

Cinematic Emotions: How Films Influence Hormonal Responses and Viewer Physiology

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Abstract. Films are not only psychological stimuli but also physiological ones, capable of triggering significant hormonal changes in viewers. This paper explores how narrative structures, visual aesthetics, sound design, and emerging technologies like VR and 3D affect the endocrine system—particularly hormones such as dopamine, cortisol, and oxytocin. Drawing from neuroscience, psychology, and film studies, the article examines how these cinematic elements modulate emotional responses by activating neural and hormonal pathways. It also considers individual differences based on gender, age, and culture, highlighting how audience-specific factors influence physiological reactions. The findings suggest that film-induced hormonal responses are complex, multisensory phenomena with potential applications in therapy, media production, and emotional research.

Keywords: Movie, Hormone, Emotion, Media Studies.

1. Introduction

Film is a multifaceted visual art form designed to simulate experiences through moving images that convey ideas, stories, perceptions, emotions, aesthetics, or atmospheres. Modern cinema combines numerous elements that engage the audience's senses—such as plot, sound design, cinematography, and editing rhythm—into a cohesive experience. These components work synergistically to influence the human endocrine system, leading to the release of hormones that evoke complex emotions like joy, anger, fear, and sadness.

The endocrine system plays a critical role in maintaining human physiological balance, releasing hormones in response to both external and internal stimuli to preserve homeostasis. It comprises several key glands, including the hypothalamus, pituitary, adrenal glands, gonads (testes and ovaries), thyroid, parathyroid, and pancreas. Hormones such as dopamine (associated with pleasure and reward), adrenaline (linked to heightened alertness and stress), and oxytocin (promoting bonding and empathy) are especially relevant to the emotional responses induced by cinematic experiences [1].

Investigating how films affect hormonal responses not only deepens our understanding of the film-viewing experience but also holds significant practical implications. Insights from such research can be applied in fields such as psychotherapy, mental health intervention, marketing, and the design of emotionally driven media content. In the context of rapidly evolving technologies—such as virtual reality, 3D cinema, and immersive storytelling—it becomes increasingly important to comprehend the physiological impacts these experiences may have on audiences.

Accordingly, this paper aims to explore how specific cinematic elements—including narrative structure, visual design, music, and editing pace—interact with the endocrine system to stimulate fluctuations in hormones like dopamine, adrenaline, and oxytocin. By integrating findings from psychology, neuroscience, and film studies, this study seeks to uncover the physiological mechanisms underlying the emotional power of film and to contribute theoretical support to interdisciplinary research on emotion regulation.

2. The Impact of Plot on Hormones

Narrative structure is fundamental in eliciting emotional responses from viewers. By portraying complex character development, moral dilemmas, and orchestrated conflict, films generate empathy and stimulate intense emotional engagement, such as tension, anger, excitement, or compassion. When viewers become psychologically immersed in the storyline, the brain's mirror neuron systems

may activate, enabling a process known as “character identification.” This phenomenon allows viewers to internalize characters’ experiences as if they were their own.

Moreover, variations in narrative pacing and climactic events can significantly influence the autonomic nervous system. For instance, suspenseful sequences or unexpected plot twists can activate the sympathetic nervous system, leading to increased heart rate and blood pressure. Conversely, emotionally resonant or cathartic scenes tend to stimulate the parasympathetic system, often resulting in emotional release such as crying. These physiological reactions are closely linked to hormonal shifts, including elevated cortisol and enhanced oxytocin levels [2].

2.1 Dopamine

Dopamine is a neurotransmitter that plays a central role in pleasure, motivation, and reward processing. Recent advances in neuroscience indicate that suspenseful plots, emotional climaxes, and anticipation-driven narrative structures can effectively activate the brain’s reward circuitry, particularly the mesolimbic dopamine pathway. This pathway originates in the ventral tegmental area (VTA) and projects to the nucleus accumbens and prefrontal cortex, regions closely associated with anticipation, reward, and emotional processing. When viewers experience a sense of expectation—especially during narrative build-ups, turning points, or moments of delayed gratification—the brain naturally releases dopamine. This neurological response enhances attention, emotional involvement, and the memorability of key plot points while also generating pleasurable sensations. For instance, layered plot twists in psychological thrillers or emotional reunions in romantic dramas can trigger significant dopamine release. This creates a direct linkage between narrative design and hormonal response, forming a physiological foundation for how film storytelling modulates viewer emotion [3].

2.2 Cortisol

Cortisol is a primary stress hormone released by the adrenal cortex in response to perceived threats or emotional stress [4]. Horror and thriller films, characterized by their rapid pacing, eerie settings, and sudden shocks, often trigger strong stress responses. These responses include activation of the sympathetic nervous system and elevated cortisol secretion. While such stimuli can heighten short-term engagement, repeated exposure to intense narratives may contribute to emotional dysregulation and prolonged psychological stress. Some studies suggest that repeated immersion in anxiety-inducing storytelling can negatively affect viewers’ mental health over time [5].

