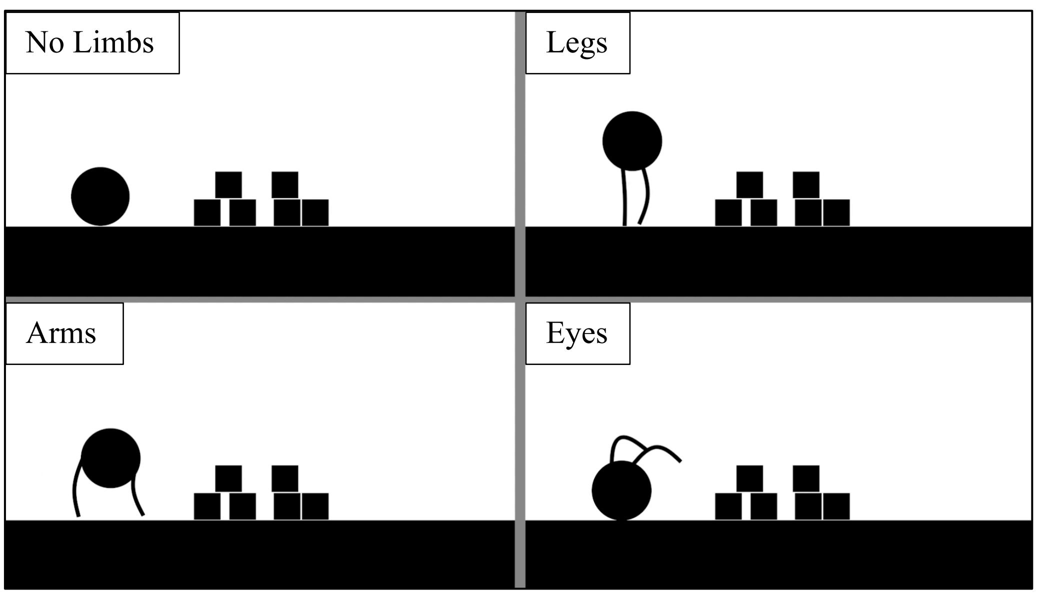

Figure 3.1: F discovers blocks

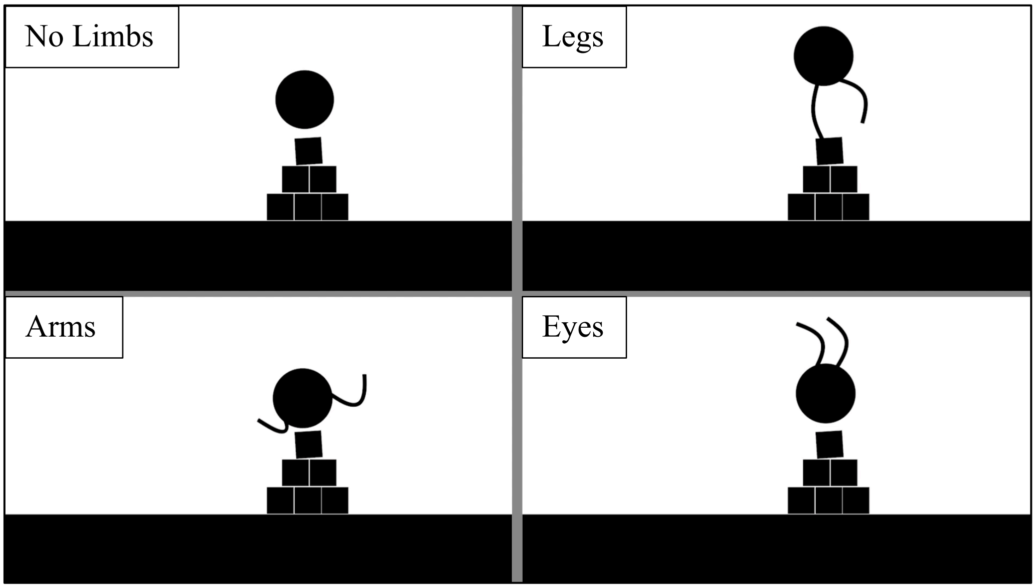

Figure 3.2: F dances on the stack of blocks

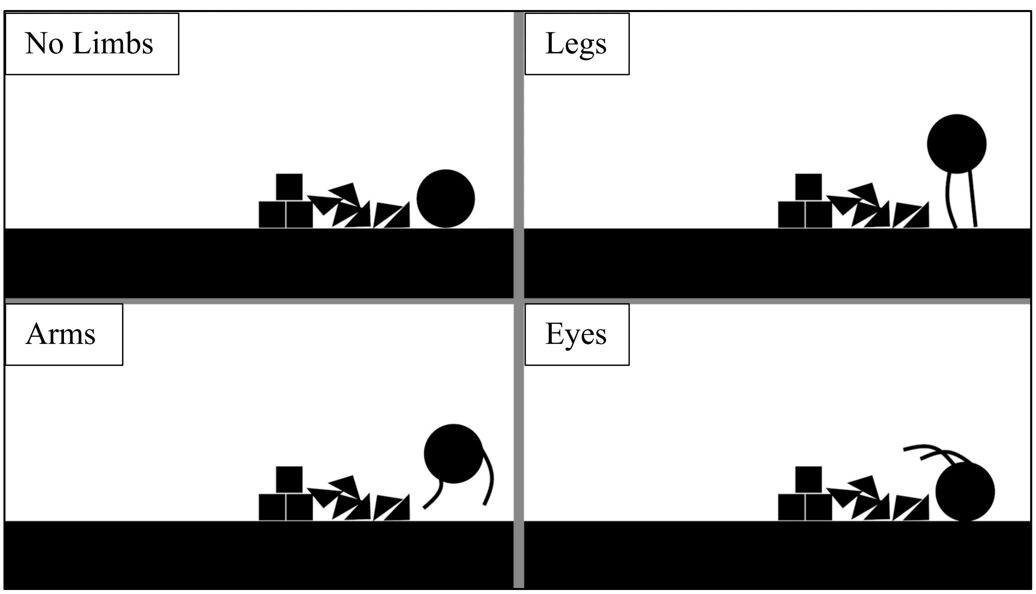

Figure 3.3: F sees the broken blocks

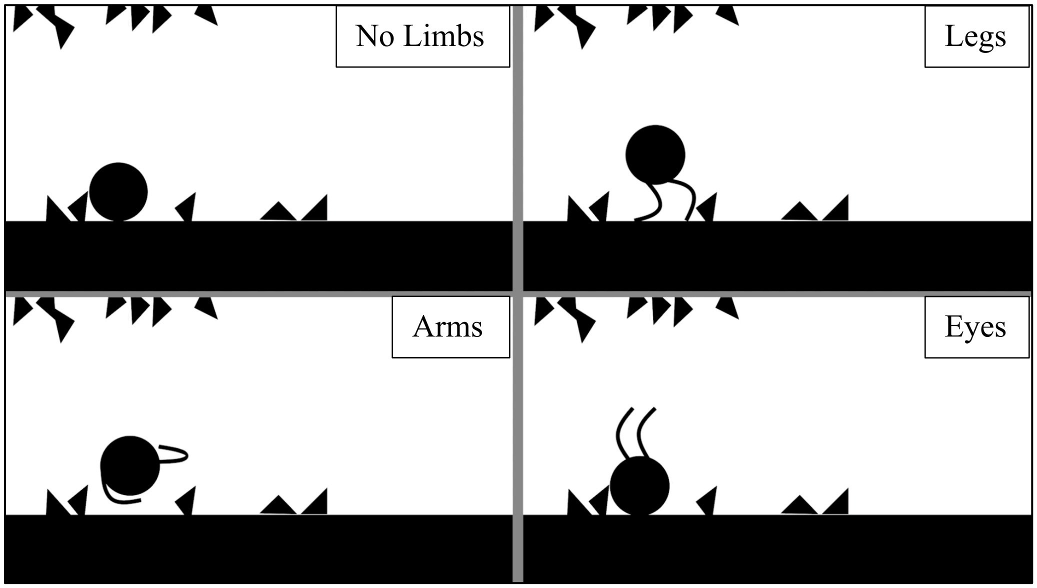

Figure 3.4: F dodges falling triangles

Description of the Four Characters

In C1, F is composed of only a shaded circle. The manner in which F interacts with its environment is designed to be similar to that in Heider and Simmel's (1944) original study. C1 is the control condition.

In the three variable conditions, F is composed of a circle and two lines (L1, L2) that are attached to the circumference of the circle and can move and bend. L1 and L2 are parented to the circle, meaning the whole figure moves as one unit.

In C2, "Legs," L1 and L2 attach to the bottom of the circle and point downwards. L1 and L2 move like legs in a basic walking cycle seen from the side. The character walks, runs, steps up onto the squares, kicks a square, etc. Common animation guidance for walk cycles was consulted when animating the leg positions.

In C3, "Arms," L1 and L2 attach to opposite sides of the circle. The figure uses its arms to pick up and move squares, stack them on top of each other, etc.

In C4, “Eyes,” L1 and L2 attach to the top of the circle and bend to point toward whatever it is looking at. They move simultaneously and always point the same direction, as in *The Blue Umbrella*. Following Lasseter’s (2001) advice, the eyes move before the character moves in order to make it appear that the character has conscious thought and intention. Like in *The Blue Umbrella*, the character’s eyes droop to indicate sadness.

Qualtrics Survey Design

After providing consent (see Appendix B), participants first watched the 30-second video and then answered questions about the events and character. The survey forced responses to all questions and did not allow participants to return to previously answered questions, giving researchers full control over the time order in which participants were exposed to questions and in the order in which they answered them.

Hypothesis 1: Measuring Anthropomorphic Language

To determine whether participants used AL without prompting, as Hypothesis 1 predicted, the survey was designed so that participants watched the video first, without any suggestion to think of F as a person or character. Question 1 (Q1) through Q3 asked participants to “Describe what happened in the video” and to label a picture of F. The wording of these three questions was general and open-ended, designed not to prompt the participants to use AL. Since Q4 and many subsequent questions prompted respondents to think of F as a person, only instances of AL that occurred in Q1-Q3 were included in the AL analysis.

