Understanding the User Preferences in the Types of Video Censorship

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Abstract

Video on demand (VOD) platforms provide immersive, inspiring, and commercial-free binge watching experiences. Recently, the number of these platform users increased dramatically as users can enjoy various contents without physical and time constraints during COVID-19. However, such platforms do not provide sufficient video censorship services while there is a strong need. In this study, we investigated the users' desire for video censorship when choosing and watching movies on VOD platforms, and how video censorship can be applied to different types of scenes to increase the censoring effect without diminishing the enjoyment. We first conducted an online survey with 98 respondents to identify the types of discomfort while watching sexual, violent, or drug-related scenes. We then conducted an in-depth online interview with 18 participants to identify the effective video filtering types and regions for each of the three scenes. Based on the findings, we suggest implications for designing a censor application for videos that contain uncomfortable scenes.

Keywords: Video Censorship, Video Masking, Survey, Interview

1. Introduction

Online Video on Demand (VOD) platforms such as Netflix (netflix.com) and Hulu (hulu.com) have advanced and now allows people to access diverse contents anywhere with any device, while also providing an inspiring, immersive, and commercial-free binge-watching experience, leading to an increase of its use [1]. Especially with COVID-19, people started pursuing contents that does not require any physical and time constraints, which caused the popularity of VOD platforms to increase exponentially [2, 3]. As such, VOD platforms provide many benefits, but they are not free from regulation problems. Unlike in TVs or movie theaters, there are no censors applied to contents in VOD platforms that may be inappropriate for young children to watch without parental guidance. Moreover, prior research reveals that adults also wish to avoid uncomfortable scenes that show sexual, violence, and drug use [4]. As a solution, they use certain systems, such as automatic video filtering service used in VidAngel (vidangel.com) and ClearPlay (clearplay.com), that allow users to watch videos provided by VOD platforms with certain censorship of having uncomfortable scenes or audios filtered out by choice.

Even though these prior solutions provide users with a full control over customization based on their individual preferences [5], they still prevent users from understanding the full context of the movie. Trimming certain scenes may cause confusion for people in understanding the story. Especially, cutting the videos forces viewers to imagine in order to keep up with the story and as the number of these cuts increases, it can overload the viewers' cognitive capability, leading to memory loss [6, 7]. In this paper, we investigated the most efficient way of censor application for different types of scenes. The research questions are as follows: 1) What are the components that cause people discomfort while watching unpleasant scenes? 2) What types of censors do people prefer the most? 3) How should the censors be applied for different scenes to eliminate discomfort while preserving the enjoyment?

We only focused on three types of scenes that people feel significant discomfort, which are sexual, violent, and drug scenes [4]. To understand which parts of the scenes cause the most discomfort and when, we first conducted an online survey and analyzed 98 responses. Through the survey, we discovered that many people felt strong discomfort when watching violent scenes, while relatively less of them felt uncomfortable watching sexual and drug scenes. Yet, our findings revealed that there is a need for censors among the participants who had felt discomfort. This confirms the findings from prior studies that there is a need for filtering to be applied on certain scenes [4, 8-10]. We then conducted a semi-structured interview to further investigate the preference in specific types of censors when they are watching uncomfortable scenes with others. The results showed that people generally favored pixelization in all three scenes because it is better to blur out the unpleasant parts and feel more familiar. Moreover, the preferred region for each type of censor differed depending on the scenes (*e.g.*, people preferred only covering the drug related substances for pixelization and the body part where drug is injected alongside to the drug related substances for posterization in drug scenes)

The results from the two studies identified the preferred censor types for different scenes and the preferred applied region for different censor types and scenes. Based on this, we present guidelines for designing an effective censor application method based on contexts.

2. Related Work

2.1 The Negative Impacts Movies Can Have on People

Various studies have been conducted to understand the discomfort people feel while watching certain scenes, such as those that contain strong sexual, violent, and drug contents. Especially, there are those who mainly focused on the negative impact of violent scenes [11-14]. As an example, Haidt *et al.* [12] discovered that violence such as envelope violation and death elicit strong disgust and are disturbing enough for people to turn off the tape before the end of the scene. They defined the feeling of disgust as a defensive emotion to maintain a line between humans and animals.

Moreover, various studies have been conducted to identify the negative impact of smoking and drinking depiction in movies, and whether regulation is required [15-18]. As an example, Hanewinkel *et al.* [15] and Sargent *et al.* [17] claims that it is significant to have a rating system to prevent young people from being exposed to alcohol and smoking. They discovered that parental restriction for children from watching movies that are targeted for adults decreases the risk of harmful substance use in the future. This result presents the importance of the censorship application for inappropriate scenes and objects, especially for children and adolescents. In addition to this, Sargent *et al.* [18] revealed that exposure to smoking scenes urged adult smokers to feel an impulse for smoking. Similar results with exposure to smoking scenes are shown in exposure to alcohol depiction in several research. For instance, Hanewinkel *et al.* [19] investigated on the relationship

between alcohol exposure and alcohol initiation among low-risk adolescents. The results revealed that adolescents who had never drunk started drinking after watching drinking scenes in movies.