2.3 Oxytocin

Oxytocin is commonly associated with emotional bonding, intimacy, and social connection. In emotionally intense dramas or romantic films, audiences often develop a sense of emotional resonance with characters, especially during scenes that highlight love, sacrifice, or familial bonds. This emotional engagement can lead to increased oxytocin secretion, fostering a sense of trust, empathy, and connection. This mechanism helps explain why certain characters or films leave lasting emotional impressions, even after the screen fades to black [6].

3. The Influence of Visual Elements

To further understand how visual elements such as color, lighting, and editing influence audience emotions, it is important to consider the cognitive and neural mechanisms underlying visual perception. Visual emotional stimuli are processed via dual neural pathways: a rapid subcortical route that sends information directly from the retina to the amygdala enables immediate emotional responses, especially to threats or intense stimuli, while a slower cortical pathway involving the visual cortex allows for detailed analysis and conscious emotional appraisal [7]. The amygdala, as a key emotional processing center, quickly reacts to salient visual cues, triggering autonomic responses and hormone release, such as adrenaline [8].

Moreover, the mirror neuron system is activated when viewers observe emotional expressions or actions on screen, facilitating empathy and emotional resonance that can increase hormones like oxytocin [9]. The integration of visual input with auditory and other sensory information enhances the emotional experience through multisensory processing networks. Additionally, the prefrontal cortex plays a regulatory role, modulating emotional reactions to visual stimuli through cognitive control mechanisms, thereby influencing the intensity of hormonal secretion [10].

This framework explains how carefully crafted visual elements in films do not simply create aesthetic effects but also engage neural circuits responsible for emotional and hormonal regulation, thus deepening the viewer's emotional immersion and physiological response.

3.1 Color and Lighting Intensity

Lighting intensity and color palette play crucial roles in shaping psychological and physiological responses. Different film genres utilize specific lighting and color strategies to convey mood and tone. For instance, action and science fiction films often employ high-intensity lighting and rapid flashing effects—such as explosions in *Terminator*—which stimulate the visual cortex and suppress melatonin production, keeping viewers alert and engaged. In contrast, horror films typically use low lighting and cool tones—such as the ominous skies in *The Conjuring* or the claustrophobic shadows in *Alien*—to induce fear and tension, raising adrenaline levels.

Warm hues like orange, pink, and gold—frequently seen in romance and fantasy films, such as the sunset-lit scenes in *Titanic*—can promote relaxation and emotional warmth, possibly triggering oxytocin release. While color and lighting often serve an artistic function, their psychological and hormonal effects vary significantly depending on the genre and directorial intent. For example, *La La Land* employs a dynamic color palette and lighting to reflect the emotional evolution of the protagonists' relationship, amplifying emotional resonance [11].

3.2 Editing Rhythm and Scene Design

Editing rhythm and scene composition significantly influence viewers' sensory and emotional experiences [12]. Fast-paced editing, common in action and spy thrillers, generates urgency and visual excitement. Rapid cuts can overstimulate the visual cortex and attention systems, activate the sympathetic nervous system, and prompt the release of adrenaline, which increases heart rate and respiratory rate. Conversely, slow-paced editing with longer shot durations allows more time for emotional processing and introspection, activating the parasympathetic system and reducing stress responses [13].

Scene design, including camera angles, spatial depth, and framing, also modulates emotional tone. For example, low-angle tracking shots—like those in *The Shining* following the child through hotel corridors—can create a heightened sense of isolation and suspense. Wide-angle shots may convey peace and openness or, depending on narrative context, evoke loneliness and emotional detachment [14].

3.3 VR and 3D Films:

Technological advancements such as three-dimensional (3D) cinema and virtual reality (VR) have significantly enhanced audience immersion. Compared to traditional 2D viewing, these immersive technologies more effectively stimulate sensory systems and trigger hormonal responses. For instance, research indicates that horror experiences in VR environments lead to significantly higher cortisol levels than those in 2D, highlighting the heightened physiological and emotional impact of immersive storytelling. According to the research by Rukshani Somarathna, VR has the potential to effectively and naturally evoke emotions by activating mechanisms of motivation and empathy, making it particularly potent medium for emotional engagement [15]. Also, Zhang and colleagues employed a novel approach combining EEG source imaging (ESI) and functional near-infrared spectroscopy (fNIRS) to study the neural effects of watching 3D films. Their findings revealed strong activation in the prefrontal and occipital lobes following 3D movie viewing. The occipital lobe is crucial for visual

processing, while the prefrontal cortex plays a key role in regulating emotion, behavior, and perception. Therefore, watching 3D films may influence visual processing, cognitive function, and emotional regulation in the brain [16].

4. The Impact of Music and Sound

Sound design in film—particularly through musical scores and audio effects—functions not merely as an emotional backdrop but plays a direct role in regulating audience emotion and hormonal responses. Distinct acoustic features—such as pitch, volume, tempo, harmony, and frequency density—activate specific neural pathways and elicit corresponding endocrine changes, influencing both psychological states and physiological reactions [17].