Four raters were selected to identify instances of AL in answers to Q1-Q3, including the PI, the faculty advisor, and two graduate students in the same program of study as the PI. Raters were chosen for convenience, and were given written guidelines for identifying AL (see Appendix C). The guidelines included the following functional definition of anthropomorphic language: “The respondent uses language that indicates the character in the video [F] is a person who has conscious thoughts, feelings, and/or goals.” In addition, raters were instructed to mark “yes” on any responses that referred to F with an explicitly human term, such as “person,” “child,” “guy,” etc. For the purpose of this study, terms such as “character,” “protagonist,” “figure,” “he,” and “she” were not considered AL because they are not explicitly human terms; such terms might as easily describe animals or bugs or robots. Further, raters were instructed to mark “yes” on any responses containing language that indicated emotions or thought processes. Such responses might include, “the character was angry/sad/happy/scared,” (language indicating emotions) or “the character wanted to/was trying to” (language indicating a thought process and/or a conscious goal). Statements that described a physical action but not a thought process, such as “the character ran/jumped,” were not considered AL. Identifying AL necessarily involved some subjective judgement on the part of the raters; when in doubt, raters were asked to make their best judgement call informed by the above guidelines.

The four raters read through all answers to Q1-Q3 and marked responses that contained AL on a binary “yes” (indicated by 1) or “no” (indicated by 0) scale. If the rater found AL anywhere in a participant’s answers to Q1-Q3, the rater marked the entire response with a 1; if the rater could not identify any AL in Q1-Q3, the entire response was marked with a 0. Each rater gave a total of 284 marks (either 1 or 0), one for each of the 284 survey responses.

Interrater reliability for raters’ AL scores was tested in SPSS using the intraclass correlation coefficient (ICC) procedure. The scores were analyzed using two-way absolute agreement measures. The average measures ICC was 0.936 (see Table 3.1), indicating high interrater reliability.

