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Performance Creativity Enhancement Method Based on Emotional Analysis and Concentration

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Abstract. *Intelligent performance creativity is a new research direction of the intersection of technology and art. At present, the cutting-edge technologies such as computer simulation, emotional computing and machine learning have been applied to the evaluation and enhancement of intelligent performance creativity. The application of these technologies has greatly increased the diversity of performance forms and the complexity of performance content. For the traditional stage performance, due to the lack of timely feedback from the audience, it is difficult for the director to enhance the creativity effectively. In order to solve this problem, this paper proposes concentration level enhancement method (CLEM). The CLEM extracts and analyzes the physiological and emotional characteristics of the audience by collecting the multimodal physiological signal data of the audience. Through the analysis of the features, the concentration information of the audience is obtained and the concentration level (CL) is defined. Based on the physiological and emotional induction mechanism, a performance creativity enhancement strategy is proposed, which enhances the performance creativity in two aspects: " Visual-based" and " Content-based". Through the concentration level enhancement method, compare the audience's performance attention changes before and after the performance creativity enhancement, select the effective strategies to enhance the performance creativity, and provide the director with quantifiable performance creativity enhancement feedback results. The experimental results show that the CLEM proposed in this paper can effectively induce significant changes in the audience's emotion, and the selected creative enhancement strategy can significantly improve the audience's concentration and achieve the purpose of enhancing the creativity of the performance.*
Keywords:

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1. **Introduction.** Under the social background of pluralistic ideology, the forms and creative ideas of artistic practice show the characteristics of diversification and multidimensionality. The traditional creative process of performance dominated by director's experience generally has the problems of long planning cycle and huge consumption of social resources. At present, cutting-edge technologies such as deep learning and cloud computing are widely used in many fields of society [1-5]. Due to the wide application of Internet and multimedia technology, the form and content of stage performance presents more and more novel means of expression and emotional expression. In this context, this paper focuses on how to improve the creativity of the performance more effectively, so as to actively control and exert a positive influence on the content and effect of the performance. With the development of new generation information technology such as artificial intelligence, the digital expression method for performing creativity has gradually become an important means to solve the above problems.

As early as 1990, Throsby [6] put forward a set of criteria for judging the quality of the performing arts, which confirmed the importance of performance quality in influencing the demand and creation of the performing arts. Based on the two-dimensional emotional space theory of "stimulation-potency", Yan et al. [7] puts forward an emotion monitoring model for performance by collecting the physiological signal characteristics of the audience. This study uses EEG data to detect audience participation in real time, and tries to improve the performance effect by emotional stimulation when the participation is reduced. In recent years, with the improvement of computer hardware and computing power, the powerful ability of automatic feature extraction can effectively determine better features, thus improving the efficiency of the model recognition system. The research fields of computer vision [8-12] and natural language processing [13-15] are developing rapidly. In [13], an attention segmental recurrent neural network (ASRNN) based on hierarchical attention nerve semi-Markov conditional random field model is proposed for sequence tagging. From the point of view of the interaction between the audience and the

performance, Rossana et al. [16] proposed a framework that relies on artificial intelligence technology to enhance the interaction between the audience and the performer, automatically detect and classify the emotions of the audience in the process of interaction, and enhance the effect of stage creation according to the emotional changes of the audience. This study combines the emotional evaluation of the audience with the stage creation of live performance to form a new paradigm of stage drama creation based on digital media.

1.1. **Related Work.** In this section, we briefly summarize the previous research work on deep learning in dance performance evaluation and text mining. Radbourne et al. [17] first proposed to monitor the emotional changes of the audience in live performances, and emphasized the importance of Engagement. Radbourne et al. [18] believes that whether the audience can correctly stimulate the emotion of watching the performance is the key to the performance evaluation. Sauter [19] described the stage environment as "a communication space between performers' behavior and audience feedback" in his preliminary study of audience experience (Audience Experience). In 2011, Latulipe et al. [20] used galvanic skin response (GSR) data to monitor the emotional arousal of six audiences in dance performances. The study divides the performance attributes into two categories: LH scale and ER scale, which represent the audience's love for the performance and the arousal degree of the performance content to the audience. The results show that the value of GSR is positively correlated with the arousal degree of ER. Wang et al. [21] uses GSR signal to synchronously monitor the emotional state of 15 subjects in the live performance. The study makes a cluster analysis of all the audiences through the obtained GSR values. The results show that the data of 10 subjects are closely related. Martella et al. [22] understands and analyzes the feedback of the audience in the live performance, and calculates the acceleration of the subjects' body movements through the three-axis accelerometer. Quantify complex emotional experiences such as "enjoyment" (Enjoyment) or "immersion" (Immersion). By calculating the dynamic changes of acceleration, the prediction accuracy of studying whether the audience is in the "enjoyment state" is nearly 90%. The study of Radford et al. [23] confirmed that when users watched highly awakening stimuli, the interhemispheric coherent waves (EEG coherence) increased significantly. The amplitude interaction of paired EEG electrodes [24] has been shown to be related to positive arousal in the emotional state. According to the affective four-quadrant theory proposed by Koelstra and Patras [25], 32 performing affective evoked materials have been divided into four affective grades: "high arousal high valence" (HAHV), "high arousal low valence " (HALV), "low arousal high efficiency valence" (LAHV) and "low arousal low valence " (LALV). Pinto et al. [26] processes ECG, EMG and skin electrical signals. Using samples from 55 subjects, unimodal and multi-peak methods are used to analyze which signals or signal combinations can better describe emotional changes.

