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**The Way Films Feel in VR**  
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## CERTIFICAT D'APPROBATION ÉTHIQUE

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## Abstract

Virtual reality (VR) is an increasingly popular technology that captivates people for its immersive aspect, particularly within the entertainment industry. In this experiment, we focused on how the 2D film experience translates into VR. Inspired by the Tarvainen et al. (2015) study, we investigated whether there was a meaningful difference in the viewing experience, regarding valence, arousal and satisfaction, of a 2D film on a 2D screen compared to using a VR Head Mounted Display (HMD), while considering the influence of film genre. There was also an exploratory part where we evaluated how aesthetics were perceived in each medium. This was a between-subjects experiment where each participant evaluated 7 film clips, in either VR or 2D, by using questionnaires. The results indicate that there was no significant differences in the levels of valence, arousal and satisfaction between VR and 2D. Although film genre had no general impact, the horror clip had stronger effects on viewer experience than other genres. With respect to aesthetics, it was harder interpreting high-level aesthetics than low-level aesthetics, particularly within the VR condition.

**Keywords:** Virtual reality, VR, two-dimensional, 2D, genre, horror, viewing experience, valence, arousal, satisfaction, emotional response, film and aesthetic.

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## **List of abbreviations and acronyms**

2D: Two-dimensional

VR: Virtual Reality

CVR: Cinematic Virtual Reality

HMD: Head Mounted Display

BFI: Big Five Inventory

UWIST: University of Wales Institute of Science and Technology

ICC: Intraclass Correlation Coefficients

AR: Augmented reality

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In addition, I would like to express my gratitude towards Jared Boasen, who helped me during the data analysis phase. His expertise was greatly appreciated and educational. I would also like to extend special thanks to Salima Tazi, who lend me the VR headset for my data collection, and to Jussi Tarvainen, one of the authors from the original study who sent me the film clips to use in this project.

Finally, I would like to thank my parents, who supported me since I started this master's program in user experience. Their words of encouragement and motivation during my completion of this thesis are very much appreciated, and I will always be thankful for that.

## Chapter 1: Introduction

Cinema is a powerful medium that captivated audiences since its inception. It is the ultimate storytelling method because it combines many different artistic elements and various tools to tell a compelling story. As this artform evolved throughout history, people's perceptions changed along with it. For instance, "The Jazz Singer" (1927) was the first feature-length film to have synchronized dialogue (Pfeiffer, 2024). It defined the end of the silent film era and the start of "talkies", which is a term used at the time to describe movies with a soundtrack (Pfeiffer, 2024). This was such a significant change that silent film actors were struggling to adapt, and their work was then considered a thing of the past (Donnelly, 2016). Films have continued to progress in many different ways since then.

The way we absorb stories is also impacted by the way in which we consume its content. In essence, one of the reasons for these changes is because of technological advancements. For instance, audiences sometimes use virtual reality (VR) to experience different types of content because it can be an effective tool to enhance immersion into a simulated environment. This technology has been gradually improving over the last few years and will continue to do so. Moreover, a significant growth during the next decade in the Global AR and VR Headsets Market is assured, due to the constant implementation of these tools in various industries (CMI Consulting, 2024). In 2023, the estimated value of the market is around 7.55 billion USD (CMI Consulting, 2024). It will likely reach a value of 143.8 billion USD by the year 2032 (CMI Consulting, 2024). In February 2024, Apple released their new product: the Apple Vision Pro (Axon, 2024), with which customers can effortlessly go from augmented reality (AR) to VR. They can navigate through their applications, where their physical space is blended with the digital world. They are able to watch movies and feel like they are in their own private theater (Axon, 2024). People are interested in VR because they want to have these immersive experiences. It is a major technological shift.

Although we see virtual reality being employed in many different domains, such as in education, in medical training and of course, for playing all sorts of video games, it is particularly used in the entertainment industry. VR certainly caught the attention of Hollywood studios since in 2015, the

Walt Disney Company invested \$66 million dollars in a VR startup called Jaunt VR (Ding et al., 2018). We see VR being present in film festivals as well. However, it is uncertain how this technology will fit in with this art form. Some filmmakers fear that it would change cinema, some argue this would simply be an extension of cinema (Sereda, 2023). In one way or another, VR will certainly have an impact on traditional storytelling and the overall film structure.

Considering these uncertainties and the direction entertainment seems to be heading, this study seeks to understand the impact of VR on viewers' experience of watching films. People can experience movies in many different formats, such as in a theater, on a television screen or on their tablet. VR can also offer unique short films that can be experienced in a 360-degree manner. When it comes to traditional 2D filmmaking, the filmmaker has a lot more control to where the viewer looks, compared to a VR creator (Carpio et al., 2023). For example, in order for the audience to feel threatened by a character in a regular movie, the director might position the camera low and point it up towards the actor to make them appear intimidating. Moreover, we occasionally witness filmmakers using a long shot to show two or three characters interacting with each other, whereas typically there would be cuts back and forth between the character's faces. By using the long shot, it allows the audience to decide where to look, as if they were the editor.

In VR, this is taken to the extreme because it is not only a different viewing experience, but also a different storytelling experience. The user is right there with the characters. There is an unedited and undirected gaze. The viewer becomes the editor in a certain way because they decide where to look. Essentially, these structural differences have a strong impact on how people watch content. Compared to traditional filmmaking, VR is considered a breakthrough. The development of this technology not only allows audiences to get immersed into another world, but it gives prominence to interactive storytelling (Wang & Hua, 2023). Audiences are always eager to experience new emotions (Bartsch & Viehoff, 2010).

This is an important topic to investigate because VR popularity is on the rise. According to Statista, in 2022, there were approximately 64 million Americans using VR (Katatikarn, 2022). These numbers will grow, as more VR headsets are going to be available on the market (CMI Consulting, 2024; Katatikarn, 2022). As mentioned before, the entertainment industry has already invested

millions of dollars into this technology. Additionally, investigating this is essential for the creation of VR movies because the film viewing experience is complex. How do viewers perceive film aesthetics through different media? Various sources explained the links between different aesthetic choices and the emotional experience they inspire (Gulhan et al., 2023; Sinnerbrink, 2012; Tarvainen et al., 2015). Is this knowledge still true when film is transferred into VR? This study can provide us with answers on how to design suitable content for viewers, to gain further insight and also help filmmakers with creating content.

When comparing these two media, which is VR versus 2D, there are many different variables that could potentially be considered. For instance, there is the two-dimensional flat screen itself which can be of various sizes. There are 2D images, 3D images and 3D immersive environments, but how can such different elements be compared? A fair amount of scientific research has been centered around new VR experiences (e.g., Pizzolante et al., 2023; Szita et al., 2018). Unfortunately, there is not a lot of literature regarding whether or not different 2D film qualities transfer to a VR viewing experience. This is a great opportunity for further investigation since this could inform us more on this topic. How would the 2D film experience transfer when viewed through a device mostly used to experience a computer-generated world in 360-degrees? An answer has been voiced at the 2017 Cannes Film Festival, when film director Alejandro González Iñárritu presented his VR film, he reassured the movie intelligentsia that VR will never replace traditional cinema because: “*Cinema is frame, cinema is length of the lens, cinema is editing, the position of images that create time and space. Virtual reality, even when it’s visual, is exactly all what cinema is not.*” (Nicolae, 2018).

The activity of watching movies still remains one of the most common forms of leisure. Although the popularity of movie theaters is declining, people enjoy streaming regular films made for two-dimensional screens, whether it be on television or on their electronic devices (Guttmann, 2023). Since the means of production between 2D film and stories told within a 3D environment are so vastly different, Iñárritu is most likely correct about the fact that 2D will always be present. Nonetheless, people could be interested in consuming content traditionally made for the screen in VR. Users could watch content from Apple TV using their Apple Vision Pro (Axon, 2024). Overall,

there is still a lot that is unknown about the movie viewing experience through these new platforms. Therefore, this thesis investigates two research questions, one confirmatory and one exploratory:

1. Is there a significant difference in the user's experience when viewing a 2D film on a 2D screen versus from a VR Head Mounted Display (HMD)?
2. How are aesthetics perceived when viewing a 2D film on a 2D screen versus from a VR HMD?

This study was not completed with the Tech3Lab. Table 1 below details the student's contributions, in percentage, to this project. My thesis supervisors guided me throughout the entire process.

**Table 1: The student's contributions**

<b>Steps</b>	<b>Contribution</b>
<b>Defining the research problem</b>	Topic idea - 100% Defining the research problem and questions - 85%
<b>Literature review</b>	Reviewing the literature, organizing the sources and identifying the gaps - 100%
<b>Ethics</b>	Completing the submission for REB - 90%
<b>Experimental design</b>	Creating the experimental protocol and design - 90% Materials - 100% <ul style="list-style-type: none"> <li>• Salima Tazi lend me the VR headset and the controllers.</li> </ul>
<b>Recruitment and participant management</b>	Recruiting participants - 100% Creating the recruitment form - 100% <ul style="list-style-type: none"> <li>• Baptiste D'Hau helped me to set up a Panelfox profile.</li> </ul> Communicating with the participants and managing compensations - 100%
<b>Data collection</b>	Pretests - 100% Collecting the data - 100%
<b>Data analysis</b>	Extracting and cleaning the data for analysis - 100% Formatting the data for analysis - 100% Statistical analysis - 80% <ul style="list-style-type: none"> <li>• Jared Boasen helped me, along with my thesis supervisors.</li> </ul> Data interpretation - 95%
<b>Writing the thesis</b>	Writing the thesis paper - 100% My thesis supervisors gave me feedback and guided me throughout the entire process.

## Chapter 2: Literature Review and Hypotheses

The objective of this literature review was to investigate and analyze the existing research as a means to learn about the general consensus regarding the different levels of impact when comparing VR to two-dimensional screens, and to develop our hypotheses and research model. Another goal of this chapter was to develop the hypotheses regarding the moderator. The following databases were used: Google Scholar and Sofia (HEC Montreal). We limited the publication dates between 2012 and 2024, in order to have the most pertinent and available information related to VR. We started by using basic keywords for our search (see Figure 1).

### **Figure 1: Basic keywords search**

« VR »
« 2D »
« VR vs 2D »
« VR versus 2D »
« virtual reality vs 2D »
« virtual reality versus 2D »
« VR vs two-dimensional screen »
« VR versus two-dimensional screen »
« virtual reality vs two-dimensional screen »
« virtual reality versus two-dimensional screen »

Additional keywords were used to combine with the ones mentioned above (see Figure 2).

### **Figure 2: Additional keywords**

« emotional response »
« immersion »
« immersive experience »
« valence »
« arousal »
« satisfaction »
« film »
« cinema »
« genre »

Throughout the various usages of combinations of these keywords (see Figure 1 and 2), the number of articles varied between 17300 and 125000 in the search results. The first step was to collect



articles that appeared relevant to our topic by reading the title and the abstract, and by skimming through the paragraphs of the paper. The inclusion criteria for this phase were the following: the studies had to compare the VR viewing experience to something else, whether it be watching 2D content within a VR headset, watching 2D content on a two-dimensional screen, or viewing digital content created in a three-dimensional environment for VR. This also included papers that had the targeted keywords (see Figure 2). In this initial stage, we were more open to articles that were not exactly related to our main subject and that were not necessarily in the context of film, because there might be useful findings that could inform the study somehow. We collected the articles by downloading the PDF version, and by saving and organizing the links of the papers into an excel sheet. A total of 40 articles were collected.

Each article was then read in rigorous detail and the important information, such as their methodology and conclusion, was written into the excel sheet where every row represented a study. We created a concept matrix to identify common variables, where concepts like “3D environments” and “presence” was a common denominator. However, these variables were not the main focus of our study. It was challenging to find articles regarding my topic since most VR studies were not in the context of film. The content that users usually experience in VR is specifically made for the device, mainly digital works. Consequently, further research was done. In the initially group of collected articles, we identified 9 sources that contained in-depth information regarding emotional response and VR versus 2D comparisons. More articles were discovered from their references.

Additionally, we also went back to the previously used databases and applied the same keywords as before (see Figure 1 and 2). Regarding this research part, we also focused on the topic of cinema, aesthetics and media because they might contain knowledge that could potentially inform our thesis. There was no exclusion criteria about the date for these additional searches, because a lot of film notions are consistent throughout history. Regarding cinema, and since the context of this study is watching film clips, it was important to understand the basic concepts of the cinematic language. Film is a complex artform. Some elements could potentially influence the user, such as the genre. We investigated the aesthetic aspect, which can affect the mood of a person. The tools change and progress, but not necessarily the techniques.

An additional 96 resources were collected, which makes it a grand total of 136. After reading all the articles, 44 were retained. The majority of studies that were dismissed did not pass the following criteria: the study being done in the context of film and comparing the viewing experience of a film scene through a VR headset and through a two-dimensional screen. Certain exceptions were made since some of those articles contained informative findings related to emotional experience through media consumption and satisfaction, or in some cases definitions of key concepts. Most studies extracted the data quantitatively from questionnaires, by using tools such as the SAM scale.

## **2.1 – Medium (VR vs. 2D) and the Viewing Experience**

Medium is the way, either 2D or VR, in which film is experienced. When the term “2D” is used in this thesis, or any other variants such as “2D film” or “2D clips”, it is referring to films that were made to be watched on a two-dimensional screen. In other words, it is the traditional films that we are all familiar with.

In contrast, virtual reality (VR) is a simulation that is generated by a computer. In most cases, its environment is made up of three-dimensional graphics. With the use of equipment such as controllers and a headset, a user can interact with this digital world (Carpio et al., 2023; Parveau & Adda, 2018). Regarding VR helmets, it is usually referred to as the VR Head Mounted Display (HMD) (Kress & Cummings, 2017). There is also the cinematic virtual reality (CVR), which is similar to VR, and they can be used interchangeably. The main differences between VR and CVR is the textual content and the purpose of its usage. The VR world is usually generated by 3D graphics and CVR only uses prerendered photos (Säks, 2022). Essentially, one of the main reason people use VR is to be immersed, meaning to completely dive into another world and forgetting about the surroundings (Chuah, 2018; Pizzolante et al., 2023). In brief, there are many ways to experience VR, but this thesis focuses on the experience of viewing a 2D film through a VR headset. Thus, medium is a construct representing whether a film is watched in 2D or VR.

In this paper, the viewing experience is composed of emotion, which contains the two dimensions being valence and arousal, and satisfaction. This experience can be influenced by the medium and the genre of the clip.

### ***2.1.1 – Medium (VR vs. 2D) on Emotions***

We are interested in knowing more about how viewers are emotionally affected by watching film clips in VR and 2D. It is a key factor in learning more about the difference between the VR and 2D viewing experience. Emotions are complex and there is no official basis for a definition. We can try to organize a framework with basic emotions such as fear and anger. However, the issue is the implication of a cognitive structure (Russell, 2003). Usually, an emotion is directed towards an object or a subject (Russell, 2003). For example, we see Marie being afraid of a snake. Her fear is directed towards the reptile, which is the intentional object. A total of 5 categories are proposed to organize emotional processes, to make them free of objects (Russell, 2003). It takes into consideration the connection between emotion and mood. In their search for primitive concepts, a lot of evidence is guided towards the following dimensions: pleasure-displeasure (valence) and activation-deactivation (arousal) (Russell, 2003). These fusion of these two dimensions is called core affect (Russell, 2003). A person can be sad-nervous or sad-relaxed. In brief, affect is an octagonal concept that is composed of valence and arousal (Russell, 2003).

