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Pastel color does not modulate viewers' emotions in audiovisual projects

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The use of color in audiovisual projects, specifically film, TV, and advertising, involves associations at different levels: physical, psychological, and esthetic. To our knowledge, the specific impact of pastel colors on viewers had not been studied by comparing them to saturated colors based on paired color productions. In this work, we aimed to approach differences in the emotions perceived by viewers when watching audiovisual projects produced with pastel colors compared with those produced with saturated colors. We hypothesized that the pastel color, due to its characteristic of being a soft color, evokes emotions with less intensity than saturated colors. To study this, we created 12 videos, six with a saturated color production design and six with a pastel color production design, evoking six basic emotions: disgust, anger, fear, happiness, sadness, and surprise. We presented these videos to 310 people distributed in two groups (half of them watched the saturated videos and half the pastel videos) and asked them to indicate how these six emotions were evoked. We only found significant differences in 4 out of the 36 comparisons made (11.11%), in videos representing disgust and anger. With those results, we did not find that pastel color in audiovisual projects clearly influences the audience's emotional perception. We conclude that to evoke emotions in the audience, additional elements to color are necessary, such as music, camera shots or lighting. This research brings more knowledge to how pastel color in images, particularly those of an audiovisual nature, can be used to evoke emotions in the audience.

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Introduction

Color plays a central role in audiovisual storytelling, shaping the viewer's perception, emotional response, and interpretation of scenes (Bordwell et al., 2016). In film, television, and advertising, color is carefully chosen to support narrative tone, guide attention, and elicit specific psychological reactions (Block, 2008; Kaiser, 1996). While considerable research has explored how saturated or contrasting colors in audiovisuals influence emotions (Baumgärtner et al. 2016; Codispoti et al., 2012; Cowan, 2015; İyilikci et al., 2024; Kennedy, 2014; Martínez et al., 2012; Sánchez-Alarcón, 2008), far less is known about the emotional impact of softer hues—particularly pastel colors—within the context of audiovisual production. This paper addresses that gap by examining whether pastel colors modulate emotional perception in audiovisual projects.

The study of color in audiovisuals

Color in audiovisual projects (film, TV, advertising) has not been studied enough in a scientific setting (Cotes, 2010; Elliot, 2015, 2016; Everret, 2007; Peacock, 2010), although it influences the way in which the audience perceives audiovisual projects (Ikeda, 2020; Pressey, 1921; Shimamura, 2013). Each color carries symbolic meaning based on its historical associations, which audiovisual producers use to influence viewers' subconscious and perception of the frame (Flückiger, 2017). In film, for example, color contributes to shaping atmosphere, mood, and provides additional context about the narrative and characters. It fulfills plot-related, dramatic, and symbolic functions within a complementary color scheme (Dziuba & Kovsh, 2022).

Color serves multiple functions in audiovisual work. Physically, it may affect viewer comfort; psychologically, it can elicit emotional responses; and esthetically, it contributes to visual balance, proportion, and composition (Cao et al., 2024; Zhang, 2024). Empirical studies support these roles: for example, color film sequences generally receive higher valence ratings than black-and-white sequences (Cao et al., 2024), and color images are found more exciting than monochrome ones in television viewing (Detenber, Simons, & Reiss, 2000). Additionally, emotions can mediate cross-modal association between music and visual color (Lindborg & Friberg, 2015). Recognizing this, audiovisual creators increasingly use color not only to enrich esthetic experience but also to enhance drama, describe characters, and convey mood and emotion—strengthening its position as a vital narrative device (Braga & Vaz Da Costa, 2011).

The perception of color and the role of context

Color is one of the fundamental properties used to identify objects, alongside size and texture (Bianconi et al., 2021). Because of this, it plays a significant role in perceptual processing (Folk, 2015). Numerous studies have demonstrated the emotional effects of color stimuli (Wilms & Oberfeld, 2017). For instance, color temperature and illuminance can influence emotional states, physiological responses, and productivity (Chen, Tsai, & Tsay, 2022); hue preference has been linked to gender and cultural background (Al-Rasheed, 2015); and saturation levels can alter perceived object size (Hagtvedt & Brasel, 2017). Saturated and bright colors are associated with higher arousal (Wilms & Oberfeld, 2017); colors are associated with tastes and flavors (Spence, 2019) and emotional tones—for instance, yellow is linked with joy, yellow-green with relaxation (Jonaskaite et al., 2019), green is associated with environmental friendliness, and grey evokes environmental unfriendliness (Lim et al., 2020).

So, the use of the color can enhance the narrative by manipulating intent and improving message delivery (Čerepinko et al., 2023). However, to fully understand color's effect, researchers

must also consider its embodied and referential associations, as well as properties like hue and saturation (Lim et al., 2020). These perceptual and symbolic layers are critical when analyzing emotional responses to color.

Research shows that color associations are relatively consistent across studies, although often limited by the range of colors and emotions analyzed (Hanada, 2017). The impact of these associations depends heavily on context, particularly in terms of embodied meanings—linked to biological responses—and referential meanings—linked to learned associations shaped by cultural background and usage (Labrecque et al., 2013). While cultural factors can influence these associations, some intrinsic perceptions of color appear to be shared globally. Therefore, context plays a determining role in activating certain associations within the semantic network and influencing perception and behavior (Labrecque et al., 2013).

Various theoretical interpretations of color perception have been proposed over the decades (Heller, 2008; Kalmus, 1935; Plutchik, 2001; Wells, 1910). Although consensus is lacking on the precise emotional effects of specific colors—or even how to name them (Uusküla et al., 2023)—some general patterns are widely accepted. For instance, red is commonly associated with danger, passion, and aggression; green with balance and respect; and blue with authority and melancholy (Edwards, 2004). Research shows that red in audiovisual scenes sustains tension, green conveys harmony, and blue emphasizes calm and communication (Čerepinko et al., 2023). Directors often select colors based not only on general associations but also personal interpretations to convey tone, mood, and character, making color one of the most influential elements in shaping audience emotion (Dziuba & Kovsh, 2022).

An example of the recognition of color potential by audiovisual producers can be seen in green marketing where green is used to signal environmental friendliness, particularly in advertising, packaging, and branding strategies (Lim et al., 2020). This can create emotional resonance, but misuse (as in greenwashing) can backfire. Similarly, experimental studies show that viewers respond emotionally to color cues even before identifying the actual content—for instance, associating red backgrounds with anger and green backgrounds with happiness in emoticons (Ikeda, 2020). Supporting this, Jonaskaite et al. (2019) found that positive moods are linked to light and chromatic colors, while negative moods correspond to dark, achromatic ones. Marketing research further supports that effective use of color enhances emotional engagement and brand loyalty, depending on visual harmony and cultural symbolism (Martínez et al., 2012).

Although these findings are significant, many researchers emphasize the need for further study to clarify how specific colors evoke emotional responses, especially in multimedia contexts (Fetterman et al., 2015; Jalil et al., 2012; Jonaskaite et al., 2020; Oittinen et al., 2015). The current study contributes to this area by exploring the emotional effects of pastel colors in audiovisual content.

Pastel color

The human eye perceives colors based on hue, saturation, and brightness (Krantz, 1972). Among these, pastel colors are characterized by lower chromatic intensity and higher luminance while retaining the original hue (Cajal, 2020; Chittick, 1980). Subjectively, they are described as soft and soothing (Arrarte-Grau, 2016). As saturation decreases, a color becomes pastel rather than vivid. Pastel tones are softer than primary colors (Fordham & Hayes, 2009) and have been used since the sixteenth

century by artists for their expressiveness and subtlety (Yang & Min, 2017).