1.2. **Motivation and contribution.** The main purpose of the enhancement of performance creativity is to improve the effect of stage performance. The simulation, control and optimization of performance creativity process by computer simulation is one of the main research directions. The above research not only contributes to the evaluation of performance quality and effective feedback from the audience, but also brings inspiration to me. However, due to the complex performance environment and many elements, it is difficult to judge whether these performance evaluation and feedback acquisition methods have a positive effect on the performance creativity itself. At present, there is no research on the specific quantification and comparative analysis of the elements and methods of performance creativity.

The contribution of the research content of this paper mainly lies in the design of creativity enhancement rules based on performance elements, the establishment of creativity enhancement methods based on "visual effect" and "stage art", and the formation of performance creativity enhancement strategy. This paper proposes a concentration level enhancement method (CLEM). By comparing the changes of the audience's concentration before and after creativity enhancement, this method selects strategies that can effectively enhance performance creativity. The method provides the director with quantifiable performance creativity enhancement feedback results, solves the problem that the traditional stage performance is difficult to give efficient feedback to the director in the creative process, and achieves the purpose of improving the performance creativity.

1.2.1. *Layout of the paper.* This paper is organized as follows: the second section reviews the relevant research works. The third section introduces the methods proposed in our study in detail. The experimental results are given in the fourth section. The fifth section summarizes and looks forward to the next work.

2. **Preliminaries.** The main research idea of this paper is to collect the multimodal physiological signal data of the audience, extract and analyze the physiological and emotional characteristics of the audience, and form a Emotional Characteristics Quantitative Model (ECQM) with time series features. Analyze the quantitative model of emotional characteristics to get the ideas to be modified, extract the audience's attention information, and define the Concentration Level (CL). as the reference standard (Ground Truth). The concentration level is divided into Positive, Neutral and Negative. The clips with low concentration level are marked as Negative, and the performance creativity enhancement strategy is applied to these clips. And collect the audience to watch the enhanced creativity of the concentration level (CL'), and finally through the comparative detection of CL and CL', the implementation of effective strategies for creative enhancement of the performance.

In this paper, according to the description of Gross's emotional regulation theory put forward by Mcrae et al. [27], human emotion can be regulated by expressing depression and cognitive reassessment, in which cognitive reassessment is the best way to regulate negative emotion. Based on the idea of Gross, this paper starts with the strategy of cognitive re-evaluation to enhance the creativity of the original emotion-induced material, so as to re-induce emotional changes to achieve the purpose of regulating audience emotion. Specifically, we design the rules of emotion-induced creativity enhancement, formulate two creative enhancement methods of Visual-based and Content-based respectively, and modify the shot clips marked as Negative in CL. Among them, the creative enhancement method of Visual-based mainly produces different emotional stimulation to the audience by adjusting the visual parameters of the original emotion-induced video, while the creative enhancement method of Content-based mainly produces emotional stimulation to the audience by modifying the stage elements dominated by the performance content.

2.1. **Analysis of Affective Evoked Variables.** According to the different performance types and the video characteristics of the emotion-induced material provided in this paper, we analyze the emotion-induced variables. The performance elements that affect the visual effect include: color, music, sound effects, props, clothing, lighting and so on. The director can produce different performance effects through the adjustment of these performance elements. Among them, the color change based on visual effect and the change of light source state are the main features of emotion induction [28]. Through analysis and comparative testing, this paper analyzes the emotional inducing ability of the following performance elements.