Table 3.1: Interrater reliability for AL scores

ICC (Avg. Measures)	Value	95% CI	Sig.
0.936	16.16	0.923, 0.948	$p < .000$

To force a dichotomous AL score for every survey response, raters' scores were averaged and responses where there was not perfect agreement were adjusted. Specifically, average scores of 0.75 were rounded up to 1 (28 instances), while average scores of 0.25 were rounded down to 0 (12 instances). Due to an even number of raters, there were 11 responses that received an average score of 0.5; in these instances, the PI evaluated the responses against the guidelines and made the final determination of 1 or 0.

Hypothesis 2: Measuring Empathy

To test whether empathy was higher among participants who used AL, as Hypothesis 2 predicted, empathy was measured using four items from Cohen's (2001) character identification scale (see Appendix A, Q4-Q7). Participants indicated their degree of agreement with each statement by selecting one option from a seven-choice scale that ranged from "Strongly disagree" to "Strongly agree." For quantitative analysis, these responses were weighted from 0 (strongly disagree) to 6 (strongly agree); thus, 6 was the highest possible empathy score. Mean empathy (E) scores were calculated by averaging each participant's answers to Q4-Q7.

Additionally, Q11, Q13, and Q15 asked participants to indicate how F felt at different points in the narrative (e.g. happy, sad, angry, and so on; see Appendix A).

Participants were allowed to "select all that apply." These questions offer the opportunity to see whether participants generally have similar interpretations of F's emotions.

Hypothesis 3: Labeling the Appendages

Hypothesis 3 anticipated that the majority of participants who watched "Legs" (C2), "Arms" (C3), and "Eyes" (C4) would label the appendages in the diagram as "legs," "arms," and "eyes," respectively, or synonyms of those terms. To test this, participants were asked to label each basic shape in a diagram of F (see Appendix A, Q3).

CHAPTER FOUR

Results

Hypothesis 1 predicted that the majority of participants would use anthropomorphic language (AL) to describe the character and/or events depicted in the video (language that attributes cognitive activity and/or emotions to the figures). Raters' adjusted AL scores revealed that 197 participants (69%) used AL without prompting, while 87 participants (31%) did not use AL without prompting (Figure 4.1). This supports Hypothesis 1.

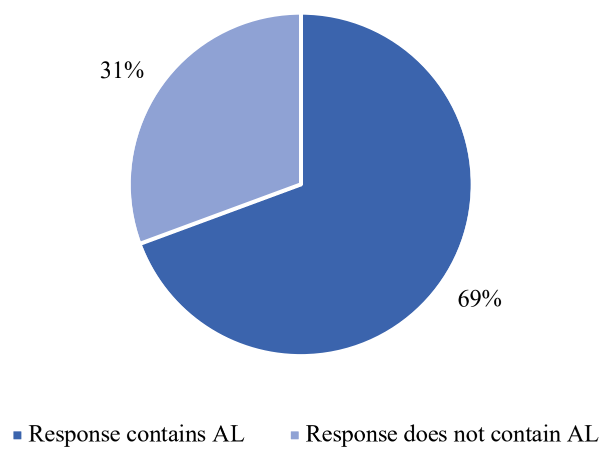

Figure 4.1: Overall percentage of participants who used AL without prompting

Hypothesis 2 predicted that empathy would be higher among participants who used anthropomorphic language. To determine whether mean empathy (E) was linked to AL, regression of E on AL was tested: $\beta = 0.33$ ($SE = .02$), $t = 5.91$, $p < .001$, $R^2_{adj} = 0.11$, 95% CI = (0.09, 0.17). Participants who used AL without prompting had a higher average E score (E = 4.56) than those who did not (E = 3.71; see Figure 4.2), demonstrating that E and AL were linked. The effect size of E on AL was small (11%) but significant, with $p <$

.000. A linear regression analysis indicated that empathy had a positive impact on the use of AL. To determine the significance of the difference in E scores, an ANOVA test was performed. The Levine's test of homogeneity of error variances was significant (p = .001), indicating a violation of the assumption of equal variances, which was not unexpected since the sample sizes were different (Figure 4.1). Therefore, the results were also analyzed based on Welch's ANOVA. The difference in E between the two groups was statistically significant, with $p < .000$ (Table 4.1). Thus, empathy was higher among participants who used AL than among those who did not. This supports Hypothesis 2.

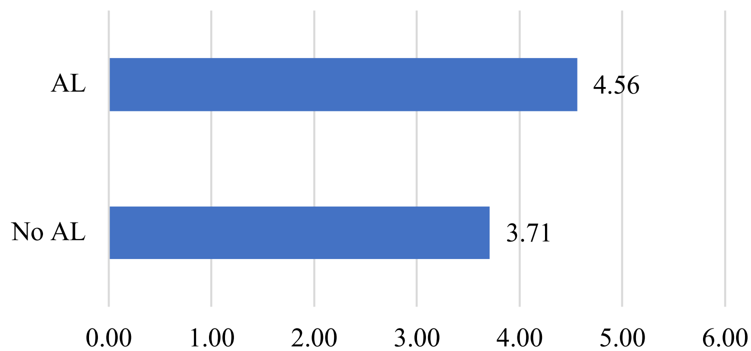

Figure 4.2: Mean empathy scores separated by AL

Table 4.1: Significance of E difference between AL and no AL

Variable	*Welch's*	$F_{(1, 285)}$	Sig.	η^2	95% CI
Empathy	28.6	36.23	$p < .000$	0.11	0.053, 0.184

Hypothesis 3 anticipated that the majority of participants who watched "Legs" (C2), "Arms" (C3), and "Eyes" (C4) would label the appendages in the diagram as "legs," "arms," and "eyes," respectively, or synonyms of those terms. Eighty-one of 83 participants who watched the Condition 2 (C2) video, "Legs," labeled the appendages "legs," for a total of 98%. Forty-four of 58 participants who watched the C3 video, "Arms," labeled the appendages “arms,” for a total of 76%. However, only 5 of 60 participants who watched the C4 video, “Eyes,” called the appendages “eyes,” for a total of 8%. Instead, the two most frequently used labels were “antennae” and “arms”: 36 participants, or 60%, called the appendages “antennae,” and 13 participants, or 22%, called the appendages “arms.”[1] Thus, Hypothesis 3 is partially supported; see chapter 5 for discussion.

