

Comparative Study of Visual Stimulus Effects on Vital Signs

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ABSTRACT

Background: The rapid increase in screen time has led to greater exposure to various visual stimuli such as comedy and horror, which can influence autonomic responses and alter vital parameters like pulse rate and blood pressure. This study aims to evaluate and compare the immediate effects of these stimuli on vital signs in healthy young adults.

Methods: A prospective experimental study was conducted among 84 healthy volunteers aged 19–24 years. Baseline pulse rate and blood pressure were recorded in a seated position before exposure. Participants were then exposed sequentially to a 20-minute comedy video, a 20-minute horror video, and 20 minutes of relaxing music while blindfolded, with a washout period of 30 minutes between each stimulus. All stimuli were unfamiliar to the participants. Vital parameters were recorded immediately after each exposure. Data were analyzed using paired t-tests, and a p-value < 0.05 was considered statistically significant.

Results: A significant increase in pulse rate and systolic blood pressure was observed after exposure to both comedy and horror stimuli ($p < 0.001$), with a greater rise seen in horror. Diastolic blood pressure increased significantly only with horror ($p < 0.001$), while comedy showed no significant change. In contrast, relaxing music significantly reduced pulse rate and blood pressure ($p < 0.001$).

Conclusion: Visual stimuli exert measurable effects on cardiovascular responses, with horror content eliciting the greatest increase in heart rate. Comedy induces moderate stimulation, while music promotes relaxation. These findings highlight the influence of emotional visual content on autonomic regulation and underscore the need for mindful digital consumption.

Key-words: Visual stimuli, Pulse rate, Blood pressure, Autonomic response, Screen time

INTRODUCTION

Screen time refers to the duration and diversity of activities performed using digital devices [1]. Since the onset of the COVID-19 pandemic, electronic device usage has markedly increased [2]. Reports indicate that overall digital device usage rose by approximately five hours per day, with heavy users reaching up to 17.5 hours daily and non-heavy users averaging 30 hours per week [3].

Among young adults, humor, music, and entertainment have emerged as the most preferred forms of digital content.

Digital technology provided short-term psychological support during the pandemic, but prolonged use has been linked to threats to physical and mental health [4]. Excessive screen time has been associated with psychological problems, low emotional stability, and increased risk of depression and anxiety [5]. In preschool-aged children, studies found no consistent correlation between screen time and blood pressure, though screen exposure before bedtime was associated with elevated blood pressure [6]. Further research concluded that daily screen time was not consistently related to cardiometabolic risk factors in early childhood, though long-term effects remain a concern [7]. Excessive digital

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media use has also been implicated in impairing psychophysiological resilience among children and adolescents [8]. During the COVID-19 pandemic, excessive screen time was specifically associated with elevated blood pressure in children and adolescents [9].

Conversely, humor and laughter have demonstrated beneficial physiological effects. Mirthful laughter elicited by comic movies has been shown to improve vascular function [10]. Laughter therapy has been reported to enhance both physiological and psychological well-being in elderly populations [11]. Neuroimaging studies confirm that humor experiences produce distinct mental state changes and positive physiological effects, including reductions in blood pressure [12]. In contrast, exposure to stressful or fear-inducing stimuli has been associated with significant increases in heart rate and blood pressure [13].

Given these contrasting findings, it is essential to investigate the immediate physiological effects of different types of visual stimuli. This study was designed to compare the impact of comedy, horror, and music on vital signs—specifically blood pressure and heart rate—in healthy young adults. Establishing such correlations may provide insights into how digital content influences cardiovascular responses and could inform recommendations for healthier patterns of media consumption.

MATERIALS AND METHODS

Study Design and Setting- This prospective experimental study was conducted in the Department of Physiology laboratory at Shri Atal Bihari Vajpayee Medical College and Research Institute, Bangalore, under controlled environmental conditions.

Study Population and Sample Size- A total of 84 healthy volunteers aged 19–24 years were included in the study.

Inclusion and Exclusion Criteria- Participants aged 19–24 years with normal body mass index (18.5–24.9 kg/m²), no known medical illness, and not on any medication were included. Individuals with a history of chronic illness or those unwilling to provide informed consent were excluded.

Study Procedure- Baseline pulse rate and blood pressure were recorded in a seated position after adequate rest. Participants were then exposed sequentially to three

different stimuli: a 20-minute comedy video, a 20-minute horror video, and 20 minutes of relaxing music (with blindfold). All stimuli were unfamiliar to the participants and presented in their preferred language. A washout period of 30 minutes was maintained between each exposure to minimize carryover effects. Vital parameters were recorded immediately after each exposure.

Measurement of Variables- Blood pressure was measured using a mercury sphygmomanometer, and pulse rate was assessed by palpation of the radial artery. All measurements were obtained under standardized conditions to minimize observer and environmental variability.

Statistical Analysis- Data were analyzed using Microsoft Excel. Comparisons between baseline and post-exposure values were performed using the paired t-test. A p-value of < 0.05 was considered statistically significant.

