



Delightfully disturbing

Utilizing uncanny valley in favour of character design

Satu Kiintonen

BACHELOR'S THESIS
November 2021

Media & arts
Interactive media

ABSTRACT

Tampereen ammattikorkeakoulu
Tampere University of Applied Sciences
Bachelor's Degree in Media and Arts
Interactive media

KIINTONEN, SATU:
Delightfully Disturbing
Utilizing Uncanny Valley in Favour of Character Design

Bachelor's thesis 48 pages, of which appendices 1 page
May 2022

This thesis examined varying theories related to the “Uncanny valley” effect – a negative psychological reaction allegedly triggered by increasingly realistic humanlike products, such as robots and 3D-characters. Through literature and video reviews of studies on eeriness, as well as inspection of the design choices and interviews of varying artists, this study’s goal was to pinpoint some of the visual and physical features in characters, which were contributing to the effect.

This study attempted to offer alternative ways to navigate the design process of eerie and creepy characters, by utilizing the strong emotional effect of uncanny valley, for the benefit of character design. Out of the themes and physical features discovered through analysis, the most prominent were applied to the design and production process of an animated 3D-game character, which acted the part of an enemy in a student-produced video game with religious themes.

The game was produced in collaboration with students from the Media and Arts study paths from Tampere University of Applied Sciences. The production of the character is recorded in this thesis, step by step.

Key words: uncanny valley, character design, psychology, eerie, uncanny

CONTENTS

1	INTRODUCTION	4
2	MAPPING THE VALLEY.....	7
	2.1 The graph.....	7
	2.2 History and the uncanny fathers.....	8
	2.3 First modern studies.....	10
	2.4 Subjectivity	12
3	EXPLANATIONS FOR THE UNCANNY	13
	3.1 The Animistic world	13
	3.2 Assumed aliveness and the effect of motion.....	15
	3.3 Memento Mori	19
	3.3.1 Post-mortem	21
	3.4 Evolutionary explanations	23
	3.4.1 Aesthetics.....	24
	3.4.2 Human directed expectations	26
	3.4.3 Unique to humans?	28
	3.4.4 Exclusive to humans?.....	31
	3.5 Alternate explanations.....	32
4	PRODUCTION.....	34
	4.1 Game world and the purpose of the character	34
	4.2 Artistic influence	34
	4.3 The design & concept art	35
	4.4 The 3D-execution.....	40
	4.5 Animation	43
	4.5.1 Butoh.....	45
5	DISCUSSION	47
	REFERENCES	49
	APPENDICES.....	52
	Appendix 1. Interview of the authors mother, Riitta Kiintonen, Specialized nurse	52

1 INTRODUCTION

In 1970 a Japanese electronics engineering magazine published an essay written by a professor of robotics Masahiro Mori. The essay bore the name “*bukimi no tani genshō* (不気味の谷現象)” – which eight years later was translated in English as “The Uncanny Valley”. This paper proposed a hypothesis of a non-linear relationship between the human likeness of a robot, and the emotional response of its perceiver. The more human a robot looked, the more positively people were to react to it. The paper however predicted, that after a certain level of human likeness, the human responses towards the robot would turn negative, resulting it to be perceived as creepy. This sudden, unexplainable plummet in the tone of responses, as well as in the graph used to visualize the theory, was dubbed as the infamous “uncanny valley”.

It took 30 years for the robotic, and even longer for the cinematic industry to realize the significance of this study to their respective fields, but today the valley has made its way to the vocabularies of almost all professional fields struggling with the same aesthetic question – How to imitate human likeness successfully? With the rise of 3D-animation technology, this question is no longer exclusively relevant to the robotic community.



PICTURE 1. Screenshot of the “Cats” movie trailer, along with audience commentary on the video (CATS - Official Trailer [HD], Youtube 2019)

As an example of the importance of the term to cinema, we could use a rather recent, but not completely unforeseen reputation of the “Cats” musical’s movie adaptation from 2019. The audience received the movie’s trailers with horror (Picture 1), and with the reluctance of the producers to change the designs of the characters in such a late stage of the production – the project had set its sail towards the loss of 70 million dollars in the box offices – and even getting disowned by the original musical’s creator Andrew Lloyd Webber (Wheeler 2019; Shoard 2020).

Another example of the destructive effects of the uncanny valley, is the case of Mass effect: Andromeda from 2017. The game’s release was received with widespread ridicule and criticism due to the game’s unfinished looks, especially regarding the game’s facial animations (Wilde 2017). Both aforementioned productions received reparative maneuvers post-release, but only the latter one was able to turn its audience’s reaction to positive and reportedly managed to make a profit (McKeand 2017).



PICTURE 2. An example of Bioware’s Mass effect: Andromeda before and after the reparative patch 1.05 (Mass Effect Andromeda: Patch 1.05 - Some Facial Animation Fixes & New Eyes, Youtube 2017)

Understandably uncanny valley’s rather vague nature has caused animation and game studios to tiptoe around realistic human representation, but what if instead

of igniting familiarity and positive responses – our aim was the complete opposite? What if instead of avoiding or attempting to cross the valley – one sought to delve into it on purpose? Not in attempt to produce a multi-million flop, but to perhaps profit from it by using it as a reference to design creepy and eerie characters?

Just as if one wanted to avoid using features eliciting creepiness or eeriness in character design – it is obviously necessary to first know what those are. For this reason, we will immerse ourselves in theories and studies related to the “Uncanny Valley” and all things eerie. To reach as complete understanding of the topic as possible, it is crucial for us to acknowledge that the uncanny valley as a phenomenon is hardly new – and that Mori did not discover our distaste towards increasingly humanlike characters. Therefore, in addition to analysing the original “The Uncanny Valley”-essay, this study also examines the very first papers made on the psychology of eeriness, as well as more recent studies on the root-causes for the eerie and the uncanny valley.

With the gained knowledge of the eerie and the features discovered, we will finally proceed to design a hopefully, virtually functional 3D game-character, capable of eliciting feelings of eeriness or creepiness in its perceivers. This task also includes the professional challenge of artistry to blend the character into the visual style and context of the game world, described more in detail in the chapter 4.1.

2 MAPPING THE VALLEY

2.1 The graph

The “Uncanny Valley”-graph (Figure 1) depicted in Mori’s essay is very straightforward. A positive reaction of a robot’s perceiver is described by a positive value, and a negative response by a negative value. The human likeness of a robot is portrayed horizontally increasing in the graph from left to the right. (Mori 2012, 98–99.)

The first robots depicted on this graph are the industrial robots. The resemblance of these robots is according to Mori still next to none, and the human reaction towards them is fittingly, indifference. The toy robots on the first hill, however, are already more potent in their resemblance of an actual human being, which makes them increasingly more relatable in comparison to the mechanical industrial robots. (Mori 2012, 98.)

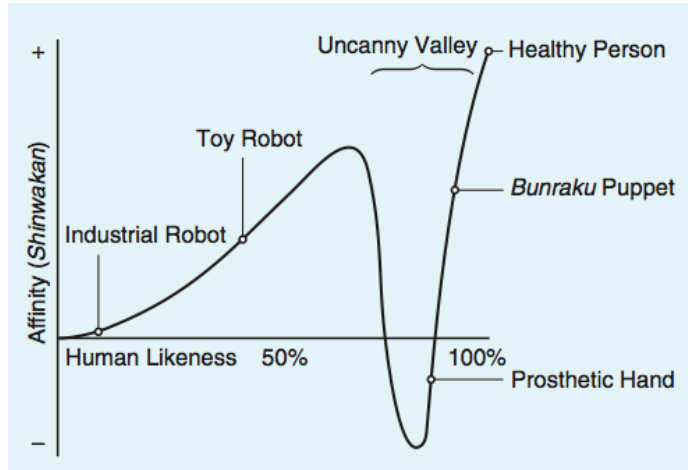
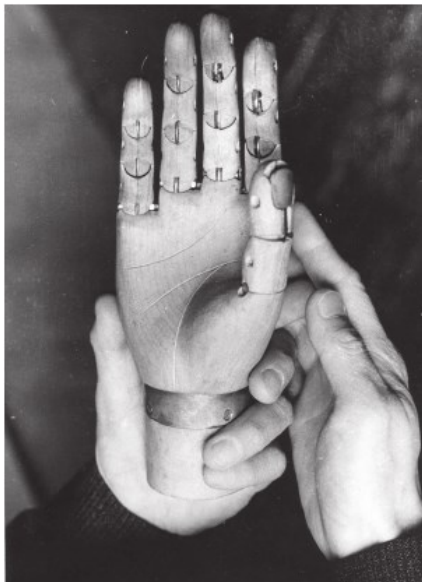


FIGURE 1. The original graph of the uncanny valley (Mori 2012, 99)

From here one could make an assumption, that by draping industrial robot’s arm in artificial skin and muscles – it would automatically increase one’s affinity towards it but this hardly seems to be the case. Instead, a physical appearance too close to a human being – would according to Mori, cause us to “reject” a robot. This is where the pressuring urgency of the “Uncanny Valley”-study was directed towards: If a single prosthetic limb had the power to trigger such strong negative

responses, how gruesome responses would a fully built humanoid robot be able to cause? (Mori 2012, 98–100.)

Unable to find an immediate solution to the problem himself, Mori's suggestion was to avoid too humanlike designs completely. He stressed the importance of stylization and aesthetics over realism and mentioned sculptors as the professionals of creating entities of "moderate human likeness and increased affinity". A prosthetic hand designed by a wood carver was presented in the study to further promote this point. This statement could be seen, even today as a recommendation to involve professionals of artistic fields into the design-processes of humanlike entities. (Mori 2012, 100.)



PICTURE 3. The wooden prosthetic-hand prototype featured in the "Uncanny Valley"-essay (Mori 2012, 100)

2.2 History and the uncanny fathers

The first ones to study our feelings of the eerie was the German psychologist Ernst Jentsch. In his most known paper "Zur Psychologie des Unheimlichen", "On the Psychology of the uncanny" 1906, he started the work with the phenomenon which the Germans called "unheimlichen". Jentsch himself described the term accordingly:

Without a doubt, this word appears to express that someone to whom something “uncanny” happens is not quite “at home” or “at ease” in the situation concerned, that the thing is or at least seems to be foreign to him. (Jentsch 1996, 8.)

Jentsch believed this feeling to be a product of an intellectual uncertainty, between “heimlich” and “unheimlich”, translating to English as “homely” and “unhomely”. Things considered as familiar and unfamiliar. These things, which varied from situation to situation, had the ability to shift from one end of the spectrum of familiarity to the other, and these feelings were to linger long as the uncertainty-inciting situation lasted. The uncanny experiences and responses however were not guaranteed to be consistent, even if the eerie-inducing situation was repeated. (Jentsch 1996, 8–9, 11.)