Empathy and AL Separated by Condition

The mean empathy score for each condition was calculated (Figure 4.3). Comparing the E scores among all four conditions revealed that C1 had the lowest average empathy of all four conditions by a statistically significant difference, while C2, C3 and C4 had similar E scores with no statistically significant difference among them (Table 4.2). The Levine’s test was not significant (p = .112), meaning the assumption of equal error variances between conditions was not violated in the ANOVA test.

Table 4.2: Difference in E scores among C1, C2, C3, and C4

(I) Condition	(J) Condition	Difference (I-J)	*SE*	Sig.	95% CI
C1	C2	-0.58	.17723	p = .007	-1.0492, -.1074
	C3	-0.66	.19540	p = .005	-1.1793, -.1408
	C4	-0.78	.19347	p < .000	-1.2911, -.2629
C2	C3	-0.08	.19540	p = 1.000	-.6009, .4375
	C4	-0.20	.19347	p = 1.000	-.7128, .3154
C3	C4	-0.12	.21024	p = 1.000	-.6756, .4417

[1] These numbers are not mutually exclusive; one participant said both “antenna” and “arm,” while one participant said both “antenna” and “eye.”

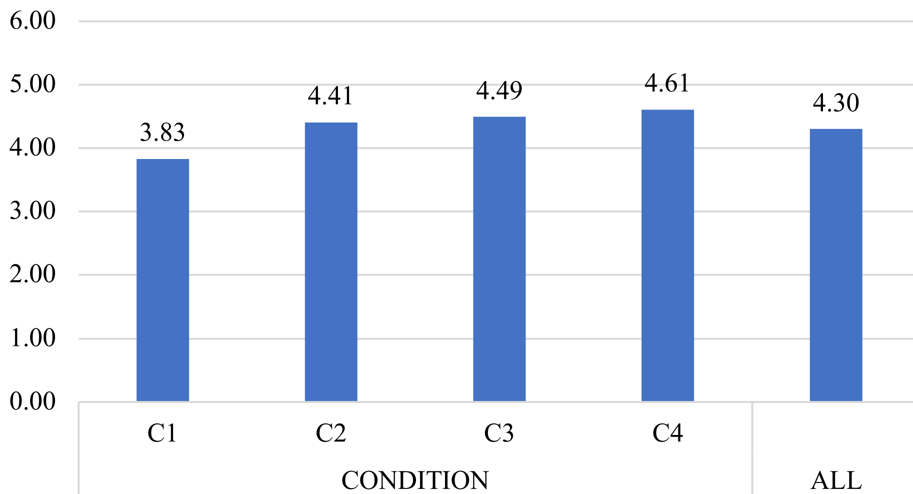

Figure 4.3: Mean empathy scores separated by condition

Only 34% of participants in C1 used AL to describe the events or characters in the video, while 82%-86% of participants in C2-C4 used AL (see Figure 4.4). The difference in AL usage among C2-C4 was not statistically significant, but the difference in AL usage between C1 and all other conditions was statistically significant. Pearson's Chi-Square test revealed a significant difference in AL usage among the four conditions (χ^2=7.36, $p < .000$).

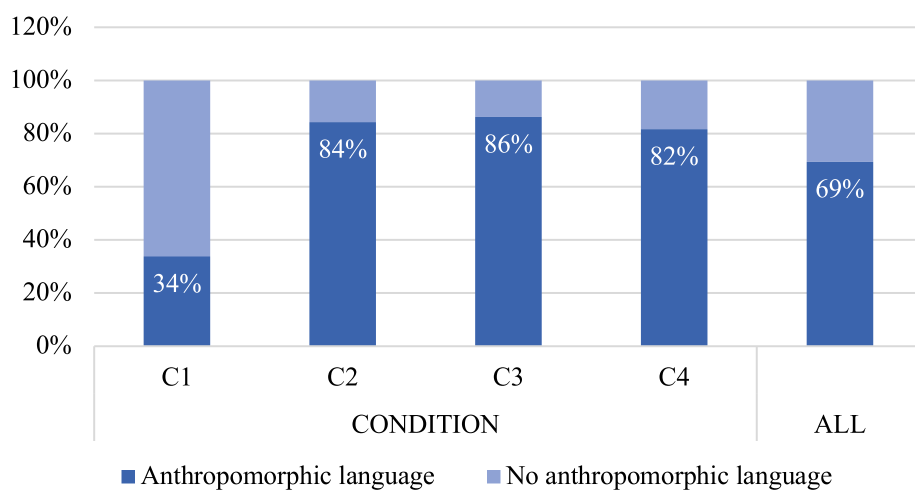

Figure 4.4: Percentage of participants who used AL in each condition

Gender

Gender did not significantly impact AL or E scores. The percentage of females who used AL was slightly higher than that of males (73% of females versus 64% of males), but the Pearson's Chi-Square test indicated the difference was not statistically significant ($\chi^2 = 2.64$; $p = .104$). Additionally, the ANOVA test indicated that males and females did not significantly differ in empathy ($p = .678$).

Understanding F's Emotions

Graphing participants' responses to Q11, Q13, and Q15 reveals clear spikes on certain emotions at each point in the narrative. When asked how F felt the beginning of the video, 56% of participants said F felt happy, and 42% said surprised (Figure 4.5). In the middle of the narrative after F falls off the blocks, 72% of participants said F felt angry (Figure 4.6). At the end of the video, 68% of participants said F felt scared (Figure 4.7).

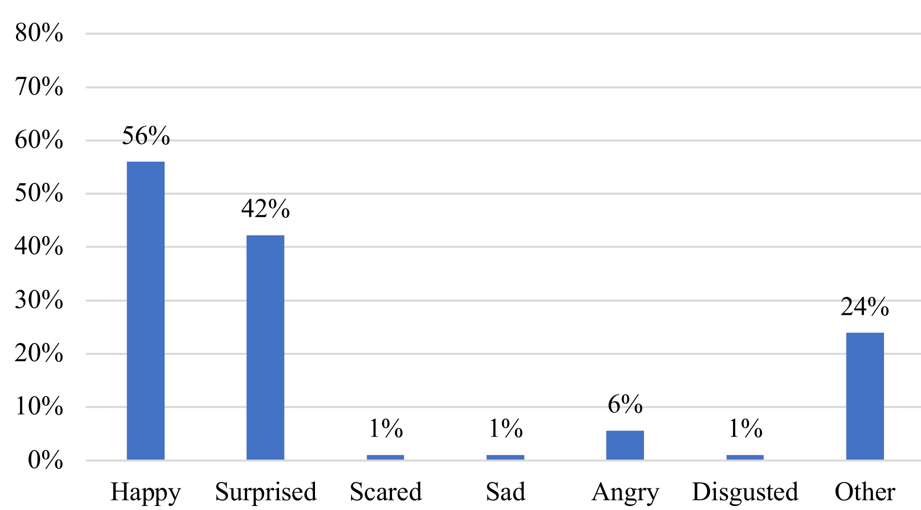

Figure 4.5: How did the character feel at the beginning of the story?