Commonly seen in commercial design, pastel colors are associated with simplicity, beauty, cleanliness, spring, summer, and relaxation (Abbasi et al., 2014; Kroeger et al., 1986; Zviran, Dov Te'eni, & Gross, 2006). Mulyati and Exposto (2023), for instance, found that colors like light green, light blue, and light yellow create calming and cheerful environments in pediatric spaces, although pink may increase anxiety. As in Ecological Valence Theory, which proposes that people's color preferences are shaped by their associations with objects or experiences they like or dislike (Palmer & Schloss, 2010), pastel tones are believed to affect consumers emotionally and intellectually (Casas & Chinoperekweyi, 2019), and their acceptance is influenced by cultural and functional norms—such as professional dress codes that favor neutral colors. Yet, despite the ubiquity of pastel colors in visual culture, the emotional impact of them within audiovisual storytelling remains underexplored.

The present study

In this context, to our knowledge, the specific impact of pastel colors on viewers had not previously been studied in a manner based on paired color productions, such as comparing pastel to saturated colors. We hypothesized that pastel colors, due to their soft nature, evoke basic emotions with less intensity, —that is, weaker or milder emotional responses, both positive and negative—compared to saturated colors. To test this, we created 12 videos—six with a saturated color design and six with a pastel color design, using the type of color as independent variable—each intended to primarily evoke one of six basic emotions: disgust, anger, fear, happiness, sadness, and surprise (Ekman, 1999, 2003). These videos were shown to participants, divided into two groups (half viewing the saturated videos and half viewing the pastel videos), and they were asked to rate the intensity of the six emotions elicited by each video. We analyzed the intensity of each of the studied emotions as dependent variables across both conditions (saturated and pastel videos) to address our research question: how does pastel color in audiovisuals modulate viewers' emotional responses?

Methods

Participants. In total, 310 subjects (205 women, 95 men, and 10 preferred not to indicate), distributed in two groups, participated in this study: 155 participants were part of the pastel group, and 155 participants were part of the saturated color group. We randomly distributed our participants between both groups of this study. The age of the participants was distributed as follows: 183 were between 18–24 years old; 42 were 25–34 years old; 23 were 35–44 years old; 33 were 45–54 years old; and 29 were 55 or older. Since 72 out of the 310 participants did not answer all the parameters, we got some data loss, but 77% of participants answered the complete study. We used all the available data from participants who did not complete the entire questionnaire. The experiment was carried out in accordance with relevant guidelines and regulations for human research and the protocol was approved by the Ethics Commission for Research with Animals and Humans (CEEAH) of the Universitat Autònoma de Barcelona (Barcelona, Spain), with CEEAH reference number 6048.

Stimuli and pre-tests. We created 12 videos, each designed to primarily promote one of Paul Ekman's basic six emotions (disgust, anger, fear, happiness, sadness, and surprise) (Ekman, 1999, 2003) in two color production approaches (pastel color and saturated color). It is important to note that our goal was not to create 'pure' emotional stimuli but rather to understand how

pastel versus saturated colors influence the perceived intensity of dominant emotions, even when other secondary emotions may be present. Emotional stimuli in real audiovisual productions are rarely pure; mixed emotional responses are common in naturalistic settings (Gabert-Quillen et al., 2015; Harold, 2010; Singh et al., 2021). The stories that happened in the videos were the following: (1) surprise: a male character arrives disappointed to his house to be surprised by his female partner; (2) disgust: a couple eat pasta in a very disgusting way; (3) anger: a male character gets irritated while speaking with a customer service representative over the phone; (4) happiness: a male character relaxes on his bedroom imagining her female partner in lovely situations; (5) fear: a male character shaves his bear in his bathroom when suddenly his dead female partner jumps out and scares him; and (6) sadness: a male character is sleeping with his female partner, when he wakes up and returns to sleep to realize his partner is dead.

Each video promoting each emotion had two versions: one with pastel colors and one with saturated colors. Both versions shared the same narrative, the same characters, the same scenarios, the same duration (30 seconds), but a different color production. The color production was approached in the production phase rather than post-production. Thus, we recorded 12 videos in total (Fig. 1). To confirm that the video evoked the intended emotion, we conducted two pre-tests.

Pre-test 1 involved the initial versions of the 12 videos, where participants were asked to identify the emotion conveyed and the color scheme of the video. A total of 78 participants completed this online pre-test over a one-week period. To ensure the accuracy of our stimuli, we set a threshold that at least 85% of participants had to agree that each video evoked the predetermined emotion. The results indicated that only the pastel sadness and saturated fear videos met this criterion. The remaining videos (pastel surprise, saturated surprise, pastel disgust, saturated disgust, pastel anger, saturated anger, pastel joy, saturated joy, pastel fear, and saturated sadness) did not meet the 85% threshold. As a result, we developed Pre-test 2, where we revised the videos based on the feedback from Pre-test 1. To further validate the changes, we sought professional opinions from six screenwriters and academics. These experts reviewed the rewritten scripts, based on the pre-test results, and provided feedback on how to enhance the scripts to better evoke the intended emotions. The final scripts incorporated their suggestions, and the videos were re-recorded to ensure they accurately conveyed the desired emotional responses. After the final stimuli were produced, we confirmed their effectiveness in eliciting the intended emotions by analyzing participants' responses in the main study. We checked that the desired emotion for each video scored higher on the corresponding Likert scale.

We used Highland2 for writing the scripts and DaVinci Resolve 17 for editing the videos. Each group of participants watched a group of six videos in either pastel color or saturated color.

Data acquisition. With the final version of the video stimuli, we created two versions of a study consisting of: (1) an introduction to the study; (2) four closed questions about age, gender, educational level, and country of residence; and (3) the presentation of six videos. One version presented the pastel videos, and the other version presented the saturated videos. After each video, participants were asked to tell what the level of each of the studied emotions (disgust, anger, fear, happiness, sadness, and surprise) in that specific video was, using a 1 to 5 Likert scale, being 1 'nothing' and 5 'a lot'. We understood that a Likert scale was the best asset to measure the impact of emotional elicitation since



Fig. 1 Screenshots of the 12 videos. **a** Surprise in saturated (left) and pastel (right) color. **b** Disgust in saturated (left) and pastel (right) color. **c** Anger in saturated (left) and pastel (right) color. **d** Happiness in saturated (left) and pastel (right) color. **e** Fear in saturated (left) and pastel (right) color. **f** Sadness in saturated (left) and pastel (right) color.

research aimed to evaluate the effectiveness of a Likert scale as a tool for measuring basic emotions and understanding their intensity in different contexts has been proven adequate (Nicoara et al., 2023).

We used Random.org for randomizing the presentation of the videos in each group (pastel group and saturated group). The aim of the study was for the participants to see each video and determine the level of emotion evoked in each one of them. The studies were online distributed between December 8th, 2022, and March 5th, 2023. We posted the links to both versions of the study from Forms.app to a mailing list of students and professors from the Universidad del Sagrado Corazón in Puerto Rico and to a mailing list provided by the Puerto Rico European Film Festival and the Puerto Rico Documentary Filmmakers Association. The links to the studies were also handled in person to students of the Universitat Autònoma de Barcelona in Spain and the Universidad del Sagrado Corazón in Puerto Rico.

Data analysis. We used participants' answers to the studies for the analysis. To approach distribution, we applied Shapiro-Wilk normality test ($p < .05$). We did multivariate tests, analysis of variances, and unpaired t-tests to the data or its equivalent non-parametric Mann-Whitney test. We compared the impact that color condition (pastel versus saturated) may have in viewers' emotions. For each video, we analyzed not only the target emotion (e.g., in the disgust video, disgust emotion), but also the rest of the acquired emotions to check if, in any case, the color condition would have a significant impact on viewers' emotions. We used JASP and Sigmaplot for statistical analysis.