Research demonstrates that experiencing film in VR generally elicits stronger emotions than watching it in 2D (Carpio et al., 2023; Ding et al., 2018). Recognizing the emotional differences between these two mediums is key to understanding the impact on the users' viewing experience. A two-dimensional model that encompasses emotional valence and arousal levels can be used to conceptualize human emotions (Citron et al., 2014). Valence describes whether an emotion is experienced as positive or negative (Citron et al., 2014). It can also be acknowledged on a hedonic level, which will be seen as pleasant or unpleasant (Barrett et al., 2007). Arousal measures the level of intensity of an emotion (Citron et al., 2014), which can go from very activated to calm.

According to one study where participants had to watch a scene from “The Jungle Book” (2016) in one of the two mediums, they found that cinematic virtual reality (CVR) produces stronger emotional effect than the 2D clips, especially with the scene that contained the snake, which

showed a significant difference (Ding et al., 2018). However, another study revealed that the difference between VR and 2D, in terms of cognitive and emotional effects, are not straightforward (Carpio et al., 2023). Both media had a big impact on the emotional state of the viewers. There was a higher level of self-rated immersion and engagement for VR than for 2D (Carpio et al., 2023).

Furthermore, people who used VR rated their sense of presence higher than those who watched the movie in 2D and had a higher chance to forget about their surroundings. One is more likely to feel discomfort when using VR (Szita et al., 2018). Interestingly enough, VR viewers could remember fewer details than those who experienced the movie on a screen (Szita et al., 2018).

The majority of studies mainly analyzed the effects of virtual environments on cognitive levels within the aesthetic context. However, there is not much literature regarding how immersion can weight in on the emotional responses to artwork when comparing to their 2D versions (Pizzolante et al., 2023). For instance, in a study where they had a 2D painting and a 360-degrees spherical version of it, they found that users had a higher level of aesthetic emotion when experiencing the immersive VR version of the painting. It elicited stronger feelings of fascination, inspiration, and surprise (Pizzolante et al., 2023).

With the use of the SAM scale, where the participants' level of pleasure and arousal was measured, a group of researchers came to the conclusion that the cinematic virtual reality (CVR) evokes a significantly higher level of arousal than two-dimensional formats, which is another indication of an increase in emotional engagement (Yu et al., 2023). Another study, which used a horror movie as a stimulus, observed that participants who watched that clip using a Head Mounted Display (HMD) were more scared than those who did not used an HMD (Kim et al., 2018). No significant emotional difference was found between these two conditions. The researchers concluded that the immersive VR experience has on emotional responses is connected to the level of arousal and solid perceptual cues (Kim et al., 2018). In brief, it appears that it is more likely that VR will elicit higher valence and arousal than 2D. This led us to the following hypotheses:

**H1:** There will be higher valence for VR than for 2D.

**H2:** There will be higher arousal for VR than for 2D.

### ***2.1.2 – Medium (VR vs. 2D) on Satisfaction***

In this study, satisfaction is defined as a user's overall enjoyment of their viewing experience (Bartsch & Viehoff, 2010; Tamborini et al., 2010). Customers will always want to satisfy their needs for entertainment somehow. According to Statista, in 2022, the most popular source of entertainment for American consumers is subscription video on demand services (SVOD) such as Netflix or Amazon Prime Video (Guttman, 2023). Additionally, around 31% of virtual reality users use their device on a monthly basis and express satisfaction with it. Plus, 55% of VR users are highly satisfied with the technology, which the reports show extreme or moderate satisfaction (Katatikarn, 2022).

Individuals generally watch movies for emotional gratification (Bartsch & Viehoff, 2010). This can be true in many different ways, such as sensation seeking. One might watch a horror movie to experience intense feelings of fright. This is categorized more of a simple hedonistic form of satisfaction (Bartsch & Viehoff, 2010). There is also the desire to experience something that satisfies the cognitive needs (Bartsch & Viehoff, 2010), like watching a movie with a strong message that is relevant in our society.

VR seems to have a positive influence in many different domains. It can be an efficient tool for learning (Dubovi et al., 2017; Graeske & Sjöberg, 2021). In the medical fields, these computer-generated environments are becoming increasingly relevant for training (McGrath et al., 2018). A study discovered that nursing students got significant learning gains from training in VR, in this case the Pharmacology Inter-Leaved Learning Virtual Reality (PILL-VR), compared to attending a regular lecture. The tool provided constant feedback and exposed students to their mistakes (Dubovi et al., 2017).

Moreover, research has shown that experiencing VR in certain industries can have a positive impact on attitudinal dimensions. For instance, in 2021 it was estimated that there were not enough young people interested in joining the electrical construction industry. The use of 360-degree

immersive environments was every effective in showing success stories regarding this field. It enhanced student's views and attitudes of the electrical construction industry (Wen & Gheisari, 2021). Additionally, workplace injury is reduced by 43% due to VR training (Blagojević, 2023). In brief, it seems that the use of VR can lead to a higher level of satisfaction for users across different industries. By extension, it would be fair to predict that VR will have a similar effect on viewing movies. Audiences often adopted various tools such as 3D glasses or went to see movies in IMAX to try to get the most out of the experience. With VR, we can expect the same.

**H3:** There will be higher satisfaction for VR than for 2D.

## **2.2 – Impact of Genre on the Relation between Medium and Viewing Experience**

Genre is generally defined as a classification method based on style, narrative elements, and the moods they induce (Miller & Stam, 1999; Sinnerbrink, 2012). There are many different genres such as comedy, adventure, action, and romance, and usually a film is a combination of many. Depending on the genre of the film that an audience member watches, they are most likely going to respond a certain way. In VR, there is a great potential to really captivate audiences on an emotional level that goes beyond the cinema we are familiar with (Carpio et al., 2023).

For instance, the horror genre elicits strong sensations in viewers, mainly fear, especially with the use of escalating music and amplifying the sense of the unknown (Sera et al., 2016). When watching a movie in this genre, people express a heightened sensation (Sera et al., 2016). Using a horror clip as a stimulus, a group of researchers discovered that participants who watched that video using an HMD were more scared than those who did not use an HMD. It was concluded that the immersive VR experience has on emotional responses is connected to the level of arousal and solid perceptual cues (Kim et al., 2018). Therefore, in this thesis, we will be comparing the horror genre against all the other genres. A horror clip is designed to obtain strong emotional reactions from viewers by scaring them. Comparing that to a comedic scene for example, it is logical to assume that the horror clip will produce higher levels of emotional response (Kim et al., 2018; Sera et al., 2016).

In essence, we hypothesize that there will be an interaction between medium and genre on all the dependent variables. By interaction, we mean that it will strengthen the relations between them. In other words, genre will help contribute to VR in eliciting a higher level of valence, arousal and satisfaction. In essence, the genre variable signifies horror versus the rest.

**H4a:** Genre (Horror vs Others) will positively moderate the relation between medium (VR vs 2D) and Valence.

**H4b:** Genre (Horror vs Others) will positively moderate the relation between medium (VR vs 2D) and Arousal.

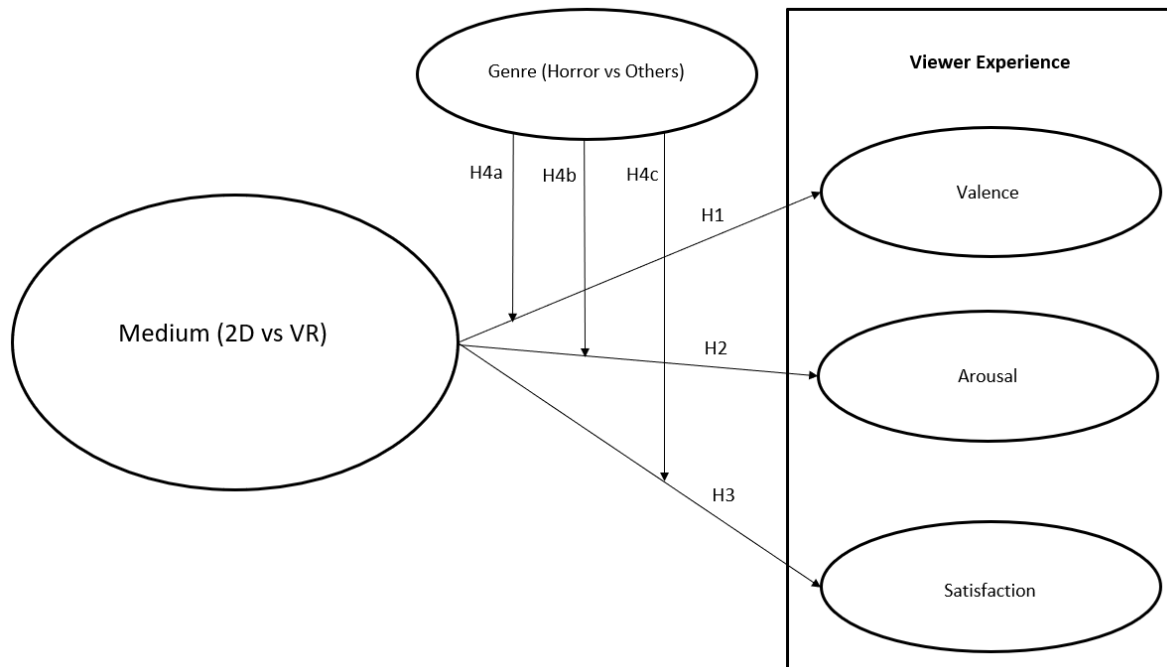
**H4c:** Genre (Horror vs Others) will positively moderate the relation between medium (VR vs 2D) and Satisfaction.

### **2.3 – Summary**

The literature suggests overall that VR produces stronger emotions in people (Carpio et al., 2023; Ding et al., 2018; Kim et al., 2018). However, most studies that compare the experiences between VR and 2D were not conducted in the context of film watching. Additionally, the various genres of films is something to consider because it might have an impact on the viewing experience. For instance, in one study, participants had a different emotional effect in VR with the same story. The film clips used were expected to create negative emotions. The conclusions were based on that specific genre, therefore they recommended to investigate how other genres affect the film viewing experience (Ding et al., 2018).

The hypotheses that were formulated throughout the literature review can be summarized in the research model (see Figure 3). The independent variable would be the medium: 2D is the control variable and VR is the treatment variable. The dependent variables are the three dimensions of viewing experience: valence, arousal and satisfaction, which are moderated through genre.

**Figure 3: Research Model**



## 2.4 – Exploratory Investigation of Aesthetics

Aesthetics are important to consider because it is an unavoidable part and crucial factor of filmmaking. Elements such as color and rhythm can vary for each movie and can have a different impact on the viewing experience. Essentially, this is the exploratory part of the study because we want to investigate whether there is more or less variation in a user’s perception in VR compared to 2D. There are not many studies that investigated this subject empirically, therefore there are no hypotheses formulated for this section.

Filmmakers use various cinematic techniques to elicit emotional responses. For instance, there are rules of shot composition, which is about how elements are arranged within a frame. A good director will keep this in mind when organizing a shot that properly conveys a theme (Maio, 2022). A single shot in a movie can be very expressive. It is a small unit of storytelling in and of itself (Ward, 2002). One might use a wider lens to create a feeling of closeness to the characters (Scott, 2023). Nonetheless, visual composition is important because the filmmaker is telling the viewer where to look, leading the eye (Maio, 2022). All of these components help the viewer to feel like they are “there” in the story (Busselle & Bilandzic, 2009).



The film critic Ricciotto Canudo defined cinema by synthesizing the rhythmic arts with the plastic arts (Bordwell, 1997). Others say that cinema is its own thing (Bordwell, 1997). Regardless, every film evokes aesthetics, which is the style of the film. It is composed and enhanced by many different elements such as story, plot, genre, and themes (Bordwell, 1997; Tarvainen et al., 2015).

We have seen an evolution in style since the beginning of cinema. In the early 1900's, the majority of silent films had a very flat image, appearing more like a stage play. Decades later, films are more dynamic (Bordwell, 1997). In essence, aesthetics are inseparable from film, yet difficult to quantify. Nevertheless, one particular study organized by Tarvainen et al. (2015) explained that aesthetics can be categorized into two groups: low-level aesthetics and high-level aesthetics (Tarvainen et al., 2015).

**Low-level aesthetics:** This group describes quantitative elements that are relevant to film style, such as the colors and the brightness. They are relevant to cinematic techniques, which can be easily controlled by the filmmaker. They are considered to be visual, auditory, and temporal features, which means that they can be easily recreated by a computer (Tarvainen et al., 2015).

**High-level aesthetics:** This group describes abstract elements that cannot be narrowed down to a precise technique, which makes it harder for a filmmaker to control. These are adjectives such as beautiful, complex, interesting, and pleasant. Essentially, they are more qualitative in nature. It is more subjective (Tarvainen et al., 2015).

These stylistic elements, such as colors and shot composition, contributes to the overall mood of a film. They described that a particular mood conveyed by aesthetic factors can elicit emotions in the viewer. In other words, mood is a key determinant of the purpose of a scene. For example, one can recognize the horror genre by its intention to scare, crafted by the use of eerie music or dark lighting. Mood can essentially be described as “atmosphere” evoked in a scene, or for the entire film (Tarvainen et al., 2015). From a psychological point of view, moods are like raw feelings (Siemer, 2009). Disregarding mood is a mistake, because it is part of the equation as to what makes

a film compelling. The lighting, texture, music and sound, are all things that can help the viewer to be invested into the story (Sinnerbrink, 2012).

Although this topic is not the direct object of this thesis, this exploratory study conducted by Tarvainen et al. (2015) is worth investigating. By looking beyond just valence, arousal and satisfaction, this could lead us to some potentially interesting findings. It would be a great addition to this thesis. Thus, making our study more unique. In the following paragraphs, we examined this article in more detail.

The Tarvainen et al. (2015) study examined the interrelation of aesthetic elements in film and their impact on shaping the film's mood. As previously stated, they categorized aesthetics into two groups: low-level and high-level. Essentially, they analyzed the interactions between all the aesthetics, and their relation to the three dimensions of mood, which are hedonic tone, energetic arousal, and tense arousal. Due to the exploratory aspect and the lack of literature in this subject, there were no hypotheses formulated.

This experiment had 73 participants. There were 44 women and 29 men, with an age range of 19 to 49. The majority of them were University students from different programs. Furthermore, the stimuli were the following: 14 film clips that each have a duration between 1 and 2.5 minutes (see Table 2).

**Table 2: Film clips used in the original study (Tarvainen et al., 2015)**

#	Group	Viewing order	Movie title	Year	Timecode [h:mm:ss]	Length [m:ss]
1	A	1/7	Amelie	2001	2:00:35	1:36
2	A	2/7	Children of Men	2006	0:26:00	2:07
3	A	3/7	Before Sunrise	1995	1:31:57	2:33
4	A	4/7	Days of Heaven	1978	0:04:05	1:37
5	A	5/7	The Night of the Hunter	1955	0:56:30	1:58
6	A	6/7	The Good, the Bad, and the Ugly	1966	2:45:49	2:17
7	A	7/7	500 Days of Summer	2009	0:31:20	2:04
8	B	1/7	E.T.: The Extra-Terrestrial	1982	1:47:42	1:10
9	B	2/7	Army of Shadows	1969	0:38:40	1:54
10	B	3/7	Punch-Drunk Love	2002	1:06:30	1:16
11	B	4/7	The Shining	1980	0:34:59	1:56
12	B	5/7	Vertigo	1958	0:26:00	1:45
13	B	6/7	Blue Velvet	1986	1:55:32	2:21
14	B	7/7	Raiders of the Lost Ark	1981	0:07:45	2:09

*Note.* Timecodes are taken from NTSC DVD releases.