2.1.1. *Color element analysis.* In the basic theoretical knowledge of color, any kind of color light source can be expressed by the combination of three basic quantities: brightness, hue (color temperature) and saturation. Therefore, brightness, hue and color saturation are collectively referred to as three elements of color [29]. In the human visual imaging system, the image is carried out through the cones, and the color sensor is the three kinds of cones in the retina. According to the different wavelengths of light, these three kinds of cells are divided into S, M and L photoreceptor cells. The output values of these three kinds of photoreceptor cells together make up the visual color presented to humans. In computer vision, the color system mainly adopts RGB color space. R, G and B refer to three specific wavelengths of light, which can form a linear color space. In the performance video evaluation experiment, one of our main concerns is the color temperature and saturation of the performance video. Color temperature is a physical quantity used to quantitatively describe the color of light. At a certain light source and a certain temperature, the light color of the light source is exactly the same as that of the complete radiator at that temperature. In this case, the temperature of the complete radiator is the color temperature of the light source, denoted by the symbol Tc, in Kelvin K. Different color temperatures can not only affect people's feelings of cold and warm, but also further affect people's physiological and psychological indicators. In the process of performance, the color temperature of the stage background and the color in the scene often have varying degrees of impact on the visual perception of the viewer, and then affect the psychological indicators of the viewer. For example, when we see red, purple and orange, we will have a warm feeling, and when we see blue, cyan and white, we will have a cool feeling. In the international color temperature standard document stipulated by the International Lighting Commission (CIE) [30], the color temperature is divided into three groups, as shown in Table 1. The director can have an impact on the viewer's

Table 1. Creative enhancement comparison table based on color temperature

Color Temperature Group	Group Name	Value
Str_c1	Warm	¡3000
Str_c2	Intermediate	3000 - 5000
Str_c3	Cold	¿5000

physiology and psychology by adjusting the color temperature of the background and stage lights. This kind of influence changes the viewer's evaluation of the performance, and even leads to a change in the audience's emotional tendency. The director can adjust the performance creativity according to the feedback of these changes. Saturation is also

Table 2. Creative enhancement comparison table based on color saturation

Color Saturation Group	Group Name	White Light Ratio
Str_s1	Very High	0 ∼25%
Str_s2	High	25%∼50%
Str_s3	Low	50%∼75%
Str_s4	Very Low	75%∼100%

one of the core elements of color, which is affected by spectral purity. The proportion of white light determines the color saturation [31]. When the white light ratio is 0, the saturation is the highest; when the white light ratio is 100, the saturation is the lowest. We use the percentage of white light to measure saturation, which ranges from 0% to 0%

100%. In the performance video, the change of the color temperature and saturation of the stage light can have a positive or negative impact on the audience psychologically or physically to a certain extent. This plays a guiding role in reasonably coordinating the characteristics of color lighting with the feelings of the audience, so that the audience can give more objective and positive evaluation to the performance video. In the creativity evaluation experiment, we divided saturation into the following categories, called saturation tables, as shown in Table 2.

2.1.2. *Luminance element analysis.* Brightness refers to the degree of light and shade of color, and it is the perceptual attribute of the visual system to the radiation or luminous intensity of visible objects. Brightness in LAB color space, brightness is a reflection of human subjective bright feeling. We define when the luminance value is adjusted to form a luminance table of four levels, as shown in Table 3.

Table 3. Creative enhancement comparison table based on luminance

Luminance Group	Group Name	Luminance Value
Str_l1	Very Dark	0 ∼25%
Str_l2	Dark	25%∼50%
Str_l3	Bright	50%∼75%
Str_l4	Very Bright	75%∼100%

2.2. **Sound effect elements analysis.** Sound is an indispensable part of life. The ticking sound of Rain water landing, the siren of galloping vehicles, the laughter of kindergarten and so on, constitute a colorful world. Sound effects are like the blood and soul of performing works, leading people to feel the ups and downs of the plot, deeply analyze the deep connotation of the works, and arouse the audience's thinking to understand the connotation and true meaning of the works. Sound effects greatly satisfy people's feelings about the authenticity of sound, enhance the artistic beauty of the whole work, make the audience feel the high-quality works derived from life and higher than life, and constantly enhance the maximum value of works of art. The main use of sound effect is to help the narrative of the plot, it will run through the performance works, make the whole work look more vivid and rich, and constantly add interest to the plot. Sound effect is to create an atmosphere, so that the audience can receive visual information while hearing is stimulated and stimulated [32].

Sound effect can enhance the comprehensive artistic expression of performance from the dimension of sound performance. Narrative narration, natural sound effects related to the performance process, and emotional music can all promote the plot and convey emotion. Sound effect can help to form the sense of spatial volume and structure in the performance. The dimension and distance of sound are received through the audience's own ability to deal with acoustic information, combined with the role of stage visual information. It can make the audience more immersed in the performance. In addition, in the timeline of the stage performance, the plot usually develops faster than the real time. Sound effects also play a role of coherent plot and switching time between these jumping and incomplete plot paragraphs. In addition to the original emotion-induced material, the director can also influence the subjective and physiological emotion of the final viewer by adding some different elements of sound effects. In this link, this paper will adopt the method of single-factor control variables and add different background sound effects one by one to compare with the original video. The elements added are shown in Table 4.