This natural mistrust to new and odd things Jentsch (1996, 8) described, is rather typical for all things alive. But the peculiarity of the phenomenon came with the fact, that the situations acting as the igniters, had not to be at all times real. Oftentimes, according to Jentsch the perceiver was also aware of this.

Indeed, even when they know very well that they are being fooled by merely harmless illusions, many people cannot suppress an extremely uncomfortable feeling when a corresponding situation imposes itself on them. (Jentsch 1996, 9–10.)

Nearly 20-years later the essay grasped the attention of an expert in the theme of repression, namely Sigmund Freud. Though the psychologists agreed on a lot of things considering the basic nature of the eerie, Freud wanted to argue that the concept behind the phenomenon would be so simple as the disparity of the things familiar and unfamiliar (1925, 2). Instead, a theory in which the uncanny experiences could be divided into two groups, was proposed.

The first group’s experiences were explainable through the theory of psychoanalysis, meaning that the eerie feelings would sprout from childhood experiences and complexes repressed (1925, 17–18). While this group could not escape from Freud’s classic combo of womb-fantasies and occasional phallicism (1925, 17–19) the theory seemed logical concerning individual cases dealing with prior experiences and trauma. This group will not be the one this study concentrates on,

since designing for such a specific demographics would firstly – be highly impractical, and counterintuitive, it would also be unethical – since purposively triggering emotional traumas of audience members would be morally questionable.

The theory considering the second group's experience proposed a more pervasive and universally applicable explanation for the uncanny. It took Jentsch's idea of the battle of tradition versus reform (1996, 8) further, by applying it into the context of a world view of an individual. This groups' experiences were explained by a repressed battle of a hereditary worldview versus a modern one (Freud 1925, 17–18) which will be examined more closely in chapter 3.1.

Freud most likely based his theories on the experiences of his patients, but both psychologists stated that in order to uncover the essence of the uncanny, the answer would not lie in the analysis of these individual cases – but the inspection of the shared circumstances and triggers (Jentsch 1996, 8; Freud 1925, 1–2).

2.3 First modern studies

Even though the uncanny valley had gradually gained popularity after the seventies, no empirical studies had been performed to back up its existence before the year 2006. In “The uncanny advantage of using androids in cognitive and social science research”, robotic engineers and professors of the Osaka University, Karl. F. MacDorman and Hiroshi Ishiguro subjected people to images of robot, android and human faces morphed together at various percentages. The test participants evaluated the features of these images in three categories: mechanical versus humanlike, strange versus familiar and eeriness, on scales 1 to 9 and from 0 to 10. The images were presented in a randomized order. (MacDorman & Ishiguro, 2006, 304–306.)

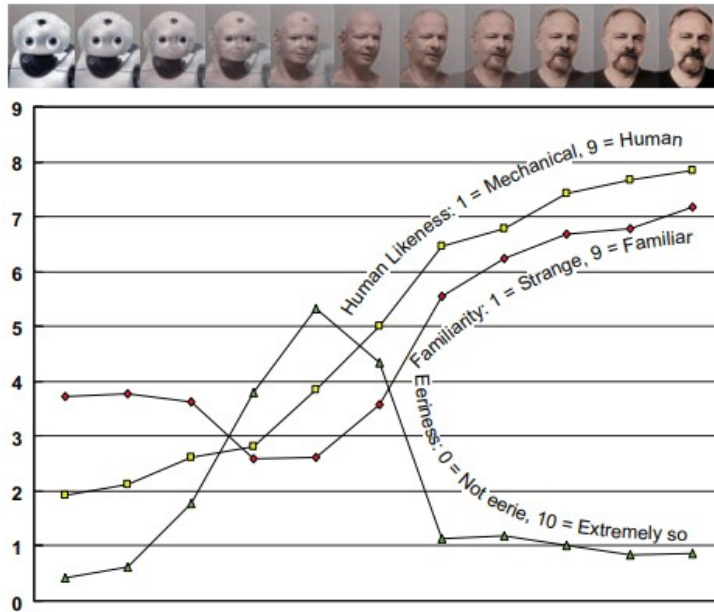


FIGURE 2. The average ratings given by participants to the image set morphing from robot to humanoid, and finally to a human face (MacDorman & Ishiguro 2006)

The test produced data similar to Mori's theory on two sets of images. The peaks of the eeriness-scores seemed to consistently match the lowest points of the familiarity scores across different image sets, while the human likeness of the morphs increased monotonically (MacDorman & Ishiguro 2006, 306). Despite the gradually increasing popularity for the "Uncanny Valley"-theory, not everyone is set on its existence. According to MacDorman and Ishiguro (2006, 307–308) David Hanson in 2005 had claimed to have been successful in eliminating the uncanny valley in a similar experiment, in which the results were achieved by adding cartoonish, more attractive elements to the characters morphed. These results in the thesis author's opinion are questionable, since when the studied image is altered, one cannot guarantee a monotonically increasing human likeness. This might cause one to skip or miss the alleged point of realism in which the claimed valley occurs. The thesis author also finds the study more affirming to Mori's theory than anything since the study achieves its results by doing just what the professor suggested in his original essay (Mori 2012,100) – avoiding the valley by creating characters more distant to that of a realistic human being, or more stylized.

2.4 Subjectivity

Both Jentsch (1996, 9–11) and Freud (1925, 1) acknowledged that people varied greatly in their sensitiveness to the ignition, as well as to the effects of the feeling. Things and situations which were uncanny for some – were not so for others at all (Freud 1925, 14). Reportedly people who were “delirious, intoxicated, ecstatic or superstitious” (Jentsch 1996, 13) were said to be most susceptible for the effects of the uncanny, and for Jentsch this included women and children as well (Jentsch 1996, 13). The feelings were thought to be most easily attainable and strongest in those who could experience and treat them as “real” through hallucinations and though extremely rare, weakest for those with the complete incapability to experience them. (Jentsch 1996, 8,13–14.)

Insensitivity for the feeling was said to be apparent when it came to the professionals of fields concerning things which ignited the uncanny feelings for others (Jentsch 1996, 10–11, 15). The thesis author believes this phenomenon is likely the reason why productions featuring uncanny characters exist in the first place. Individuals working with humanlike characters most possibly lose their self-awareness to the appearance of their creation, and the growing familiarity caused by the hours spent in proximity of the artifact might be the root-cause for the statements like that of David Hanson – whose company Hanson robotics, despite the results of his studies, still produces quite aggressively uncanny pieces of robotic engineering, in the author’s personal opinion.



PICTURE 4. Hanson Robotics’s flagship product, android “Sophia” (Shalvey 2021)

3 EXPLANATIONS FOR THE UNCANNY

Mapping the valley is crucial for all that strive to design humanlike characters which' purpose is to be relatable (Mori 2012, 100) – as it is for those whose aim is the opposite. The scientific explanations for the purpose of the feeling still vary greatly, ranging between the subconscious and instinctual, and the conscious and cognitive processes (MacDorman, Green, Ho & Clinton 2009, 696). For this study as well, it was necessary to examine these theories.

3.1 The Animistic world

Mori presented his theory in metaphors. For him, the valley represented the stages of human life. On the top of the second hill, watching over the valley was a healthy human being – whereas the bottom of the uncanny valley was the realm of the dead – and even beyond (Mori, 2012, 100). Whereas in his own time, Freud, during his linguistic studies on the eerie (1925, 2, 13) had come to uncover, that in Arabic and Hebrew the word “uncanny” bears the same meaning as the impressions “daemonic,” and “gruesome” – while in German the expression “an unheimliches house” stands for a “haunted house.” It should not come as a surprise then, that one of the considered explanations for the uncanny was thought to be closely tied to the world of spirits.

Jentsch referred in his text (1996, 13–14) to a time in human history, in which spirits were believed to inhabit all things around us – and Freud (1925, 9) called these reflections “doubles”. This process of projecting oneself onto their surroundings, was at the time a way to rationalize the surrounding world, and to familiarize foreign and unexplainable things (Jentsch 1996, 13–14; Freud 1925, 9–13). This primitive world once inhabited by spirits is largely now abandoned – but the “animistic” worldview is supposedly constantly lurking in the depths of our simian minds – just waiting to emerge in a time of doubt, to overtake the modern worldviews we have adopted. These occasions in which the eerie feelings emerged were supposedly “tests” of strength of one’s beliefs and worldview. (Freud 1925, 13, 17.) One’s personal inclination to spiritual superstition and the

vividness of an individual's imagination were said to play a large role "when something that we have hitherto regarded as imaginary appears before us in reality" (Freud 1925, 9). One of not spiritual nature, who has embraced the modern worldviews fully, and disowned the "old world" should – according to Freud, be completely unaffected by these situations, whereas another individual can see these occurrences as proof of the existence of otherworldly entities. The anxiety related to the uncanny – characteristically to the psychoanalysis, reportedly only resulted as the consequence of repression of these thoughts. (Freud 1925, 9,11,13,17.) Jentsch found this humane ability to be afraid of their own reflections and creations rather amusing. He speculated the feeling to be rather close to one's fear for their own psyche or the unconscious, since they also generally tend to be for people, rather foreign. (Jentsch 1996, 13–14.)

Androids could be called a kind of doubles as well. In general people do not like things that tend to put their uniqueness in a questionable position, and with the surge of modern individualism, even less so. When it comes to romantic love, parent's love, individual's undertaking at work, or that matter anything in our lives which involves status – all these positions pose an underlying, subliminal uncertainty of being replaced. Androids and humanlike cg-characters could initiate these fears, and according to MacDorman et al. (2009, 697) challenge our "need for uniqueness". Though we generally as species are very fond of repetition, symmetry, and duplicates – according to Freud the context in which this repetition happens is crucial (1925, 10–11). The borderline in which the "natural" and pleasing repetition becomes "unnatural" and repulsive, is indefinite and most definitely varies depending on the individual as well (Freud 1925, 10–11). As one could most certainly imagine however, it is a completely different thing to admire pleasing patterns of a wallpaper on your bedroom wall – than it would be for you to bump into a perfect double of oneself – a "Doppelgänger", on the street.