Ethical Considerations- The study was conducted after obtaining informed consent from all participants. Confidentiality and anonymity were maintained throughout the study.

RESULTS

A total of 84 participants aged 18–24 years were included in the study. The effects of different visual stimuli on pulse rate and blood pressure are summarized in Tables 1–3.

Pulse rate showed significant variation across different stimuli (Table 1). A statistically significant increase in pulse rate was observed following exposure to both comedy and horror stimuli compared to rest ($p < 0.001$), with a greater rise noted in response to horror stimuli. In contrast, exposure to blindfolded relaxing music resulted in a significant reduction in pulse rate ($p < 0.001$).

Table 1: Effect of Visual Stimuli on Pulse Rate

Condition	Mean \pm SD	p-value (vs)
Rest	77.46 \pm 6.62	—
Comedy	87.83 \pm 6.86	< 0.001*
Horror	102.80 \pm 8.10	< 0.001*
Blind folded relaxing	69.77 \pm 6.01	< 0.001*

Systolic blood pressure also demonstrated significant changes with different stimuli (Table 2). Both comedy

and horror stimuli produced a statistically significant increase in systolic blood pressure compared to baseline ($p < 0.001$), with the highest values observed during horror exposure. Conversely, blindfolded relaxing music led to a significant decrease in systolic blood pressure ($p < 0.001$).

Table 2: Effect of Visual Stimuli on Systolic Blood Pressure

Condition	Mean \pm SD	p-value (vs)
Rest	121.57 \pm 2.88	-
Comedy	126.24 \pm 3.00	< 0.001*
Horror	131.17 \pm 2.83	< 0.001*
Blind folded relaxing	118.57 \pm 2.86	< 0.001*

Diastolic blood pressure responses varied depending on the type of stimulus (Table 3). While comedy exposure did not produce a statistically significant change ($p = 0.25$, i.e. > 0.05), horror stimuli resulted in a significant increase in diastolic blood pressure ($p < 0.001$). In contrast, blindfolded relaxing music was associated with a significant reduction in diastolic blood pressure ($p < 0.001$).

Table 3: Effect of Visual Stimuli on Diastolic Blood Pressure

Condition	Mean \pm SD	p-value (vs)
Rest	78.57 \pm 4.93	-
Comedy	78.90 \pm 5.01	> 0.25 (NS)
Horror	88.14 \pm 7.49	< 0.001*
Blind folded relaxing	75.90 \pm 4.26	< 0.001*

Overall, horror stimuli elicited the most pronounced increase in cardiovascular parameters, whereas blindfolded relaxing music demonstrated a calming effect, leading to reductions in both pulse rate and blood pressure.

These findings are further illustrated graphically in Fig. 1–3. The graphical representations clearly demonstrate the trend of an increase in cardiovascular parameters with horror stimuli and reduction with blindfolded relaxing music.