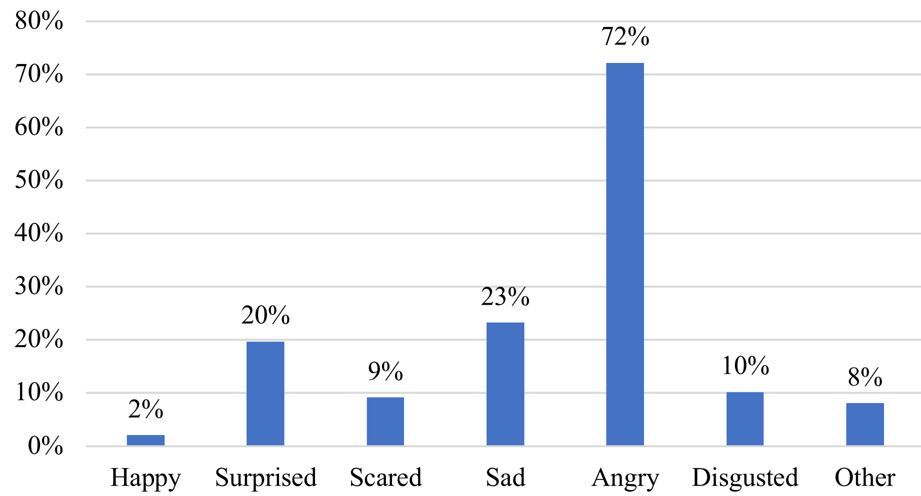

Figure 4.6: How did the character feel after falling off the blocks?

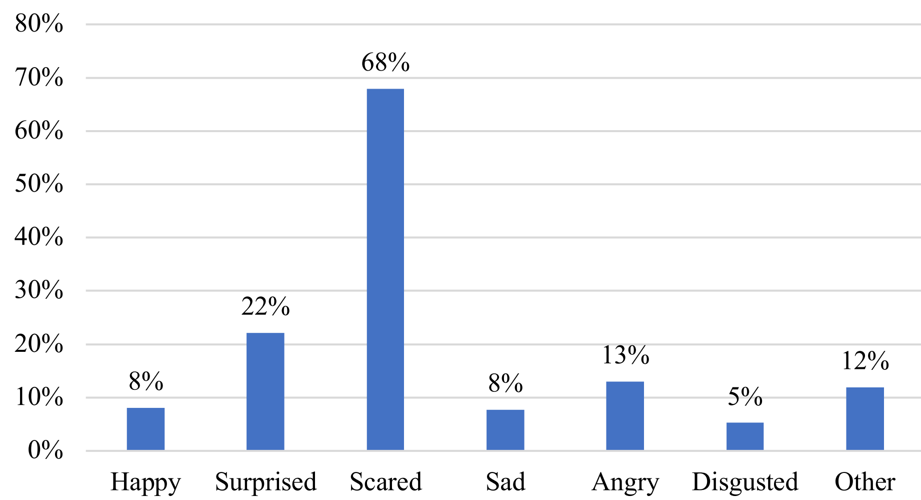

Figure 4.7: How did the character feel at the end of the story?

Labeling the Circle

When asked in Q3 to label the circle, the majority of labels fell into one of two categories: geometric terms (including "ball, circle, sphere, etc.") and anatomical terms (including "head, body, face, torso, etc."). Only a negligible number of participants (3 of 284) used anthropomorphic language as per the previously given definition (e.g., "person"). When labeling the F in C1 ("No Limbs"), no participants used anatomical terms;

instead, the majority (87%) used geometric terms (Figure 4.8)[2]. The majority (73%) of participants used anatomical terms for the circle in C2 ("Legs"; Figure 4.9). The majority (58%) of participants used anatomical terms for the circle in C4 ("Eyes"; Figure 4.11). Unexpectedly, in C3 ("Arms"), the majority (72%) of participants used geometric terms rather than anatomical terms; only 28% used anatomical terms (Figure 4.10).

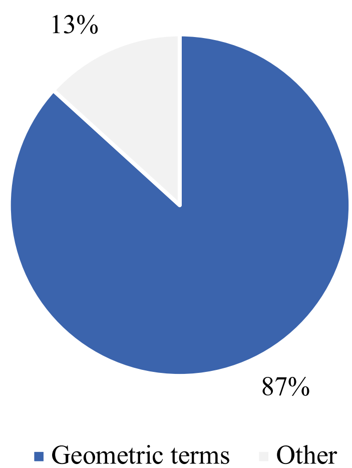

Figure 4.8: Labels given to circle in C1 ("No Limbs")

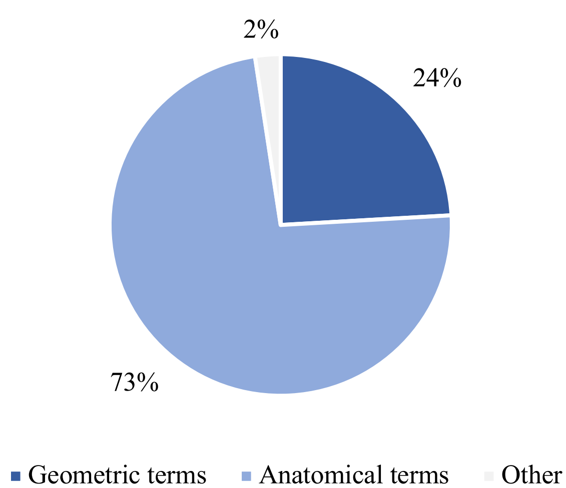

Figure 4.9: Labels given to circle in C2 ("Legs")

[2] Three participants (4%) called the C1 circle the "protagonist" or "antagonist"; these are included in the "Other" segment of the pie chart.