The theory of animism could arguably be most effectively utilized in the scenario- and narrative-driven bodies of projects, and in the terms of game design this could be achieved, for example, by design choices applied in attempt to break the "fourth wall". Such effects have already appeared in the game market, for example in productions like the "Undertale" (2015), "Pony Island" (2016), and "Doki Doki Literature Club!" (2017). Whereas in the case of character design, the

theory could most effortlessly be utilized by exploiting features usually associated with superstition. The themes of spiritualism, folklore and myths could provide inspiration – though it is debatable if the implementation of features related to these sources would have a positive effect on the character’s design, considering the audiences growing familiarity towards the imagery caused by the overexposure in media. Speculatively, the most successful implementation of the theory today, could be achieved by utilizing the trends of internet horror – the copy-paste stories for instance, which today seem to have assumed the position of urban legends. The popularity of these stories most likely stems from their enhanced navigation in the narrative space of modern reality in comparison to their classical counterparts. This makes them more relatable for the modern audience, and a potentially better platform for igniting strong emotional responses.



PICTURE 5. One of the circling internet horror stories was related to “the android Tara” in 2009 (I Feel Fantastic — FULL SOURCE (HD), Youtube 2018)

3.2 Assumed aliveness and the effect of motion

In the study of the uncanny, one cannot escape the reoccurring theme of creatures close to the human form. Mori’s Mannequins, prosthetics, and robots (2012, 99–100), Jentsch’s wax figures (1996, 12) and Freud’s automatons (1925, 5). Similar in their appearance – as they usually are in their role considering the uncanny. Whenever any of these objects are mentioned, there is also often the mention of an underlying uncertainty of them coming to life.

The relativity of motion and assumed aliveness is a prevalent theme throughout Mori's "The Uncanny Valley" (2012). In addition to the more popular figure one (Figure 1), another one (Figure 3) was used to emphasize the amplifying effect of movement to the uncanny valley.

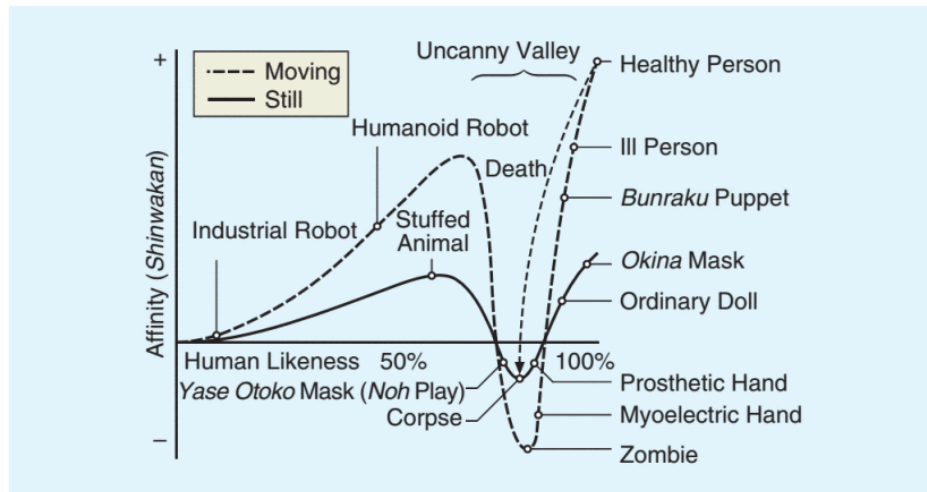


FIGURE 3. The second graph of the uncanny valley depicting the amplifying effect of movement (Mori 2012, 99)

Movement is fundamental to animals—including human beings—and thus to robots as well. Its presence changes the shape of the uncanny valley graph by amplifying the peaks and valleys (Figure 2). For illustration, when an industrial robot is switched off, it is just a greasy machine. But once the robot is programmed to move its gripper like a human hand, we start to feel a certain level of affinity for it. (Mori 2012, 99).

Mori tied his uncanny theory rather strictly to the aforementioned humanlike entities, but even if anthropomorphic, and especially anatomically detailed entities, do seem to hold a rather special place in the ignition of uncanny responses (Jentsch 1996, 12–13), they are by far the sole igniters. Jentsch gave an example of this with a description of a hypothetical scene of a “primal” man witnessing a modern vehicle for the first time. The autonomous movements and “regular noises of the machine” he speculated, would give the impression that the object is alive, and would thus ignite uncanny feelings in its spectators. (Jentsch 1996, 11–13.)

“a particularly favourable condition for awakening uncanny sensations is created when there is intellectual uncertainty whether an object is alive or not, and when an in-animate object becomes too much like an animate one.” (Freud 1925, 8–9).

There are a few formats in popular media, which intentionally blur the lines between organic beings and machines for this certain kind of effect. For example the game series “Metal Gear Solid” and the animated series “Neon Genesis Evangelion” are some of the most known ones.



PICTURE 6. Metal gear Solid 4, and the bleeding Gekko-robots (Metal Gear Solid 4 | Raiden vs Gekko Battle 4K UHD |, Youtube 2020)

In a study part of “The uncanny advantage of using androids in cognitive science research” (MacDorman & Ishiguro, 2006), test participants observed an android from a distance. 70% of the participants believed the android to be human when it was moving, comparing to only 23% whilst it was stationary. This could be because for live things, it is extremely hard – if not impossible, to stay completely still. Mimicking these involuntary autonomic gestures might be essential for androids and cg-characters to pass this “visual Turing-test” in future too. (MacDorman & Ishiguro 2006, 314.)

When it comes to diminishing uncanny effects however, simply being in motion is not enough. Just like the second graph of the “Uncanny Valley” suggested (Figure 3), motion acts as amplifier for the eerie. According to Mori, the speed in which these actions are performed is crucial as well. As an example he describes

an innocent smile of a robot, which will quickly be perceived as sinister if the execution speed of the artificial facial muscles is halved. (Mori 2012, 100.) This flavor of the movement plays an important part on how we perceive humanlike things. The Japanese “Bunraku” puppets, which Mori refers to in his essay, do not appear very humanlike, but Mori insisted on their likeness nevertheless – on the grounds of how they moved (Mori 2012, 99). One could argue that Mori and the Japanese could feel more affinity towards the Bunraku dolls because of the specific cultural exposure to the dolls’ appearance. Regrettably, Mori does not go much further in differentiating the effects of appearance and behavior as contributors to the uncanny valley in his essay (MacDorman & Ishiguro 2006, 308).



PICTURE 7. A single Bunraku puppet with its puppet master Kanjuro Kiritake (Daily Sabah 2020)

A question begs to be answered: How much of the eeriness we feel towards humanlike characters is caused by their physical appearance and how much of it is the idea of them coming to life? Freud wanted to argue that this fear was very much context dependant. We are not frightened by ideas of inanimate objects coming to life in fairy-tales of Hans Christian Andersen, and children even casually wish – or believe, their toys to be alive. (Freud 1925, 9,16.) Both Jentsch and Freud suggested that children might not feel eeriness over humanlike things as powerfully as adults do, because they do not tend to make such strong distinctions between living or not-living things (Jentsch 1996, 13–14; Freud 1925, 9).

The author however wishes to raise the possibility that children might in fact be more prone to the effects of eeriness, exactly because of their frail capability to distinguish the creations of their imagination, from real life. The “Boogeyman”, along with an innumerable total of other creepy creatures, are quite common visitors in homes in which children reside. Whichever the case, it would seem that for both children and adults, the phenomenon has more to do with the believed motives and the nature of the forces moving the object (Freud 1925, 5, 14) rather than the simple fear of them coming to life – thus intertwining itself closer to the theory of animism.

3.3 Memento Mori

Freud supported Otto Rank’s claim of the soul being the first of ‘doubles’ (1925, 9). This product of self-projection is a remnant of the animistic world and an appendage to our current egocentric worldview. A tool to preserve one’s ego even after death. The mummies of the Egyptians’ are a manifestation of this very same endeavour (Freud 1925, 9–10) – stunningly similar to robotic engineer’s fixation to duplicate themselves and their loved ones today.



PICTURE 8. Ishiguro with his robot look-a-like (Stafford 2016)

Freud and Jentsch disagreed on the role of death considering the eerie. Jentsch claimed that a real corpse of a person could never be as unsettling as an artificial humanlike figure (1996, 12), whereas Freud argued (1925, 13–14) that the expe-

rience is absolutely unavoidable when it comes to death and corpses. MacDorman and Ishiguro supported Freud's vision (1925, 13–15) with their claim that robots and humanlike entities possibly trigger our innate fear of death – because we might relate disassembled androids and prosthetic limbs to bodily mutilation, along with the fright of proximity of a conflict and physical harm (MacDorman & Ishiguro 2006, 313).

According to Freud (1925, 14), the sights close to carnage would become especially haunting when a supernatural element is added. “Feet which dance to themselves” (Freud 1925, 14), or a lone hand which moves itself autonomously. The susceptibility to these kinds of sights could once again, be related to the strength of superstition in one's mind. The fear of the inanimate, the dead – coming to life. (Freud 1925, 13.) In the aforementioned second figure (Figure 3) of the uncanny valley, these living corpses “zombies” inhabit the bottom of the valley, suggesting that they are the most eerie entities of them all (Mori 2012, 99).

In our daily lives, there are not that many occasions in which one could encounter sights of death, aside from professionals who actively work with dead bodies as a part of their profession. Freud claimed that the eeriness surrounding the dead and death itself was caused by its still largely unexplained and not necessarily final nature (Freud 1925, 13). This however would hardly be the case today. We know greatly more of death than we did one hundred years ago, and the more we learn, the more faraway the claim would seem. Rather than being all that unexplainable and mystical anymore – the thesis author wonders, if the eeriness of death is caused by our own willful distancing from it. There is a clear dissonance concerning the traditions related to death, and the science of it.

A theory which aims to explain our obscure relationship to death is the “Terror management”-theory. It proposes that things which remind us of death, including robots, might trigger our “culturally-supported defenses” which are said to help us cope with the crushing inevitability of death. According to the theory, people are prone to seek refuge from death, from things widely considered permanent “family, nation, God, or an immortal soul” (MacDorman et al. 2009, 697). These values largely considered conservative, bring solace to people who feel the need to be conserved themselves.

The haunting absurdness of death lies in its simplicity. It is familiar for all those who have ever witnessed death of a beloved family member, or a pet. There is a similar kind of sweet disbelief in relation to dead bodies as there is to the artificial humanlike characters. A Doubt, fear, or maybe hope – which creates a sensation as if the body could get up and carry on with their business as usual at any minute.