Unfortunately, little research has been conducted regarding sexual contents, due to ethical concerns [20]. However, there are rising concerns with erotic materials because they can have several negative impacts, such as sexual callousness, being cynical towards love, and encouraging promiscuity to be perceived as normal [21, 22]. As such, prior studies identified the desire for filters when watching unpleasant scenes but did not investigate on whether the degree of desire for censors differ depending on the scenes and the differing impact various censor application methods have on the scenes and we intend to do so.

## 2.2 The Influence of Video Manipulation in Watching Movies

Various research has been conducted to investigate the effect of various types of video manipulation techniques to enhance privacy protection [23-26]. As an example, Hubers *et al.* [26] investigated the effectiveness of various censor methods in protecting the privacy by conducting an experiment where the participants were asked to perform observational tasks. They noticed that such manipulation techniques were effective in preserving the privacy without diminishing the remote users' task performance. Also, Hassan *et al.* [25] replaced privacy-sensitive objects in the videos with abstract cartoons taken from clip arts. They discovered that such method improves the obscuring of the detailed privacy of the object, while preserving the video's semantic content.

On the other hand, several studies focused on whether cutting out the uncomfortable contents affect users' enjoyment negatively while watching movies [4, 14, 27, 28]. Among them, Diener *et al.* [27] examined the effect of violent contents on adventure TV show's popularity by first rating the TV shows' violence with professional raters and had the participants watch two versions of the videos (with and without violent scenes) and rate their preference. The results revealed that the original version with violent scenes was perceived significantly more violent than the edited version, and the presence of violence did not necessarily increase the level of preference of the show. This indicates that removing the violent scenes had the desired effect of deducting the unpleasantness. In addition to this, Lichtman *et al.* [4] analyzed the VidAngel data[1] and investigated the market for filtered videos. The results show that those who used filters to watch uncomfortable scenes showed the same degree of enjoyment as those who watched the unedited version. Furthermore, Weaver *et al.* [14] assessed the relationship between violence and viewers' enjoyment by having the participants watch 5 different TV programs that varied in its degree of violence (graphical violence, sanitized violence, and nonviolence), then report their enjoyment and emotional reactions. This revealed that the participants favored the nonviolent content the most. Also, the presence of violence detracted users' focus on the quality of the plot.

There were prior research focusing on investigating the impact cutting out the uncomfortable scenes have on users' enjoyment while watching movies. However, little has studied the method of effectively applying censorships when watching uncomfortable videos.

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[1] An accumulated record of filtered streams that included which filters had been used and how long they had been applied.
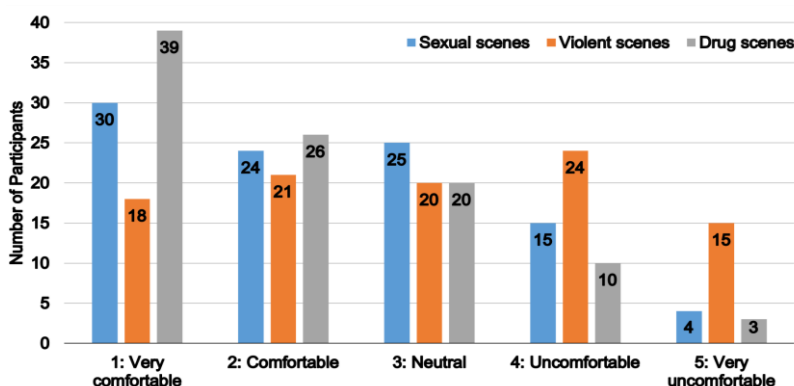
Figure 1. The histogram of the number of respondents for discomfort level for each scene.

3. Formative Study: An Online Survey

We conducted an online survey to understand the types of discomfort people feel while watching certain scenes. Particularly, we focused on scenes that include sexual, violent, or drug use contents, based on the results of a prior study revealing that the participants feel strong desire to avoid scenes that included three criteria mentioned above [3]. We also investigated the preference on the need for and the targets of censorship.

3.1 Participants

The survey was distributed in various online and local communities including the researchers' own institution. We specified the criteria that participants need to be between 18 and 65 of age and are current subscribers of a VOD platform such as Netflix. A total of 98 participants (64.6% female, 31.3% male, 4% preferred not to specify) responded to the survey, whose average age was 33.1 ($SD = 8.9$). All of them reported that they use a VOD platform when watching videos but the frequency of its usage varied. Also, almost 80% of the participants responded that they watch movies alone when using VOD platforms (78.8%).