This study was organized into four sessions, and the participants were divided into two groups: Group A and Group B. Each group had to watch seven clips. There was another session aimed at experts and non-experts for each group. The experiment took place inside a movie theater, where each individual had at least a 30-degree viewing angle. After each clip ended, they had to immediately evaluate it. Before the session began, each person had to complete a background survey, where they were asked to provide their age, gender, profession, level of film expertise, characteristics of their personality, using the Big Five Inventory (BFI) questionnaire, and initial mood, which was assessed using the 24-item UWIST Mood Adjective Checklist. On this checklist, there were terms such as “anxious” and the participants had to give a rating from 1 to 4, 1 being “not at all applicable” and 4 being “definitely applicable”. These ratings were then translated into mood ratings, in regard to hedonic tone, energetic arousal and tense arousal. There was no data collection regarding cinematic preferences, such as a favorite genre or actor. Once the background survey was completed, the participants would then view the clips. For each clip, they noted their emotional state, along with the clip’s mood and aesthetic. The mood and emotional response were evaluated using the UWIST Mood Adjective Checklist, and it was done first due to its limited duration. Regarding the clip aesthetics, which were 13 low-level and 14 high-level, they were assessed on a scale from 1 to 5, 1 being “not at all applicable” and 5 being “definitely applicable”. After all the film clip evaluations, the participants were asked to judge how easy it was to rate the film mood and the emotional response. It was based on a scale from 1 to 5, 1 being “hard” and 5 being “easy” (Tarvainen et al., 2015).

During the analysis phase, based on the procedure by (Matthews et al., 1990), the UWIST item ratings were transformed into mood ratings (hedonic tone, energetic arousal and tense arousal). The authors used the Intraclass Correlation Coefficients (ICC) to approximate the participant’s level of consistency. They used the two-way random effects single-measures model to calculate this. They found that there was more consistency in the ratings of the low-level aesthetics, than the high-level aesthetics. Furthermore, background factors, such as age and personality type, had no influence on the ratings. A couple of low-level aesthetics are related to beauty, pleasantness, and interest, which are high-level aesthetics. Plus, low-level features are better predictors of mood than high-level features. In essence, low-level aesthetics are crucial in shaping the viewer’s attention, and their aesthetic and affective impressions (Tarvainen et al., 2015).

After reading this article by Tarvainen et al. (2015), we realized that it would be a great source of inspiration for this thesis for several reasons. Firstly, the way it was designed makes it possible to evaluate the emotions and the satisfaction level of the participants. The film clips they used are great because there is a variety of genres, including horror. This allows us to compare horror with the rest of the genres. When it comes to evaluating aesthetics, there is not enough research to develop hypotheses. Therefore, this would be the exploratory part of the research, where we would evaluate the differences in how participants perceive aesthetics in VR and 2D. This will be further explained in the following chapters.

## Chapter 3: Methodology

In order to test the research model that was developed in the previous section, we set up a laboratory experiment to test the hypotheses, as well as to evaluate whether aesthetics are perceived differently in 2D versus VR in an exploratory way. This was a between-subjects design study, therefore each participant watched movie clips in, as the hypotheses suggest, either VR or 2D. Essentially, we want to study the causal effects of VR versus 2D. We drew inspiration from the Tarvainen et al. (2015) study for reasons that were mentioned earlier.

This project was approved by the Research Ethics Board (REB) of HEC Montréal. It has been evaluated in accordance with ethical conduct for research involving human subjects.

The objective of the experiment is to test the 4 hypotheses, and thus examine the causal effects of medium on user experience. The medium was the independent variable, which took two values: VR or 2D, i.e. the context in which the participant experienced the film clips. Since this was a between-subjects design study, each participant watched movie clips in one of the two media. VR represents the treatment and 2D represents the control. As for the exploratory aspect of the study, we wanted to see how participants assessed aesthetic features in each medium and to compare the results.

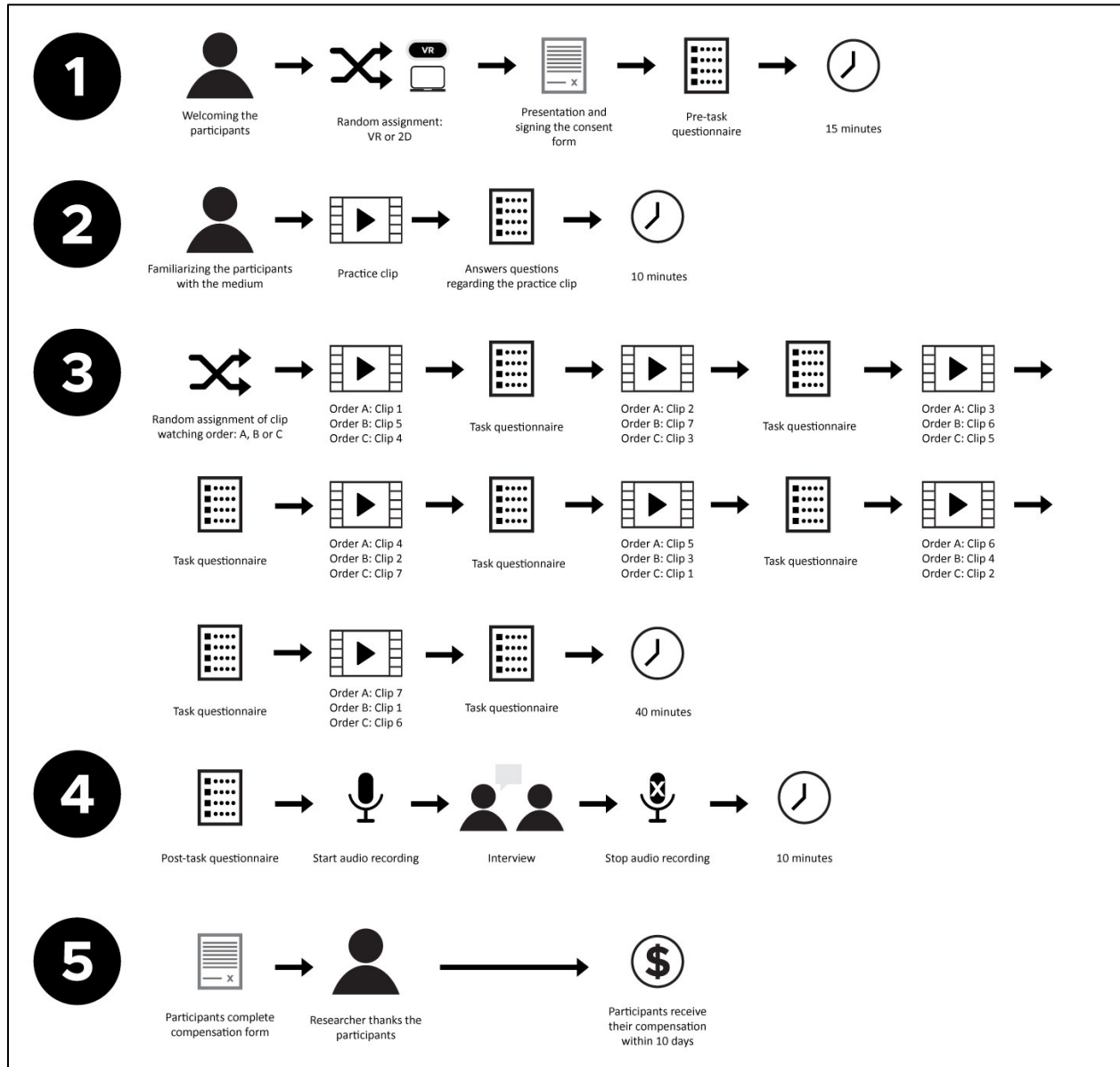
Individuals were recruited with the use of the HEC panel, which had a research pool of 6367 potential participants. The researcher also asked personal colleagues and friends if they were interested in attending. As compensation, each participant received \$20.00 via Interact transfer after they have completed the study.

### 3.1 – Experimental protocol

Whether it was during the pretests or during data collection, each participant was randomly assigned to one of the two conditions: VR or 2D. The research project was advertised as being about watching film scenes and answering questions. There was no mention of a particular

medium. Nobody knew the medium they would watch the clips in. The protocol for both conditions was the same (see Table 3 and Figure 4).

**Figure 4: Experimental protocol**



First, the participants were welcomed by the researcher. When they entered the room, depending which medium they were randomly assigned to, they would see on the table either the VR headset or the laptop for the 2D condition. After listening to the presentation by the researcher and signing the consent form, they completed the pre-task questionnaire (see part 1 of Figure 4).

The participants were then familiarized with the assigned medium and process. For the VR condition, when the headset was on, the participant saw a folder with all the clips. They pointed and clicked, by using the controller, on the practice clip mentioned by the researcher. A screen would appear, which had the film clip playing, with nothing else around it. They could turn 360-degrees and it would be nothing but darkness. The screen however did not move at all. It was as if they were in their own private movie theater. When the movie scene ended, they pressed B on the controller, and it took them back to the folder. They then removed the VR helmet and answered the questions regarding what they watched (see part 2 of Figure 4). Please note that the practice clip was not included when analyzing the data, because it was used to familiarize the participants with the process.

Regarding the 2D condition, certain steps were put into place in order for the process to be as similar as possible to the VR condition. The participant would have a folder opened on the laptop, similar to how a VR participant would see the folder containing all the videos. The 2D participant had to use the mouse to point and click on the practice clip, which the title was announced by the researcher. Then they answered questions about the practice clip. This was done to ensure that the experimental conditions only varied by watching medium (see part 2 of Figure 4).

There were 3 orders in which the 7 film clips, that the experimental task consisted of, were watched (see Appendix A). The order was assigned randomly across and within experimental groups. The researcher always announced which film clip they had to select. The participants would watch 1 clip, then answer the task questionnaire. In total, this was repeated 7 times, once for each film clip, until all clips were watched and evaluated (see part 3 of Figure 4).

The researcher then asked the participants to complete the post-task questionnaire. Once completed, an audio recorded interview took place (see part 4 of Figure 4). Afterwards, the participants completed the compensation form and were thanked by the researcher for their participation. Each participant received their compensation within 10 days (see part 5 of Figure 4).

**Table 3: Materials used for each medium**

<b>Medium</b>	<b>Materials</b>
<b>VR</b>	The virtual reality headset Oculus Quest 2 was used, along with two controllers.
<b>2D</b>	Dell XPS 15 (9510) laptop

### **3.2 – Stimuli: Clip selection**

From the Tarvainen et al. (2015) study, we used 7 film clips, in order to avoid fatigue, to be evaluated by the participants (see part 3 of Figure 4), which were later employed in the analysis. An additional film clip was selected for practice purposes before the evaluation of the 7 clips (see part 2 of Figure 4).

The 7 clips were chosen through an online survey process where 12 participants rated the 14 initial clips according to how clear was the "story within the clip", where the ratings varied from "1" being not clear at all to "7" being very clear, and if the clip could readily be associated to a specific film genre. There was also an optional section for additional comments.

Based on the participants' responses, the 7 film clips were selected (see Table 4). Additionally, they each contained elements that were designed to elicit some kind of response or emotion like fear. The film clip "Days of Heaven" (1978) was personally selected by the researcher as the practice clip, because it was an ordinary clip. Furthermore, as we explained earlier, to avoid a potential systematic bias of film order in the results, 3 different sequences for the order in which the 7 film clips were presented, were employed randomly (see part 3 of Figure 4).

**Table 4: Clips used for the official study**

<b>Clip #</b>	<b>Movie title</b>	<b>Genre</b>	<b>Story clarity</b>
1	Before Sunrise (1995)	Romance	6.58
2	The Good, the Bad, and the Ugly (1966)	Western	6.75
3	500 Days of Summer (2009)	Comedy	4.92
4	E.T.: The Extra-Terrestrial (1982)	Science-fiction	6
5	Punch-Drunk Love (2002)	Romance	6.25
6	The Shining (1980)	Horror	5
7	Raiders of the Lost Ark (1981)	Adventure	6.67



### 3.3 – Measures

The measures were divided into 3 different questionnaires employed at different points in time (see Figure 4): the pre-task questionnaire (see part 1 of Figure 4), the task-questionnaire (see part 3 of Figure 4), and the post-task questionnaire (see part 4 of Figure 4). The quantitative data was extracted from these questionnaires (see Appendix B).

For the pre-task questionnaire (see part 1 of Figure 4), there were:

- General questions related to their background, such as age, gender, field of study, profession, and their level of film knowledge.
- The Big Five Inventory (BFI) questionnaire (John et al., 2008), which is a self-reported personality test. It had a five-point scale, from “Disagree a lot” (1) to “Agree a lot” (5). These points were then calculated into five different numbers, one for each characteristic (agreeableness, neuroticism, conscientiousness, openness, and extraversion).
- The 24-item UWIST (University of Wales Institute of Science and Technology) Mood Adjective Checklist (Matthews et al., 1990), which was to evaluate their current mood. It had a four-point scale, from “Not at all applicable” (1) to “Definitely applicable” (4).

For the task-questionnaire (see part 3 of Figure 4), participants had to answer the same set of questions after each clip, for a total of 7 clips. For valence and arousal, the Self-Assessment Manikin (SAM) scale was used (Ortiz de Guinea et al., 2013), and the rating was between 1 and 9. For valence, it was from most pleasant (1) to most unpleasant (9) (Ortiz de Guinea et al., 2013). For arousal, it was from most activated (1) to most calm (9) (Ortiz de Guinea et al., 2013). The participants answered those questions first, because emotional reactions can be quickly forgotten. For satisfaction, there was a 5-point scale; from “Completely Satisfied” to “Completely Dissatisfied”, which was inspired by the 5-point Likert scale from a study conducted by Butt and Rehman (Butt & Rehman, 2010). For the aesthetic features, the questionnaire was inspired by the original article (Tarvainen et al., 2015). This study (Pizzolante et al., 2023) also supports the idea of evaluating aesthetics by using similar concepts. We used all 27 adjectives: 13 low-level and 14 high-level. Please note that we replaced the word “Fitful” with “Choppy”, which has a very similar definition, because it was a confusing term. For each feature, the participant had to give it a rating on a five-point scale, where “1” was not at all applicable and “5” was definitely applicable.

For the post-task questionnaire (see part 4 of Figure 4), they rated how easy or difficult it was to rate their emotional response and the film mood, which had a five-point scale of “Hard” (1) to “Easy” (5). Then, there was a brief audio recorded interview. The information retrieved from these interviews, and the post-task questionnaire, were not used for the analysis.

### 3.4 – Pretest

Before starting the data collection, a pretest was done to fine tune the experimental protocol. In total, the pretest was done with 8 participants, which were recruited personally by the researcher. Four of them were under the VR condition, and the others did the 2D condition. Several changes to the questionnaires were made mainly due to the feedback from the participants, as it is explained in the following paragraphs.

For the pre-task questionnaire, 3 additional questions related to their methods of film watching were added. This decision was based on the fact that audiences consume content in various formats, and it would be interesting to gain further insight into their viewing habits. For the 24-item UWIST Mood Adjective Checklist part, not a single participant knew what the word “Unenterprising” meant. They all asked for its meaning. Therefore, it got marked with an asterisk, kept in the questionnaire, and its definition was put at the bottom of the page, which said: “\**Unenterprising: someone who lacks boldness. An ambitionless person.*”.