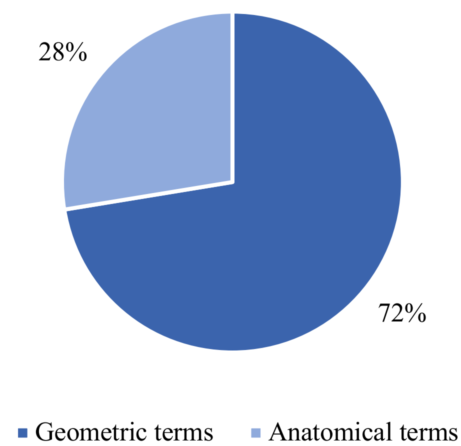

Figure 4.10: Labels given to circle in C3 ("Arms")

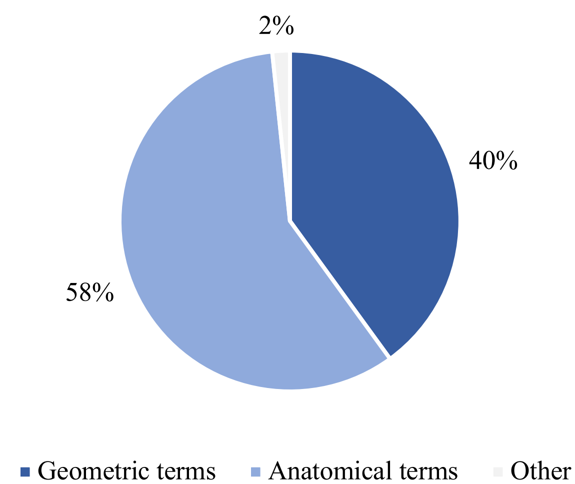

Figure 4.11: Labels given to circle in C4 ("Eyes")

CHAPTER FIVE

Discussion

The presence of appendages significantly increased participants' empathy toward the character as well as their tendency to use anthropomorphic language. Interestingly, the type of appendage did not significantly impact use of AL or empathy, since there was no significant difference in E or AL among conditions 2-4 (Table 4.2, Figure 4.3, Figure 4.4). Participants empathized equally, and were equally likely to use anthropomorphic language, whether the character had legs, arms, or eyes/antennae. This seems to indicate that the type of appendage is unimportant; rather, the mere presence of appendages increases empathy and anthropomorphism. Literature on anthropomorphism and character appearance would suggest that the more human-looking characters generated more embodied simulation-driven empathy. However, the fact that viewers empathized with the "Eyes" character as much as with "Legs" and "Arms" despite calling the eyes "antennae" (see Hypothesis 3 discussion below) suggests that appearance was not the primary factor in increasing empathy and use of AL. A likelier explanation is that the movement of the appendages provided additional information that viewers could use to infer the character's thoughts and emotions. Drawing upon theory of mind literature, having a better understanding of thoughts and emotions would logically lead to increased anthropomorphism and empathy. Further, this explanation agrees with literature suggesting that character movement is more important than appearance for causing viewer empathy (Chaminade et al., 2007; Gallese, 2007; Kozlowski & Cutting, 1977; Piwek et al., 2014).

Even though the majority of participants used anthropomorphic language overall, as Hypothesis 1 predicted, participants were unlikely to use AL when the character had no appendages whatsoever (only 34% of participants used AL in Condition 1; see Figure 4.4). This contrasts with Heider and Simmel's (1944) findings, where 33 of 34 participants who watched the movements of the three limbless shapes "interpreted the movements as actions of animate beings, in most cases of persons; in two cases of birds" (p. 246). A contributing factor may be the type of interactions portrayed. The character in this study interacted only with lifeless objects and not with other "sentient" shapes, whereas Heider and Simmel's showed interactions among three characters. Another possible factor might be the length of the video. Viewers of Heider and Simmel's film had 2½ minutes to process and interpret the shapes' movements and to see them as thinking, emotional agents, whereas the video in this study was only 30 seconds long (a fifth of the running time).

As Hypothesis 2 predicted, empathy was higher among participants who used anthropomorphic language. It is reasonable to suggest that empathy, in part, led to the use of anthropomorphic language and not vice versa. First, it is clear that feelings of empathy preceded the use of AL: empathy occurs instantaneously (Rizzolatti & Sinigaglia, 2008), and because of the structure of the survey, the participant viewed the video (and was exposed to the character) before the participant used AL. Second, the study results showed that empathy and AL were linked; empathy had an 11% effect on the use of AL. Therefore, it is logical to conclude feelings of empathy led to the use of AL. However, the effect size indicates that empathy does not fully explain the use of AL, which suggests further study is needed.

Hypothesis 3 predicted that the majority of participants who viewed "Eyes" would call the appendages "eyes" or a synonym. However, the majority called them "antennae." Both antennae and eyes are sensory organs (bugs can smell or feel with their antennae), but the two terms are arguably not synonyms. However, the term "antennae" does indicate that most participants in C4 interpreted F's appendages as being used to sense its surroundings, even if not specifically to see its surroundings. A likely explanation for the use of this term is that the appearance of F's "eyes" was dissimilar to human eyes and most animal eyes. Human eyes are small, round, and located within the head. F's eyes were long, limb-like, and stuck outward from the head. It could be argued that the eyes both appeared and moved more like antennae than eyes, as they did not look like human eyes and there was limited similarity of their movement to human eye movement. Because the character was designed to be composed of the same basic shapes in different arrangements, this limited the ability to closely mimic human eyes.

Despite the dissimilarity to human eyes, participants had equal empathy and used AL just as often for F in C4 as they did with both other Fs that had limbs. This would seem to confirm that a human appearance is not necessary for communicating person-ness, as demonstrated by films such as *Luxo Jr.*, *The Blue Umbrella*, *WALL-E*, and many others.