Table 4. Creative enhancement comparison table based on sound effect

Sound Effect Group	Group Name
Str_e1	Fierce Storm
Str_e2	Noisy Crowd
Str_e3	Birdsong
Str_e4	Ocean Wave

2.2.1. *Stage art elements analysis.* In the process of stage performance, the background video of the stage, the costume design of the actors, the lighting design of the stage and the performance actions of the actors will have a strong visual and emotional guidance to the visual attention of the audience. In this paper, in the analysis of the creativity enhancement of the performance elements, the stage background videos of different colors and patterns are combined or replaced to achieve the purpose of changing the dance design. Secondly, the actor costume design plays a role in shaping the character and setting off the performance theme, plays a key role in the audience's understanding of the performance plot and story line, and affects the audience's cognition of the concepts of character, values, aesthetics and so on. In the experiment, the costume design of the actors is adjusted, mainly by changing the hue, texture and shape of the clothing as the mechanism of emotional induction. The body movements of the actors, especially those of the dancers, play a decisive role in expressing the core ideas of a performance and showing the beauty of the dance. Finally, the lighting design of the stage performance is the regulating factor that can best guide the audience's attention. it can directly guide the audience's attention to a specific performance area or performance elements, and turn the part of the stage into visual focus in the most direct way. this method effectively enhances the spatial characteristics of the audience's physiological and emotional space sequence. Therefore, starting with these four elements, this paper modifies and verifies the performance content on the interactive digital performance simulation platform. The above four physical elements based on performance content are designed according to the following aesthetic features and artistic styles, as shown in Table 5.

Table 5. Creative enhancement comparison table based on stage art design

Design Category	Group	Group Name
Backgroud Video	Str_ v1	Polychromatic background change
	Str_ v2	Monochromatic background change
Clothing Design	Str_d1	Simple style
	Str_d2	Folk dress style
Lighting Design	Str_i1	Light and shadow transformation
	Str_i2	Color transformation
Performing Action	Str_m1	Classical dance style
	Str_m2	Ballet style
	Str_m3	Modern dance style
	Str_m4	Folk dance style

2.3. **Analysis and Evaluation of Performance Creativity.**

2.3.1. *Analysis of performance creativity.* The evaluation method of performance creativity based on Co-training is adopted in this paper. As a very classical semi-supervised

learning algorithm, Co-training has the advantage of using a relatively small amount of labeled data and a large number of unlabeled data for learning. Based on the characteristics of Co-training algorithm, its requirement for data is "multi-view", and the data faced by the algorithm is required to have at least two sufficient and conditionally independent views. The physiological emotion data and subjective emotion data extracted in this study have the characteristic information of both time and space dimensions, which accords with the characteristics of "multi-view". And the data divided according to the two dimensions contain enough information for learning in each view and are conditionally independent. In this paper, the physiological signal data and evaluation of the audience correspond to each other, so the information of the two views in the output space is consistent. For the same performance video, the audience's eye movement, heart rate, expression and other physiological signal data are collected synchronously. For example, through facial expression analysis, the audience shows a happy mood in a certain period of time, and their heart rate will rise at the same time. From this, we can preliminarily verify the excitement of the audience, and to a large extent, we can draw the conclusion that the audience has a positive attitude towards this performance segment. It is obvious that the "complementarity" of these data facilitates the learning of the model.

We divide the emotionally induced video material into multiple shots according to the time sequence, and the segmentation principles are different for different performance types: the segmentation of movie video can be divided according to the structure of shot language, and the performances such as drama and dance drama can be divided according to scene or plot structure.

We use the audience's subjective emotional characteristics space-time series S_e to label the physiological characteristics space-time series S_P in the time segment T time range. Among them, the subjective evaluation of the audience is usually general or aimed at some time segments, which cannot accurately cover all the time segments. We think that the subjective emotional characteristics do not have the characteristics of complete time series, so the S_e in this study has partial time series characteristics, and only when the S_e is consistent with the S_P in the corresponding time segment T, Co-training is carried out.

Our analysis and evaluation algorithm for performance creativity is as follows:

Algorithm 1

Input:
Labeled sample set $S_{pa} = \left\{\left(\left\langle s_{p1}^{*1}, s_{p1}^{*2}\right\rangle, s_1\right), \ldots, \left(\left\langle s_{pa}^{*1}, s_{pa}^{*2}\right\rangle, s_a\right)\right\}$;
Unlabeled sample set $S_{pb} = \left\{\left(\left\langle s_{p(a+1)}^{*1}, s_{p(a+1)}^{*2}\right\rangle\right), \ldots, \left(\left\langle s_{p(a+b)}^{*1}, s_{p(a+b)}^{*2}\right\rangle\right)\right\}$;
Buffer pool size k;
The number of positive examples selected in each round m;
The number of negative examples selected in each round n;
Basic learning algorithm L;
Number of learning rounds T;
Process:
1: k samples randomly selected from S_pb to form buffer pool S_pk;
2: $S_{pb} = S_{pb} \backslash S_{pk}$;
3: **for** $j = 1, 2$ **do**
4: $\quad S_{pa}^{j} = \left\{\left(s_{pi}^{j}, s_i\right) \mid \left(\left\langle s_{pi}^{j}, s_{pi}^{3-j}\right\rangle, s_i\right) \in S_{pa}\right\}$
5: **end for**
6: **for**$j = 1, 2, \ldots, T$ **do**
7: $\quad$ **for** $j = 1, 2$ **do**
8: $\quad\quad h_j \leftarrow L\left(S_{pa}^{j}\right)$;
9: $\quad\quad$ Examine the classification confidence of h_j on $S_{pk}^{j} = \left\{s_{pk}^{j} \middle| \left\langle s_{pi}^{j}, s_{pi}^{3-j}\right\rangle \in S_{pk}\right\}$, select m samples with the highest confidence in positive cases $S_{pm} \in S_{pk}$ and n samples with the highest confidence in counterexamples $S_{pn} \in S_{pk}$;
10: $\quad\quad$ Pseudo mark positive example $\widetilde{S}_{pm}^{3-j} = \left\{\left(s_{pi}^{3-j}, +1\right) | s_{pi}^{j} \in S_{pm}^{j}\right\}$ generated by S_{pm}^{j};
11: $\quad\quad$ Pseudo mark positive example $\widetilde{S}_{pn}^{3-j} = \left\{\left(s_{pi}^{3-j}, +1\right) | s_{pi}^{j} \in S_{pn}^{j}\right\}$ generated by S_{pn}^{j};
12: $\quad\quad S_{pk} = S_{pk} \backslash (S_{pm} \cup S_{pn})$;
13: $\quad$ **end for**
14: $\quad$ **if** h_1, h_2 have changed **then**
15: $\quad\quad$ **break**
16: $\quad$ **else**
17: $\quad\quad$ **for** $j = 1, 2$ **do**
18: $\quad\quad\quad S_{pa}^{j} = S_{pa}^{j} \cup \left(\widetilde{S}_{pm}^{j} \cup \widetilde{S}_{pn}^{j}\right)$;
19: $\quad\quad$ **end for**
20: $\quad\quad$ $2m + 2n$ samples were randomly selected from S_{pb} and added to S_{pk}
21: $\quad$ **end if**
22: **end for**
Output:h_1, h_2

2.3.2. *Emotional feature classification.* The distributions of S_P and S_e are two kinds of nonlinear separable samples. We introduce kernel function to introduce samples from low-dimensional space into high-dimensional space, and then obtain the optimal classification surface to solve the nonlinear classification problem of two kinds of feature distribution. According to the distribution of S_P and S_e in the feature space obtained in this paper, the optimal classification plane of the original feature space and high-dimensional space is shown in Figure 1, in which the round point is the physiological and emotional feature S_P and the square point is the subjective emotional feature S_e.

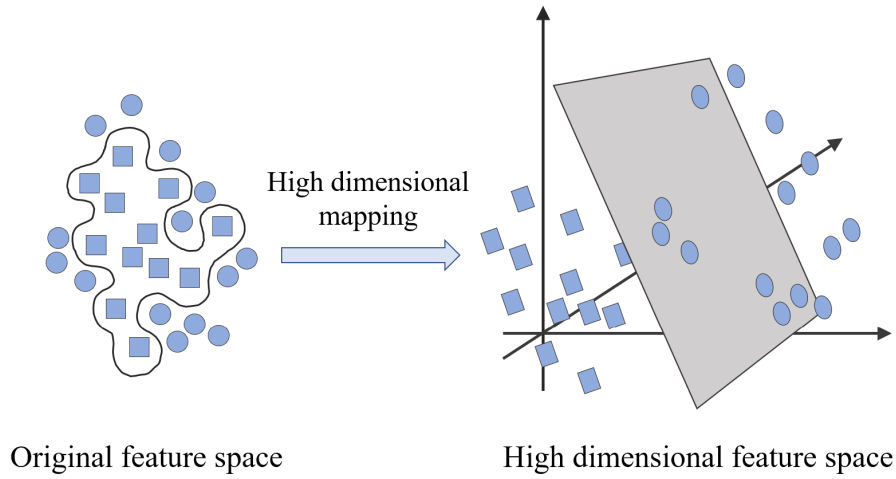

Figure 1. Nonlinear classification space mapping

First of all, Lagrange function is introduced:

$$L(w,b,a) = \min_{w,b} \frac{1}{2}\|w\|^2 - \sum_{i=1}^{n} a_i \{y_i [w.x_i + b = 0] - 1\} \tag{1}$$

When the following constraints are met:

$$\sum_{i=1}^{n} y_i a_i = 0, \quad a_i \geq 0, \quad i = 1, 2, \ldots, n \tag{2}$$

Solve the Lagrangian coefficient A corresponding to each sample:

$$Q(a) = \sum_{i=1}^{n} a_i - \frac{1}{2} \sum_{i,j=1}^{n} a_i a_j y_i y_j (x_i.x_j) \tag{3}$$