For the task-questionnaire, there were more detailed instructions added regarding the user experience. Although initially the words “Valance” and “Arousal” were used, these were modified for clarity purposes. For example, the initial description “*Valence: the level of pleasure felt when watching the clip (1 = positive to 9 = negative)*”, was changed to: “*Q1: On a scale going from most pleasant (1) to most unpleasant (9), how was your experience with this last clip?*”. These changes were made due to participants expressing confusion, like not necessarily knowing the meaning of the words. Regarding the aesthetic evaluation, the low levels and high levels were initially separated and identified. In the final version, that distinction was eliminated by the researcher in order to avoid bias from the participants. Furthermore, an additional instruction was

added, which was to remind participants to ignore context outside the scene if they have seen the movie already. They were never explicitly asked if they saw the movie, but this change was made since some of them asked whether or not they had to consider the context outside the scene.

For the post-task questionnaire, more detailed instructions were added as well to address participants' expressed confusion. The changes helped assure that participants could understand and answer all questions.

Overall, these changes were made mainly due to participants comments or them being confused. When these changes were implemented, it was clearer for the participants since they did not express any confusion when asked about their comprehension of the instructions. Essentially, all these changes helped to make the process more efficient and effective.

### **3.5 – Participants**

We recruited participants using the HEC panel, which only comprised of university students from HEC Montreal. Additionally, the researcher also recruited some participants using the Calendly application, which is a scheduling tool. A Calendly link was shared with either friends or colleagues from school to participate in the study, where they were able to book a time slot on the calendar.

The requirements to participate in the study were simple. The participants had to be at least 18 years old, and not older than 35. They had to be able to understand English orally and in writing, with an advanced level since all the film clips were in this language. This condition was particularly important because it assured efficiency, reduced the chances of misunderstanding the scenes and prevented a negative experience that could have affected their judgements. There was only one exclusion criteria, which was anyone with epilepsy. In brief, a total of 54 individuals participated in my experiment, and every single one of their data was employed in the analyses.

## Chapter 4: Results

A total of 54 individuals participated in this study, and everyone's data was employed in the analysis. Since each individual watched 7 clips, there were 378 (7 x 54) watching experiences analyzed for testing the hypotheses. The presentation of the results will be organized as follows: first, we will look at the results for each hypothesis, which consist of comparing the effects of VR to 2D on valence, arousal, and satisfaction, as well as the moderation by genre. Afterwards, there will be an exploratory analyses section which will compare the way people rated their perception of the aesthetics for each medium.

The quantitative data was extracted from the paper questionnaires for analysis<sup>1</sup> and entered into SPSS. There was a back-and-forth use of excel and SPSS when it came to organizing the data, but ultimately, SPSS was used to analyze the data.

### 4.1 - Demographics

There were 27 participants who employed VR and 27 who employed 2D when watching the clips. Twenty-four (44.4%) of them were male, 29 (53.7%) were female, with 1 (1.9%) individual identifying as other. The majority of them, 72.2%, were students. The age range went from 19 to 37, and the average age of a participant was around 26 years old. In the original study, they made note of who's a film expert and who is not. Therefore, in the pre-task questionnaire, certain questions were asked about a user's level of film knowledge and their viewing habits. Regarding whether participants had filmmaking as a hobby, 52 (96.3%) said no. Regarding those who studied filmmaking, 41 participants (75.9%) said "Never", and 10 participants (18.5%) somewhat studied the subject. Additionally, there was a question about their preferred way of watching movies. The answers varied from "theaters" to "laptop". This data was categorized into three separate groups: big screen size (which included theaters), medium screen size (which included television screens and laptops) and small screen size (which included mobile devices). We can observe that at least half of the participants likes to experience movies on the big screen (see Table 5).

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<sup>1</sup> The interviews that were informally collected at the end of the experiment, along with the data from the post-task questionnaires, were not used for analysis.

**Table 5: Demographics statistics**

Values	Frequency – number of participants
Gender	Male (24)
	Female (29)
	Other (1)
School	Yes (39)
Filmmaking hobby	No (52)
Filmmaking study	Yes (3)
	No (41)
	Somewhat (10)
Preferred watch – First choice	Big screen size (28)
	Medium screen size (25)
	Small screen size (1)

Regarding the level of cinema knowledge, most of them had little knowledge (51.9%). Regarding the frequency of movie watching, 26 participants (48.1%) sometimes watched movies and 16 participants (29.6%) often watched movies. Regarding the frequency of watching movies in theaters, most of them answered “Sometimes” (48.1%). Regarding the frequency of watching movies on a laptop, 20 participants (37%) answered “Sometimes” and 20 participants (37%) answered “Often” (see Table 6).

**Table 6: Descriptive statistics**

Values	Minimum	Maximum	Mean	Std. Deviation
Cinema knowledge	1	5	2.61	0.878
Watching movies	2	5	3.52	0.841
Movies in theatres	2	5	3.00	0.801
Movies on laptop	1	5	3.46	0.966

In the post-task questionnaire, there was a question seeking to know whether or not it was difficult for participants to rate their emotional response and film mood. Overall, participants thought these elements were easy to rate (see Table 7).

**Table 7: Descriptive statistics for the post-task questionnaire**

Values	Minimum	Maximum	Mean	Std. Deviation
Ease of rating emotional response	2	5	3.70	1.021
Ease of rating film mood	1	5	3.91	0.875

## 4.2 – Properties of the measures

Reliability scores are not applicable to single item measures. Therefore, no reliability can be reported for the one item measures of valence, arousal and satisfaction. We calculated the correlations of all the variables in the model, which are medium, valence, arousal, satisfaction and genre (see Tables 8 and 9). In SPSS, the medium variable, 2D was coded as “0” and VR was coded as “1” because of the way the hypotheses was framed. In addition, the genre variable was coded as follows: “1” for the film clip that was identified to the horror genre, which was only “The Shining” (1980), and “0” for the rest of the clips since none of them belonged to the horror genre (see Table 4).

**Table 8: Descriptive statistics**

	Mean	Std. Deviation
Valence	3.50	2.223
Arousal	4.56	2.506
Satisfaction	2.15	1.060
Medium	0.50	0.501
Genre	0.14	0.350

**Table 9: Pearson Correlation**

	Valence	Arousal	Satisfaction	Medium	Genre
Valence	1	0.083	0.620**	0.012	0.314**
Arousal	0.083	1	0.210**	-0.027	-0.239**
Satisfaction	0.620**	0.210**	1	0.025	0.193**
Medium	0.012	-0.027	0.025	1	0.000
Genre	0.314**	-0.239**	0.193**	0.000	1

\*\* Correlation is significant at the 0.01 level (two-tailed).

### 4.3 – Test of the hypotheses

In this section, we present the results from the tested hypotheses (H1 to H4). The presentation of these results will be separated into 2 sections. First, we present the analysis of hypotheses H1 to H3. Then, the analysis of the moderator hypotheses, which are H4a to H4c, will follow.

For hypotheses H1 to H3, we used the ANCOVA method rather than ANOVA, because we took into consideration several covariates. The covariates were: the order of the clips, participants age, their gender, whether they go to school, whether they have filmmaking as a hobby, whether they studied filmmaking, their level of knowledge in cinema and the quantity of movies they watch. It was important to consider these variables because they might have had an influence on the results.

Furthermore, we chose to do a one-tailed test because we wanted to see if VR was higher or lower than 2D for all dependent variables. Since SPSS calculates a two-tailed test when performing ANCOVA, we therefore divided the p-value by 2 to adjust for a one-tail test. Essentially, here is the basis of the null hypothesis and the alternative hypothesis, where  $\mu_2$  represents the mean of each of the 3 dependent variables when VR is employed, and  $\mu_1$  represents the means when 2D is used:

$$H_0: \mu_1 \geq \mu_2$$

$$H_1: \mu_1 < \mu_2$$

We are now going to explain in detail the results of the ANCOVA tests for H1 to H3. These tests were done to see if VR elicits a higher level of valence, arousal and satisfaction than 2D.

**Table 10: Descriptive statistics for valence, arousal and satisfaction**

Medium	Valence		Arousal		Satisfaction	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
2D	3.47	2.170	4.62	2.302	2.12	1.057
VR	3.52	2.280	4.49	2.699	2.17	1.065
2D and VR	3.50	2.223	4.56	2.506	2.15	1.060

Hypothesis 1 (H1), which suggests that there will be a higher level of valence for VR than for 2D, is not supported. We can observe that there is a very minimal difference in the mean and standard

deviation between 2D and VR (see Table 10). Valence is not higher for VR than for 2D when the p-value is adjusted for a one-tailed test ( $F = 0.388$  ;  $p > 0.05$  ;  $df = 1$ ) (see table 11). Also, most control variables (i.e., the order of clips, a participant’s age, whether they have filmmaking as a hobby, whether they studied filmmaking and the quantity of movies they watch) were not significant. In other words, these covariates did not have any effects on valence. However, others including gender, whether they attended school and level of cinema knowledge were significant, meaning that they had an effect on valence (see Table 12).

Hypothesis 2 (H2), which suggests that there will be a higher level of arousal for VR than for 2D, is not supported. We can observe that there is a small difference in the mean and standard deviation between 2D and VR (see Table 10). Arousal is not higher for VR than for 2D when the p-value is adjusted for a one-tailed test ( $F = 0.142$  ;  $p > 0.05$  ;  $df = 1$ ) (see table 11). Also, the only covariate that was significant was the participant’s age. It had an effect on arousal (see Table 13).

Hypothesis 3 (H3), which suggests that there will be a higher level of satisfaction for VR than for 2D, is not supported. We can observe that there is a very minimal difference in the mean and standard deviation between 2D and VR (see Table 10). Satisfaction is not higher for VR than for 2D when the p-value is adjusted for a one-tailed test ( $F = 0.549$  ;  $p > 0.05$  ;  $df = 1$ ) (see table 11). Also, the only covariates that were not significant were whether they have filmmaking as a hobby and the quantity of movies they watch. The rest of the covariates had an effect on satisfaction (see Table 14).

**Table 11: Summary of the ANCOVA test results for the effects of medium on the variables of interest**

Hypotheses	df	F	p-value (adjusted for one-tail test)	Support
<b>H1: The effects of medium (VR vs 2D) on valence.</b>	1	0.388	0.267	No
<b>H2: The effects of medium (VR vs 2D) on arousal.</b>	1	0.142	0.353	No
<b>H3: The effects of medium (VR vs 2D) on satisfaction.</b>	1	0.549	0.230	No



**Table 12: Valence - Covariates in Tests of Between-Subjects Effects**

Covariates	df	F	p-value (adjusted for one-tail test)
Clip order	1	0.935	0.167
Age	1	0.510	0.238
Gender	1	12.209	<b>&lt;0.001</b>
School	1	4.144	<b>0.021</b>
Filmmaker hobby	1	1.609	0.103
Filmmaking study	1	0.002	0.483
Cinema knowledge	1	13.225	<b>&lt;0.001</b>
Watching movies	1	0.309	0.290

**Table 13: Arousal - Covariates in Tests of Between-Subjects Effects**

Covariates	df	F	p-value (adjusted for one-tail test)
Clip order	1	1.043	0.154
Age	1	2.120	<b>0.073</b>
Gender	1	0.274	0.301
School	1	0.171	0.340
Filmmaker hobby	1	0.616	0.217
Filmmaking study	1	0.221	0.319
Cinema knowledge	1	0.124	0.363
Watching movies	1	0.350	0.277

**Table 14: Satisfaction - Covariates in Tests of Between-Subjects Effects**

Covariates	df	F	p-value (adjusted for one-tail test)
Clip order	1	10.823	<b>&lt;0.001</b>
Age	1	2.947	<b>0.044</b>
Gender	1	5.635	<b>0.009</b>
School	1	2.167	<b>0.071</b>
Filmmaker hobby	1	0.529	0.234
Filmmaking study	1	1.992	<b>0.080</b>
Cinema knowledge	1	10.052	<b>0.001</b>
Watching movies	1	0.000	0.493

For hypotheses H4a to H4c, a three two-way ANOVAs were performed. The same covariates mentioned above were also included. The null hypothesis signifies there is no interaction between genre and medium on viewer experience, and the alternative hypothesis means that there is an interaction.

Now we are going to analyze the results for H4a, H4b and H4c. We adjusted the resulting p-value as before for the test to be one-tail.

Hypothesis 4a (H4a), which suggests that genre (horror vs non-horror) will positively moderate the relation between medium (VR vs 2D) and valence, is not supported ( $F = 1.005$  ;  $p > 0.05$  ;  $df = 1$ ) (see table 15). In essence, the genre does not strengthen the effect of VR on valence.

Hypothesis 4b (H4b), which suggests that genre (horror vs non-horror) will positively moderate the relation between medium (VR vs 2D) and arousal, is not supported ( $F = 0.081$  ;  $p > 0.05$  ;  $df = 1$ ) (see table 15). In essence, the genre does not strengthen the effect of VR on arousal.

Hypothesis 4c (H4c), which suggests that genre (horror vs non-horror) will positively moderate the relation between medium (VR vs 2D) and satisfaction, is not supported ( $F = 0.389$  ;  $p > 0.05$  ;  $df = 1$ ) (see table 15). In essence, the genre does not strengthen the effect of VR on satisfaction.

Finally, it is important to note that the genre variable itself had a significant effect on the 3 dependent variables. The horror clip had a greater impact on valence ( $F = 40.975$  ;  $p < 0.05$  ;  $df = 1$ ), arousal ( $F = 22.612$  ;  $p < 0.05$  ;  $df = 1$ ) and satisfaction ( $F = 14.464$  ;  $p < 0.05$  ;  $df = 1$ ) than the other genres (see Table 16).

**Table 15: Summary of two-way ANOVA - The interaction between medium and genre**

Hypotheses	df	F	p-value (adjusted for one-tail test)	Support
<b>H4a: Genre will positively moderate the relation between medium and valence.</b>	1	1.005	0.159	No
<b>H4b: Genre will positively moderate the relation between medium and arousal.</b>	1	0.081	0.389	No
<b>H4c: Genre will positively moderate the relation between medium and satisfaction.</b>	1	0.389	0.267	No

**Table 16: Genre (Horror vs Others) - Tests of Between-Subjects Effects**

DV	df	F	p-value (adjusted for one-tail test)
<b>Valence</b>	1	40.975	<0.001
<b>Arousal</b>	1	22.612	<0.001
<b>Satisfaction</b>	1	14.464	<0.001

#### 4.4 – Exploratory analysis of aesthetics features

This section examines aesthetics perceptions. Since this is the exploratory part of the thesis, there were no hypotheses formulated. We essentially did 3 analyses. First, for each clip a participant watched, we calculated the intraclass correlation (ICC) of the aesthetic variables, and we extracted the descriptive statistics for VR and 2D (see Tables 17 and 18). This allows us to look at variations in aesthetics perceptions and across levels of aesthetics and media.