Results

In the present study, we aimed to answer if pastel color would impact in viewers' emotions compared with saturated color. Initially, a MANOVA Wilks' test was performed to analyze the effect of the type of color [color condition: pastel color or saturated color] would have on the type of emotion [emotion condition: disgust, anger, fear, happiness, sadness, and surprise] on the rating of participants in the Likert scale to the stimuli. There was non-significant difference in rating the emotions based on color condition ($F_{(1,1375)} = 0.906$, $p = .906$, Wilk's $\Lambda = .998$). Simple ANOVA tests in each studied emotion showed that color condition did not have a statistically significant effect on the

rating of participants to videos in any of those: disgust: $F_{(1,1375)} = 0.019$, $p = .890$; anger: $F_{(1,1375)} = 0.369$, $p = .544$; fear: $F_{(1,1375)} = 0.040$, $p = .841$; happiness: $F_{(1,1375)} = 1.430$, $p = .232$; sadness: $F_{(1,1375)} = 0.315$, $p = .575$; surprise: $F_{(1,1375)} = 0.194$, $p = .660$. The goal of this work was related to the impact that pastel color may had on viewers. Here, we found that, analyzing the data altogether, color condition did not affect viewers' perception. Then, we analyzed the data per video, divided into the six emotions (disgust, anger, fear, happiness, sadness, and surprise) that we approached in both color conditions (pastel and saturated color). See the results below.

Disgust video. When comparing pastel and saturated versions of disgust video, we found significant differences ($p < .05$) between them, when asked about the emotions of fear and happiness (Table 1), but not in the disgust emotion itself neither in anger, sadness, and surprise. The emotion that obtained a higher rank in the Likert scale was disgust, confirming that the video properly provoked the desired emotion in participants (Fig. 2).

Anger video. In the anger video, the comparison between pastel and saturated versions, presented significant differences ($p < 0.05$) in happiness and sadness, but not in anger, disgust, fear, or surprise (Table 2). The emotion that obtained a higher rank was anger, suggesting that the video provoked the desired emotion (Fig. 3).

Fear video. In the fear video, we did not find significant differences ($p < 0.05$) between both styles of videos in any of the six studied emotions (Table 3). The emotion with a higher rate was fear as it was intended (Fig. 4).

Happiness video. The video showing the emotion of happiness did not show significant differences between both color approaches in any of the studied emotions (Table 4). The happiness emotion was the one that obtained a higher score, as desired, but note that the opposite sadness emotion was not far (Fig. 5).

Sadness video. In the sadness video, no significant differences ($p < 0.05$) were found between pastel and saturated colors in the videos (Table 5). The sadness emotion was the one that obtained

Table 1 Descriptive data and non-parametric comparison of emotions ranked by participants when watching disgust video in pastel and in saturated colors.						
Emotion	Videos	N	Mean	SD	p	Mann-Whitney test
Disgust	Pastel	154	4.1	±1.3	0.764	W = 11417.50, with a biserial rank correlation effect size of −0.018.
	Saturated	151	4.2	±1.1		
Anger	Pastel	127	1.9	±1.2	0.294	W = 7070.50, with a biserial rank correlation effect size of −0.072.
	Saturated	120	2.1	±1.2		
Fear	Pastel	123	1.5	±1.0	0.046*	W = 6239.00, with a biserial rank correlation effect size of −0.125.
	Saturated	116	1.8	±1.1		
Happiness	Pastel	124	1.1	±0.6	0.002*	W = 6245.00, with a biserial rank correlation effect size of −0.139.
	Saturated	117	1.4	±0.8		
Sadness	Pastel	122	1.2	±0.6	0.425	W = 6798.50, with a biserial rank correlation effect size of −0.031.
	Saturated	115	1.2	±0.7		
Surprise	Pastel	122	2.6	±1.3	0.151	W = 6409.00, with a biserial rank correlation effect size of −0.102.
	Saturated	117	2.3	±1.4		

* indicates $p < .05$.

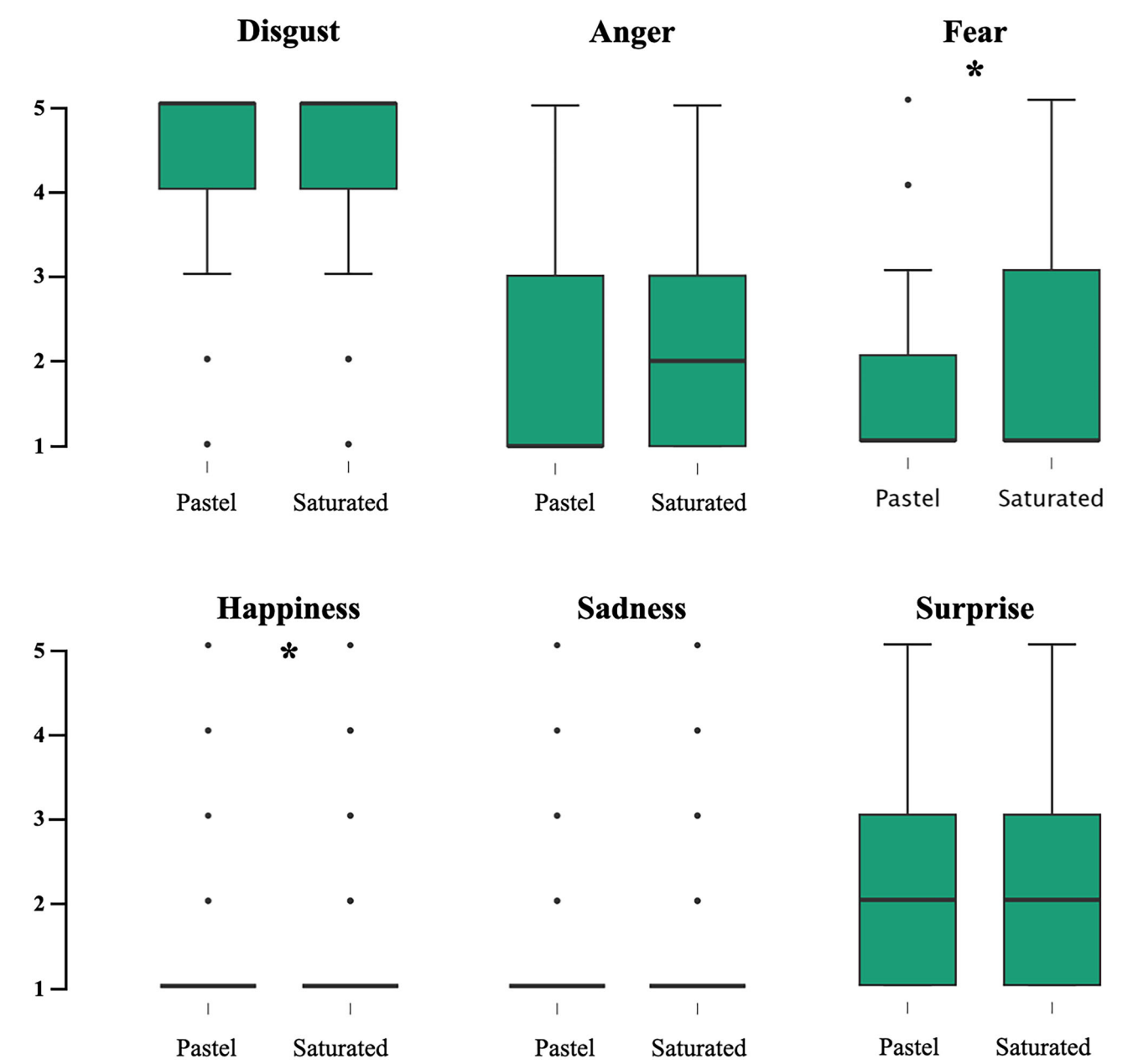


Fig. 2 Boxplots with results on disgust video by pastel/saturated condition in each studied emotion. * indicates $p < .05$.