We assume that the nonlinear mapping is:

$$x \to \varphi(x) \tag{4}$$

The above formula can be transformed into:

$$Q(a) = \sum_{i=1}^{n} a_i - \frac{1}{2} \sum_{i,j=1}^{n} a_i a_j y_i y_j \varphi(x_i) \varphi(x_j) \tag{5}$$

Introduce kernel function:

$$K(x_i, x_j) = \varphi(x_i) \varphi(x_j) \tag{6}$$

From this, we can get:

$$Q(a) = \sum_{i=1}^{n} a_i - \frac{1}{2} \sum_{i,j=1}^{n} a_i a_j y_i y_j K(x_i, x_j) \tag{7}$$

Finally, we get that the discriminant function of the optimal classification surface is:

$$f(x) = \operatorname{sgn}\left(\sum_{x_i \in SV} a_i^* y_i K(x_i, x_j) + b^* \right) \tag{8}$$

For each class of samples, the distances between the positive and negative samples in the class and the hyperplanes of their respective classes are as follows:

$$d_{i+} = \frac{\left|\widehat{w}^T (x_i - x_+)\right|}{\|\widehat{w}\|} \tag{9}$$

$$d_{i-} = \frac{\left|\widehat{w}^T (x_i - x_-)\right|}{\|\widehat{w}\|} \tag{10}$$

Because the distribution of emotional characteristics in this paper is nonlinear, using nonlinear mapping, it can be concluded that the central point of positive and negative classes is the following:

$$\emptyset (x_+) = \frac{1}{n_+} \sum_{i=1}^{n_+} \emptyset (x_i) \tag{11}$$

$$\emptyset (x_-) = \frac{1}{n_-} \sum_{i=1}^{n_-} \emptyset (x_i) \tag{12}$$

Similarly, the kernel function is introduced:

$$\widehat{W} = \varphi (x_+) - \varphi (x_-) \tag{13}$$

Get the distance from the positive and negative samples to the hyperplane in their respective classes:

$$d_{k+} = \frac{\left|\hat{w}^T (x_k - x_+)\right|}{\|\hat{w}\|} = \frac{\left|value_{k_+}\right|}{D} \tag{14}$$

$$d_{k-} = \frac{\left|\hat{w}^T (x_k - x_-)\right|}{\|\hat{w}\|} = \frac{\left|value_{k_-}\right|}{D} \tag{15}$$

3. **Strategy of Performance Creativity Enhancement.** According to the above analysis and comparison of the performance elements, this paper statistics the content of the performance creativity enhancement strategy, the specific enhancement strategy is shown in Table 6. Aiming at the selected enhancement strategy, this paper uses the single factor variable method to carry out the experiment, that is, only one enhancement strategy is carried out at a time, and the comparison of strategy combination schemes is not carried out, in order to quantify the ability of each performance element to enhance performance creativity. However, the experiment of strategy combination cannot accurately measure the proportion of each performance element, so this paper does not consider the combination mode for the time being.

Table 6. Strategy of performance creativity enhancement

	Policy Category	Strategy Selection
Visual-based	Color Temperature	Str_c1, Str_c3
	Color Saturation	Str_s1, Str_s4
	Luminance	Str_l2, Str_l3
	Sound Effect	Str_e1, Str_e2, Str_e3, Str_e4
Content-based	Background Video	Str_v1, Str_ v2
	Clothing Design	Str_d1, Str_d2
	Lighting Design	Str_i1, Str_i2
	Performing Action	Str_m1, Str_m2, Str_m3, Str_m4

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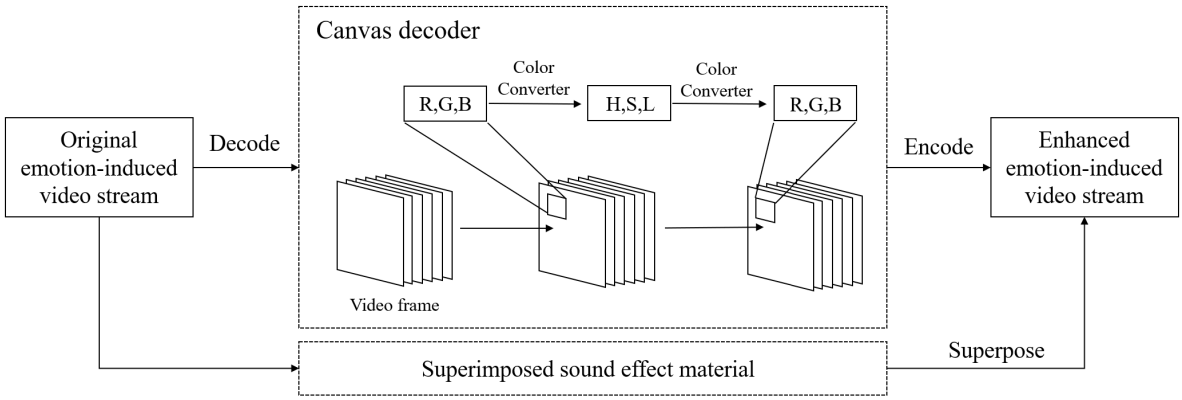