**Table 17: VR – Descriptive statistics for aesthetics**

Aesthetics	Level Type	ICC	p-value	Upper Bound	Lower Bound	Upper-Lower
Bright	Low	0.933	< 0.001	0.986	0.833	0.153
Dark	Low	0.949	< 0.001	0.989	0.871	0.118
Colorful	Low	0.889	< 0.001	0.977	0.723	0.254
Colorless	Low	0.870	< 0.001	0.973	0.674	0.299
Loud	Low	0.946	< 0.001	0.989	0.864	0.125
Quiet	Low	0.910	< 0.001	0.982	0.776	0.206
Dialogue-based	Low	0.985	< 0.001	0.997	0.963	0.034
Music-based	Low	0.988	< 0.001	0.997	0.969	0.028
Fast	Low	0.941	< 0.001	0.988	0.853	0.135
Slow	Low	0.937	< 0.001	0.987	0.844	0.143
Smooth	Low	0.717	0.00	0.942	0.293	0.649
Choppy	Low	0.710	0.00	0.941	0.273	0.668
Rhythmic	Low	0.916	< 0.001	0.983	0.790	0.193
Beautiful	High	0.896	< 0.001	0.979	0.741	0.237
Ugly	High	0.887	< 0.001	0.977	0.718	0.259
Complex	High	0.768	< 0.001	0.953	0.420	0.533
Simple	High	0.872	< 0.001	0.974	0.681	0.292
Familiar*	High	0.561	0.04	0.910	-0.094	1.005
Unfamiliar*	High	0.055	0.39	0.807	-1.359	2.166
Interesting*	High	0.730	0.00	0.945	0.326	0.619
Tiresome*	High	0.339	0.18	0.865	-0.654	1.519
Pleasant	High	0.803	< 0.001	0.960	0.509	0.451
Unpleasant	High	0.850	< 0.001	0.969	0.628	0.342
Predictable*	High	0.660	0.01	0.931	0.154	0.777
Unpredictable	High	0.701	0.00	0.939	0.255	0.684
Understandable	High	0.850	< 0.001	0.969	0.625	0.345
Unclear	High	0.819	< 0.001	0.963	0.546	0.417

\*Variables that ended up being discarded after the Bonferroni correction.

**Table 18: 2D – Descriptive statistics for aesthetics**

Aesthetics	Level Type	ICC	p-value	Upper Bound	Lower Bound	Upper-Lower
<b>Bright</b>	Low	0.947	< 0.001	0.989	0.869	0.120
<b>Dark</b>	Low	0.938	< 0.001	0.987	0.845	0.142
<b>Colorful</b>	Low	0.894	< 0.001	0.978	0.736	0.243
<b>Colorless</b>	Low	0.831	< 0.001	0.966	0.577	0.389
<b>Loud</b>	Low	0.912	< 0.001	0.982	0.782	0.200
<b>Quiet</b>	Low	0.710	0.00	0.941	0.275	0.666
<b>Dialogue-based</b>	Low	0.994	< 0.001	0.999	0.985	0.013
<b>Music-based</b>	Low	0.994	< 0.001	0.999	0.984	0.014
<b>Fast</b>	Low	0.934	< 0.001	0.986	0.835	0.152
<b>Slow</b>	Low	0.953	< 0.001	0.990	0.883	0.108
<b>Smooth</b>	Low	0.839	< 0.001	0.967	0.599	0.368
<b>Choppy</b>	Low	0.782	< 0.001	0.955	0.457	0.498
<b>Rhythmic</b>	Low	0.925	< 0.001	0.985	0.812	0.172
<b>Beautiful</b>	High	0.918	< 0.001	0.983	0.796	0.187
<b>Ugly</b>	High	0.919	< 0.001	0.983	0.796	0.187
<b>Complex</b>	High	0.907	< 0.001	0.981	0.769	0.212
<b>Simple</b>	High	0.907	< 0.001	0.981	0.769	0.212
<b>Familiar*</b>	High	0.550	0.04	0.908	-0.120	1.028
<b>Unfamiliar*</b>	High	0.675	0.01	0.933	0.190	0.744
<b>Interesting*</b>	High	0.487	0.08	0.895	-0.277	1.173
<b>Tiresome*</b>	High	0.565	0.04	0.911	-0.087	0.998
<b>Pleasant</b>	High	0.951	< 0.001	0.990	0.879	0.111
<b>Unpleasant</b>	High	0.949	< 0.001	0.990	0.872	0.118
<b>Predictable*</b>	High	0.663	0.01	0.931	0.162	0.769
<b>Unpredictable</b>	High	0.809	< 0.001	0.961	0.525	0.436
<b>Understandable</b>	High	0.911	< 0.001	0.982	0.779	0.203
<b>Unclear</b>	High	0.953	< 0.001	0.990	0.883	0.107

\*Variables that ended up being discarded after the Bonferroni correction.

We then applied the Bonferroni correction for all aesthetics, due to the risk of a type I error, where we multiplied every p-value by 27. If a variable had a p-value that was equal or greater than 0.05 in both media, they were discarded. Therefore, the following 5 aesthetics, which are all high-level, were removed and no longer used in the analysis from this point forward: familiar, unfamiliar, interesting, tiresome and predictable. Thus, the calculation of the ICC helped us select the aesthetics that showed high variance across clips watched within the same medium.

#### 4.4.1 – Analysis 1

We conducted an univariate ANOVA to compare the ICC values (see Tables 17 and 18) based on each media and level (high and low) of aesthetics, and we discovered that it was marginally significant ( $F = 2.455$  ;  $p < 0.10$  ;  $df = 3$ ). The results do not show significant differences on rating agreement for low-level aesthetics compared to high-level aesthetics ( $F = 1.388$  ;  $p > 0.10$  ;  $df = 1$ ). However, the medium was marginally significant ( $F = 3.302$  ;  $p < 0.10$  ;  $df = 1$ ). Within the VR condition, there is a more noticeable disagreement regarding high-level aesthetics when compared to the 2D condition (see Table 19 and Figure 5). Furthermore, there is a marginally significant interaction between level and medium ( $F = 3.759$  ;  $p < 0.10$  ;  $df = 1$ ) (see also Table 20).

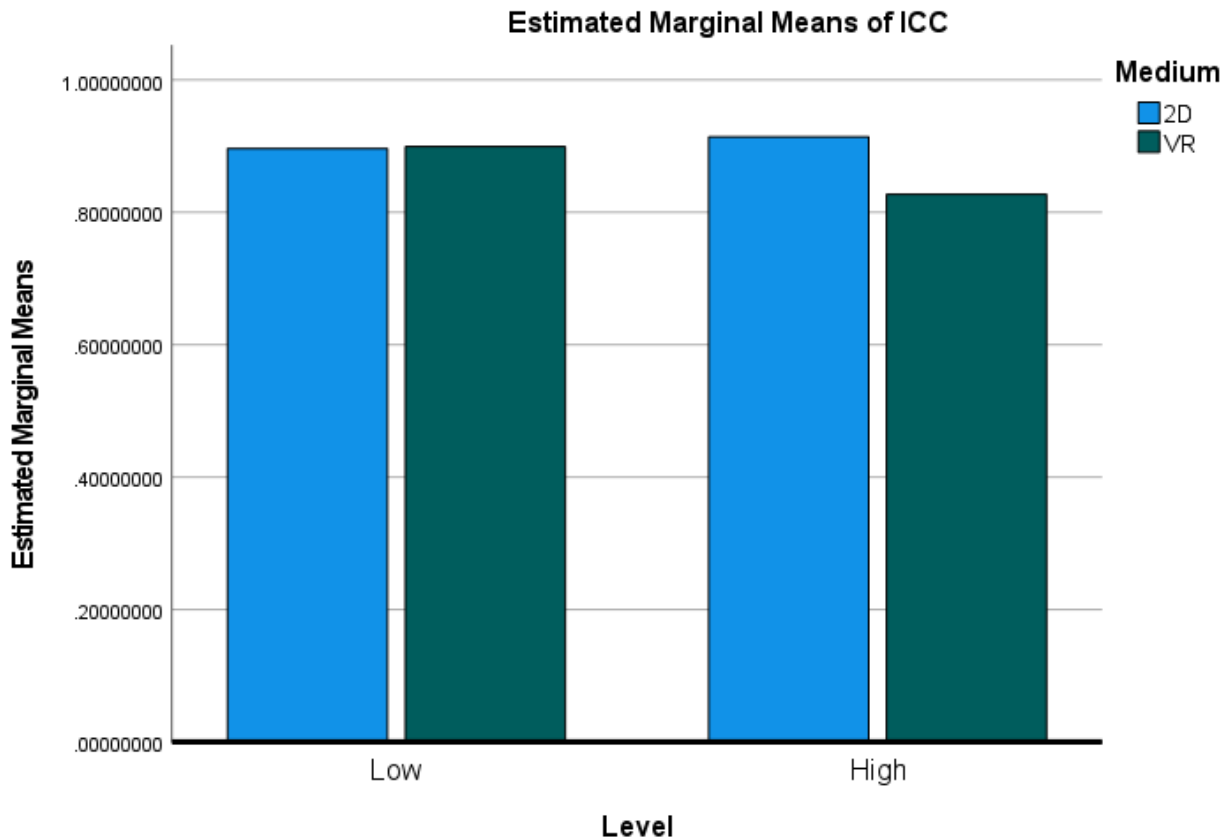
**Table 19: Descriptive statistics - Univariate ANOVA on the ICC values (Dependent variable: ICC)**

Level	Media	Mean	Std. Deviation	N
<b>Low</b>	2D	0.896	0.084	13
	VR	0.899	0.089	13
	2D and VR	0.898	0.085	26
<b>High</b>	2D	0.914	0.044	9
	VR	0.827	0.063	9
	2D and VR	0.871	0.069	18
<b>Total</b>	2D	0.904	0.069	22
	VR	0.870	0.086	22
	2D and VR	0.887	0.079	44

**Table 20: The interaction between the aesthetic level and medium (dependent variable: ICC)**

Level	Medium	Mean	Std. Error	Lower Bound	Upper Bound
<b>Low</b>	2D	.896	.021	.854	.939
	VR	.899	.021	.857	.941
<b>High</b>	2D	.914	.025	.863	.965
	VR	.827	.025	.777	.878

**Figure 5: Estimated Marginal Means of ICC**



#### 4.4.2 – Analysis 2

Based on our findings from the first analysis, we further investigated by conducting a repeated measures ANOVA by comparing the upper and lower bound ICC values based on the factors of medium and aesthetic level. The assumption of the sphericity for repeated measures ANOVA was met. The results show that the interaction between bound (upper and lower) and aesthetic level (high and low) was not significant ( $F = 1.377$  ;  $p > 0.10$  ;  $df = 1$ ) (see also Table 21). The interaction between bound (upper and lower) and medium (VR and 2D) was marginally significant ( $F = 3.304$  ;  $p < 0.10$  ;  $df = 1$ ) (see also Table 22). Furthermore, the interaction between bound (upper and lower), aesthetic level (high and low) and medium (VR and 2D) was marginally significant ( $F = 3.744$  ;  $p < 0.10$  ;  $df = 1$ ) (see also Table 23).

In Figure 6, we can see that the upper bound values were similar for both media (VR and 2D), regardless of the aesthetic level. However, in Figure 7, we can see within the lower bound values

that there is a disparity between high-level and low-level aesthetics for VR compared to 2D appears. This signifies that when people disagreed about high-level aesthetics in VR, their disagreements were more heterogeneous than those who were in the 2D group (see Tables 22 and 23). Essentially, the upper bound indicates when people agree while lower bound reflects when people disagree.

**Table 21: Pairwise Comparisons**

Medium	Bound	Level (I)	Level (J)	Mean Difference (I-J)	p-value (b)	Lower bound	Upper bound
2D	Upper	Low	High	-0.004	0.594	-0.017	0.010
		High	Low	0.004	0.594	-0.010	0.017
	Lower	Low	High	-0.044	0.593	-0.208	0.121
		High	Low	0.044	0.593	-0.121	0.208
VR	Upper	Low	High	0.015*	0.033	0.001	0.028
		High	Low	-0.015*	0.033	-0.028	-0.001
	Lower	Low	High	0.179*	0.034	0.014	0.344
		High	Low	-0.179*	0.034	-0.344	-0.014

Based on estimated marginal means

\*The mean different is significant at the 0.05 level.

b. Adjustment for multiple comparisons: Bonferroni

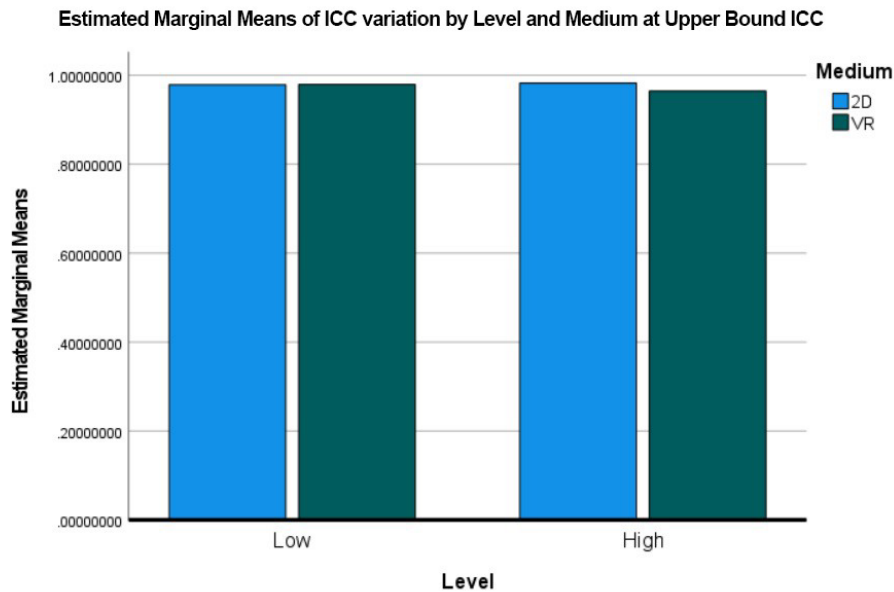
**Table 22: The interaction between the aesthetic level (high and low) and medium and bound**

Level	Medium	Bound	Mean	Std. Error	Lower Bound	Upper Bound
Low	2D	Upper	0.979	0.004	0.970	0.987
		Lower	0.741	0.052	0.636	0.847
	VR	Upper	0.979	0.004	0.971	0.988
		Lower	0.748	0.052	0.643	0.853
High	2D	Upper	0.982	0.005	0.972	0.993
		Lower	0.785	0.063	0.659	0.912
	VR	Upper	0.965	0.005	0.954	0.975
		Lower	0.569	0.063	0.443	0.696

**Table 23: Descriptive statistics - Dependent variable - Upper and Lower Bound**

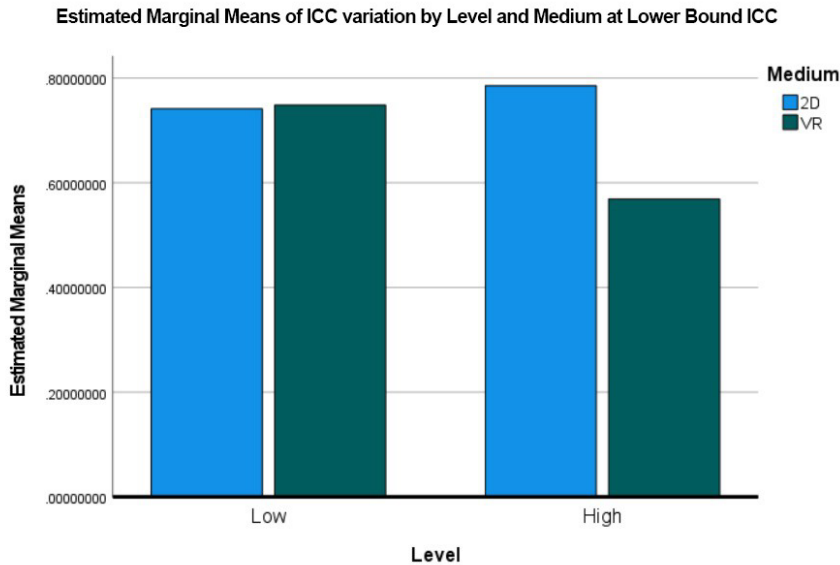
DV	Level	Medium	Mean	Std. Deviation	N
<b>Upper Bound</b>	Low	2D	0.979	0.017	13
		VR	0.979	0.018	13
		2D and VR	0.979	0.017	26
	High	2D	0.982	0.009	9
		VR	0.965	0.013	9
		2D and VR	0.974	0.014	18
	Total	2D	0.980	0.014	22
		VR	0.973	0.017	22
		2D and VR	0.977	0.016	44
<b>Lower Bound</b>	Low	2D	0.741	0.210	13
		VR	0.748	0.222	13
		2D and VR	0.745	0.212	26
	High	2D	0.785	0.109	9
		VR	0.569	0.157	9
		2D and VR	0.677	0.172	18
	Total	2D	0.759	0.173	22
		VR	0.675	0.214	22
		2D and VR	0.717	0.197	44

**Figure 6: Upper Bound**





**Figure 7: Lower Bound**



#### 4.4.3 – Analysis 3

Based on our findings from the second analysis, we sought to further understand by analysing the interaction between clip and medium for high-level aesthetics only by conducting a two-way repeated measures ANOVA. We wanted to see whether the higher variance was driven by a particular clip. If not, then it would suggest that this is a general VR phenomenon. To perform this analysis, we calculated the means and standard deviations across all participants for every clip. Additionally, we used the boundary range of all aesthetics (see variable “Upper-Lower” from Tables 17 and 18). The test of the sphericity assumption was significant, therefore the correction by Greenhouse-Geisser was employed for the results.