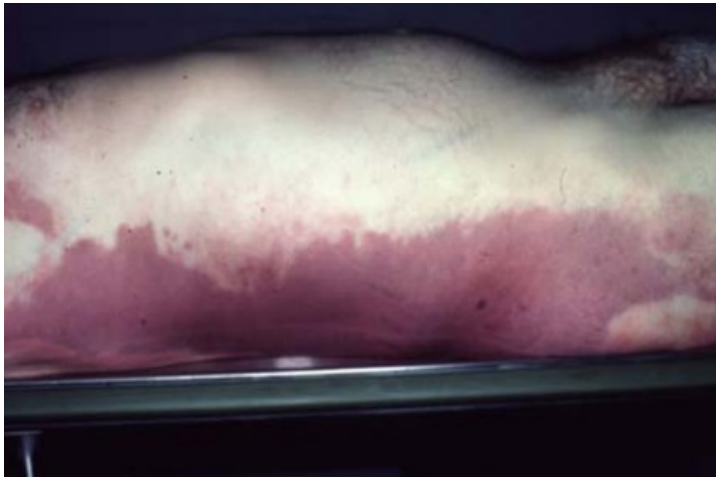
The emergence and the end of life are topics which humans still have a rather hard time handling in a calm and rational manner (Freud 1925, 13–14) – Understandably. It would be sweet to cradle oneself in the embrace of a thought of an everlasting life, but because of the maybe unfortunate topic of our research – we do not have the kind of luxury to escape the gruesome reality of our fate.

3.3.1 Post-mortem

It is time to get accustomed to the reality of death. The author's own mother (Kiintonen 2021, Appendix 1) luckily for this research, happens to be a professional of elderly care of 25-years, so the initial information of palliative-care and death was readily available for the author – as well as guidance to take the research into the right direction. The initial physical changes, which might also be only apparent to the caretaking staff at the site of death – were also exceptionally easily accessible this way. Please be mindful that the following chapter contains images which some might find disturbing. Presence of a motherly figure is recommended when examining the unnerving imagery.

And so, we get to the actual physical process of “dying”. As the time of an individual draws in closer, the weakening, and eventually complete halt in the blood circulation and oxygen intake turn the body pale or “greyish”. This transformation commences from a white ring-like-shape from the skin around the lips – which themselves take a blueish tint – to the rest of the body. (Kiintonen 2021, Appendix 1; Intermountain Healthcare 2021, 2.) This is the first stage of bodily decomposition, called the “fresh stage” (Lee Goff 2009, 31). Due to the weakening and eventual halt of the circulation of blood, gravity causes it to pack into the parts of the body closest to the ground, causing discoloration referred to as “Livor mortis” (Kiintonen 2021, Appendix 1; Lee Goff 2009, 22–23). The shade of this coloration

will vary depending on the cause of death from “cherry red” to yellow and brown colorations (French & Jacques 2020). If death comes slow, some of these phenomena might be observable while the person is still alive. (Kiintonen 2021, Appendix 1; Intermountain Healthcare 2021, 2)



PICTURE 9. Livor mortis (Lee Goff 2009, 24)

Immediately after death the body is in almost absolute limp state, causing the facial features of the passed perhaps seem sharper – as well as make the eyes seem more sunken. This limpness persists until the well-distinguished stiffening of the body, “Rigor mortis” begins. (Kiintonen 2021, Appendix 1; Lee Goff 2009, 23–24)

The swelling of the body, caused by the build-up gases in the cavities of it – most commonly the abdomen – will inform you of the end of the “fresh stage” and the beginning of the “bloated stage” (Lee Goff 2009, 32–33). First recognizable by the green pigmentation of the skin of the abdominal area, the swelling is most often partnered with the emergence of “purge liquids” from bodily orifices, and can also involve skin slippage, cracking and/or marbling. The marbling of the skin is apparent when skin’s blood vessels “take a mosaic kind of appearance” (Lee Goff 2009, 26) in colors of green and purple. Another distinctive physical feature often related to death, the cloudy and bloodshot cornea, most often appears between these “fresh” and “decomposing” stages as well. A black line crossing over the iris, “Tache noir” is also a common sight caused by the continuously drying eyes of the corpse. (Lee Goff 2009, 25–26, 32–33; French & Jacques 2020; Trokielewicz 2019, 7–11.)



PICTURE 10. Marbling on skin (Lee Goff 2009, 7)

After a time, the gases escape the body and it collapses. From there on, depending on the environment the body was left in, it continues to mummificate or sapofonicate. Mummification causes the body to gain a leathery, yellowish appearance, and the sapofonation a waxy gray one. This is the final stage of the body, the “decay stage” and ironically marks the beginning of the extensive feast of the necrophagous insects as well as the putrefactive bacteria and fungus, which in time, continue to break the body down into skeletal remains. (Lee Goff 2009, 26, 33, 35; French & Jacques 2020.)

3.4 Evolutionary explanations

In his original essay on the uncanny valley, Masahiro Mori (1970) was left speculating the purpose of the valley:

I think this explains the mystery of the uncanny valley: Why do we humans have such a feeling of strangeness? Is this necessary? I have not yet considered it deeply, but it may be important to our self-preservation. (Mori 1970, 100).

As with death and animistic heritage, humans have seemed to be rather successful in distancing themselves from their origins. Both Jentch (1996, 8–9, 13) and Freud (1925, 9, 13–14, 17–18) wrote of the primitive man, but both also were rather strict in their distinctions between the psyche of an animal and that of a

man. If the effect indeed is an evolutionary remnant of times long gone – its' alien, elusive and indefinable nature would become more explicable indeed.

3.4.1 Aesthetics

People seem to have high agreement with each other on who is attractive and who is not (MacDorman et al. 2009, 697), and as all species, we have come to favor certain features over others. The question of physical attractiveness may sound rather vague and irrelevant at first, but our reactions to the physical state of other individuals can in fact, tell us a lot of the behaviour we practice without our conscious knowledge. According to MacDorman and Ishiguro (2006, 312), we owe these preferences to the “selective pressures on our ancestors“. Freud at his time rather reluctantly admitted that one of the explanations for the uncanny could lie with aesthetics, (1925, 16) but today it is, no matter the old man's opinion, considered as a valid explanation for the existence of the valley.

there are universal norms of beauty that apply to human movement and physical appearance, which are correlated with many physiological qualities including fitness, fertility, and health. Although deviations from these norms are evident along many axes, the decisions that are based on them are often binary — for example, whether to select or reject a particular mate. (MacDorman & Ishiguro 2006, 311.)

MacDorman and Ishiguro list a number of studies linked to their statements considering evolutionary aesthetics (2006, 310–311). For instance, a study of Dunson, Colombo and Baird (2002) on the menstrual cycle and youth, is referred along with the claim that those who are considered attractive – are oftentimes also considered more fertile. “Youth, vitality, bilateral symmetry, skin quality, and the proportions of the face and body.” (MacDorman & Ishiguro 2006, 310) – are listed as features generally considered desirable in a partner, and this would indeed seem to be true regardless of one's position on the variegated fabric of sexual orientations. Expressiveness and mid-level body index are mentioned to be a merit for attractiveness from a study of Maisley, Vale, Cornelissen and Tovée from 2002, along with the consideration to Cunningham, Roberts, Barbee and Druen's study from 1995 on cross-cultural preferences – that a slight variation in

these features is perceivable amongst different cultures, but people still generally tend to prefer those valued in their own. (MacDorman & Ishiguro 2006, 310–311.)

The attraction need not to be only reproduction oriented. The physical state of creatures bearing resemblance to us, is relevant in other terms as well – for example in terms of threat and pathogen avoidance. Avoiding sick individuals of our own species, and of those genetically close to us – is advantageous in terms of self-preservation. Species genetically close to us are more likely to bear fatal illnesses more readily contractable to us, than species genetically distant from us. We might unconsciously perceive Robots and cg-faces as ill, which might trigger our in-built instinctual mechanics: aversion and avoidance. The reaction tends to be stronger, the more humanlike the robot looks, which might be directly in proportion to the responses of our survival instincts. (MacDorman & Ishiguro 2006, 310–311; Steckenfinger & Ghazanfar 2009, 18362; MacDorman et al. 2009, 696.)

But what is the case with children? Still rather uninfluenced by societal norms, they make rather curious test subjects when it comes to evolutionary and instinctual behaviour research of the human-species. Though they do not yet fully comprehend the contexts of group behaviour, babies and young children according to studies of Langlois et al. (1987 & 2000), and Salvia, Sheare & Algozzine (1975), referenced by MacDorman et al. (2009), have been reported to already hold preferences aligning with aforementioned features of evolutionary aesthetics (MacDorman et al. 2009, 697).

This seemed to be supported by a study conducted by Takayuki Kanda and his peers on children's interaction with Ishiguro's child robot "Repliee R1". One-year-old babies still responded to the presence of the android fairly well, but children from ages from three to five, were already visibly uncomfortable and scared of the robot – manifesting their reluctance to interact by avoiding eye-contact with the robot. (Kanda, Hirano, Eaton, & Ishiguro 2004.)



PICTURE 11. Ishiguro's Repliee R1 (left) and Eveliee P1 (right). (MacDorman & Ishiguro 2006, 298)

3.4.2 Human directed expectations

Humans, very similarly to onions, are multi-layered – only psychological organisms. Micro-behaviour is but a single example of the complexity of interpersonal interactions, but another manifestation of this complexity is the collective framework used to reference these interactions, “Norms”. Norms, to put it simply, define what can generally be considered as “normal”, and the behaviour out of these norms is usually considered anomalous. This sort of behaviour may ignite wariness – though not at all times results in eerie feelings. (MacDorman & Ishiguro 2006, 309; Jentsch 1996, 10–11.) According to speculations, once androids and other imitations of human likeness come to look more like humans, they are more likely to elicit responses similar to human interaction and even though subconsciously – we might tend to expect more of them. (Steckenfinger & Ghazanfar 2009, 18362); MacDorman & Ishiguro 2006, 302, 316.)

Ishiguro's actroid robot Repliee Q2 “Uando” is a prime specimen for examining “humanlike expectations” directed at robots and humanlike characters. She has the physicality of a Japanese woman – so already certain kind of cultural and societal expectations are directed towards her – but in exchange, she also sets expectations on the behaviour of her perceiver as well. According to MacDorman & Ishiguro (2006, 313–317) Uando has autonomic responses such as shifting

posture, blinking, breathing, as well as verbal and gestural reactive behaviors, which supposedly enhance her “human presence” – which in turn, increases empathy felt towards her. (MacDorman & Ishiguro 2006, 313–317.) This seems to be the case at least with children. In a study Ishiguro was previously a part of, (Kanda, Hirano, Eaton, Ishiguro 2004), reportedly kids who were prone to “rough-house” their less humanlike android Robovie, abstained themselves from violence around Uando. (MacDorman & Ishiguro 2006, 313–314).