3.2 Procedure

We used Google Forms to create the survey and collected responses for 2 weeks (from July 12th, 2021 to July 26th, 2021). It consisted of in total 32 questions, which was designed to take 10 to 15 minutes to complete. The survey included questions asking participants' degree of discomfort in watching uncomfortable scenes, the specific components of the scenes that causes the most discomfort, and their reaction when encountering uncomfortable scenes. It also asked whether they wish to have censors applied and a follow-up question to those who wished to have censors, which parts of the scene they wish to have censors applied and what types of censorship they desire. For the opponents, the reason why they do not perceive censors to be useful in relieving discomfort while watching uncomfortable scenes. Participants were opted to draw for a $5 gift card at the end of the survey.

3.3 Findings
3.3.1 The Overall Discomfort of Scene Types

To understand if the level of comfort varies depending on the scenes, we asked the participants to rate their comfort when watching each of the three scenes that depict sexual, violent, and drug contents. As shown in Figure 1, the number of participants who feel discomfort varied depending on the type of scene. Moreover, similar to the discomfort scores result, we found that a greater number of respondents perceived violent scenes to be more uncomfortable compared to the other two scenes.

3.3.2 The Reason of Discomfort

To understand if the reason for discomfort varies depending on the scene type, we asked the participants, who had answered that they had experienced discomfort while watching the scenes, why they felt uncomfortable for each scene type. As a result, we found that the reasons for discomfort vary depending on the context. The specific types of scenes the participants felt the most uncomfortable and the impact of presence of others while watching those scenes are summarized as below:

- **Embarrassing to watch sexual scenes with others.** The top reason for the participants (N = 34) to feel discomfort while watching sexual scenes was because it is embarrassing to watch with family or friends (61.7%), followed by unnecessary scene in the overall content (44.1%), and unpleasant to watch when alone (35.3%). For further responses, there were because it is too sexual to watch when alone and seemed likely to have it registered in memory.
- **Unpleasant to watch violent scenes alone.** The reasons for those (N = 57) who found violent scenes uncomfortable were because it was unpleasant to watch when alone (75.4%), seemed likely to have it registered in the memory (54.4%), and too violent to watch when alone (54.4%). The following responses were because the seemed unnecessary in the overall content and too violent to watch with friends or family.
- **Disturbing to watch drug scenes even when alone.** The reason to why the participants (N = 22) found drug scenes uncomfortable varied. More than half of the participants (63.6%) mentioned that they found the scene disturbing, 40.9% felt that the scene seemed unnecessary in the overall content, and 36.4% answered that they perceived the scene to be inappropriate to watch with friends and families.

3.3.3 The Censor Application Method Should Differ Depending on the Scenes

To investigate the precise preference for the censor application of each scene, we asked the participants, who had answered that they desire censors, what parts of the scene they do not wish to watch and what type of censorship they prefer. The results are shown in Figure 2. Compared to the ratio of the number of participants in experiencing discomfort while watching the three uncomfortable scenes, the desire for the censors were the highest with drug scenes, having 68.2% of those who found drug scenes uncomfortable showing the desire for censors. For the other two scenes, 29.4% of the participants wanted censors applied to sexual scenes and 49.1% for violent scenes. The specific types of scenes they wish to avoid for each uncomfortable scene and how they hope to have the censors applied are summarized as below:

- **The depiction of detailed sexual activities with both sound and certain parts of bodies censored.** We asked a follow-up question asking those, who had experienced discomfort while watching sexual scenes (N = 34), about the specific types of scenes they had felt uncomfortable watching. The majority of the participants did not favor scenes that included sexual activities shown with detail (73.5%). Moreover, half of the respondents commented that they felt uncomfortable when watching scenes that involved specific body parts emphasized in a sensual way. To further investigate the respondents' desire, we asked what specific parts in the scene they would like to have censored. The most chosen response was the entire scene where detailed sexual activities are shown (50%), followed by the entire nude body (30%), and the entire scene where sexual activities can be inferred (20%).