According to our analysis, there is no significance for the model containing the interaction as well as the main effects of each variable ( $F = 14.125$  ;  $p < 0.05$  ;  $df = 6.000$ ). There is no overall interaction between clip and medium ( $F = 1.125$  ;  $p > 0.05$  ;  $df = 3.305$ ), but there is an overall effect of clip ( $F = 13.086$  ;  $p < 0.05$  ;  $df = 3.305$ ).

Furthermore, every clip has significant differences with some of the other clips (please refer to Table 24 to know which clip is which). For instance, clip #1 is significantly different than clip #2 and #3 ( $p < 0.05$ ). Clip #2 is significantly different than clip #1, #3, #4, #5 and #7 ( $p < 0.05$ ). Clip

#4 is significantly different than clip #2 and #6 ( $p < 0.05$ ). Clip #6 is significantly different than clip #3, #4, #5 and #7 ( $p < 0.05$ ). Overall, the higher variance in high-level aesthetics seems to be VR related (see Tables 24 and 25, and Figure 8).

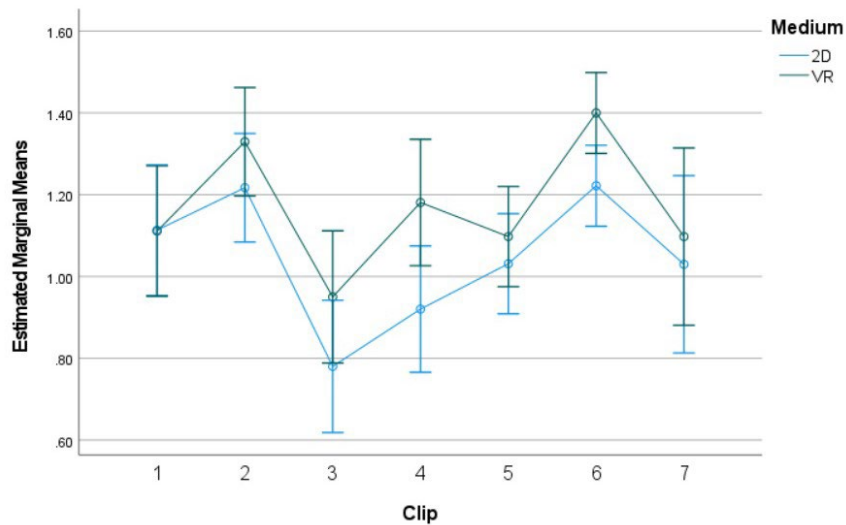
**Table 24: Descriptive statistics**

<b>Film clips</b>	<b>Media</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>N</b>
<b>Clip 1: Before Sunrise (1995)</b>	2D	1.113	0.246	9
	VR	1.111	0.232	9
	2D and VR	1.112	0.232	18
<b>Clip 2: The Good, the Bad, and the Ugly (1966)</b>	2D	1.217	0.253	9
	VR	1.330	0.124	9
	2D and VR	1.273	0.202	18
<b>Clip 3: 500 Days of Summer (2009)</b>	2D	0.780	0.184	9
	VR	0.950	0.290	9
	2D and VR	0.865	0.251	18
<b>Clip 4: E.T.: The Extra-Terrestrial (1982)</b>	2D	0.920	0.275	9
	VR	1.181	0.179	9
	2D and VR	1.051	0.262	18
<b>Clip 5: Punch-Drunk Love (2002)</b>	2D	1.031	0.155	9
	VR	1.098	0.208	9
	2D and VR	1.064	0.181	18
<b>Clip 6: The Shining (1980)</b>	2D	1.222	0.164	9
	VR	1.400	0.131	9
	2D and VR	1.311	0.171	18
<b>Clip 7: Raiders of the Lost Ark (1981)</b>	2D	1.030	0.331	9
	VR	1.098	0.319	9
	2D and VR	1.064	0.317	18

**Table 25: The interaction between the medium and clip – high-level aesthetics**

Medium	Clip	Mean	Std. Error	Lower Bound	Upper Bound
2D	1	1.113	0.080	0.944	1.283
	2	1.217	0.066	1.077	1.358
	3	0.780	0.081	0.609	.952
	4	0.920	0.077	0.757	1.084
	5	1.031	0.061	0.901	1.161
	6	1.222	0.049	1.117	1.327
	7	1.030	0.108	0.800	1.260
VR	1	1.111	0.080	0.942	1.280
	2	1.330	0.066	1.189	1.470
	3	0.950	0.081	0.779	1.122
	4	1.181	0.077	1.017	1.345
	5	1.098	0.061	0.968	1.227
	6	1.400	0.049	1.295	1.505
	7	1.098	0.108	0.868	1.327

**Figure 8: Estimated Marginal Means of the Standard Deviation for all 7 clips**



In brief, based on all our analysis regarding the aesthetics, it is more difficult to interpret high-level aesthetics than low-level aesthetics. This difficulty increases significantly when viewing the film clips in VR, regardless of the clip and genre.

## **Chapter 5: Discussion**

The main objective of this thesis was to deepen our understanding of the causal effects of VR versus 2D. We studied the viewing experience of watching a regular 2D film clip on a traditional 2D screen and compared it to watching it through a VR Head Mounted Display. We tested our hypotheses regarding whether the medium in which film clips are watched, results in differences in the level of valence, arousal and satisfaction, as well as whether these differences are moderated by genre. Additionally, we evaluated whether aesthetics are perceived differently in 2D versus VR in an exploratory way. To achieve these objectives, we conducted an in-person laboratory experiment where 54 individuals participated. This permitted us to collect the necessary data to test the research model and hypotheses developed in chapter 2.

### **5.1 – Implications for research**

The results obtained in this study do not demonstrate that VR elicits stronger emotions than 2D. The first hypothesis, which tested whether or not there will be a higher level of valence for VR than for 2D, was not supported. The second hypothesis, which tested whether or not there will be a higher level of arousal for VR than for 2D, was not supported. Regarding the satisfaction level, we hypothesized that it would be higher for VR than 2D. This third hypothesis was not supported. Overall, there were no differences in the viewing experiences between the two media regarding these dependent variables.

We observed that media does not provide significant experiences on their own. According to our analysis, the covariates, which were the order of the clips, age, gender, whether the participant goes to school, whether they have filmmaking as a hobby, whether they studied filmmaking, their level of knowledge in cinema and the quantity of movies they watch, seem to be an influential factor. We can see that the variables valence and satisfaction were generally influenced by intellectual and cultural factors (see Tables 12 and 14). Arousal was only influenced by age (see Table 13). It is certain covariates that can cause higher levels of valence, arousal and satisfaction in VR, rather than the medium itself. Whereas in the Tarvainen et al. (2015) study, the background factors had no notable effect on the ratings. In brief, the results of this study contrast with the

literature which suggests that, usually, the VR experience elicits stronger emotions than 2D (Ding et al., 2018; Kim et al., 2018; Yu et al., 2023).

Furthermore, the genre did not positively moderate the relation between medium and any of the dependent variables. Essentially, the genre did not strengthen the effect of VR on neither valence, arousal nor satisfaction. However, when analyzing the genre variable independently, the horror clip had a greater impact on valence, arousal and satisfaction than the non-horror clips, regardless of medium. This is generally aligned with the literature which suggests that horror content produces strong emotions (Kim et al., 2018; Sera et al., 2016). In both media, the emotional intensity goes through the majority of these social factors. It makes further sense for the horror clip to stand out since it produces the highest level of arousal.

Regarding aesthetics, there was more variation in the perceptions of high-level aesthetics than low-level aesthetics, to a greater extent within the VR medium despite the genre and the clip. This is consistent with Tarvainen et al. (2015), who found that the ratings of low-level aesthetics are more consistent than those of high-level aesthetics. This might be due to the fact that in general, high-level aesthetics are more abstract, therefore there could be various interpretations. As to why this variation in perception was particular within the VR medium, it might be due to certain expectations that people have about this device, which might have caused even greater perceptive heterogeneity. When a user tries a VR headset, they expect to be immersed and captivated by the content. But when that content, in this case 2D film scenes, was not made to be experienced in VR, it might be somewhat underwhelming, and thus influence their perception. Since low-level aesthetics are more concrete in nature, it is not surprising that there was a greater consensus among participants, regardless of the medium. Aesthetics such as “colorful” or “dark” should be consistent across all platforms since these are elements that are mainly controlled by the filmmaker.

## **5.2 – Implications for practice**

According to the conclusions arising from our analysis, it allows us to suggest that it is not necessarily advantageous to view 2D films through a VR Head Mounted Display, neither from an emotional nor satisfactory standpoint. However, while the interviews at the end of the experiment

were not employed in our analysis, some participants revealed that they would not be opposed to watching 2D content, including feature length films, in VR, as long as they would be in a comfortable setting.

Secondly, filmmakers should not be concerned about VR regarding movie making itself nor popularity, because it is a different experience. Since the results are statistically non-significant, audiences are better off watching the 2D films on two-dimensional screens, the way they were intended to be seen. VR would simply be an extra tool, just like a tablet or a mobile device, to watch movies. In fact, since users expressed greater disagreements of high-level aesthetics within VR, the VR headset might hinder the goals of the filmmaker. The viewer might not experience the film the way the director intended.

### **5.3 – Limitations and future research**

Some of the limitations of this study could explain the reasons for the statistically non-significant results. First of all, the sample size of 54 participants, which were mainly comprised of HEC University students, was possibly too small to effectively illustrate the differences in the viewer's experience between the two media. Although it was demonstrated in the original study, by Tarvainen et al. (2015), that film expertise had very little influence on ratings, it would have been beneficial for our study having many more participants with great film knowledge and experience, in order to corroborate that finding. Additionally, motion sickness should have been taken more into consideration. Although none of the participants experienced it throughout the data collection, there should have been a question related to it within the questionnaire.

Secondly, there were certain limitations regarding the media. The 2D condition, in which a laptop was used, could have been an issue due to the screen size. If the participants would have watched the film clips on a television screen, phone or in a movie theater, it could have influenced their viewing experience. Another factor to consider would be the limitations within the VR space, which is the artificial world that the user enters when they put on the VR headset. Although the participant had the ability to turn 360-degrees, the unmoving screen occupied only a portion of the virtual environment. As described in chapter 3, it was completely dark around the screen. The fact

that the film clips, that the users watched, were not made to be experienced in 360-degrees might have been an influential factor. Plus, there was also the distance of the screen from the viewer within the VR space. For future research, there are many possibilities to experiment with various screen sizes and devices, along with different types of VR headsets, that could impact the results.

Thirdly, film is a very complex art form which makes it very difficult to quantify movie clips. It is comprised of numerous audio and visual components, accompanied by the performances of the actors. There are various types of shots, such as establishing shots and medium shots, which can affect the perception of its content. The musical score plays a very important role in determining the overall mood. Essentially, there is a significant number of elements that could influence the viewer's experience, along with the user's subjective point of view. Additionally, during the experiment, the participants could have had vastly different interpretations of the meaning of the aesthetics. Plus, their personal taste might have influenced their judgement. For example, one participant expressed that they do not like Adam Sandler as an actor when the "Punch-Drunk Love" (2002) scene appeared. That opinion could have had an affect on their answers. That is one of the many reasons why there needs to be more studies using a variety of different clips. There are endless potential movie scenes to choose from. Usually movies contain multiple genres, which makes it difficult for evaluation. That is why, for the purpose of this thesis, we wanted to keep it as simple as possible by using clips that had a strong sense of a specific genre. We also wanted a variety of genres. Since the horror genre was found to be significant compared to others, there could be future studies where there are combinations compared with each other. For example, horror comedy versus psychological horror versus gothic horror.

To conclude this chapter, we would like to address the fact that AI technology is becoming increasingly better at creating realistic videos from text prompts. This would be extremely useful for future studies of this nature because researchers would be able to have precise control over their creation and would be able to modify the aesthetical elements with ease. For example, they could even have two exact videos, but one version of the clip might be a little bit more colorful. There is the potential to study one aesthetic more precisely, with more accuracy and control. Moreover, this study worked great with short film clips, but using feature length films would have been challenging. It would have been time consuming and exhausting for the participants.

## Chapter 6: Conclusion

In this thesis, we investigated whether there was a significant difference in the user's viewing experience of a 2D film between a 2D screen and a VR Head Mounted Display. The viewing experience included emotion, where the two dimensions were valence and arousal, and satisfaction. The moderator was the genre of the film clips, where we also compared horror with the other genres. We also analyzed how aesthetics are perceived when viewing a 2D film on a 2D screen versus from a VR HMD, which was the exploratory part of this study.

With the data that we collected, we were not able to demonstrate that the level of valence, arousal and satisfaction was higher in VR than in 2D. Although genre did not strengthen the effect of VR on any of the 3 dependent variables, the effects of the genre variable itself were significant, meaning that the horror clip had a larger influence on valence, arousal and satisfaction than the non-horror clips. Furthermore, regarding aesthetics, there was greater disagreement about the ratings for high-level aesthetics than low-level aesthetics. In brief, this study showed that watching 2D film clips in a VR HMD is not necessarily more advantageous than watching them on two-dimensional screens.

There are various possible reasons why the results were non-significant, such as the sample size, the medium itself and the complexity of the cinematic artform. Considering that VR usage will increase in popularity, it will be necessary to conduct further studies using different clips and genres, and to verify the emotional and satisfactory levels. Moreover, AI will allow researchers to create various types of videos with precision. This could make it easier for future researchers to evaluate aesthetics and overall film clips.