PICTURE 12. Ishiguro along with the actroid robot Uando (Whitehouse 2005)

Both Mori and Ishiguro have stated that in order to design comfortably relatable robots – we have to first understand our psyche and what makes us human (Kageki 2012; Commonwealth 2015). Before we can create characters that are relatable or unrelatable, we have to understand the expectations themselves first.

“If someone wearing the (prosthetic) hand in a dark place, shook a woman’s hand with it, the woman would assuredly shriek.” (Mori 2012, 99). This is how Mori first touched the subject of broken humanlike expectations. Humanlike products currently cannot answer our expectations directed towards them – which is why we do not perceive them as fully alive (MacDorman & Ishiguro 2006, 309). This is also the reason no AI currently can pass the Turing test. Negative emotional responses caused by broken expectations oftentimes drive producers to purposely lower these expectations by designing less-humanlike characters – similarly to the case of the animation and game-industries. The sensibility we have for humanlike robots’ shortcomings however– according to MacDorman and Ishiguro, make them perfect subjects for the future study of humanlike expectations (MacDorman & Ishiguro 2006, 316–317).

The testing done so far however, indicates that uncanny valley and the eerie feelings might not strictly be bound only to the simple human likeness of characters. “Under certain circumstances, less humanlike CG faces can be eerier than more humanlike CG faces.” This is what a set of tests “Too real for comfort? Uncanny responses to computer generated faces”, once again conducted by MacDorman et al. came to claim as well (MacDorman et al. 2009, 699–700,703–704, 706).

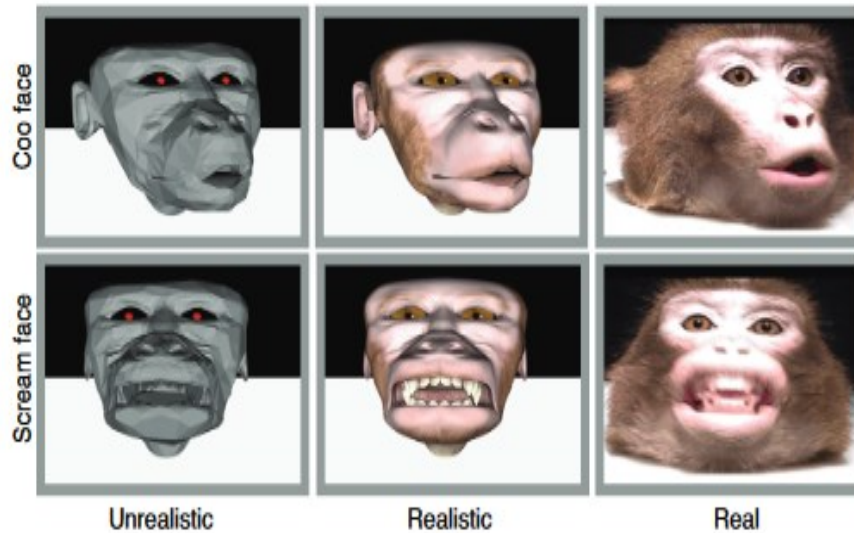
The participants of the test were subjected to cg-faces with varying texture types, proportions and levels of detail. They evaluated the faces’ eeriness, naturalness, attractiveness and human likeness. With high-polygon counts, the least eeriness occurred with smoothing and near ideal facial proportions, whereas with exaggerated facial proportions however – these features were not a merit. The effect was in fact, the opposite. Increasing the eye size 50% increased the eerie effect, especially in highly detailed models – while decreasing naturalness and attractiveness. Surprisingly, the least eerie face only had 75% skin photorealism while the most natural face was not the least eerie. The study concluded that increased human likeness in cg-characters does not necessarily result in eeriness – even though faces deviating from human-norms might benefit from lowering the level of realism. Photorealistic textures on unusual facial proportions and the combination of human- and non-human like features was not advised in the designs of 3D-characters – which aim was to be relatable. (MacDorman et al. 2009, 708–709.)

3.4.3 Unique to humans?

But is there a possibility for monkey-directed expectations? A study by the Princeton university (Steckenfinger & Ghazanfar 2009) aimed to provide data whether the uncanny valley was unique to humans or not, by concentrating on the visual behaviour of Macaque monkeys, a primate species closely related to humans.

The respectable test participants were presented 3D-models in 2 render styles in comparison to a real image of a fellow macaque. The render types “realistic-synthetic” and “unrealistic-synthetic” along with real images, were featured in 3 facial expressions: “neutral”, “scream” and “coo”. Dynamic images were presented as

well. The preference of an individual was measured similar to that way with humans: the duration and the number of eye-fixations performed by the perceivers. (Steckenfinger & Ghazanfar 2009, 18362–18363.)



PICTURE 13. The set of images used in monkey-research by Princeton university (Steckenfinger & Ghazanfar 2009, 18363)

The results strongly suggested that the monkeys experienced at least something similar to the uncanny valley. The “unrealistic-synthetic” faces and real macaque faces were ones that the monkeys preferred to look the longest and most often, showing similarity to the study with human children mentioned before. The varying expressions did not have an influence on the valley, and the importance of movement was described as marginal between the static and dynamic images. The monkeys seemed to however, look at the moving images longer in general than the static ones and a more robust uncanny valley effect was recorded considering these images. (Steckenfinger & Ghazanfar 2009, 18363–18364.)

The Princeton university’s study came to support what McDorman et al. (2009) stated in the case of humans: Increasing the level of realism does not always elicit uncanny valley – but rather “lowers the tolerance for abnormalities” as well as increases criticism. It is hard to say how attractive the monkeys would have rated the unrealistic synthetic faces – but it seems safe to assume on this basis,

that humans and monkeys at least partly share the same preferences on evolutionary aesthetics as well as the expectations on behavior. (Steckenfinger & Ghazanfar 2009, 18364.)

For seasoned pet owners, the news of animals possibly experiencing the uncanny valley hardly come as a surprise. One does not need to search hard to find videos of animals in interaction with robots bearing resemblance their species – neither be an animal behaviouralist to recognize the dissimilarity in the demeanour of animals when in presence of the representatives of their own species and robots.



PICTURE 14. (Cats React to Robot Cat, Youtube 2015)

Could it then be that – for example cats, can experience something similar in the face of automata-toys, as people do when in interaction with androids? If it indeed is so, this could mean that the uncanny valley most likely has its roots in a mix of instinctual wariness and behavioural practices learned in later stages of our mammal-life. Children, neither animals, have not been commonly considered to embrace complex philosophical contexts regarding death or their existence – yet they still seem to experience the valley. This remark would very least pose a challenge for those aforementioned theories, which attempt to explain the valley through philosophical means.

3.4.4 Exclusive to humans?

We have already established that the valley-igniting entities will not have to be potent in their human likeness, but the question rises whether 3D-animals could have similar kind of effects as a 3D-human avatar? A study “Is there an uncanny valley of virtual animals? A quantitative and qualitative investigation” (Schwind et.al 2018) was reportedly initiated following a reporters’ comments on the character of Azrael in the Smurfs 2 movie released in 2013. Its aim was to test whether the principles of the “Uncanny Valley” were applicable to 3D-animals and if they were – which features were responsible for the eerie effect in the case of virtual animals? (Schwind et.al 2018, 49–50.)



PICTURE 15. A screenshot of the character of Azrael from the first Smurfs movie from 2011 (Kay 2017)

The paper addressed the effects of the uncanny valley in virtual animals in 2 studies. The first one addressed the effects of realism for the uncanny valley, and the other studied the effect of human emotions on an animal face. In the first study, the test participants rated images of cats in varying rendering styles – as well as provided free-commentary on images of 3D-cats already featured in video games and web sources. The completely unchanged reference photograph of a live cat scored the highest points in familiarity, aesthetics as well as realism on all the render types. Lowest ratings on familiarity were recorded on the “levels of realism usually utilized in 3D-video games”, while the stylized and unrealistic cats again, fared better in familiarity – causing the uncanny valley manifest itself in the graph. Based on the commentary provided on the already existing 3D-cats, it

was determined that 3D-cats ignited negative responses when they seemed to lack resemblance to the animal they were supposed to represent, or when they seemed to be ill or practiced unnatural body-language. (Schwind et.al 2018, 52,55–56.)

The second study received data similar to the first study, as well as to the one conducted by MacDorman et al. (2009) on human cg-faces. Unnatural proportions, such as enlarged eyes had the same effect as with human 3D-models – they greatly decreased familiarity, and even on otherwise unchanged reference images, humanlike expressions on animals were enough to ignite uncanny responses. In general, the test concluded that any deviations from an animal's natural appearance or behaviour, especially in models rendered with high realism, are very much likely to ignite negative responses. The test concluded that principles of the “Uncanny Valley” are potentially applicable in the case of 3D-animals. (Schwind et.al 2018, 58.)

3.5 Alternate explanations

In this stage, it is safe to assume that the uncanny valley is not a simple psychological phenomenon (Steckenfinger & Ghazanfar 2009, 18362), and might not have any singular causes. Alternate theories vary from fears of being reduced, or being soulless organic-machines ourselves (MacDorman & Ishiguro 2006, 313), to “Shared circuits for empathy” (MacDorman et.al 2009, 696–697). Live people can be uncanny if their motives are unknown, and humanlike entities might appear eerie to us because of our inability to read their intentions (Freud 1925, 14) – or maybe in the case of robots and cg-faces, lack of them.

A classical “fight or flight reaction” caused by the atypical composition of robots has also been presented as one of the possible explanations, (MacDorman et.al 2009, 696) and reportedly there are also environmental factors with the ability to enhance the eerie sensations – for example, darkness and silence (Freud 1925, 20). Finally, the thesis author ponders on the possibility of the effect serving as a

tool for recognizing competing or invasive species – on the basis of studies performed on animals and young children. Evidently, more research would have to be conducted to support these suspicions.

4 PRODUCTION

4.1 Game world and the purpose of the character

The premise of the game begins from the seemingly never-ending climb to a top of a tower, in which once divine, yet desperate creatures dwell. The creatures have become putrid and corrupt in the absence of their creator. They seek solace by reaching out to the player for deadly embraces. During the production of the game, we have called these creatures “angels”. The player, a lone crusader will fight his way through these once pure images of faith on his journey to the more and more tainted top of the tower. The theme of the game was closely tied to the idea of the mortality salience, also referenced by MacDorman & Ishiguro (2006, 330) in their studies, and the questions of worldview related to it.