Table 2 Descriptive data and non-parametric comparison of emotions ranked by participants when watching the anger video in pastel and in saturated colors.						
Emotion	Videos	N	Mean	SD	p	Mann-Whitney test
Disgust	Pastel	123	1.4	±1.0	0.225	W = 6548.00, with a biserial rank correlation effect size of −0.066.
	Saturated	114	1.4	±0.7		
Anger	Pastel	147	3.0	±1.5	0.424	W = 10763.00, with a biserial rank correlation effect size of 0.053.
	Saturated	139	2.9	±1.5		
Fear	Pastel	126	1.8	±1.2	0.472	W = 7018.00, with a biserial rank correlation effect size of −0.048.
	Saturated	117	1.8	±1.1		
Happiness	Pastel	126	1.2	±0.7	0.007*	W = 6490.50, with a biserial rank correlation effect size of −1,134.
	Saturated	119	1.5	±0.9		
Sadness	Pastel	124	1.6	±0.6	0.038*	W = 6380.50, with a biserial rank correlation effect size of −0.097.
	Saturated	114	1.3	±0.7		
Surprise	Pastel	127	2.3	±1.3	0.751	W = 7699.00, with a size of -0.022 rank-biserial correlation effect.
	Saturated	124	2.3	±1.4		
* indicates $p < .05$.						

Table 3 Descriptive data and non-parametric comparison of emotions ranked by participants when watching fear video in pastel and in saturated colors.						
Emotion	Videos	N	Mean	SD	p	Mann-Whitney test
Disgust	Pastel	125	1.8	±1.2	0.561	W = 7787.00, with a biserial rank correlation effect size of 0.038.
	Saturated	120	1.7	±1.0		
Anger	Pastel	122	1.2	±0.6	0.605	W = 6848.50, with a biserial rank correlation effect size of −0.024.
	Saturated	115	1.2	±0.6		
Fear	Pastel	150	3.0	±1.4	0.987	W = 10563.00, with a biserial rank correlation effect size of −0.001.
	Saturated	141	3.0	±1.3		
Happiness	Pastel	119	1.0	±0.2	0.074	W = 6360.00, with a rank-biserial correlation effect size of −0.046.
	Saturated	112	1.1	±0.4		
Sadness	Pastel	124	1.8	±1.3	0.190	W = 7785.00, with a biserial rank correlation effect size of 0.082.
	Saturated	116	1.5	±0.9		
Surprise	Pastel	133	2.7	±1.5	0.697	W = 8345.00, with a biserial rank correlation effect size of −0.027.
	Saturated	129	2.7	±1.3		

a higher score indicating, again, that participants perceived the intended emotion of the video (Fig. 6).

Surprise video. In the surprise video, no statistically significant differences ($p < 0.05$) were found when comparing the emotions ranked in pastel and saturated videos (Table 6). Both videos (pastel and saturated) obtained the higher score in the surprise emotion, indicating that the video was mainly perceived as surprising (Fig. 7).

Discussion

The aim of this work was to study the impact that pastel colors could have on viewers’ emotions, compared to saturated colors. We hypothesized that pastel color would evoke emotions with less intensity than saturated colors. The analysis of all the data together showed non-significant differences in viewers’ emotions based on the color condition. When looking at the data in detail, our findings revealed significant differences in only 4 out of the 36 comparisons made (11.11%), specifically in videos representing disgust and anger, where pastel color production resulted in a less intense emotional response in only three of the cases. In the case of the disgust video, the emotions that presented significant differences were happiness and fear, with a lower impact of them in the pastel videos. In the case of the anger video, the emotions that provoked different emotional responses were happiness and sadness, with a lower level of the emotion in the pastel condition in the case of happiness. So, these modest differences suggest that pastel color in audiovisual projects does not significantly

influence the audience’s emotional perception on its own. Note that while each video was designed to primarily evoke a specific target emotion (e.g., disgust, anger), we analyzed participants’ responses across all six basic emotions for each video. This approach allowed us to explore whether pastel colors decreased emotional intensity broadly, regardless of whether the emotional response matched the video’s target emotion.

Previous research on color-emotion associations shows that primary saturated colors like red, green, yellow, purple, and blue evoke stronger emotions than intermediate and achromatic colors (Kaya & Epps, 2004). Our study reveals that pastel colors do not have a solid way in emotional response compared to saturated colors. Many previous empirical works have proven that, in audiovisual projects, light (Matbouly, 2022), diegetic and non-diegetic sound such as explosions or gunshots (Shimamura, 2013), surround sound (Langiulli et al., 2023), music (Hunter & Schellenberg, 2010), cuts (Andreu-Sánchez et al., 2022), or style of editing (Andreu-Sánchez et al., 2018,) among many others, impact viewers’ perception and/or emotions.

Color in audiovisual projects has previously been linked to emotions (Kennedy, 2014), but it seems that saturation of color, or even removing color information from audiovisual projects, has only a slight influence on them: research by Codispoti et al. (2012) has shown that color information in audiovisual stimuli does not necessarily influence emotional responses. Their study found that removing color did not affect the emotional processing of natural scenes, regardless of exposure duration, suggesting that recognizing the emotional content of scenes does not heavily depend on color. Similar findings were found by İyilikci and

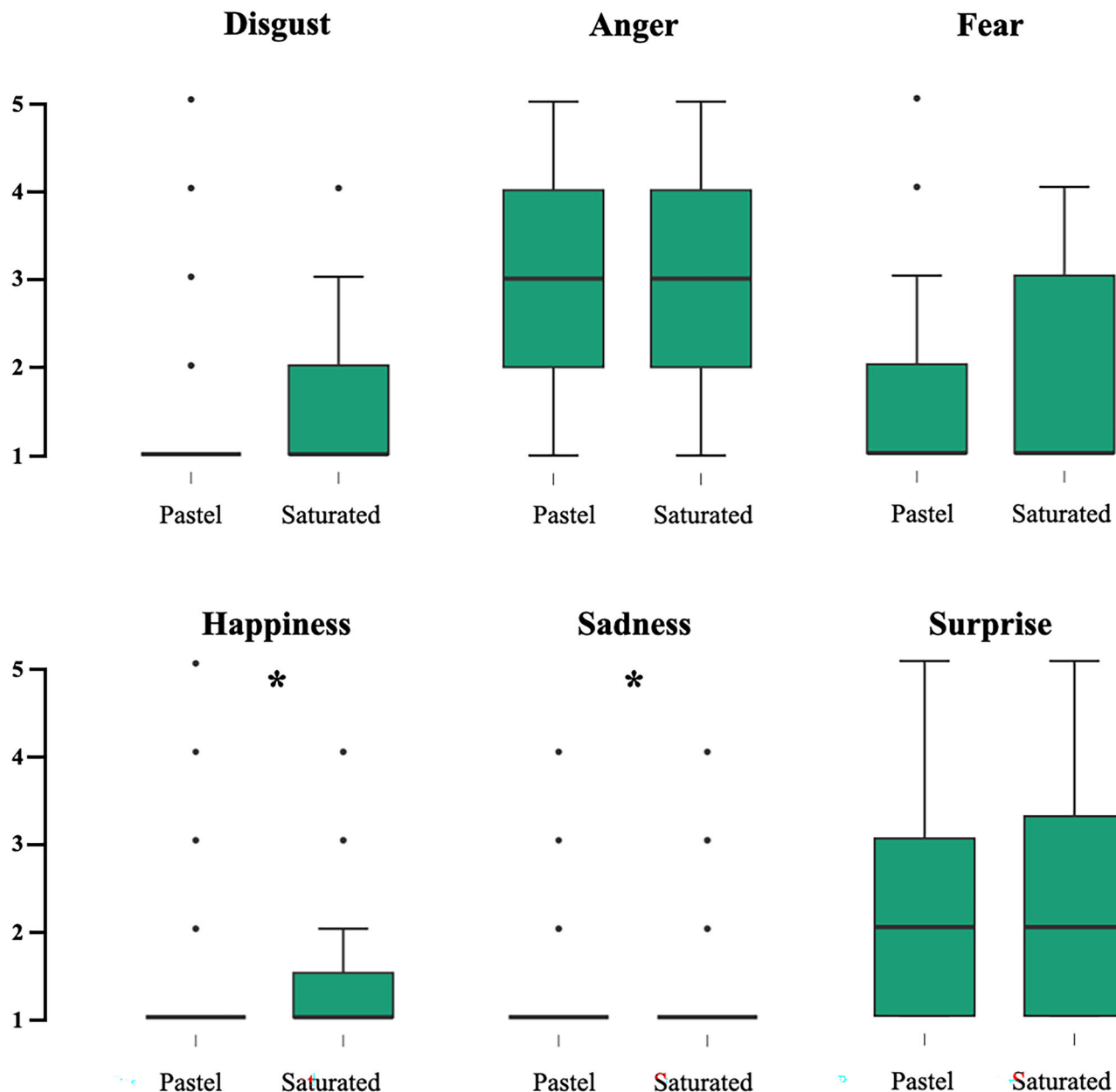


Fig. 3 Boxplots with results on anger video by pastel/saturated condition in each studied emotion. * indicates $p < .05$.