Figure 2. The principle of creativity enhancement based on visual effect

4. **Performance Creativity Enhancement Based on Visual Effects.** The creative enhancement of visual effect adopts a video frame effect adjustment method based on Canvas decoder, and the specific implementation process is shown in Figure 2. In the Canvas decoder, the RGB value of each picture pixel of the original emotion-induced video is converted into HSL color mode, the color temperature, color saturation and brightness are modified, and finally the creative enhanced emotion-induced video stream is generated by encoding and drawing output.

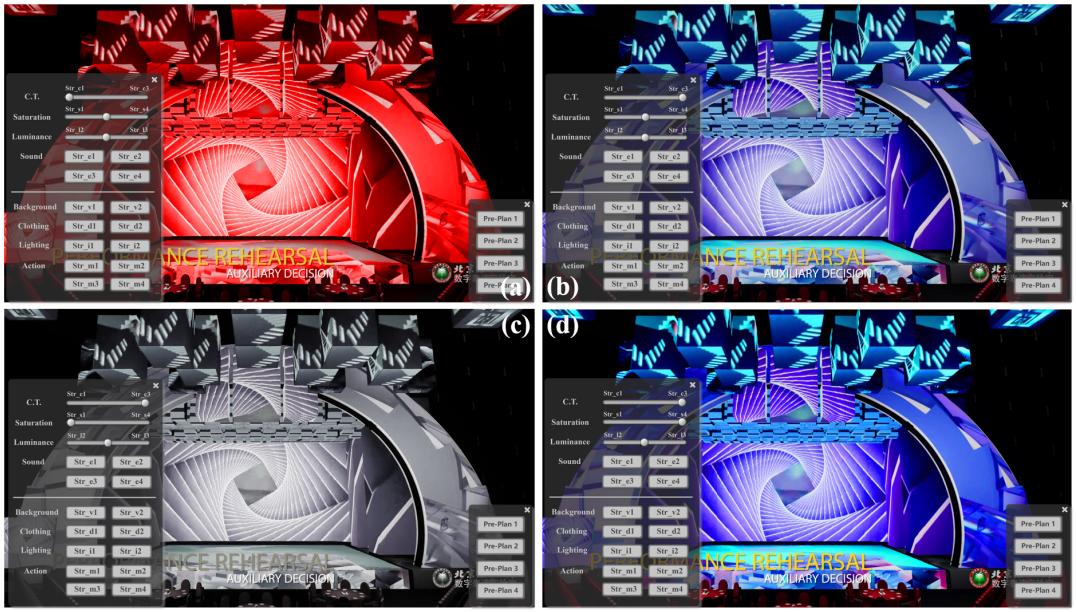

Figure 3. Comparison of creative enhancement methods based on visual effects (a) Color temperature strategy Str_c1; (b) Color temperature strategy Str_c2; (c) Color saturation strategy Str_s1; (d) Color saturation strategy Str_s2

As shown in Figure 3, we use the visual interface method to edit the visual effect enhancement strategy, and call the parameter values of different visual effect strategies through the UI operation to visually process the current video picture. As shown in Figure 2, (a) the visual effect when using the color temperature strategy Str_c1. (b) the visual effect when using the color temperature strategy Str_c3. (c) for the visual effect of Str_s1 with saturation strategy, and (d) for the visual effect of Str_s4 with saturation strategy.