When participants were asked to label the circle in each condition, most participants used geometric terms for the circle in "No Limbs" (Figure 4.8), while most used anatomical terms for the circle in "Legs" and "Eyes" (Figure 4.9, Figure 4.11). This seems logical, given that the latter two conditions had higher uses of AL than "No Limbs." However, the majority of participants used geometric terms for the circle in "Arms"—not anatomical terms (Figure 4.10). This was surprising given the fact that all three limb conditions had essentially equal empathy and AL scores (Figure 4.3, Figure 4.4). This result suggests that the type of label each participant gave to the circle was not tied to how much the participant empathized with or anthropomorphized the character. However, further study would need to identify what other factors led to this outcome.

The video in this study was a very brief narrative that had no dialogue and featured a character that was made of simple, geometric shapes. Yet even with such limited information, participants had similar interpretations of F's emotions throughout the story, as the graphs revealed (Figure 4.5, Figure 4.6, Figure 4.7). Participants especially agreed about F feeling angry in the middle of the video and scared at the end. A character that had no face, no voice, and no interactions with other characters was still able to communicate basic emotions that the majority of participants interpreted the same way.

Limitations

The length of the video was limited to 30 seconds in order to keep the story short and simple. However, it is possible that a longer video would give viewers more time to become acquainted with the character and to process and infer the character's thoughts and emotions, which could affect empathy.

The shape of the "eyes" did not cause participants to perceive them as eyes, but rather as antennae. The four figures in the videos were created using the same basic shapes; in C2-C4, the two rectangles were simply rearranged in different configurations. Because rectangles were used to represent eyes, they did not closely align with a normal eye schema. If the focus of this study had been about eye or facial movement, it would have been necessary to offer a more accurate representation of eyes, similar to the eyes in *The Blue Umbrella* (Unseld, 2013). However, as this study focused on overall silhouette and motion, similarity to human anatomy was sacrificed for the sake of simplicity and similarity among the figures.

Future Research

Empathy partially explains the use of anthropomorphic language. However, because the effect size of empathy on AL was only 11%, additional research is needed to explore what other factors lead to the anthropomorphism of simplified, moving shapes.

While Heider and Simmel found that nearly all participants anthropomorphized shapes without limbs, most participants in this study did not use anthropomorphic language to describe the limbless character. It is possible that the interpersonal interactions among shapes portrayed in Heider and Simmel's study might have been a factor. Future studies could explore whether the portrayal of interpersonal relationships among shapes contribute to greater anthropomorphism and empathy.

Although this study identified the use of anthropomorphic language, this is not equivalent to measuring anthropomorphism. Anthropomorphism is an internal process in which an individual attributes person-ness to a non-human agent, whereas the use of AL is an external action. Thus, it would be beneficial to measure anthropomorphism on a scale as this would provide more information than the binary AL scores used in this study. A scale for measuring anthropomorphism was not found among the literature cited in this research, but would be useful for future study. Because definitions of anthropomorphism vary among scholarly works, an anthropomorphism scale should first clearly define the term. The scale should approach the concept of anthropomorphism from a variety of angles, including cognitive and emotional aspects of person-ness. Researchers could then ask viewers to indicate their agreement on an agree-disagree scale in order to ascertain to what extent the viewer saw the character as a person. Cohen’s (2001) identification scale would be a good model on which to pattern an anthropomorphism scale.

The question of why some non-human characters are more engaging than others is particularly pertinent to filmmakers and animators. As with any art form, animation advice and practices are often based on observation and intuition about what “feels right.” However, further study could provide theoretical underpinnings that would help reduce trial and error in the character creation and animation process. This would help animators more effectively create engaging and successful non-human characters.

CHAPTER SIX

Conclusion

Humans are hard-wired to empathize with other humans; empathy is built into the brain and can happen without conscious intention. According to the definition given in this study, empathy is both visceral and rational—body and mind—giving a holistic sense of what another person might be feeling and thinking. Even though human-to-human empathy is more studied, fictional characters don't need to be human to inspire empathy as long as they exhibit person-ness in how they look and move. When character appearance parallels human appearance, embodied simulation can lead to empathy. Yet even characters with minimal to no human appearance can inspire empathy if their movement sparks theory of mind interpretations of the characters' thoughts and feelings. Empathy with non-humans requires anthropomorphism; if a viewer can see a character on screen and say, "That is a person who thinks and feels as I do," the scenario is ripe for empathy. However, more research is needed to identify other factors that lead to empathy for and anthropomorphism of inanimate objects in animated films. The literature agrees that viewers do empathize and anthropomorphize, but the question of *why* this happens is still largely unanswered. Further research could provide a theoretical framework to help animators and filmmakers create non-human animated characters that are more successful and engaging.

APPENDICES

APPENDIX A

Qualtrics Survey

Thank you for participating in this study! Data collected in this survey will remain confidential and will be used for academic purposes. Please do not provide personal information in your answers (e.g. names, passwords, or contact information). The survey will take about 15 minutes.

Consent Form (See Appendix B).

Watch the video before continuing. The video is best viewed in full screen. Because the rest of the questions are based on this video, you may want to view it a couple of times as you won't be able to watch it again once you click continue.

Q1 Describe what happened in the video.

____

____

____

____

Q2 What is this figure?

F1. (See)

____

F2. (See)

____

F3. (See)

____

F4. (See)

____

Q3 Label the diagram.

F1. (See)

- A (1) ____

F2. (See)

- A (1) ____
- B (2) ____
- C (3) ____

F3. (See)

- A (1) ____
- B (2) ____
- C (3) ____

F4. (See)

- A (1) ____
- B (2) ____
- C (3) ____

Please indicate how much you agree with the following statements.

Q4 While viewing the video, I could feel the emotions the character portrayed.

- Strongly agree (6)
- Agree (5)
- Somewhat agree (4)
- Neither agree nor disagree (3)
- Somewhat disagree (2)
- Disagree (1)
- Strongly disagree (0)

Q5 During viewing, I felt I could really get inside the character's head.

- Strongly agree (6)
- Agree (5)
- Somewhat agree (4)
- Neither agree nor disagree (3)
- Somewhat disagree (2)
- Disagree (1)
- Strongly disagree (0)

Q6 At key moments in the video, I felt I knew exactly what the character was going through.