High-frequency sounds, rapid tempos, and abrupt acoustic shifts—such as screeching metal, explosions, or jump scares commonly used in horror films—can rapidly stimulate the auditory cortex and amygdala, triggering the sympathetic nervous system and leading to the release of stress-related hormones like adrenaline and cortisol. These sound cues generate tension and urgency, increasing heart rate and alertness, thereby intensifying the viewer’s engagement with suspenseful or high-stakes scenes [18].

Conversely, low-frequency, slow-paced, and harmonically rich music is more likely to activate the prefrontal cortex and hypothalamus, stimulating the parasympathetic nervous system. This activation promotes the release of calming hormones such as oxytocin, serotonin, and endorphins. Such compositions are often employed in scenes evoking intimacy, nostalgia, or melancholy—as in the tender piano themes of *Her* or the emotionally resonant Latin melodies of *Coco*—enhancing empathy and emotional connection with the characters [19].

Additionally, shifts in musical pitch and rhythm often parallel changes in narrative pacing, forming a kind of “emotional guide track.” When music aligns with story rhythm, the brain’s reward system is activated, leading to dopamine release and heightened sensations of pleasure and anticipation. Studies show that this multisensory integration affects not only the auditory system but also emotional processing and endocrine responses, deepening the viewer’s emotional involvement in the film [20].

In sum, film sound design is far more than an artistic choice—it acts as a powerful tool for emotional modulation and physiological response, reinforcing the psychological and physiological impact of cinematic storytelling.

5. Individual Differences in Hormonal Responses

5.1 Gender

Numerous studies have found gender-related differences in hormonal responses to cinematic stimuli. Women are generally more responsive to emotional and relational content, often exhibiting higher oxytocin release when watching romantic or family-centered films. This tends to result in deeper emotional engagement and more pronounced fluctuations in dopamine and cortisol. In contrast, men often show stronger stress-related hormonal responses when viewing action or suspense films but may exhibit reduced sensitivity to romantic narratives, suggesting distinct mechanisms of endocrine and emotional regulation [21].

5.2 Age

Age also plays a role in shaping hormonal responses to film. Younger viewers, due to greater neural plasticity and emotional reactivity, tend to show stronger hormonal responses to emotional stimuli. Older adults, while often emotionally stable, may process emotional content differently and recover from intense scenes more quickly. However, they may also be more susceptible to negative emotions, depending on personal and cognitive factors [22].

5.3 Cultural Background

Cultural context significantly influences how individuals experience and interpret films. Cultural values affect emotional expression, narrative preferences, and social behavior, which in turn shape hormonal responses. For example, American films often emphasize individual heroism, Indian cinema integrates musical expression, while Korean films may critique societal norms. These cultural narratives reflect differing values and expectations, which can lead to varying endocrine and emotional reactions to similar cinematic elements. For example, research indicates that Chinese audiences experience different emotional responses when watching Chinese and Western films. Although both types of films can effectively evoke emotions, culturally matched films tend to elicit stronger emotional reactions. Therefore, in most cases, viewers are more likely to resonate emotionally with content that aligns with their own cultural background, which may lead to more significant hormonal changes [23].

6. Conclusion

This paper, through a comprehensive review of existing literature, explores how diverse cinematic elements—including narrative, visual design, sound, and technological innovation—affect the human endocrine system and regulate hormones such as dopamine, cortisol, and oxytocin. The evidence suggests that film's emotional influence is multifaceted, involving complex interactions between sensory input, psychological processes, and physiological mechanisms. While each factor has been analyzed individually, their combined effect in real viewing experiences is far more nuanced. Different cinematic elements stimulate various sensory and psychological mechanisms that effectively promote hormonal responses, thereby modulating emotional states. Narrative structure and plot progression engage viewers' anticipation, empathy, and emotional investment, primarily promoting the release of dopamine and oxytocin. Moments of tension and unexpected events elevate levels of adrenaline and cortisol. Color and lighting stimulate the visual cortex and emotional centers such as the amygdala and pineal gland, indirectly influencing hormonal secretion. Editing rhythm and scene composition modulates the autonomic nervous system, inducing either arousal or relaxation, which correlates with emotional and physiological changes. Sound and music activate reward systems and areas involved in emotional resonance, influencing the release of dopamine and oxytocin. Emerging technologies like 3D and virtual reality, due to their immersive nature, produce stronger and more direct emotional and endocrine responses. Based on these findings, filmmakers can intentionally design narrative, color schemes, pacing, and soundscapes to guide emotional responses with greater scientific and emotional precision. Psychologists may adopt film as a tool for emotional induction or therapeutic intervention in both clinical and experimental contexts. Media theorists can reevaluate audiovisual language through the lens of sensory physiology and emotional impact. Future interdisciplinary research should integrate neuroimaging, physiological data, and subjective reports to systematically investigate the causal links between cinematic language and hormonal regulation and develop personalized emotional response models to support applications in education, therapy, and entertainment. Understanding how films modulate hormonal activity holds important implications for fields such as psychology, physiology, media studies, and even clinical therapy and emotional regulation.

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