colleagues (İyilikci et al., 2024) regarding the use of color to elicit emotions. In their studies, they aimed to investigate the potential effects of sound and color in film clips on emotion-elicitation levels. The researchers found that color had a smaller impact on self-reported feelings compared to sound in response to film clips. Removing color only slightly affected emotions, causing a minor decrease in sadness ratings and a slight increase in anger ratings within their respective categories. These results, along with ours, make us think that color may not have such an important impact on viewers' emotions. Another observation İyilikci and colleagues (İyilikci et al., 2024) found about color was that the color versions of calm or neutral film clips elicited higher levels of pleasantness. In contrast, the black-and-white versions of these clips tended to evoke more boredom and confusion. Given that the calmness category mostly features daylight nature scenes, it's expected that colors like blue, green, or bright hues are linked to positive emotions (İyilikci et al., 2024). In this regard, color impacts differently based on the type of content represented: while removing

color from portraits increases perception of pleasantness and beauty and reduces tension, removing color from landscapes reduces the perception of beauty (Polzella, Hammar & Hinkle, 2005).

In a study made with humans and monkeys, it was proven that color cues have a different impact in the task of categorization depending on the type of object that must be recognized (Delorme, Richard, & Fabre-Thorpe, 2000). These observations are relevant to our results since we found that the content of the video has more impact on viewers' emotions than the type of color (pastel versus saturated) itself.

Another study (Kuzinas et al., 2016) set to find correlations between hue and content to trigger an emotional response in the audience showed that natural scenes evoked more positive and less arousing emotions compared to urban scenes. Green images were less arousing than red ones, and original images triggered the most pleasant emotions. Notably, green was the only hue where the emotional impact of the content was evident. Natural

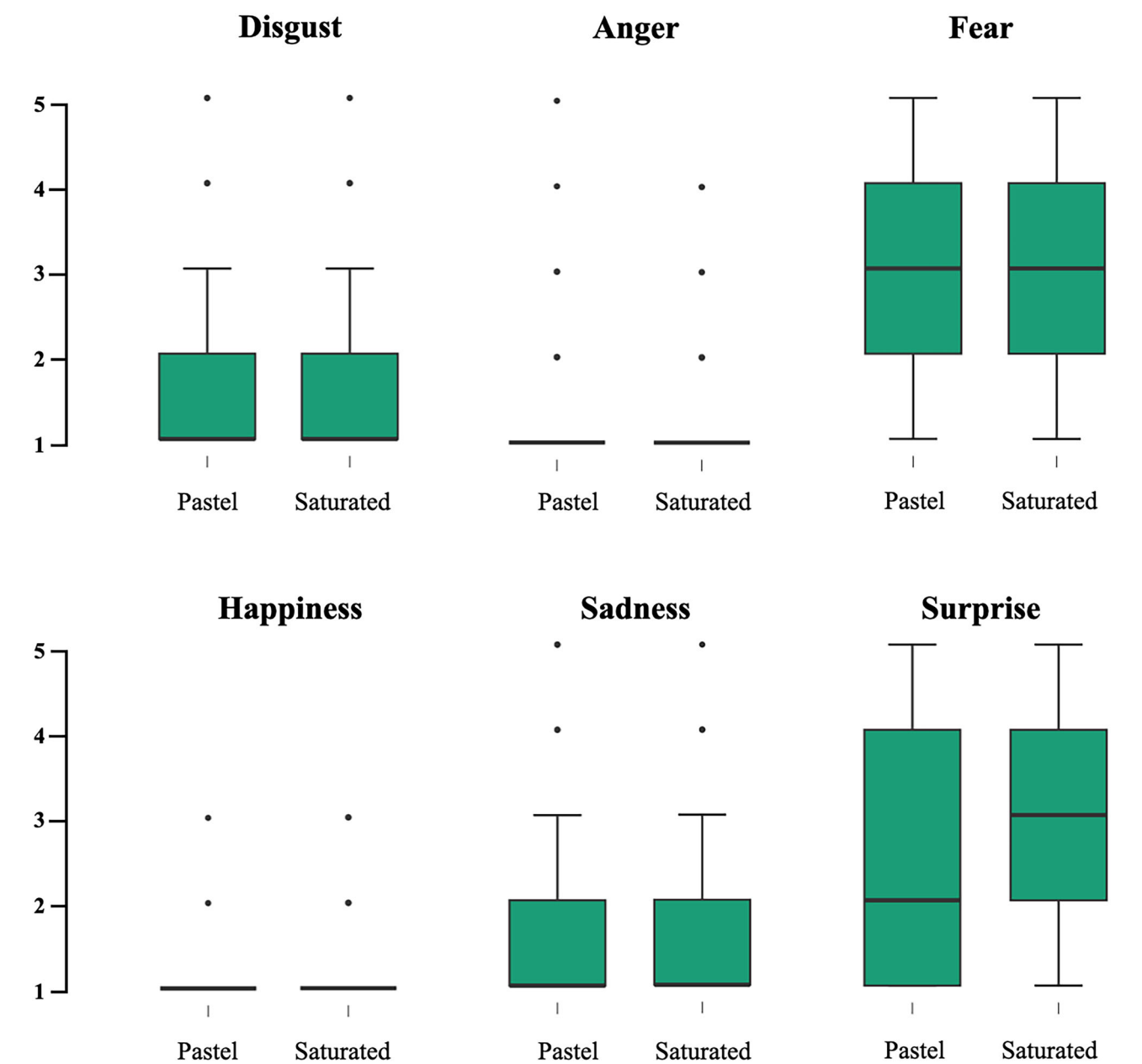


Fig. 4 Boxplots with results on fear video by pastel/saturated condition in each studied emotion. * indicates $p < .05$.