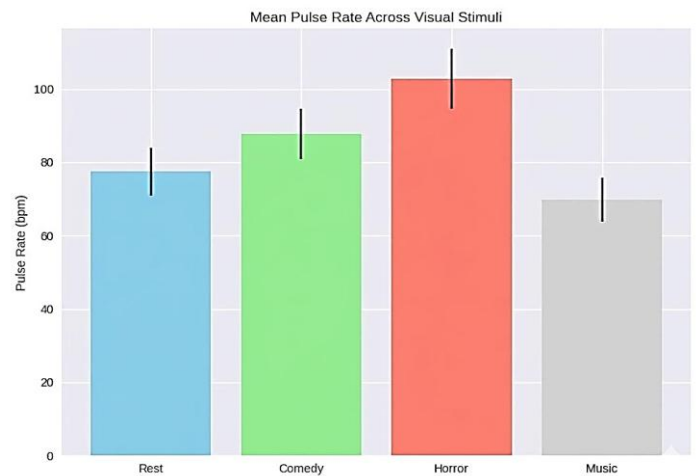


Fig. 1: Graph showing mean pulse rate across various stimulus

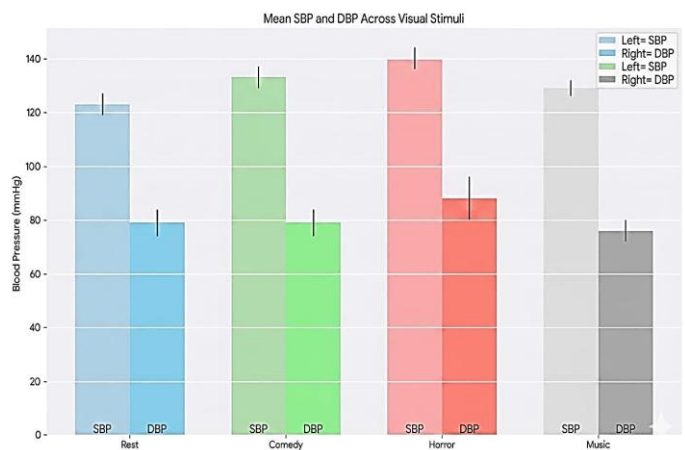


Fig. 2: Graph showing mean blood pressure across various stimulus

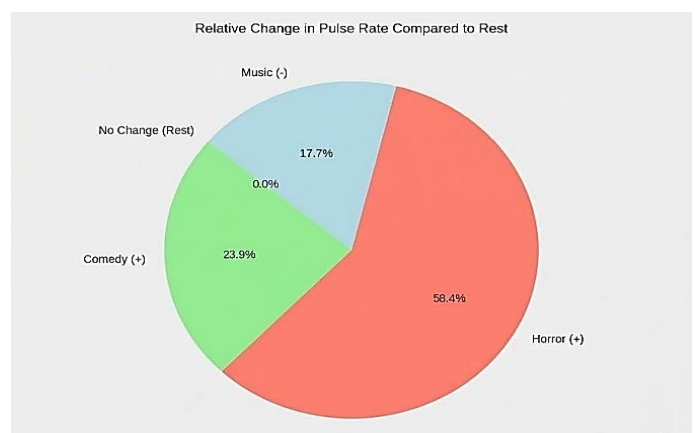


Fig. 3: Graph showing percentage change in pulse rate compared to Rest

DISCUSSION

This study demonstrated that different visual stimuli exert distinct effects on vital signs in young adults. Comedy stimuli resulted in a statistically significant increase in pulse rate and systolic blood pressure, while



horror stimuli produced a more pronounced and highly significant rise in these parameters. In contrast, exposure to relaxing music with no visual stimulus led to a statistically significant reduction in pulse rate and blood pressure. These variations can be attributed to differential activation of the autonomic nervous system. Emotional stimuli are known to modulate the balance between sympathetic and parasympathetic activity through central autonomic networks, thereby influencing cardiovascular responses^[14].

These findings align with prior literature. Mirthful laughter has been shown to improve vascular function^[10] and enhance psychological well-being^[11]. Neuroimaging studies further support the beneficial physiological effects associated with humor^[12]. Additionally, studies have demonstrated that watching comedy videos can significantly influence vital signs, including heart rate and blood pressure^[15]. Our results corroborate these observations, as comedy exposure produced favorable cardiovascular responses compared to horror stimuli.

Although comedy stimuli resulted in a statistically significant increase in pulse rate, this response likely reflects positive emotional arousal rather than stress. Laughter is known to enhance parasympathetic activity, improve vascular function, and reduce stress-related physiological responses, thereby exerting an overall beneficial effect on cardiovascular health. This phenomenon may be explained by improved autonomic regulation and enhanced parasympathetic activity associated with positive emotional states, as supported by studies on brain–heart interaction and autonomic control^[14]. Furthermore, the initial rise in sympathetic activity observed during comedy exposure may be followed by a parasympathetic rebound; however, further longitudinal studies are warranted to elucidate this pattern and confirm the underlying autonomic mechanisms.

Exposure to stressful or fear-inducing content has previously been linked to significant increases in heart rate and blood pressure^[13]. The present study confirms this association, with horror stimuli eliciting the greatest and statistically significant rise in vital parameters, including both systolic and diastolic blood pressure. This response is mediated by activation of stress pathways and increased sympathetic arousal, which have been shown to alter heart rate variability and cardiovascular

responses under stress conditions^[16]. These findings highlight the potential cardiovascular risks of consuming stressful digital content, particularly in susceptible individuals.

Conversely, music exposure with no visual stimulus demonstrated significant calming effects, reflected by reductions in pulse rate and both systolic and diastolic blood pressure. This effect is likely mediated through enhanced parasympathetic activity and reduced sympathetic tone. Recent studies have demonstrated that music listening significantly modulates autonomic nervous system activity and improves heart rate variability, thereby contributing to reduced cardiovascular stress^[17,18].

Overall, the study emphasizes the importance of content type in influencing physiological responses during screen time. Comedy and music with no visual stimulus may be considered relatively safer or beneficial stimuli, whereas horror content may induce significant cardiovascular stress responses, particularly in individuals with underlying vulnerabilities.

LIMITATIONS

The present study has certain limitations. The duration of exposure to visual stimuli was relatively short, which may not reflect the long-term physiological effects of such stimuli. Additionally, the study population was restricted to a narrow age group of young adults, limiting the generalizability of the findings to other age groups. Therefore, future research involving larger and more diverse populations is recommended to obtain more comprehensive insights.

CONCLUSIONS

Visual stimuli significantly influence cardiovascular parameters in young adults. Horror stimuli produced the greatest increase in pulse rate and blood pressure, indicating a strong sympathetic response, while comedy stimuli resulted in moderate increases. In contrast, exposure to relaxing music with no visual stimulus led to a significant reduction in pulse rate and blood pressure, reflecting a calming effect. These findings suggest that the type of content consumed can meaningfully impact physiological well-being.

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