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## Appendix A

Below are the 3 different orders of the clips:

Clip #	Order A
1	Before Sunrise (1995)
2	The Good, the bad and the ugly (1966)
3	500 Days of summer (2009)
4	E.T.: The Extra-Terrestrial (1982)
5	Punch-Drunk Love (2002)
6	The Shining (1980)
7	Raiders of the Lost Ark (1981)

Clip #	Order B
1	Punch-Drunk Love (2002)
2	Raiders of the Lost Ark (1981)
3	The Shining (1980)
4	The Good, the Bad, and the Ugly (1966)
5	500 Days of Summer (2009)
6	E.T.: The Extra-Terrestrial (1982)
7	Before Sunrise (1995)

Clip #	Order C
1	E.T.: The Extra-Terrestrial (1982)
2	500 Days of Summer (2009)
3	Punch-Drunk Love (2002)
4	Raiders of the Lost Ark (1981)
5	Before Sunrise (1995)
6	The Good, the Bad, and the Ugly (1966)
7	The Shining (1980)

## Appendix B

The questionnaire, with order A, for the VR condition:

**Demographic questions (A\_VR)**

This questionnaire serves to collect characteristics about the participants of this study. You have the right to not answer any question.

1. How old are you?  
\_\_\_\_\_

Prefer not to say.

2. What gender do you identify with?

Male

Female

Other

Prefer not to say.

3. Are you currently in school?

Yes

No

Prefer not to say.

4. If you're in school, what are you currently registered in?  
\_\_\_\_\_

Not in school.

Prefer not to say.

5. What is your profession?  
\_\_\_\_\_

N/A

Prefer not to say.



6. Do you have filmmaking as a hobby?

- Yes
- No
- Prefer not to say.

7. Have you ever studied filmmaking (University course, self-taught, etc.)?

- Yes
- Somewhat
- No
- Prefer not to say.

8. How knowledgeable are you in cinema?

- Very knowledgeable
- Knowledgeable
- Somewhat knowledgeable
- Little knowledge
- Not knowledgeable at all
- Prefer not to say.

9. Do you watch a lot of movies?

- Always
- Often
- Sometimes
- Rarely
- Never
- Prefer not to say.

10. Do you go to see movies in theatres?

- Always
- Often
- Sometimes
- Rarely
- Never
- Prefer not to say.

11. Do you watch movies on your laptop?

- Always
- Often
- Sometimes
- Rarely
- Never
- Prefer not to say.

12. In order of preference, what are your preferred ways of watching movies? For example, watching a film on a television screen, on a laptop, etc.

1<sup>st</sup> choice: \_\_\_\_\_

2<sup>nd</sup> choice: \_\_\_\_\_

3<sup>rd</sup> choice: \_\_\_\_\_

- Prefer not to say.

## BFI (A\_VR)

The following questionnaire, the Big Five Inventory (BFI), serves to measure the big five personality traits, which are: extraversion, agreeableness, conscientiousness, neuroticism, and openness. If you do not wish to answer a question, you have the right to leave it blank.

Are you someone that.....

	Disagree a lot				Agree a lot
1. Talks a lot	1	2	3	4	5
2. Notices other people's weak points	1	2	3	4	5
3. Does things carefully and completely	1	2	3	4	5
4. Is sad, depressed	1	2	3	4	5
5. Is original, comes up with new ideas	1	2	3	4	5
6. Keeps their thoughts to themselves	1	2	3	4	5
7. Is helpful and not selfish with others	1	2	3	4	5
8. Can be kind of careless	1	2	3	4	5
9. Is relaxed, handles stress well	1	2	3	4	5
10. Is curious about lots of different things	1	2	3	4	5
11. Has a lot of energy	1	2	3	4	5
12. Starts arguments with others	1	2	3	4	5
13. Is a good, hard worker	1	2	3	4	5
14. Can be tense; not always easy going	1	2	3	4	5
15. Clever; thinks a lot	1	2	3	4	5
16. Makes things exciting	1	2	3	4	5
17. Forgives others easily	1	2	3	4	5
18. Isn't very organized	1	2	3	4	5
19. Worries a lot	1	2	3	4	5
20. Has a good, active imagination	1	2	3	4	5
21. Tends to be quiet	1	2	3	4	5
22. Usually trusts people	1	2	3	4	5

	Disagree a lot				Agree a lot
23. Tends to be lazy	1	2	3	4	5
24. Doesn't get upset easily; steady	1	2	3	4	5
25. Is creative and inventive	1	2	3	4	5
26. Has a good, strong personality	1	2	3	4	5
27. Can be cold and distant with others	1	2	3	4	5
28. Keeps working until things are done	1	2	3	4	5
29. Can be moody	1	2	3	4	5
30. Likes artistic and creative experiences	1	2	3	4	5
31. Is kind of shy	1	2	3	4	5
32. Kind and considerate to almost everyone	1	2	3	4	5
33. Does things quickly <u>and</u> carefully	1	2	3	4	5
34. Stays calm in difficult situations	1	2	3	4	5
35. Likes work that is the same every time	1	2	3	4	5
36. Is outgoing; likes to be with people	1	2	3	4	5
37. Is sometimes rude to others	1	2	3	4	5
38. Makes plans and sticks to them	1	2	3	4	5
39. Get nervous easily	1	2	3	4	5
40. Likes to think and play with ideas	1	2	3	4	5
41. Doesn't like artistic things (plays, music)	1	2	3	4	5
42. Likes to cooperate; goes along with others	1	2	3	4	5
43. Has trouble paying attention	1	2	3	4	5
44. Knows a lot about art, music and books	1	2	3	4	5

### The 24-item UWIST Mood Adjective Checklist (A\_VR)

Before we begin the study, this questionnaire will evaluate your current mood. If you do not wish to answer a question, you have the right to leave it blank.

	Not at all applicable			Definitely applicable
Cheerful	1	2	3	4
Contented	1	2	3	4
Satisfied	1	2	3	4
Happy	1	2	3	4
Dissatisfied	1	2	3	4
Depressed	1	2	3	4
Sad	1	2	3	4
Sorry	1	2	3	4
Anxious	1	2	3	4
Jittery	1	2	3	4
Tense	1	2	3	4
Nervous	1	2	3	4
Calm	1	2	3	4
Restful	1	2	3	4
Relaxed	1	2	3	4
Composed	1	2	3	4
Active	1	2	3	4
Energetic	1	2	3	4
Alert	1	2	3	4
Vigorous	1	2	3	4
Unenterprising*	1	2	3	4
Sluggish	1	2	3	4
Tired	1	2	3	4
Passive	1	2	3	4

\*Unenterprising: someone who lacks boldness. An ambitionless person.

**Emotions and Aesthetics Assessment (A\_VR) – practice clip: Days of Heaven (1978)**

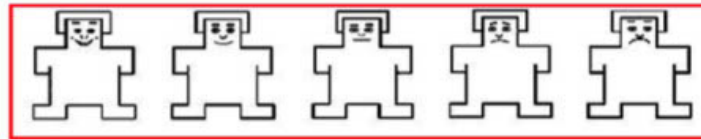
After viewing each clip, fill the following 4 scales and surveys to the best of your abilities. There are no right or wrong answers. If you do not want to answer a question, please leave it blank.

Note: if you have seen the movie before, please ignore all the information outside the scene. Only consider what is happening in the scene.

**Self-Assessment-Manikin Scale:** Start by assessing your emotional response to the clip.

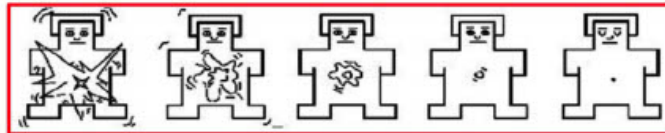
We need to measure the extent to which you perceive your experience of watching the movie clip as **pleasant** or **unpleasant**.

**Q1:** On a scale going from most pleasant (1) to most unpleasant (9), how was your experience with this last clip?



We need to measure the extent to which you perceive your experience of watching the movie clip as **activated** or **calm**.

**Q2:** On a scale going from most activated (1) to most calm (9), how was your experience with this last clip?



**Q3 - Satisfaction:** How satisfied are you with the overall experience of watching this last clip?

Completely Satisfied	Somewhat Satisfied	Neither Satisfied nor Dissatisfied	Somewhat Dissatisfied	Completely Dissatisfied
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Aesthetic features**

Instructions: Please assess the aesthetic features below by circling a number for each feature. If you don't understand a word, interpret it freely.

	Not at all applicable				Definitely applicable
Bright	1	2	3	4	5
Dark	1	2	3	4	5
Colorful	1	2	3	4	5
Colorless	1	2	3	4	5
Loud	1	2	3	4	5
Quiet	1	2	3	4	5
Dialogue-based	1	2	3	4	5
Music-based	1	2	3	4	5
Fast	1	2	3	4	5
Slow	1	2	3	4	5
Smooth	1	2	3	4	5
Choppy	1	2	3	4	5
Rhythmic	1	2	3	4	5
Beautiful	1	2	3	4	5
Ugly	1	2	3	4	5
Complex	1	2	3	4	5
Simple	1	2	3	4	5
Familiar	1	2	3	4	5
Unfamiliar	1	2	3	4	5
Interesting	1	2	3	4	5
Tiresome	1	2	3	4	5
Pleasant	1	2	3	4	5
Unpleasant	1	2	3	4	5
Predictable	1	2	3	4	5
Unpredictable	1	2	3	4	5
Understandable	1	2	3	4	5
Unclear	1	2	3	4	5

**Emotions and Aesthetics Assessment (A\_VR) – clip #1: Before Sunrise (1995)**

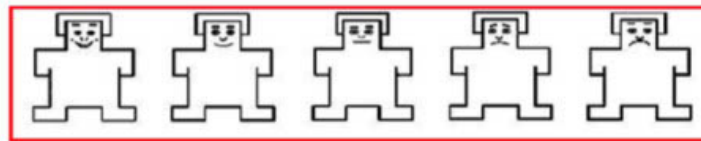
After viewing each clip, fill the following 4 scales and surveys to the best of your abilities. There are no right or wrong answers. If you do not want to answer a question, please leave it blank.

Note: if you have seen the movie before, please ignore all the information outside the scene. Only consider what is happening in the scene.

**Self-Assessment-Manikin Scale:** Start by assessing your emotional response to the clip.

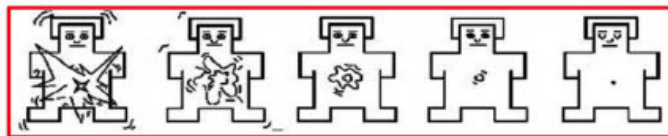
We need to measure the extent to which you perceive your experience of watching the movie clip as **pleasant** or **unpleasant**.

Q1: On a scale going from most pleasant (1) to most unpleasant (9), how was your experience with this last clip?



We need to measure the extent to which you perceive your experience of watching the movie clip as **activated** or **calm**.

Q2: On a scale going from most activated (1) to most calm (9), how was your experience with this last clip?





**Q3 - Satisfaction:** How satisfied are you with the overall experience of watching this last clip?

Completely Satisfied	Somewhat Satisfied	Neither Satisfied nor Dissatisfied	Somewhat Dissatisfied	Completely Dissatisfied
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Aesthetic features**

Instructions: Please assess the aesthetic features below by circling a number for each feature. If you don't understand a word, interpret it freely.

	Not at all applicable	1	2	3	4	5	Definitely applicable
Bright	1	2	3	4	5		
Dark	1	2	3	4	5		
Colorful	1	2	3	4	5		
Colorless	1	2	3	4	5		
Loud	1	2	3	4	5		
Quiet	1	2	3	4	5		
Dialogue-based	1	2	3	4	5		
Music-based	1	2	3	4	5		
Fast	1	2	3	4	5		
Slow	1	2	3	4	5		
Smooth	1	2	3	4	5		
Choppy	1	2	3	4	5		
Rhythmic	1	2	3	4	5		
Beautiful	1	2	3	4	5		
Ugly	1	2	3	4	5		
Complex	1	2	3	4	5		
Simple	1	2	3	4	5		
Familiar	1	2	3	4	5		
Unfamiliar	1	2	3	4	5		
Interesting	1	2	3	4	5		
Tiresome	1	2	3	4	5		
Pleasant	1	2	3	4	5		
Unpleasant	1	2	3	4	5		
Predictable	1	2	3	4	5		
Unpredictable	1	2	3	4	5		
Understandable	1	2	3	4	5		
Unclear	1	2	3	4	5		

**Emotions and Aesthetics Assessment (A\_VR) – clip #2: The Good, the bad and the ugly (1966)**

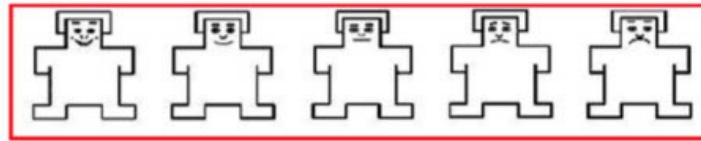
After viewing each clip, fill the following 4 scales and surveys to the best of your abilities. There are no right or wrong answers. If you do not want to answer a question, please leave it blank.

Note: if you have seen the movie before, please ignore all the information outside the scene. Only consider what is happening in the scene.

**Self-Assessment-Manikin Scale:** Start by assessing your emotional response to the clip.

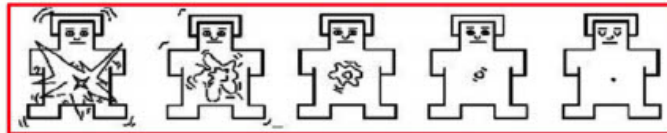
We need to measure the extent to which you perceive your experience of watching the movie clip as **pleasant** or **unpleasant**.

Q1: On a scale going from most pleasant (1) to most unpleasant (9), how was your experience with this last clip?



We need to measure the extent to which you perceive your experience of watching the movie clip as **activated** or **calm**.

Q2: On a scale going from most activated (1) to most calm (9), how was your experience with this last clip?



**Q3 - Satisfaction:** How satisfied are you with the overall experience of watching this last clip?

Completely Satisfied	Somewhat Satisfied	Neither Satisfied nor Dissatisfied	Somewhat Dissatisfied	Completely Dissatisfied
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Aesthetic features**

Instructions: Please assess the aesthetic features below by circling a number for each feature. If you don't understand a word, interpret it freely.

	Not at all applicable	1	2	3	4	5	Definitely applicable
Bright	1	2	3	4	5		
Dark	1	2	3	4	5		
Colorful	1	2	3	4	5		
Colorless	1	2	3	4	5		
Loud	1	2	3	4	5		
Quiet	1	2	3	4	5		
Dialogue-based	1	2	3	4	5		
Music-based	1	2	3	4	5		
Fast	1	2	3	4	5		
Slow	1	2	3	4	5		
Smooth	1	2	3	4	5		
Choppy	1	2	3	4	5		
Rhythmic	1	2	3	4	5		
Beautiful	1	2	3	4	5		
Ugly	1	2	3	4	5		
Complex	1	2	3	4	5		
Simple	1	2	3	4	5		
Familiar	1	2	3	4	5		
Unfamiliar	1	2	3	4	5		
Interesting	1	2	3	4	5		
Tiresome	1	2	3	4	5		
Pleasant	1	2	3	4	5		
Unpleasant	1	2	3	4	5		
Predictable	1	2	3	4	5		
Unpredictable	1	2	3	4	5		
Understandable	1	2	3	4	5		
Unclear	1	2	3	4	5		

**Emotions and Aesthetics Assessment (A\_VR) – clip #3: 500 Days of summer (2009)**

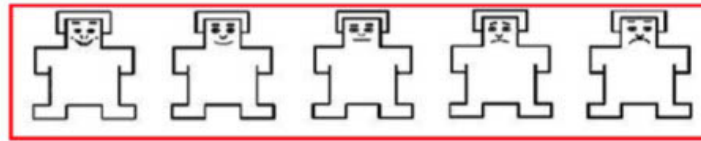
After viewing each clip, fill the following 4 scales and surveys to the best of your abilities. There are no right or wrong answers. If you do not want to answer a question, please leave it blank.