Table 4 Descriptive data and non-parametric comparison of emotions ranked by participants when watching htthe appiness video in pastel and in saturated colors.						
Emotion	Videos	N	Mean	SD	p	Mann-Whitney test
Disgust	Pastel	123	1.1	±0.4	0.895	W = 6984.00, with a biserial rank correlation effect size of −0.004.
	Saturated	114	1.1	±0.5		
Anger	Pastel	123	1.1	±0.3	0.282	W = 7240.00, with a biserial rank correlation effect size of 0.024.
	Saturated	115	1.0	±0.1		
Fear	Pastel	124	1.3	±0.7	0.151	W = 7601.00, with a biserial rank correlation effect size of 0.066.
	Saturated	115	1.2	±0.5		
Happiness	Pastel	146	2.8	±1.5	0.884	W = 10467.00, with a biserial rank correlation effect size of 0.010.
	Saturated	142	2.8	±1.4		
Sadness	Pastel	134	2.3	±1.4	0.781	W = 8534.00, with a biserial rank correlation effect size of 0.019.
	Saturated	125	2.2	±1.4		
Surprise	Pastel	124	1.4	±0.9	0.682	W = 7545.00, with a rank-biserial correlation effect size of 0.023.
	Saturated	119	1.4	±0.8		

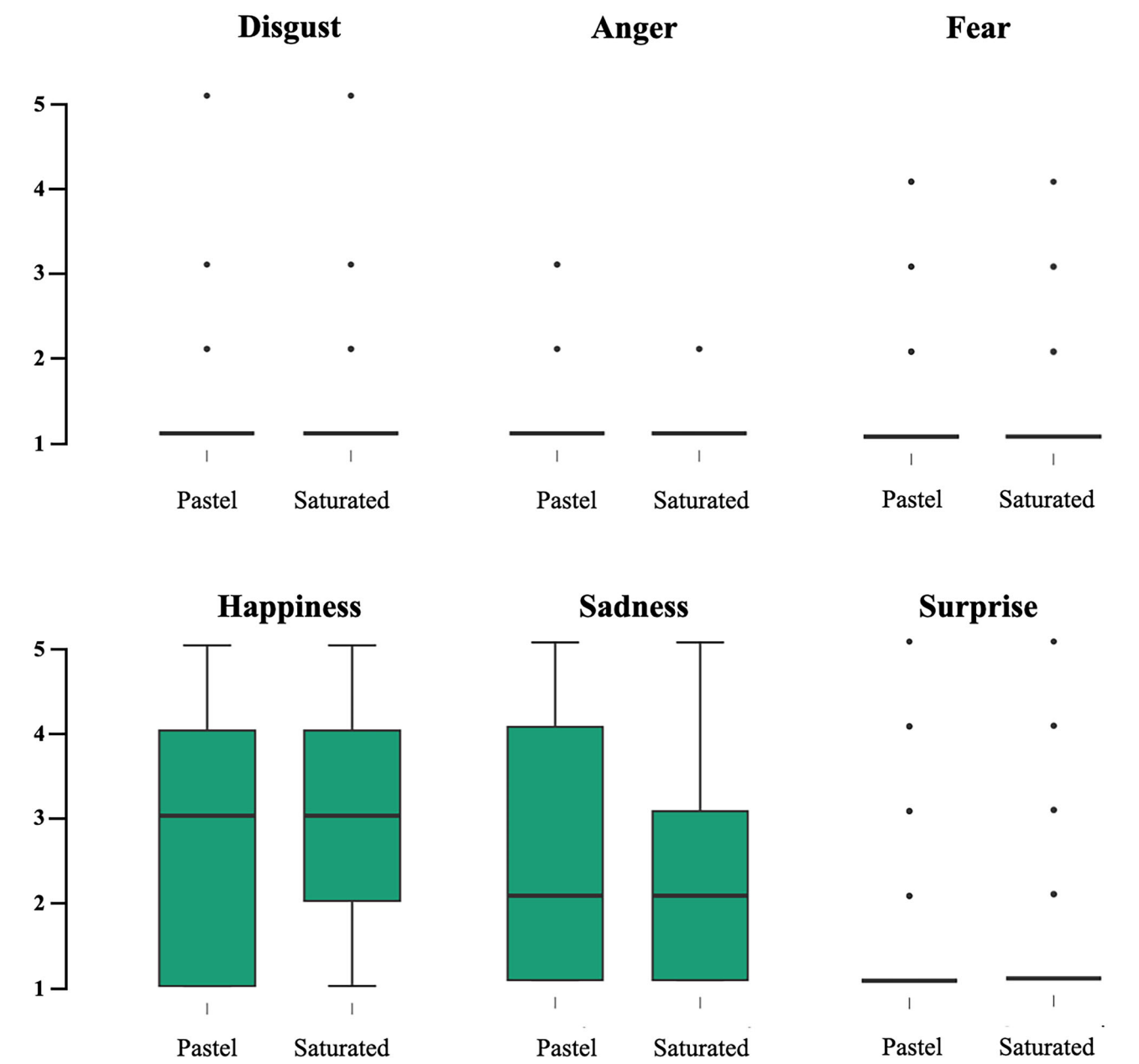


Fig. 5 Boxplots with results on happiness video by pastel/saturated condition in each studied emotion. * indicates $p < .05$.

Table 5 Descriptive data and non-parametric comparison of emotions ranked by participants when watching sadness video in pastel and in saturated colors.						
Emotion	Videos	N	Mean	SD	p	Mann-Whitney test
Disgust	Pastel	121	1.1	±0.3	0.469	W = 6824.50, with a biserial rank correlation effect size of −0.019.
	Saturated	115	1.1	±0.6		
Anger	Pastel	122	1.0	±0.2	0.653	W = 6936.00, with a biserial rank correlation effect size of −0.011.
	Saturated	115	1.1	±0.5		
Fear	Pastel	125	1.3	±0.7	0.841	W = 7394.00, with a biserial rank correlation effect size of 0.011.
	Saturated	117	1.3	±0.8		
Happiness	Pastel	122	1.3	±0.8	0.801	W = 6920.00, with a biserial rank correlation effect size of −0.014.
	Saturated	115	1.3	±0.7		
Sadness	Pastel	152	3.0	±1.4	0.248	W = 10545.00, with a biserial rank correlation effect size of −0.075.
	Saturated	150	3.2	±1.3		
Surprise	Pastel	123	2.2	±1.3	0.960	W = 7468.00, with a biserial rank correlation effect size of 0.004.
	Saturated	121	2.1	±1.2		