  In addition, we asked to those who answered that they wish censors (N = 10), what type of censorship
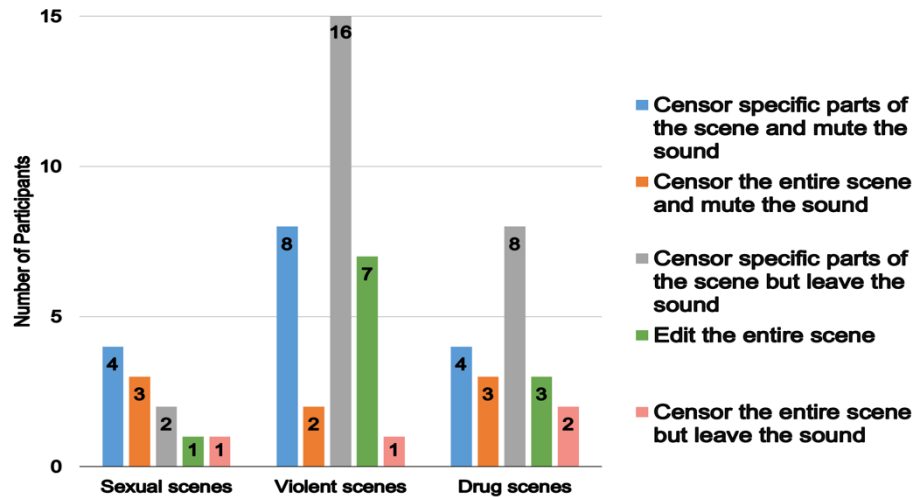
Figure 2. The types of censors the participants wish to have applied to watch each sexual (*N* = 10), violent (*N* = 28), and drug scene (*N* = 15), without feeling any discomfort.

they would prefer. Forty percent of the participants wished to have both the sound and certain parts of bodies to be censored, 30% hoped to have the sound and the whole scene to be blurred out, and 20% was only wished to have certain parts of bodies to be censored.

- **Realistic depiction of physical violence with only specific body parts censored.** The scenes that made the participants (N = 57) uncomfortable while watching violent scenes were those that showed details of injuries, bloodshed, and bodily harm (82.8%), those that included realistic murder (79.3%), and scenes where realistic assault is shown (48.3%). Other responses were scenes with tools used for assault and scenes with either assault or murder inferred. For the question asking exactly what sections of the scene they would like to have censors applied, 89.3% answered specific body parts being subjected to violence, 46.4% chose tools that are used for violence, and 35.7% preferred the victim of violence.

    Among those who need censors (N = 28), 57.1% hoped to have specific parts of body censored without any alteration to the sound, while 28.6% desired to remove the sound alongside with injured body parts being censored. Also, 25% chose to have the entire scene edited.

- **Manufacture and use of drugs with specific parts of the scene censored.** The types of drug scenes that the participants (*N* = 22) felt uncomfortable watching, were scenes where manufacture and the use of drugs are shown (68.2%), where the use of medicine, psychotropic drugs, and other harmful substances are depicted (63.6%), and smoking and drinking scenes (13.6%). For the specific portions of the scene that need to be censored, 66.7% selected scenes with the use of medicine, psychotropic drugs, and other harmful substances are shown, 60% chose the whole scene where using and manufacturing drugs are depicted, and 46.7% answered drugs itself.

    Also, among those who found drug scenes to be uncomfortable to watch (*N* = 22); 68.2% wished to have censors applied to the scene. Especially, 53.3% of them mentioned that censoring several parts of the scene without muting the sound would relieve discomfort, while 26.7% wanted the sound muted and parts of the scene censored.

4. Main Study: A Design Probe Study

4.1 Participants

We recruited 18 participants (14 female and 4 male) among those who responded in the survey and had
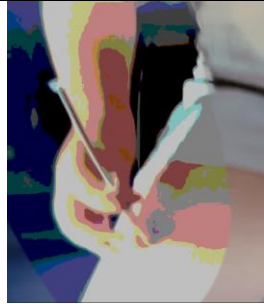
shown interest in participating in the main study. The recruited participants had given a score of over 3 to at least one of the scenes regarding the degree of discomfort they receive while watching the scene. The average age was 27.8 (*SD* = 6.36). The participants were given a gratitude of $10 for participating in the study.

4.2 Apparatus

Starting from the above among top lifetime grossing movies listed by IMDbPro[2] and are rated R, we chose each sexual, violent, and drug related movies based on the MPAA certification in the IMDb parents' guide. As a result, *Deadpool 1* (2016), *Joker* (2019), and *The Hangover Part 2* (2011) were selected for the use of sexual, violent, and drug scenes, respectively. From each movie, approximately 30 seconds of the three categories mentioned were extracted. The sexual scene consisted of contents regarding sexual interaction and strip club. The violent scene included a victim being stabbed twice by a scissor and its head constantly being beaten against the wall. For the drug scene, powder-like drug use and needle injection were depicted.