Note: if you have seen the movie before, please ignore all the information outside the scene. Only consider what is happening in the scene.

**Self-Assessment-Manikin Scale:** Start by assessing your emotional response to the clip.

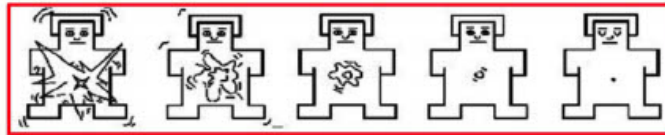
We need to measure the extent to which you perceive your experience of watching the movie clip as **pleasant** or **unpleasant**.

**Q1:** On a scale going from most pleasant (1) to most unpleasant (9), how was your experience with this last clip?



We need to measure the extent to which you perceive your experience of watching the movie clip as **activated** or **calm**.

**Q2:** On a scale going from most activated (1) to most calm (9), how was your experience with this last clip?



**Q3 - Satisfaction:** How satisfied are you with the overall experience of watching this last clip?

Completely Satisfied	Somewhat Satisfied	Neither Satisfied nor Dissatisfied	Somewhat Dissatisfied	Completely Dissatisfied
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Aesthetic features**

Instructions: Please assess the aesthetic features below by circling a number for each feature. If you don't understand a word, interpret it freely.

	Not at all applicable				Definitely applicable
Bright	1	2	3	4	5
Dark	1	2	3	4	5
Colorful	1	2	3	4	5
Colorless	1	2	3	4	5
Loud	1	2	3	4	5
Quiet	1	2	3	4	5
Dialogue-based	1	2	3	4	5
Music-based	1	2	3	4	5
Fast	1	2	3	4	5
Slow	1	2	3	4	5
Smooth	1	2	3	4	5
Choppy	1	2	3	4	5
Rhythmic	1	2	3	4	5
Beautiful	1	2	3	4	5
Ugly	1	2	3	4	5
Complex	1	2	3	4	5
Simple	1	2	3	4	5
Familiar	1	2	3	4	5
Unfamiliar	1	2	3	4	5
Interesting	1	2	3	4	5
Tiresome	1	2	3	4	5
Pleasant	1	2	3	4	5
Unpleasant	1	2	3	4	5
Predictable	1	2	3	4	5
Unpredictable	1	2	3	4	5
Understandable	1	2	3	4	5
Unclear	1	2	3	4	5

**Emotions and Aesthetics Assessment (A\_VR) – clip #4: E.T.: The Extra-Terrestrial (1982)**

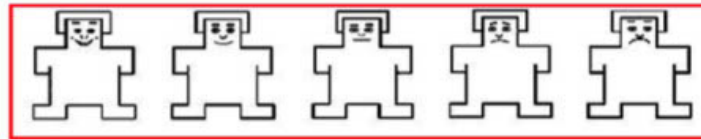
After viewing each clip, fill the following 4 scales and surveys to the best of your abilities. There are no right or wrong answers. If you do not want to answer a question, please leave it blank.

Note: if you have seen the movie before, please ignore all the information outside the scene. Only consider what is happening in the scene.

**Self-Assessment-Manikin Scale:** Start by assessing your emotional response to the clip.

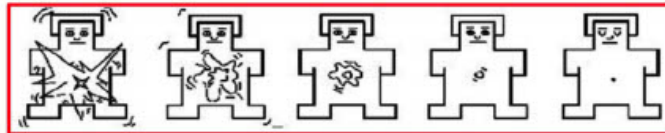
We need to measure the extent to which you perceive your experience of watching the movie clip as **pleasant** or **unpleasant**.

**Q1:** On a scale going from most pleasant (1) to most unpleasant (9), how was your experience with this last clip?



We need to measure the extent to which you perceive your experience of watching the movie clip as **activated** or **calm**.

**Q2:** On a scale going from most activated (1) to most calm (9), how was your experience with this last clip?



**Q3 - Satisfaction:** How satisfied are you with the overall experience of watching this last clip?

Completely Satisfied	Somewhat Satisfied	Neither Satisfied nor Dissatisfied	Somewhat Dissatisfied	Completely Dissatisfied
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Aesthetic features**

Instructions: Please assess the aesthetic features below by circling a number for each feature. If you don't understand a word, interpret it freely.

	Not at all applicable	1	2	3	4	5	Definitely applicable
Bright	1	2	3	4	5		
Dark	1	2	3	4	5		
Colorful	1	2	3	4	5		
Colorless	1	2	3	4	5		
Loud	1	2	3	4	5		
Quiet	1	2	3	4	5		
Dialogue-based	1	2	3	4	5		
Music-based	1	2	3	4	5		
Fast	1	2	3	4	5		
Slow	1	2	3	4	5		
Smooth	1	2	3	4	5		
Choppy	1	2	3	4	5		
Rhythmic	1	2	3	4	5		
Beautiful	1	2	3	4	5		
Ugly	1	2	3	4	5		
Complex	1	2	3	4	5		
Simple	1	2	3	4	5		
Familiar	1	2	3	4	5		
Unfamiliar	1	2	3	4	5		
Interesting	1	2	3	4	5		
Tiresome	1	2	3	4	5		
Pleasant	1	2	3	4	5		
Unpleasant	1	2	3	4	5		
Predictable	1	2	3	4	5		
Unpredictable	1	2	3	4	5		
Understandable	1	2	3	4	5		
Unclear	1	2	3	4	5		



**Emotions and Aesthetics Assessment (A\_VR) – clip #5: Punch-Drunk Love (2002)**

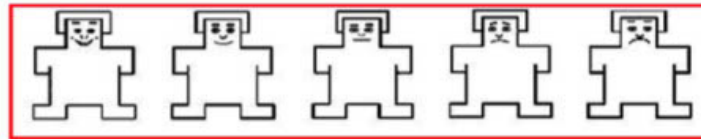
After viewing each clip, fill the following 4 scales and surveys to the best of your abilities. There are no right or wrong answers. If you do not want to answer a question, please leave it blank.

Note: if you have seen the movie before, please ignore all the information outside the scene. Only consider what is happening in the scene.

**Self-Assessment-Manikin Scale:** Start by assessing your emotional response to the clip.

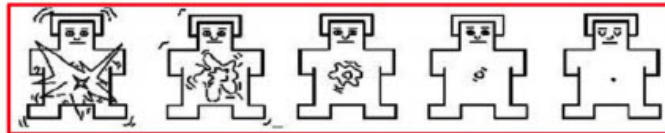
We need to measure the extent to which you perceive your experience of watching the movie clip as **pleasant** or **unpleasant**.

Q1: On a scale going from most pleasant (1) to most unpleasant (9), how was your experience with this last clip?



We need to measure the extent to which you perceive your experience of watching the movie clip as **activated** or **calm**.

Q2: On a scale going from most activated (1) to most calm (9), how was your experience with this last clip?





**Q3 - Satisfaction:** How satisfied are you with the overall experience of watching this last clip?

Completely Satisfied	Somewhat Satisfied	Neither Satisfied nor Dissatisfied	Somewhat Dissatisfied	Completely Dissatisfied
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Aesthetic features**

Instructions: Please assess the aesthetic features below by circling a number for each feature. If you don't understand a word, interpret it freely.

	Not at all applicable				Definitely applicable
Bright	1	2	3	4	5
Dark	1	2	3	4	5
Colorful	1	2	3	4	5
Colorless	1	2	3	4	5
Loud	1	2	3	4	5
Quiet	1	2	3	4	5
Dialogue-based	1	2	3	4	5
Music-based	1	2	3	4	5
Fast	1	2	3	4	5
Slow	1	2	3	4	5
Smooth	1	2	3	4	5
Choppy	1	2	3	4	5
Rhythmic	1	2	3	4	5
Beautiful	1	2	3	4	5
Ugly	1	2	3	4	5
Complex	1	2	3	4	5
Simple	1	2	3	4	5
Familiar	1	2	3	4	5
Unfamiliar	1	2	3	4	5
Interesting	1	2	3	4	5
Tiresome	1	2	3	4	5
Pleasant	1	2	3	4	5
Unpleasant	1	2	3	4	5
Predictable	1	2	3	4	5
Unpredictable	1	2	3	4	5
Understandable	1	2	3	4	5
Unclear	1	2	3	4	5

**Emotions and Aesthetics Assessment (A\_VR) – clip #6: The Shining (1980)**

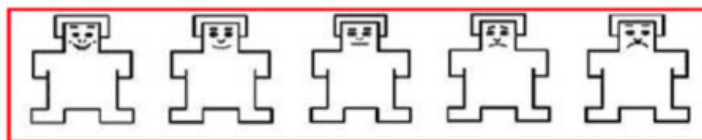
After viewing each clip, fill the following 4 scales and surveys to the best of your abilities. There are no right or wrong answers. If you do not want to answer a question, please leave it blank.

Note: if you have seen the movie before, please ignore all the information outside the scene. Only consider what is happening in the scene.

**Self-Assessment-Manikin Scale:** Start by assessing your emotional response to the clip.

We need to measure the extent to which you perceive your experience of watching the movie clip as **pleasant** or **unpleasant**.

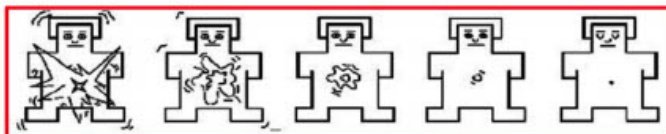
Q1: On a scale going from most pleasant (1) to most unpleasant (9), how was your experience with this last clip?



1 2 3 4 5 6 7 8 9

We need to measure the extent to which you perceive your experience of watching the movie clip as **activated** or **calm**.

Q2: On a scale going from most activated (1) to most calm (9), how was your experience with this last clip?



1 2 3 4 5 6 7 8 9

**Q3 - Satisfaction:** How satisfied are you with the overall experience of watching this last clip?

Completely Satisfied	Somewhat Satisfied	Neither Satisfied nor Dissatisfied	Somewhat Dissatisfied	Completely Dissatisfied
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Aesthetic features**

Instructions: Please assess the aesthetic features below by circling a number for each feature. If you don't understand a word, interpret it freely.

	Not at all applicable	1	2	3	4	5	Definitely applicable
Bright	1	2	3	4	5		
Dark	1	2	3	4	5		
Colorful	1	2	3	4	5		
Colorless	1	2	3	4	5		
Loud	1	2	3	4	5		
Quiet	1	2	3	4	5		
Dialogue-based	1	2	3	4	5		
Music-based	1	2	3	4	5		
Fast	1	2	3	4	5		
Slow	1	2	3	4	5		
Smooth	1	2	3	4	5		
Choppy	1	2	3	4	5		
Rhythmic	1	2	3	4	5		
Beautiful	1	2	3	4	5		
Ugly	1	2	3	4	5		
Complex	1	2	3	4	5		
Simple	1	2	3	4	5		
Familiar	1	2	3	4	5		
Unfamiliar	1	2	3	4	5		
Interesting	1	2	3	4	5		
Tiresome	1	2	3	4	5		
Pleasant	1	2	3	4	5		
Unpleasant	1	2	3	4	5		
Predictable	1	2	3	4	5		
Unpredictable	1	2	3	4	5		
Understandable	1	2	3	4	5		
Unclear	1	2	3	4	5		

**Emotions and Aesthetics Assessment (A\_VR) – clip #7: Raiders of the Lost Ark (1981)**

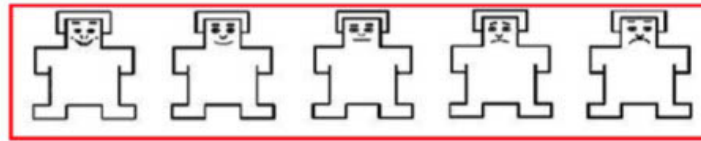
After viewing each clip, fill the following 4 scales and surveys to the best of your abilities. There are no right or wrong answers. If you do not want to answer a question, please leave it blank.

Note: if you have seen the movie before, please ignore all the information outside the scene. Only consider what is happening in the scene.

**Self-Assessment-Manikin Scale:** Start by assessing your emotional response to the clip.

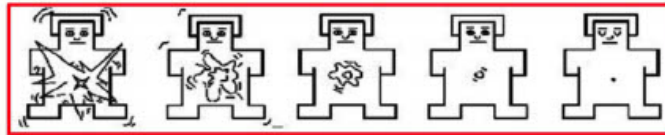
We need to measure the extent to which you perceive your experience of watching the movie clip as **pleasant** or **unpleasant**.

**Q1:** On a scale going from most pleasant (1) to most unpleasant (9), how was your experience with this last clip?



We need to measure the extent to which you perceive your experience of watching the movie clip as **activated** or **calm**.

**Q2:** On a scale going from most activated (1) to most calm (9), how was your experience with this last clip?



**Q3 - Satisfaction:** How satisfied are you with the overall experience of watching this last clip?

Completely Satisfied	Somewhat Satisfied	Neither Satisfied nor Dissatisfied	Somewhat Dissatisfied	Completely Dissatisfied
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Aesthetic features**

Instructions: Please assess the aesthetic features below by circling a number for each feature. If you don't understand a word, interpret it freely.

	Not at all applicable				Definitely applicable
Bright	1	2	3	4	5
Dark	1	2	3	4	5
Colorful	1	2	3	4	5
Colorless	1	2	3	4	5
Loud	1	2	3	4	5
Quiet	1	2	3	4	5
Dialogue-based	1	2	3	4	5
Music-based	1	2	3	4	5
Fast	1	2	3	4	5
Slow	1	2	3	4	5
Smooth	1	2	3	4	5
Choppy	1	2	3	4	5
Rhythmic	1	2	3	4	5
Beautiful	1	2	3	4	5
Ugly	1	2	3	4	5
Complex	1	2	3	4	5
Simple	1	2	3	4	5
Familiar	1	2	3	4	5
Unfamiliar	1	2	3	4	5
Interesting	1	2	3	4	5
Tiresome	1	2	3	4	5
Pleasant	1	2	3	4	5
Unpleasant	1	2	3	4	5
Predictable	1	2	3	4	5
Unpredictable	1	2	3	4	5
Understandable	1	2	3	4	5
Unclear	1	2	3	4	5

### Ease of rating - emotional response and film mood (A\_VR)

This questionnaire serves to know how easy or difficult it was to evaluate your emotional response and film mood. In brief, let's have a discussion about your overall experience with this study.

#### Questions

Was it hard or easy to rate your emotional response and film mood? If you don't want to answer a question, you have the right to leave it blank.

	Hard				Easy
Emotional response	1	2	3	4	5
Film mood	1	2	3	4	5

#### Discussion

Note: You have the right to not answer a question. To do so, please say "I don't want to answer".

Q: Were you immersed into the film clips?

Q: Were you focused while watching the film clips?

Q: Would you watch a full-length film using the same medium?

Q: Were you comfortable while watching the film clips?