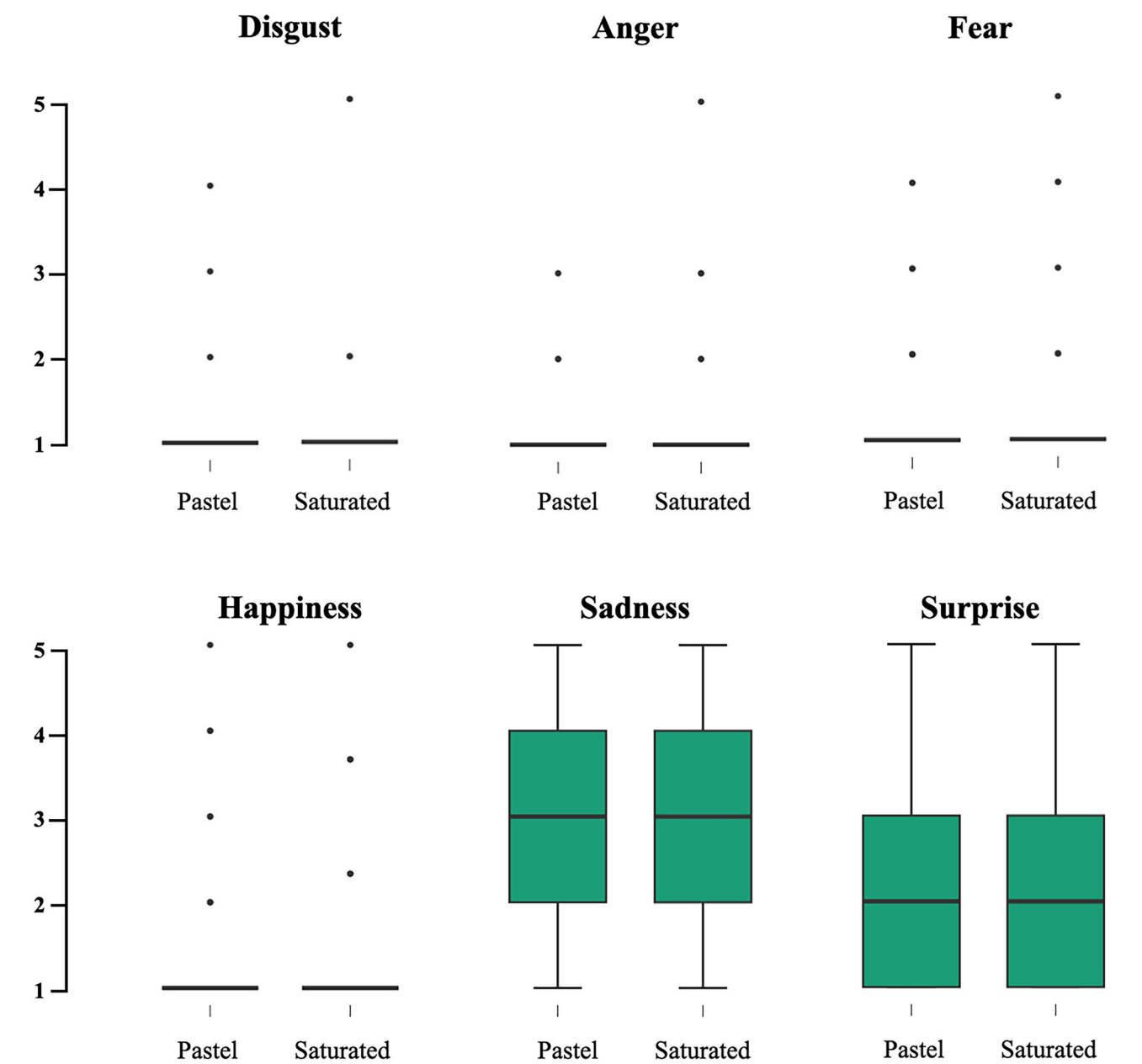


Fig. 6 Boxplots with results on sadness video by pastel/saturated condition in each studied emotion. * indicates $p < .05$.

Table 6 Descriptive data and non-parametric comparison of emotions ranked by participants when watching surprise video in pastel and in saturated colors.						
Emotion	Videos	N	Mean	SD	p	Mann-Whitney test
Disgust	Pastel	124	1.1	±0.4	0.895	W = 7098.00, with a biserial rank correlation effect size of 0.004.
	Saturated	114	1.1	±0.4		
Anger	Pastel	121	1.2	±0.6	0.217	W = 7147.00, with a biserial rank correlation effect size of 0.045.
	Saturated	113	1.1	±0.5		
Fear	Pastel	122	1.5	±0.8	0.578	W = 7437.50, with a biserial rank correlation effect size of 0.033.
	Saturated	118	1.4	±0.8		
Happiness	Pastel	131	2.7	±1.5	0.643	W = 8303.00, with a biserial rank correlation effect size of -0.032.
	Saturated	131	2.7	±1.3		
Sadness	Pastel	122	1.3	±0.7	0.131	W = 7355.50, with a biserial rank correlation effect size of 0.067.
	Saturated	113	1.2	±0.7		
Surprise	Pastel	149	2.7	±1.5	0.286	W = 9689.50, with a biserial rank correlation effect size of -0.071.
	Saturated	140	2.9	±1.4		

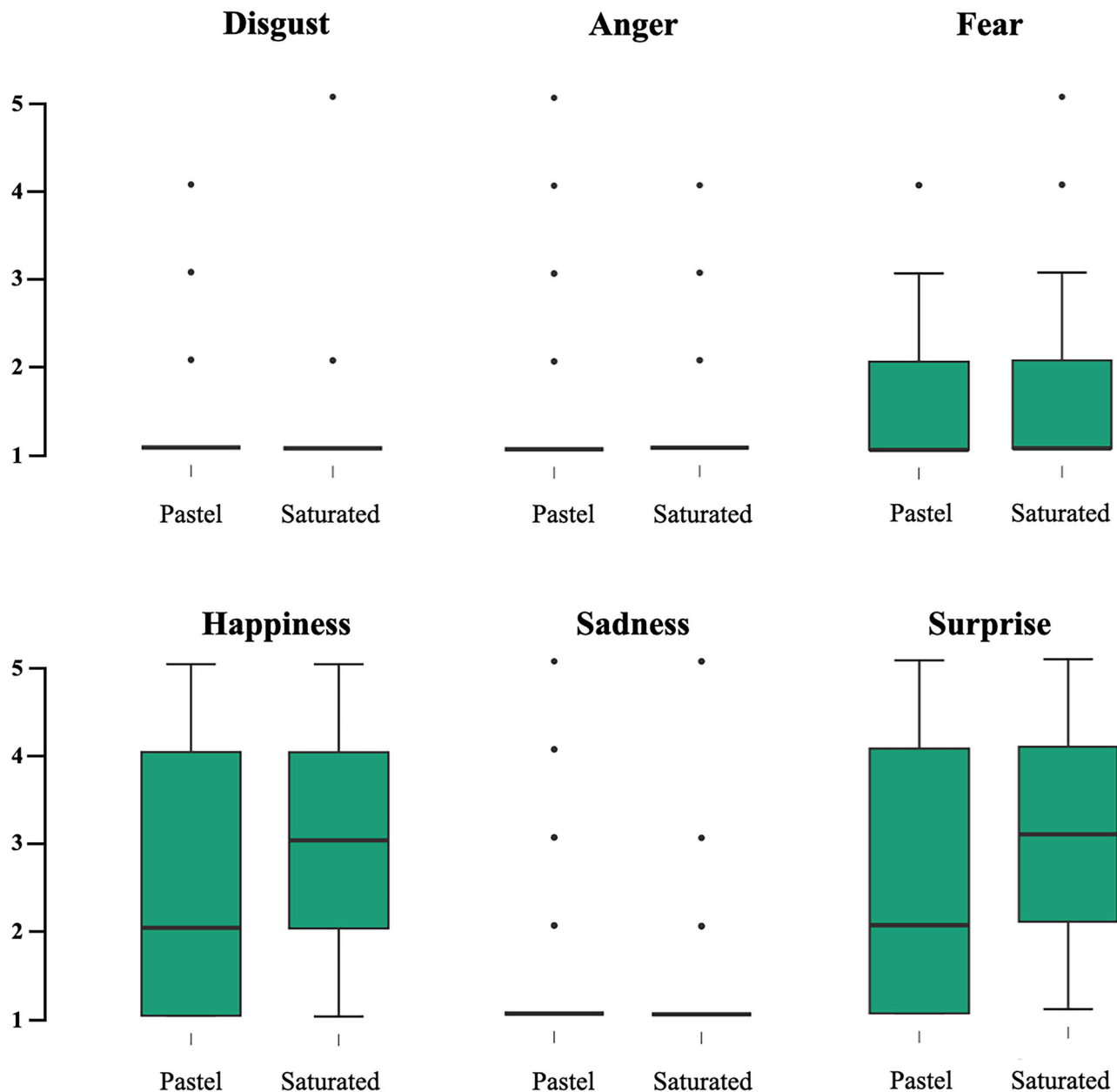


Fig. 7 Boxplots with results on surprise video by pastel/saturated condition in each studied emotion. * indicates $p < .05$.

scenes paired with green elicited more positive emotions than urban scenes paired with green. These results are interconnected and can be understood within the framework of cognitive fluency, meaning that when something is easy to understand, recognize, or process, it tends to evoke more positive emotions and perceptions. In the context of our results, there may be no difference in the experience of processing content with saturated colors versus with pastel colors.