Among a list of video effects provided by the video editing software application, Adobe Premiere Pro, we chose to investigate two types of censors, pixelization and posterization. Pixelization is one of the dominantly used type of censor and its obfuscation effect has been proven [29]. However, this obscuring method can have an adverse effect on viewers' satisfaction or the aesthetic of the image [30]. In contrast, posterization is a rather unfamiliar type of censor and its potential of effectively censoring the undesired parts is yet to be discovered. For pixelization, we used the size of 40 × 30 square pixels to enable the preservation of the overall context of the scene. In contrast, posterization alters the scene to have only a certain number of colors. Depending on the brightness of the scene, we either applied level 5 or 6 posterization because allowing diverse colors to be used did not have the effect of censoring the scene. The application of the types of censors were performed through Adobe Premiere Pro and was run on a computer that has an Intel i7-9700K (3.60GHz) CPU with 32.0GB of RAM and a GeForce RTX 2070 graphics card.

Table 1. The sample images captured from the drug scenes, showing how each censor type was applied for each type of region (posterization level set to 5).

Type / Region	$Region\_S$	$Region\_M$	$Region\_L$
Pixelization			
Posterization			

4.3 Conditions

In this study, we investigated the difference in users' preferences between two types of censor technique, pixelization and posterization, and three regions of the application of each censor for each scene. The examples for the application of the censors on each scene are shown in Table 1. We did not revise the types of scenes initially determined in the survey, since it was clear that people felt the need for censors for all three, regardless of the difference in the degree of desire. Below are how the three types of applied regions for each scene:

- **Small** (*Region_S*)
  o Sexual scene: Only the specific parts of a nude body.
  o Violent scene: Specific body parts that are being subjected to violence.
  o Drug scene: Drug related substances itself.
- **Medium** (*Region_M*)
  o Sexual scene: Full nude body.
  o Violent scene: Specific body parts that are being subjected to violence and the tools used for violence.
  o Drug scene: Drug related substances and where it is used or injected.
- **Large** (*Region_L*)
  o Sexual scene: Entire scene where sexual activities are implicit or occurring.
  o Violent scene: Whole victim of violence alongside with the tools used for violence.
  o Drug scene: The entire scene where the use or manufacturing of drug related substances are depicted.

4.4 Procedure

The study was conducted online, via Zoom, for an hour. We first had the participants sign the consent form, then started with asking their overall experience with watching movies that contained uncomfortable scenes, such as whether they had faced uncomfortable scenes while watching it with someone else or by themselves and how they responded in each situation. Next, we explained that they would be watching three types of scenes, where each scene has 6 different versions (2 types of censors × 3 regions of each censor) of censor technique applied. The videos were played to the participants in a random order. After watching each version of the video, the participants were asked to grade the amount of discomfort that was released, in a 5-point Likert scale. Also, after watching videos of all 3 regions of a censor type, they answered the questions asking about the reason why they perceived the release of discomfort differently depending on the applied region of the censor, and their preference towards that particular type of censor. After watching the entire 6 versions of videos of a specific scene, the participants were given the questions whether having censors applied helped them feel less uncomfortable, the reason why they preferred different regions of censors depending on the
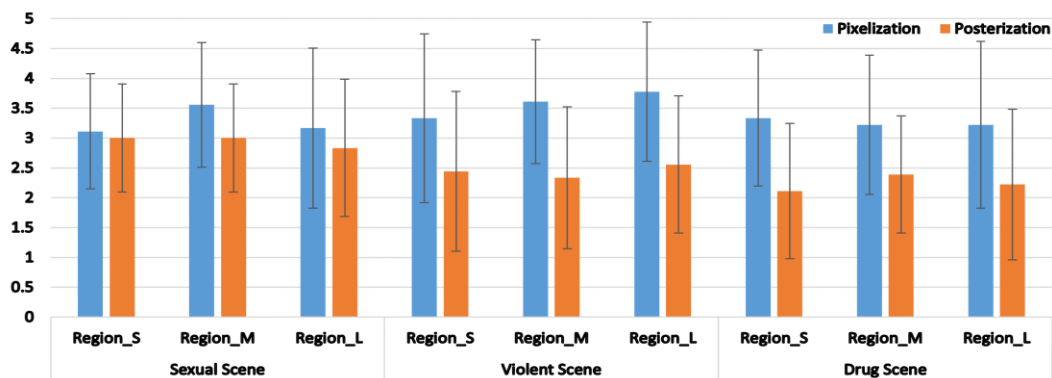

Figure 3. The average scores participants (*N* = 18) gave for each region for both types of censors in all three scenes. The error bar indicates the standard deviation of the data.

censor type, and their preference between pixelization and posterization. At the end of the user study, we asked three additional questions, asking why their desire towards the types and regions of censors differed depending on the scenes, and whether they wished to be able to use a system that enables them to customize the application of censors when watching uncomfortable scenes with others.

4.5 Findings

### 4.5.1 Preference in the Applied Region of Pixelization for Each Scene

   To understand the suitable method for applying pixelization on each type of scene, we asked the participants what region they favor the most for each three scenes. The average scores the participants gave for each region in pixelization can be found in Figure 3.