4.2 Artistic influence

Like Freud said: “in the world of books”, or in this case video games – anything can happen. If handled properly, in this world of imagination, the eerie effect can be reiterated and multiplied beyond that of real life – assuming one does not stray too far from reality. In case the uncommon is normalized too early, the eerie will not have the chance to reach its full potential. (Freud, 1925 18–19.) The storytellers of varying medias have diverging freedom considering this – but game developers are bound exceptionally little. Even the laws of physics might not have to apply – since even those are adjustable to one’s personal liking in the game engine. This makes games a wonderful medium to compose eerie situations.

A brilliant example of the possibilities of the eerie in games – and a great influencer in the becoming of the form of the angels, in addition to research was the game artist Masahiro Ito, and especially his designs in the game “Silent Hill 2”. In an interview involved “In the making of” -documentary of the game, Ito described his creative process behind monsters accordingly:

My basic idea in creating the monsters of Silent Hill 2 – was to give them a human aspect. In the beginning the game payer would believe they were human. Then I proceeded to undermine this human aspect, by giving weird movements to these creatures, and by using improbable angles for their bodies, based on the mannerisms and movements of drunk people, or the tentative walk of very young children. (Making of Silent Hill 2, 2001.)

In this interview, Ito described a few of the eerie-igniting features that we have discovered through research. Negative responses ignited by broken humanlike expectations, lack of control in perceived movements, questionable nature of the forces moving the bodies – as well as the mix of human elements to non-human ones. Other artists whose works the author sought inspiration from, were Hieronymus Bosch as well as the contemporary sculptor Choi Xooyang, who also has the tendency to utilize some of these features – most notably mixing humanlike features to non-human ones. A couple of famous game characters “Dead Hand” from Zelda-franchise and “Slenderman” worked as additional reference as well.



PICTURE 16. Sculptures by Choi Xooyang (Juxtapoz 2013)

4.3 The design & concept art

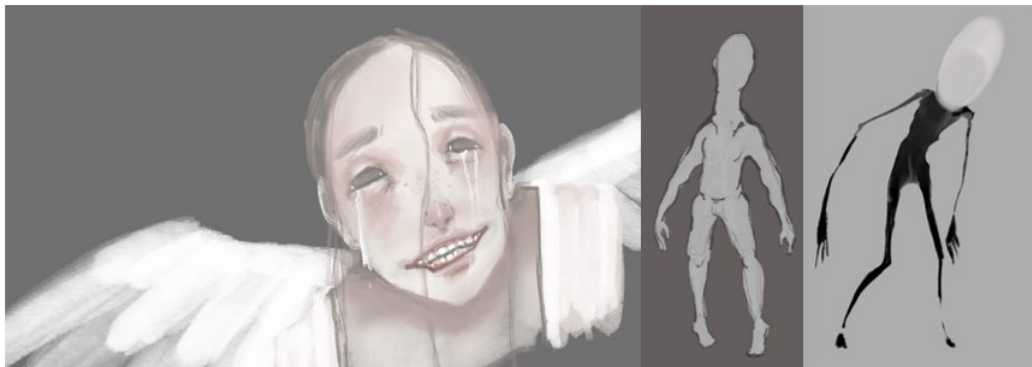
A well-designed character can tell a story in itself, and the first step of our story was to conjure a design sheet for the Angels. This followed the creative decisions on what the artist wished to communicate through the character, and the aforementioned purpose of it in the context of the game’s world and lore. It was decided early in the creation process that the design should not only be based on

research – since that could easily cause the character to look detached from the game world. For the same reasons, the game’s tone was set to be surrealistic – to minimize the restricting effects of the story to the execution of the game, and to grant full creative freedom for people involved.

true art, in wise moderation, avoids the absolute and complete imitation of nature and living beings, well knowing that such an imitation can easily produce uneasiness (Jentsch 1996, 12)

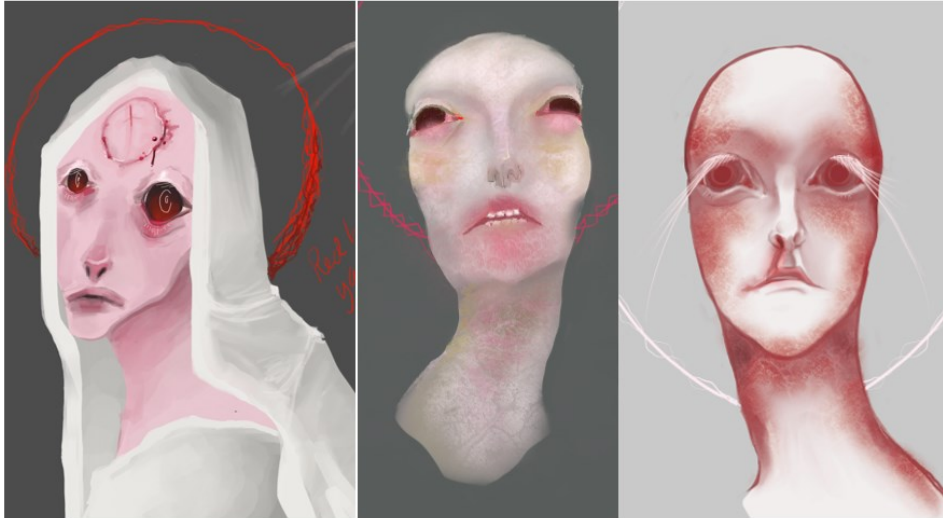
Art can indeed evoke strong emotions with seemingly little effort, similarly to uncanny reactions which can be conjured by very incomplete representations of the human form. Considering the 3D-execution of the character, a topological mismatch of the face and head was initially conceived – but eventually it was decided that a solid spread of topology was preferred, since utilizing too many of the eerie-igniting elements was thought to make the design not as streamlined, and possibly messy. On the basis on Jentsch’s statements concerning the effects of increasingly detailed executions of organic forms (1996, 12–13), supported by studies performed by MacDorman et al. (2009, 708–709) as well as Steckenfinger & Ghazanfar (2009, 18364), it was decided that the design was to be executed high polygon counts, combined with photorealistic texture and distorted physical features.

Sketches were produced gradually as the research progressed, but some were made pre-research (Picture 17). These intuitively produced sketches were created to set the tone for the design process of the game.



PICTURE 17. The pre-research sketches varied from more surreal to humanlike

As the study of the research materials progressed, the references to death and dead bodies featured in the chapter “Post-mortem”, begun influencing designs. Rotten flesh, discoloration of skin and eyes, and the presence of purge fluids were considered – as well as more animalistic features.



PICTURE 18. More death-related features on designs

Mostly the thesis author relied on the inspection of the anatomy of diverging fauna as a reference for the atypical facial and bodily features, which were conceptualized to be the main eerie-eliciting factors in the final design. Leopard seals from Antarctica and the Potoo birds from southern America (Picture 19) were few which' extreme physical transformations inspired for the surprise-eliciting shapeshifting animation-states of the angels, described more in detail later on.



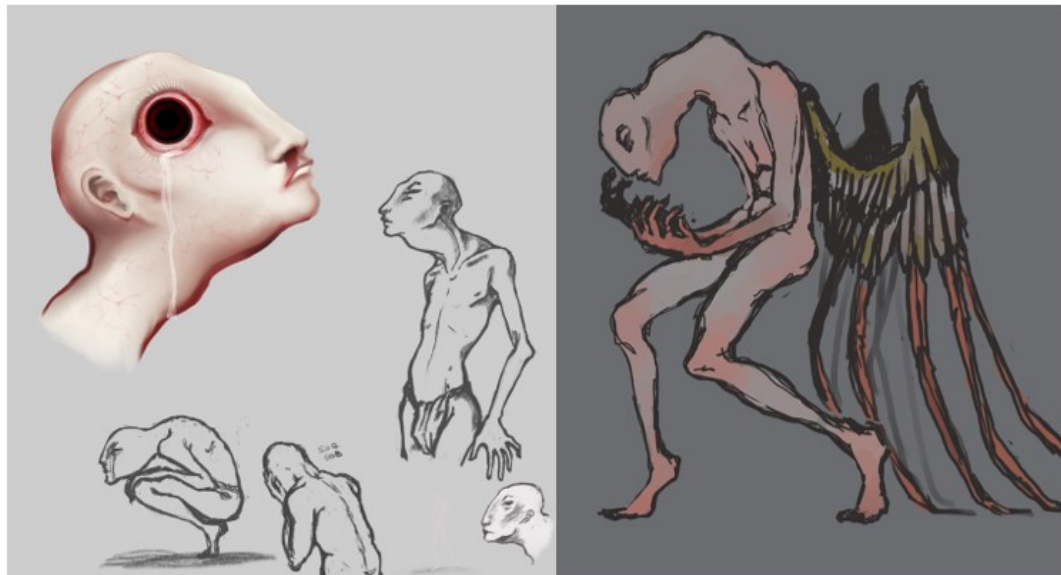
PICTURE 19. The Potoo bird exhibiting the characteristic pupil dilation (Blogora)

Along with concrete examples from the animal Kingdom, the “transformation” sketches by Charles Le Brun from 1671, acted as an additional source of inspiration when it came to mixing human physiology with that of fauna. Following the inspection of animal physique, the face of the angels was slightly elongated, and the angle of neck was tilted horizontally. The bridge of the nose became wider, forehead was drawn backwards, jaw became more pronounced, and the eyes shifted closer to the temples of the head.