Not taking color into consideration, we could argue that by working on the script, on the production, the acting, and the sound, media creators can achieve the desired emotions. İyilikci and colleagues (İyilikci et al., 2024) found that sound-enhanced film clips were more effective at evoking target emotions compared to their silent counterparts. These results, which show small to moderate effect sizes, align with the notion that sound, particularly background music, contributes additively to the emotional experience, given that the visual content already elicits a strong emotional response (İyilikci et al., 2024). Following a similar line

of research, a study using the effectiveness of different aspect ratios instead of sound to elicit emotions found that mid-wide aspect ratios like (16:9) elicit higher emotional response compared to standard (4:3) and ultra-wide (21:9) aspect ratios. This demonstrates that designing features within an audiovisual project can have emotional effects when determining emotional reactions in viewers (Kuzinas et al., 2024). This is consistent with previous studies such as those of Arthur Shimamura (2013) or Noël Carroll and William Seeley (2013), which emphasize the primordial need for an intention on the part of audiovisual makers to evoke emotions over any practical element in audiovisual production. Lingzhie Nie (2021) argues that the development of the connoted meanings of colors is related to the development of the spiritual and material culture of each linguistic community and, therefore, reflects each culture. Color preferences are closely linked to the emotions they evoke, with certain colors consistently eliciting positive or negative feelings. Although some colors are universally preferred across different

ages, racial groups, and cultures, there is evidence suggesting that color preferences can also be influenced by cultural factors (Kaya & Epps, 2004). Since the values associated with colors vary in different cultures, they can cause difficulties in understanding and translation. For an adequate translation, it is essential to grasp the context, especially the extralinguistic context. It can be argued that this is a reason why, in an audiovisual project, color alone can have no significant effect in evoking a desired emotion by the audiovisual producer (Nie, 2021).

Color, as well as camera movements and editing techniques, are preconceived and stereotyped devices that audiovisual producers use to control attention and filter the information available to the audience throughout the narrative of an audiovisual project (Carroll & Seeley, 2013). In this sense, Noël Carroll and William Seeley (2013) argue that audiovisual projects can be considered attention management tools intentionally designed to direct the viewer's attention towards the perceptual characteristics that have artistically been highlighted by the audiovisual producer. A director's creative decisions come from the intention he or she wishes to communicate (Carroll & Seeley, 2013). These creative decisions can be camera shots, editing, soundtrack, and color in production design. Nonetheless, this does not mean that creative decisions, like the use of color in an audiovisual project, translate properly without the context intended for them, as seen in the present research. Previous literature reviews have suggested that pastel colors can evoke softer emotional responses (Casas & Chinoperekweyi, 2019; Mulyati & Exposto, 2023). However, in our study, we did not observe these differences to be statistically significant. While many publications discuss the potential emotional impact of color on audiences, few have examined this topic using a quantitative and experimental approach with full control over confounding variables. In our design, participants viewed the same emotionally charged narrative under two different color conditions: pastel and saturated. Our goal was not to create 'pure' emotional stimuli, but to explore how pastel versus saturated colors influenced the perceived intensity of the dominant emotion, while also examining the presence and intensity of secondary emotions. The finding that emotional content had a stronger influence on viewers' perceptions than the color treatment aligns with previous research. For instance, Andreu-Sánchez et al. (2021) concluded that, in some cases, narrative content exerts a greater emotional impact than formal elements such as cinematography or design choices. They suggested that the scriptwriter may hold more influence over viewers' emotional responses than directors of photography, producers, or creative designers. This interpretation enriches the discussion and provides valuable insights for future studies exploring the relative impact of form and content in audiovisual media. So, since pastel color alone in audiovisuals may not be a strong determinant of emotional response, future research could explore additional contexts in which pastel tones might influence viewers' affective reactions —such as educational videos, branding and marketing contexts, or different narrative genres.

Limitations. The main limitation of our work is that, while our stimuli were carefully designed and revised based on expert feedback and two rounds of pre-testing, they were not drawn from previously validated emotional video sets. This may limit the generalizability and emotional strength of the stimuli. For instance, the mean rating for happiness was relatively low (2.8 on a 5-point Likert scale), suggesting that the intended emotion was not strongly elicited in all cases. Such variability in emotional intensity could have moderated the potential effects of color on emotional perception, possibly dampening any differences between pastel and saturated versions. Future research would

benefit from further refining custom stimuli to achieve stronger and more consistent emotional responses. Including physiological or behavioral measures in addition to self-reports could also help confirm the effectiveness of emotional elicitation. Future work should consider these limitations. Another limitation of our work is not having asked the exact age of participants to be able to present the mean, the standard deviation, the minimum, and maximum levels, rather than the frequency distribution of age. Related to this, a limitation that might have influenced this study is the fact that the most common age of our study respondents is in the 18-24 age bracket. In contrast to younger individuals who favor bold and bright colors, middle-aged and older populations tend to prefer pastel tones (Hunjet & Vuk, 2017). This statement correlates with the findings of Kurt and Osueke (2014) study regarding the effects of color on the mood of college students. In their finding, the least favorite colors preferred by the respondents were pastel colors, pink, and grey (Kurt & Osueke, 2014). Our study was conducted with a specific sample size and demographic, which may limit the generalizability of the findings to broader populations. Also, cultural differences in color perception and emotional response could also affect the outcomes, and these were not accounted for in the study. Besides that, individual differences in color perception, such as color vision deficiencies or personal associations with certain colors, were not accounted for, which could have influenced the results. So, given that previous experiences influence people's preferences, as proposed by the Ecological Valence Theory (Palmer & Schloss, 2010), a more culturally diverse sample would have benefited this study. Another limitation is that the questionnaires allowed participants to finish their participation without having answered 100% of the questions. In future works, this should be avoided. Also, the study specifically compared pastel and saturated colors, which may not cover the full spectrum of color's impact on emotion. Other color variations, such as monochromatic or complementary color schemes, were not explored and could yield different results. Another limitation is that the measurement of the affective experience was based on a categorical approach, and other core dimensions, such as valence or arousal, could have been included in the study. An additional limitation of this study is the absence of post hoc correction (as Bonferroni correction or other methods) to control for multiple comparisons. Our primary goal was to explore potential trends in how pastel and saturated colors influence emotional responses rather than to strictly control for family-wise error rate in a confirmatory hypothesis-testing framework. Given the exploratory nature of this work and the relatively limited number of comparisons, we decided not to apply Bonferroni corrections, which, while effective in reducing Type I errors, can be overly conservative and substantially increase the risk of Type II errors (i.e., overlooking potentially meaningful effects). Nonetheless, we acknowledge that this approach increases the likelihood of false positives, and future confirmatory studies should employ appropriate multiple-comparison corrections to ensure robust replication. Additionally, future studies with larger and more diverse stimulus sets could examine whether the observed trends hold under more stringent statistical controls and across different experimental designs. In addition, this study focused on six basic emotions: disgust, anger, fear, happiness, sadness, and surprise. Human emotions are nuanced and varied, and the selected emotions may not fully represent the range of emotional responses that color can evoke.

Conclusion

We conclude that pastel color in audiovisual project does not significantly influence, on its own, viewers' emotional perception.

Despite its characteristic of being a soft color, pastel color does not significantly evoke emotions with less intensity than saturated colors. This research contributes to a deeper understanding of how pastel colors in audiovisual content can influence emotional responses, although their impact may be limited without the support of other cinematic elements.

Data availability

The datasets generated during and/or analyzed during the current study are available in the Zenodo repository, <https://doi.org/10.5281/zenodo.14516497>

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Author contributions

HJL: conceptualization, stimuli creation, project administration, investigation, data curation, writing-original draft preparation. CA-S: methodology, formal analysis, writing-review & editing, validation.

Competing interests

The authors declare no competing interests.

Ethical approval

Ethical approval: Approval was granted by the Ethics Commission for Research with Animals and Humans (CEEAH) of the Universitat Autònoma de Barcelona (Barcelona, Spain). This study was performed in accordance with the principles of the Declaration of Helsinki and relevant guidelines/regulations applicable when human participants are involved. The approval reference number is CEEAH 6048. The date of approval is October 21, 2022. The scope of the approval was 'The use of pastel color to evoke emotions in the audience'.

Informed consent

Informed consent was obtained digitally from all participants, following recommendations of the Ethics Commission. It covered participants' voluntary agreement to take part in the study, explaining the purpose, data anonymity and use, the absence of compensation, the lack of risks to them of participating, and consent to publish aggregated results without personal identification. Informed consent was obtained from all participants before their participation, which took place between December 8, 2022, and March 5, 2023.

Additional information

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