- **Censoring the whole nude body in sexual scenes is preferred the most, using pixelization.** For the small, medium, and large region of pixelization application, the average scores given by the participants were 3.1, 3.6, and 3.2 out of 5, respectively. Moreover, 44.4% of the participants favored the medium region the most and the most dominant reason was because having the whole nude body covered allowed them to understand the context of the scene, while not having to watch the details. Other than this, 36.1% preferred the large region the most, due to having all the sexual context covered. Those who liked the small region the most did not enjoy having their views interrupted by censors.

- **Censoring the whole victim is preferred the most in violent scenes, using pixelization.** The participants gave 3.3, 3.6, and 3.7 out of 5 for each small, medium, and large region of pixelization use. Mostly, 52.8% of the participants favored the large region the most because the censor covered most of the uncomfortable parts of the scene: blood, the victim's face contorted in pain, and the tool used for violence. On the other hand, those who preferred the small region the most took up 33.3% of the participants. The ruling reason was because being able to see the tool enabled them to predict and prepare themselves for the next action. Lastly, the main reason for those to pick the medium region as the best region was simply because the region was suitable. Also, several participants commented that due to the characteristics of violent scenes, where the actions are usually big and easy to guess, having a large region of censor applied did not affect their understanding of the context.

- **Censoring only the drugs is preferred the most in drug scenes, using pixelization.** For the drug scene, the participants gave 3.3, 3.2, and 3.2 out of 5 for small, medium, and large region, respectively. Among them, 41.7% favored the small region the most because it allowed them to understand the whole context easily, without focusing on the drug. Also, 41.7% preferred the large region the most since watching the process of drug injection is the main cause of discomfort. The reason for those who enjoyed the medium region the most was because covering the character's entire face affects the immersion, while censoring only the drugs is a bit anxious.

4.5.2 Preference in the Applied Region of Posterization for Each Uncomfortable Scene

   To understand the suitable method for applying posterization on each type of scene, we asked the participants what region they favored the most for each three scenes. The average scores the participants gave for each region in posterization can be found in Figure 3.

- **Censoring the whole victim is preferred the most in violent scenes, using posterization.** For the
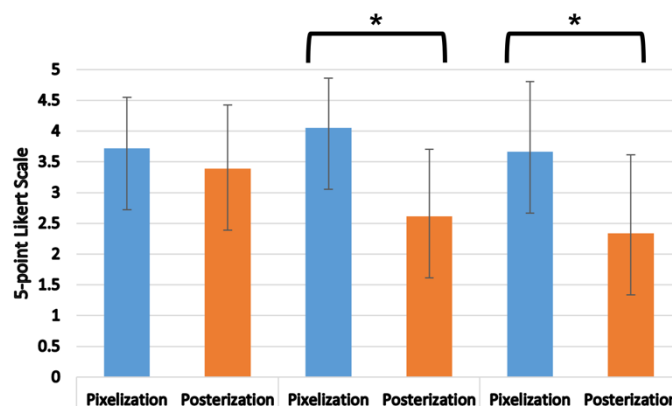
Figure 4. The average scores participants gave for each type of censor in all three scenes. The '*' mark indicates p value under .05. The error bar indicates the difference between the lowest and the highest score.

violent scene, the participants gave 2.4, 2.3, 2.6 out of 5 for small, medium, and large region of application, respectively. Among the participants, 41.7% perceived the large region as the most suitable because since posterizing effect does not fully blur out the parts where it is applied, the larger the better. Also, 27.8% of the participants favored the small region the most because censoring only the parts where violence is the most concentrated, such as injuries, is enough. For the medium region, 13.9% favored this region because the tool was also censored, alongside with the injuries. However, 22.2% of the participants did not favor any of the regions due to disfavoring posterization. Especially, P12 commented:

> "*It only changed the colors and it actually made me focus on where the censor is applied. It actually emphasizes the part.*"

- **Censoring the whole person using the drugs is preferred the most in drug scenes, using posterization.** The participants gave a score below 2.5 for the each region for the drug scene. Among the participants, 27.8% selected the large region as the most suitable due to censoring the whole person using the drug. For both the small and medium region, 25% of the participants favored each region. The reason for favoring the small region was because it reduces the white color of the drug and does not stick out from the overall scene. For the medium region, the participants commented that it is better for its larger application than the small region, but slightly has an emphasizing effect. Apart from this, 22.2% of the participants did not find any of the regions germane for posterization, due to its lack of censoring effect.

4.5.3 Pixelization vs. Posterization: Preference in Censor Type for Each Scene

To investigate in detail the reasons to why people preferred a specific type of censor, we asked the participants the reason for their choice. Please check Figure 4 to find the scores the participants gave for each type of censor in all three scenes. However, the participants generally favored pixelization over posterization for all three scenes, as revealed in Figure 5.