- Strongly agree (6)
- Agree (5)
- Somewhat agree (4)
- Neither agree nor disagree (3)
- Somewhat disagree (2)
- Disagree (1)
- Strongly disagree (0)

Q7 While viewing the video, I wanted the character to succeed in achieving his or her goals.

- Strongly agree (6)
- Agree (5)
- Somewhat agree (4)

- o Neither agree nor disagree (3)
- o Somewhat disagree (2)
- o Disagree (1)
- o Strongly disagree (0)

Q8 How much did you like the video?

- o Liked a great deal (6)
- o Liked a moderate amount (5)
- o Liked a little (4)
- o Neither liked nor disliked (3)
- o Disliked a little (2)
- o Disliked a moderate amount (1)
- o Disliked a great deal (0)

Q9 What kind of person is the character?

____
____
____
____

Q10 At the beginning of the story, what objects did the character discover? What did the character do with them?

____
____
____
____

Q11 How did the character feel at the beginning of the story? Check all that apply.

- ☐ Happy (1)
- ☐ Surprised (2)
- ☐ Scared (3)
- ☐ Sad (4)
- ☐ Angry (5)
- ☐ Disgusted (6)
- ☐ Other (please specify) (7)

Q12 In the middle of the story, the character fell off of the blocks. What did the character do then? Why?

____
____
____
____

Q13 How did the character feel after falling off the blocks? Check all that apply.

- ☐ Happy (1)
- ☐ Surprised (2)

☐ Scared (3)
☐ Sad (4)
☐ Angry (5)
☐ Disgusted (6)
☐ Other (please specify) (7)

Q14 At the end of the story, what did the character do? Why?

____
____
____
____

Q15 How did the character feel at the end of the story? Check all that apply.

☐ Happy (1)
☐ Surprised (2)
☐ Scared (3)
☐ Sad (4)
☐ Angry (5)
☐ Disgusted (6)
☐ Other (please specify) (7)

Almost finished! Please answer the following demographics questions. Your answers will remain confidential.

Q16 Age

____

Q17 Gender

○ Male (1)
○ Female (2)

Q18 Race (check all that apply)

☐ White (1)
☐ Black or African American (2)
☐ American Indian or Alaska Native (3)
☐ Asian (4)
☐ Native Hawaiian or Pacific Islander (5)
☐ Other (6)

Thank you again for participating! Please feel free to share this survey with others. Click the arrow to finish.

APPENDIX B

Consent Form

Baylor University

Department of Film and Digital Media

Consent Form for Research

Animated Shapes Survey

PRINCIPAL INVESTIGATOR: Alyssa Edwards

SUPPORTED BY: Baylor University

Purpose of the research:
The purpose of this study is to investigate film viewer's cognitive and emotional interactions with animated shapes. We are asking you to take part in this study because you are a potential movie viewer.

Study activities:
If you choose to be in the study, you will watch a short animated video and answer several questions about the video. The survey will take approximately 15 minutes to complete.

Risks and Benefits:
To the best of our knowledge, there are no risks to you for taking part in this study.

There are no benefits to you from taking part in this research. Others may benefit in the future from the information that is learned in this study.

Confidentiality:
A risk of taking part in this study is the possibility of a loss of confidentiality. Loss of confidentiality includes having your personal information shared with someone who is not on the study team and was not supposed to see or know about your information. The researcher plans to protect your confidentiality.

Confidentiality will be maintained to the degree permitted by the technology used. Your participation in this online survey involves risks similar to a person's everyday use of the Internet, which could include illegal interception of the data by another party. If you are concerned about your data security, you should not participate in this research.

We will keep the records of this study confidential. Electronic data will be kept in a password-protected computer. We will make every effort to keep your records confidential. However, there are times when federal, state, or international law requires the disclosure of your records.

Authorized staff of Baylor University may review the study records for purposes such as quality control or safety.

Questions or concerns about this research study
You can call us with any concerns or questions about the research. Contact information is listed below:

Dr. Daniel M. Shafer
Email: daniel_m_shafer@baylor.edu
Office: +1 254-710-4471

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), you may contact the Baylor University IRB through the Office of the Vice Provost for Research at 254-710-3708 or irb@baylor.edu.

Taking part in this study is your choice. You are free not to take part or to stop at any time for any reason. No matter what you decide, there will be no penalty or loss of benefit to which you are entitled. If you decide to withdraw from this study, the information that you have already provided will be kept confidential. Information already collected about you cannot be deleted.

By continuing with the survey and completing the study activities, you are providing consent.

☐ I hereby consent to participate in this study.

APPENDIX C

Guidelines for Identifying Anthropomorphic Language

Functional Definition of Anthropomorphic Language

The respondent uses language that indicates the character in the video is a person who has conscious thoughts, feelings, and/or goals.

Indicators

Indicators of anthropomorphic language may include:

- The respondent calls the character an explicitly human term, such as "person," "child," "guy," etc.
- The respondent uses words that suggest the character has internal emotions and/or thought processes.
- Descriptions of the character and/or actions include wording that could be attributed to a human being or high-functioning animal (e.g. a chimpanzee), and not to a lower-functioning animal (e.g. a squirrel or a bug).

Examples

Anthropomorphic Language

- "The character was angry/sad/happy/scared etc." (language that indicates emotions)
- "The character wanted to/was trying to" (indicates a thought process and/or a conscious goal)
- "Stick man," "woman," "dude," "teenager" (these are explicitly human labels)

Not Necessarily Anthropomorphic Language

- "The character ran/jumped" (this describes a physical action, NOT a thought process)

- “Character,” “protagonist,” “figure,” “he,” “she” (these don’t necessarily indicate human-ness; they could just as easily describe animals or bugs or robots)

Instructions

Each row represents a unique survey response; consider each row separately. Type a “1” in the “anthropomorphic language” column (column A) if you find <u>any anthropomorphic language</u> anywhere within that particular row. Leave the cell blank if there is no anthropomorphic language anywhere in the row.

Please note that marking the responses as anthropomorphic or not will necessarily involve subjective judgement, which is why multiple raters have been recruited in order to reach a general consensus regarding each response. When in doubt, simply make your best judgement call informed by the above guidelines.

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