PICTURE 20. Testing of more animalistic facial proportions as well as anatomical details, fat and wrinkles

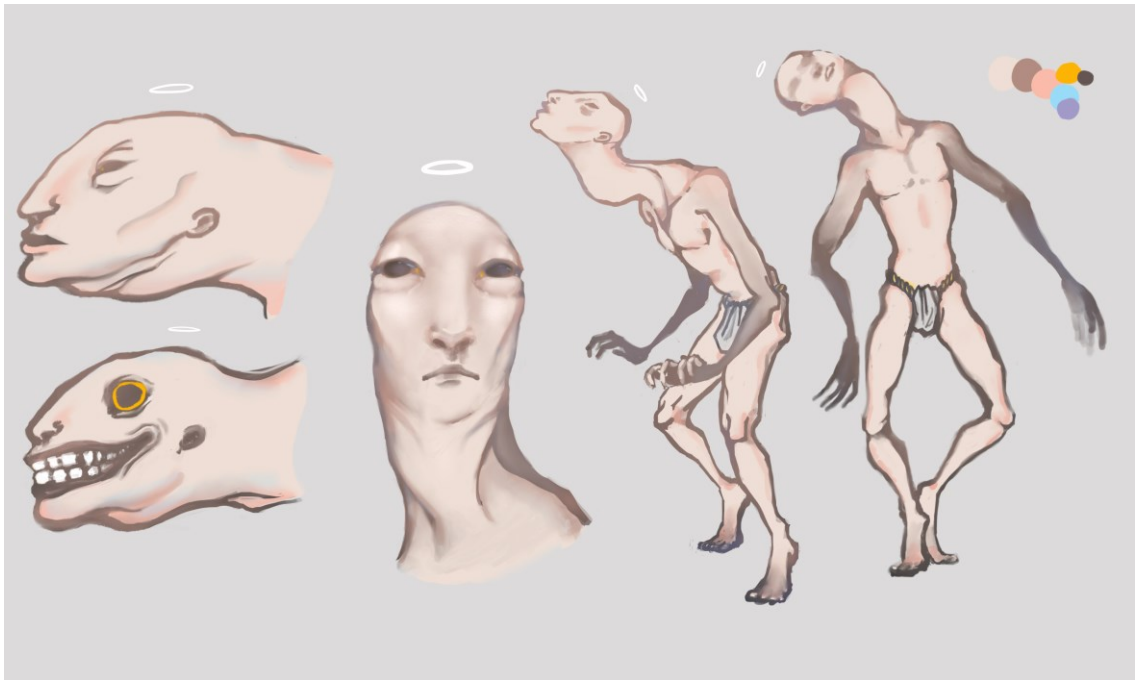
In the final stages of the research (Picture 21), which mostly involved of the studies of human directed expectations, the final features of the angel were finally nailed down. Following the inspection of the study of Macdorman et.al. (2009) the character’s neck began to gain length, eyes moved permanently further from each other, as well as becoming more enlarged. The angel found its posture from the balls of its feet, similarly to an animal. Around this time, it was also decided that the visual features associated with death would be implemented on the more “infected” versions of the enemy character, appearing further along in the game – to offer continuous visual variation for the player.



PICTURE 21. Late-stage concept art of angels

In the complete and the final design sheet of the angels (Picture 22), the characteristic facial and physical features became all the more exaggerated. The neck reaching its' final length, along with the shape of the head becoming yet more streamlined. Limbs were elongated to articulate the movement as it was needed to be clear and readable from a distance. This was the case with the neck as well, which was designed to act erratically to create an impression of lack of control. The eyes found their final place even further apart on the sides of the head, and a youthful appearance was emphasized by fresh and fleshy pink tones on the body to enhance the impression of an organic being, as well to bring aesthetic conflict, of attraction and aversion. The surprise element of broken expectations was conceived to be produced with extreme facial deformations as well as the elongation of the neck.

The form of angels went through multiple versions, but the surrounding theme of the uncanny – conflict, persisted. Themes of life and death, beauty and ugliness, youth and aging, familiarity and unfamiliarity, animalistic and the humane – and most importantly empathy and threat.



PICTURE 22. The final design sheet of the angel-character.

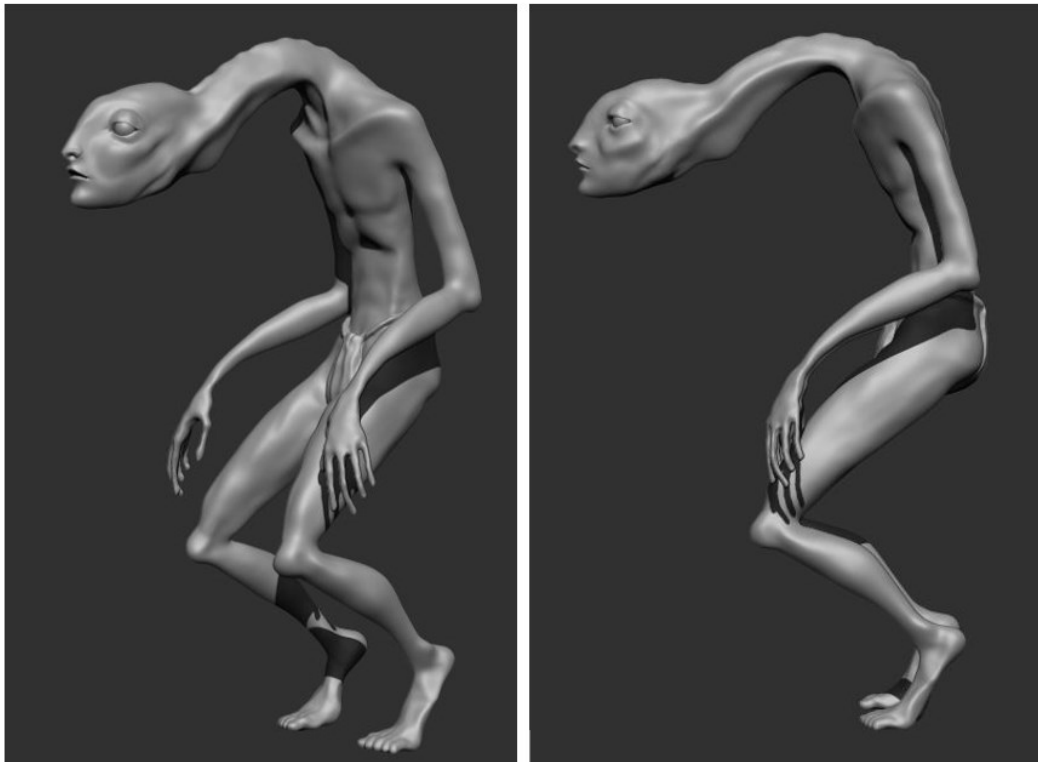
4.4 The 3D-execution

The shaping of the 3D-character began by a production of a 3D-sculpt, in the software ZbrushCore. A wire-sculpt, similar to a one used in traditional sculpting was initially made to sketch out the basic shape-flow of the 3D-character. From here the model gradually gained volume along with additional details – facial features, rough muscle definition, bone structure and secondary limbs like fingers.



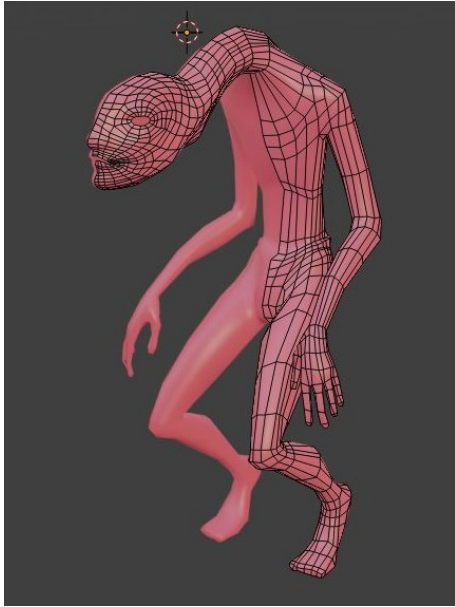
PICTURE 23. The progression of the 3D-sculpting process. The robust digital stick-figure sculpt (left), next to a gradually fleshed out version (middle) and the robust detailed version (right)

Shaping the character into its' final form, entailed getting set on the final silhouette as well as addition of details such as clothing. Some changes in the facial structure were implemented to better match the original design sheet, and in addition to features of death, the thesis author also decided to utilize the features of birth. During the sculpting process, the character was given a more protruding spine to grant the creature features reminding that of an early developmental stage human.



PICTURE 24. The final sculpt pictured orthographically (left) and from the side (right).

From here the 3D-production continued in the modeling software “Blender” and the texture software “Substance Painter”. In the aforementioned software the character was retopologised and textured. The inhuman shape of the character and expected extreme bodily transformations, made the planning of the topology-flow challenging, but offered a great learning experience on the topology of non-human forms.



PICTURE 25. Finished retopology of the character

The texturing process began with a hand-painted texture base emphasizing the bumps and dents of the normal map, produced from the initial 3D-sculpt. A grungy roughness map and an additional normal map were created to imitate the surface of the skins' texture with its' pores and veins. Many of the details had to be apparent from a distance, since in the game the model was not going to be stationary, and the game was conceptualized to be played in third person.



PICTURE 26. The hand painted base for the skin texture

The final renders of the character were produced in Blender’s render engine “Eevee”. The images were also produced as a reference for the angels’ desired outlook in the game, produced in the Unity game-engine.



PICTURE 27. Final renders of the character in “t-pose”, in and out of the “grin”-facial animation-state

4.5 Animation

The angels’ movements were carried out mostly as keyframe animations in Blender. The armature used was a close-to-standard humanoid skeleton with a few additions to the bone structure of the neck, face and limbs. The animation work began with the facial animation “grin”, also featured in the design sheet. This animation consisted of the deformation of the mouth, eyelids as well as the dilation of the pupils, similar to that of the Potoo bird (Picture 19). Overall, the character was given two dormant animations, one idle walk, one charge animation – and one attack animation. The amount of animations will however probably increase with the ongoing production of the game.



PICTURE 28. Neck in states hidden and unhidden. Example of an attempt at the “surprise element” needed to break expectations, as well of the erratic neck movement

From the very start the motion language of the angels was desired to be relatable and empathy-inducing. The aim was to build positive expectations through the character as much as possible – with the final aim to break them. The behaviour of the creatures was purposely made childlike, since children generally seem to be great at expressing unfiltered human emotions and breaking societal norms. Compulsive, almost ritual like repetition of movement, and body language resembling panic attacks were utilized. The theme of compulsive repetition (Freud, 1925, 10–11) was heavily applied in the process of shaping the angels. Symmetry tools were utilized in all of the design and production-stages of the angels.

Sadness, lethargy, desperation, and self-imposed mental withdrawal were to be core themes in the production of the Angel’s “dormant” animations – which feature the creature in curled up positions. This was to impose an image of a creature protecting itself, and to ignite empathy-induced responses in players, similarly to Ishiguro’s actroid “Uando” (MacDorman & Ishiguro 2006, 313–317).

The same themes were also carried out in the walk animation of the angels. The creatures walk slowly whilst holding their head hanging down. The change in the flavour of the interaction would only come after the player would enter into the

proximity of the creature. This would lead to “spotting” animation in which the creature would stop and extend its’ neck upwards. This would act as the desired surprise element and contrast, in comparison to the so far relatable actions of the unrelatable looking character. This animation was intended to be used in unison of the pupil dilation, or possibly even the “grin”-animation.

From there on Angel will approach the player with a compulsive and heavy “stomping” with its’ arms extended at the player. Following with either the “attack”, “impact” or “miss” animations – depending whether the player decides or succeeds to counter or dodge the initial charge. Additional animations will be conceived for the gradually more “infected/diseased” versions of the angels.

4.5.1 Butoh

The biggest artistic influencer whilst creating the movement of the angels was a branch of contemporary dance, Butoh – first presented in Japan 1959. The unnatural and jerky movements of the dancers are the distinctive trademark of this Avant Garde art-form. The dance performances usually feature the human body morphing and twisting in such bizarre ways, that they often leave their audience questioning whether the performers are human at all, or are they at least being possessed.