- **The difference in preference between the two types of censors was not significant in sexual scenes.** The participants gave 3.7 out of 5 for pixelization, and 3.4 out of 5 for posterization. Those who favored pixelization more mentioned that this type of censorship is much more familiar and has better ability to blur out the unpleasant parts. On the other hand, the participants who chose posterization over pixelization reasoned that posterization makes the censored part less vivid, which diminishes the realistic sense, while
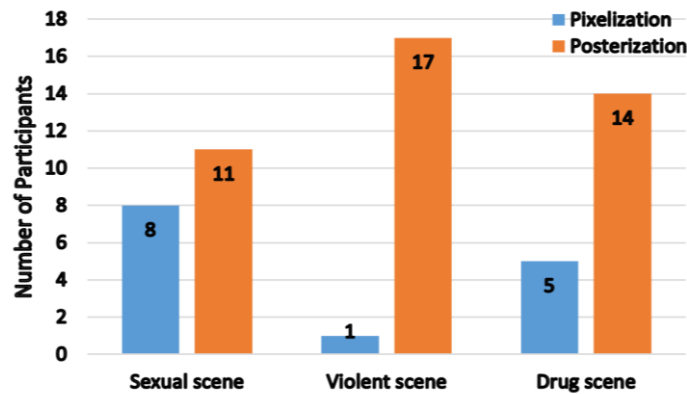
Figure 5. The number of participants that showed favor for each type of censor. (One participant did not have a strong preference over a particular type of censor for sexual and drug scenes.)

harmonizing with the overall beauty of the scene. Apart from this, one participant (P11) did not favor a particular type of censor and commented:

"*Because I don't want to see others' sexual activities and since pixelization blurs it out a lot better, I choose pixelization for the bed scene. However, for the club scene, posterization makes it less realistic while preserving the overall context, so I choose posterization for this scene.*"

- **Pixelization was preferred for violent scenes, because of its ability to blur out better.** The participants gave 4.1 and 2.6 out of 5 for pixelization and posterization, each. Majority of the participants chose pixelization as a more suitable type of censor and the reason was because it has a better capability of covering up the parts, while posterization has an opposite effect and emphasizes the censored parts. One participant who favored posterization reasoned that this type of censor seems to blur out the censored parts more naturally.

- **Pixelization was preferred for drug scenes, because of its ability to blur out better.** For the application of censors on drug scenes, the participants gave 3.7 and 2.3 out of 5, respectively. Similar to the other scenes, the reason for the participants to favor pixelization was because of its better ability to cover the censored parts, compared to posterization, and is more familiar. On the other hand, those who preferred posterization more reasoned that it alters the censored parts to be less realistic, while harmonizing well with the overall scene. Aside from this, one participant did not favor either of the censor type because the censored region did not include the characters after they used the drugs, such as going into shock or collapsing.

4.5.4 Pixelization vs. Posterization: Difference in Preference of Applied Region

To further understand the reason for the difference in preference of the applied region depending on the type of censor, we asked the participants for the reason of their choice. Those who did not have a particular region they favored for each type of censor, were either due to a strong preference for only one type of censor or region. Apart from these participants, the preference in the applied region for each type of censor differed depending on the participants, because the cause of discomfort varied between them. As an example, for sexual scenes, several participants mentioned that as the applied region gets larger with pixelization, it tends to harm the beauty of the scene, while with posterization, it becomes unidentifiable from the scene and does not have any censoring effect. On the other hand, there were those who favored a larger region for posterization compared to pixelization, since it altered the scene to be less realistic.

5. Discussion

5.1 Different Censorship-related Desires for Different Scenes

The survey and the interview findings revealed that there is a desire for the application of censors in uncomfortable scenes. However, the demand differed depending on the types of scenes. Compared to sexual scenes and drug scenes, the desire was the strongest for violent scenes. First of all, the results showed that there was a higher demand for censors when watching sexual scenes with others, compared to when watching alone. However, for the violent scenes, except those who do not find violence unpleasant, most of the people simply did not wish to see others in pain regardless of whom they are watching with, if any. Lastly, due to cultural background, where drug is quite unfamiliar, not many people were uncomfortable with watching drug scenes. Overall, those who felt strong discomfort while watching unpleasant scenes expressed the need for censors for their own needs, while others who did not find the scenes significantly uncomfortable, wished to have censors when watching with others.

5.2 Different Censorship Type Preference for Different Scenes

The participants generally favored pixelization over posterization in all three scenes. However, unlike the violent and drug scene, where the majority of the participants chose pixelization, the preference for pixelization was not as strong as the other two scenes in the sexual scene. The difference in the preference of the censor type varied depending on the type of emotion the scenes raised, and the effect each censor type has. Several participants perceived pixelization to be better at blurring out the parts, making visual identifications of those parts more difficult. On the other hand, posterization affects the color of the scenes, simply making the parts less realistic. Since violent and drug scenes elicit negative emotions, such as disgust and discomfort, the participants wished to have the content completely blurred out, favoring pixelization much more. However, sexual scenes raise embarrassment and awkwardness rather than discomfort, which led to slightly less than half of the participants favoring the posterization method. Moreover, since pixelization is more prevalent in the actual practices, some of the participants mentioned that such censor type being applied in sexual scenes emphasizes the sensual sensation. It is recommended to use pixelization regardless of scene types, but posterization can also be a solution for sexual scenes, depending on the viewers.

5.3 The Application Region Should Differ Depending on the Type of Scene

The application of region should differ depending on the type of scene, regardless of the censor type. The reason for such variance is because the cause of discomfort differed depending on the type of scene. As an example, as mentioned in Section 5.1, sexual scenes generally provide awkwardness and embarrassment due to watching nude bodies and sexual activities. Due to this, censors applied to the whole scene are not required and covering the whole body was enough. On the other hand, violent scenes can raise disgust and repulsion for viewers, which require censors to cover as much region as it can. Moreover, since not many participants find drug scenes to be highly unpleasant, large region of application was unnecessary. Although, the process of drug injection, such as powder being injected through the nose or needle puncturing the skin, caused several participants discomfort and wished this part to be censored as well.

5.4 The Application Region Should Differ Depending on the Type of Censor

First, for sexual scenes, applying pixelization on the whole nude body, while applying posterization to only specific parts of nude bodies is recommended. Using pixelization only on specific body parts was simply not enough, while applying it on the whole scene inhibited users from understanding the overall context of the scene. On the other hand, since posterization only affects the color of the censored parts, large region of application did not successfully blur out the origin of discomfort, especially when it was applied to only the

whole nude body. Using posterization to cover the entire scene had an unexpected effect of altering the scene to be less realistic, eliminating the sensual chemistry. For violent scene, regardless of the type of censors, covering the whole victim and the tool used for violence is recommended. The cause of discomfort was mostly due to visibly shown blood and the victim's face crumpled in pain. Some even wished to have all the splattered blood covered. Lastly, the small region and the medium region are recommended for the application of pixelization and posterization in drug scenes, each. Compared to sexual and violent scenes, not many participants found drug scenes strongly uncomfortable, leading to a lesser necessity of censors. As such, since pixelization effectively blurs out the parts, the small region is favored. However, posterization had an adverse effect of emphasizing the censored parts, if applied to only a small region.

6. Limitations

There are certain limitations to our study. First of all, the ratio between men and women was not proportionate for the survey, which led to having the problem continue to the interview. Due to this, we were not able to fully identify whether the result differs between two genders. Also, due to lack of enthusiasm among survey respondents in participating in the in-depth interview, given that it required them to watch uncomfortable scenes multiple times, we were not able to recruit participants with diverse preferences in movies or censorship types. Moreover, we conducted the interview with only two types of censors, which may be a good starting point, but is limited. This research can expand further with other promising censorship types [31, 32]. Due to this, we determined to focus our study on identifying the varying degree of desires for censors depending on the scene, and whether the most suitable censor application method differs for each scene. Based on this, we investigated only on the effects of two types of censors, as pixelization is one of the most dominantly used censor and posterization is rather unfamiliar but its potential is yet unidentified and its censoring effect quite distant from pixelization.

7. Conclusion & Future Work

In this paper, we focused on investigating the specific reasons for those to feel uncomfortable while watching sexual, violent, and drug scenes, and what type of censoring method for each scene would release the most discomfort for them. We first conducted an online survey and discovered that there are those who feel discomfort and have the desire for censors for all three scenes, but especially violent scenes. Moreover, the content of the scene people did not wish to watch and the desired censorship method differed depending on the type of scene. Based on the survey findings, we conducted an online in-depth interview and specified the reasons to why people wished to avoid the uncomfortable scenes differed. In addition, between two types of censors, pixelization and posterization, the former was generally favored for all three scenes, while the preferred regions of application differed depending on the type of scene and the type of censor. One thing to note is that unlike violent and drug scenes, the preference for pixelization was not significantly stronger from posterization in sexual scenes. With the findings we have revealed, we plan to implement a customizable video censoring system using AR glasses. This will allow people to apply censors in any way they desire, while watching the same movie with other people. Also, we intend to adopt a deep learning model [33] that can detect the unpleasant parts of scenes in real-time. After the implementation, we plan on conducting an evaluation study to identify if such system can help users in effectively releasing discomfort, especially while watching uncomfortable scenes with others.

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