PICTURE 29. Swiss Butoh dancer Imre Thormann's performance at Hiyoshi Tai-sha Shrine in Shiga (Japan) (Butoh Dance Performance in Japan, Youtube 2007)

These scenes bear striking similarity to that of Freud's theory of animistic possession (1925, 12), and Jentch's theory of intellectual uncertainty (1996, 8–9). One knows the dancers to be human, but the impression created by these professionals and the soundscape is such an overwhelming one, that one cannot help but doubt.

5 DISCUSSION

The goal of this thesis was to identify and inspect the causes of the uncanny valley-phenomenon and to see if they could be utilized for the benefit of an eerie character's design. After immersing ourselves into a variety of studies from a wide interval, it could be concluded that despite an abundance of new studies emerging, the basic principles of the eerie have not changed much from the time they were first presented by Jentsch – but only become more precise. Our findings suggest, that the most plausible causes for the uncanny valley might be evolutionary, and at least partially rooted in learned social behaviours, internalized in adolescence and early stages of social development. Based on the observations made, a 3D-character was designed and constructed, bearing physical features reminiscent of the findings. In the design of the “Angel” character, multiple flavours of eerie were combined, varying from broken expectations to mixing inhuman features with human ones.

During the time of our research, we observed the peculiar nature of humanlike characters in relation to ourselves, but also in relation to each other. We came to witness a kind of race, on who'll succeed to cross the valley first: robots or cg-characters? The fields struggling for the endeavour of humanlike characters are constantly evolving, and only one example of this rapid evolution is the recent emergence of deep-fake algorithms. If one had to speculate on the winner of this race, the thesis author would bet their money on the cg. The aforementioned advantages in the cg-technology and the sensory advantage which they hold over robots and androids, lead the thesis author to believe that in the future 3D-characters will be more swift in their endeavours to cross the valley than their physical-counterparts.

This study is a mere surface scratch on a subject deserving a decade of its own research. The aim of this study was to offer designers alternative routes for the design processes of their characters. For one attempting to study the topic further – the author would advise the willing individual to focus their research on studies of infantile and evolutionary psychologies, whether one's goal is to elicit eerie feelings, or diminish them.

When the overall production of the game reaches an appropriate stage for testing, the responses of the players will tell us in time whether the design of our character was successful in eliciting eerie feelings or not. A comparative study of the theories will also be in order, to specify which features contribute the most to the birth of the eerie feelings. Until then the only confirmed consensus on the eeriness of the character – fittingly to the anecdotal nature of the Uncanny Valley – is the subjective, personal experience of the reader of this thesis.

REFERENCES

Blogora, Blogora.com website. 9. Most Insane Facts About Potoo Bird. [Picture]. <https://blogora.co/9-most-insane-facts-about-potoo-bird/>

Butoh Dance Performance in Japan. Screenshot of the video. Youtube 2007. Watched on 13.03.2020. <https://www.youtube.com/watch?v=9ms7MGs2Nh8>

Cats React to Robot Cat. Screen capture of the video. Youtube 2015. Watched on 13.03.2020. <https://www.youtube.com/watch?v=uy-HrPwpgbM>

CATS - Official Trailer [HD]. Screen capture of the video and a comment on it. Youtube 2019. Watched on 19.08.2020. <https://www.youtube.com/watch?v=FtSd844cl7U&t=3s>

Daily Sabah. 2020. Nearly extinct Japanese puppet theater helps master get through coronavirus pandemic. [Picture from a web publication]. Published on 14.09.2020. Photography accredited to Reuters Photo. <https://www.dailysabah.com/arts/performing-arts/nearly-extinct-japanese-puppet-theater-helps-master-get-through-coronavirus-pandemic>

French, K., Jacques, R. 2020. Postmortem changes. Released on 10.9.2020. Read on 28.01.2021. <https://www.pathologyoutlines.com/topic/forensicspostmortem.html>

Freud, S. 1925. The "Uncanny". Trans. Strachey, A. London: The Hogarth press and the institute of psycho-analysis. A part of "The standard edition of the complete works of Sigmund Freud". Original work 1919.

I Feel Fantastic — FULL SOURCE (HD). Screenshot of the video. Youtube 2018. Watched on 28.01.2021. <https://www.youtube.com/watch?v=a6TdRD3moBk&t=421s>

Intermountain Healthcare. 2021. As Death Approaches: A guide to symptoms and comfort. [Fact sheet for patients and families]. Updated on January 2021. Read on 28.1.2021. <https://intermountainhealthcare.org/ckr-ext/Dcmnt?ncid=521523288>

Making of Silent Hill 2. 2001. Direction: Nicolas Beuglet. Production: FunTV.

Jentsch, E. 1996. On the Psychology of the Uncanny. Trans. Sellars, R. Angelaki 2 (1), 7–16. Original work 1906.

Juxtapoz. 2013. Sculptures by XooAng Choi. [Picture]. <https://www.juxtapoz.com/news/xooang-choi/>

Kageki, N. 2012. An Uncanny Mind: Masahiro Mori on the Uncanny Valley and Beyond. [Interview of Masahiro Mori]. Released on 12.06.2012. Read on 13.03.2020. <https://spectrum.ieee.org/automaton/robotics/humanoids/an-uncanny-mind-masahiro-mori-on-the-uncanny-valley>

Kay, L. 2017. The Smurfs (2011). [Picture]. <https://cinemacats.com/the-smurfs-2011/>

Kiintonen, R. Specialized nurse. 2021. Interview on 28.01.2021. Interviewer Kiintonen, S. Transcribed and translated from a phone interview in Finnish. Helsinki & Ruovesi.

Lee Goff, M. 2009. Early postmortem changes and stages of decomposition in exposed cadavers. *Experimental and Applied Acarology* 49 (1-2), 21–36.

MacDorman, K. & Ishiguro, H. 2006. The uncanny advantage of using androids in cognitive and social science research. *Interaction Studies* 7 (3), 297-337.

MacDorman, K., Green, R., Ho, C., Koch, T. 2009. Too real for comfort? Uncanny responses to computer generated faces. *Computers in Human Behavior* 25 (3), 695–710.

Mass Effect Andromeda: Patch 1.05 - Some Facial Animation Fixes & New Eyes. Screen capture of the video. Youtube 2017. Watched on 28.1.2021. <https://www.youtube.com/watch?v=KZvqbLyK8L0>

McKeand, K. 2017. Mass Effect: Andromeda was a financial success. [News article of a web publication]. Updated on 28.07.2017. Read on 19.08.2020. <https://www.pcgamesn.com/mass-effect-andromeda/mass-effect-andromeda-sales-numbers>

Metal Gear Solid 4 | Raiden vs Gekko Battle 4K UHD |. Screen capture of the video. Youtube 2020. Watched on 19.01.2021. <https://www.youtube.com/watch?v=3UckQh25T-4>

Mori, M. Professor of engineering. 2012. The uncanny valley. Trans. MacDorman, K & Kageki, N. *IEE Robotics & automation magazine* 7 (2), 98–100. Original work 1970.

Schwind, V. Leicht, K. Jäger, S. Wolf, K. Henze, N. 2018. Is there an uncanny valley of virtual animals? A quantitative and qualitative investigation. *International Journal of Human-Computer Studies* 111, 49–61.

Shalvey, K. 2021. Sophia, the talking humanoid robot, is being readied for mass production during the pandemic. [News article of a web publication]. Published on 07.02.2021. Photograph: Evertt Kennedy Brown. <https://www.businessinsider.com/hanson-robotics-plans-to-mass-produce-humanoid-robot-sophia-2021-2?r=US&IR=T>

Shoard, C. The Guardian. 2020. Andrew Lloyd Webber calls Cats film 'ridiculous'. [News article of a web publication] Released on 03.08.2020. Read on 19.08.2020. <https://www.theguardian.com/film/2020/aug/03/andrew-lloyd-webber-calls-cats-film-ridiculous>

Steckenfinger, S. & Ghazanfar, A. 2009. Monkey visual behavior falls into the uncanny valley. *PNAS* 106 (43), 18362–18366.

Trokielewicz, M., Czajka, A., Maciejewicz, P. 2019. Post-mortem Iris Decomposition and its Dynamics in Morgue Conditions. Released on November 2019. Read on 28.1.2021. https://www.researchgate.net/publication/337158131_Post-mortem_Iris_Decomposition_and_its_Dynamics_in_Morgue_Conditions

Stafford, A. 2016. Android clone v human: will you be able to tell the difference at work?. [Picture from a web publication]. Published on 02.11.2021. Photograph: Evertt Kennedy Brown. <https://www.theguardian.com/sustainable-business/2016/nov/03/android-clone-v-human-will-you-be-able-to-tell-the-difference-at-work>

Wheeler, A. 2019. Box office cats-tastrophe: Cats projected to lose \$70m. [News article of a web publication]. Released on 31.12.2019. Read on 19.08.2020. <https://www.theguardian.com/film/2019/dec/31/cats-film-box-office-failure-universal>

Whitehouse, D. 2005. Japanese develop 'female' android. [Picture from a web publication]. Updated on 27.07.2005. <http://news.bbc.co.uk/2/hi/science/nature/4714135.stm>

Wilde, T. 2017. The internet is brutally mocking Mass Effect: Andromeda's animations. [News article of a web publication]. Released on 17.03.2017. Read on 19.08.2020. <https://www.pcgamer.com/the-internet-is-brutally-mocking-mass-effect-andromedas-animations/>

APPENDICES

Appendix 1. Interview of the authors mother, Riitta Kiintonen, Specialized nurse

Interview on 28.01.2021 (in finnish)

Riitta Kiintonen, erikoissairaanhoidaja

Saanut saattohoitokoulutuksen.

Voitko kuvailla lyhyesti havaitsemiasi ulkoisia kuoleman jälkeisiä muutoksia?

Ensimmäisinä tulee mieleen lautumat, selässä ja niissä osissa jotka on kontaktissa alustaan. Mustelman kaltaisia sini-violetteja tummunemia. Muutoin kalpeus. Huulet alkavat kuoleman jälkeen sinertää. Kalpeus leviää ”renkaana” huulten ympäriltä muuhun ruumiiseen. Jo viikko tai kaksi ennen kuolemaa piirteet alkavat terävöityä kasvoissa, etenkin nenässä havaittavissa huomattava muutos. Painuneet silmät, posket menevät lommolle. Poskipäiden luut helpommin havaittavissa. Ihon hiljainen kuivettuminen myös. Laajat pupillit jotka eivät reagoi valoon.