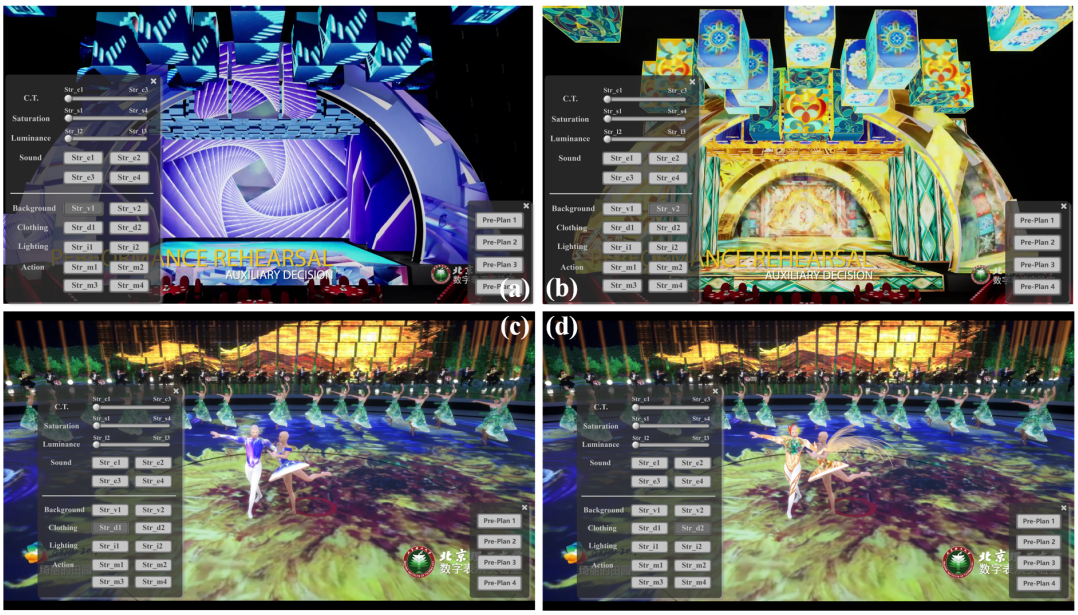

Figure 4. Comparison of creative enhancement methods based on stage art (a) Background video strategy Str_v1; (b) Background video strategy Str_v2; (c) Clothing design strategy Str_d1; (d) Clothing design strategy Str_d2

Through the visual editing interface, we can quickly enhance the creativity of the original emotion-induced material and generate new emotion-induced material videos.

5. **Performance Creativity Enhancement Based on Stage Art.** The creative enhancement of the stage art is implemented through the interactive digital performance simulation platform. The platform is developed based on the core technology of digital performance accumulated by the intelligent digital performance discipline in nearly a decade of stage performance project experience. The platform mainly aims at the creative scheme of the director to generate virtual performance content. Through the platform, the director can set and edit the background video, actor costume, stage lighting and other performance elements in the performance space. After the modification of the plan, the director can rehearse the whole process of the performance content. The platform realizes the auxiliary design function of real-time performance creativity, and provides the enforceability of the strategy for the creativity enhancement based on performance content. The editing interface based on interactive digital performance simulation platform is shown in Figure 4, in which (a) is the visual effect when using background video strategy Str_v1. The content in this video changes little, and the rhythm is relatively slow. (b) is the visual effect when using background video strategy Str_v2. The video has a cheerful rhythm and rich and rapid changes in content. (c) is the visual effect when using clothing strategy Str_d1. The design of this suit is relatively simple. (d) is the visual effect when using clothing strategy Str_d2. This suit adopts a stylized design with national characteristics and a variety of colors. In the process of implementing the performance action strategy, we update four different performance action strategies by collecting on-the-spot action data. We use high-precision optical motion capture equipment to collect different styles of dance movements. Using NOKOV's MARS system-level motion capture architecture, we deployed a 10m × 10m data performance motion capture experimental space as shown in Figure 5. The experimental space includes 24 MARS12H lenses and high-precision real-time SDK to provide bone calibration, correction and instantaneous attitude control

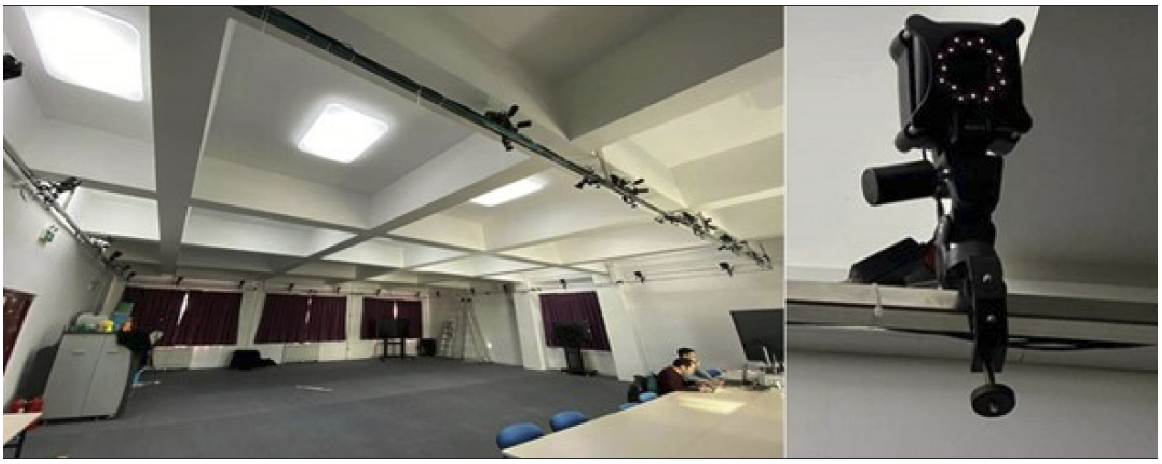

Figure 5. Performing motion capture experimental space (capture space)

system. Through motion capture, different bone movement data are transferred to the interactive digital performance simulation platform to realize the rapid data update between physical space and virtual space, which not only meets the standardized processing of performance action data, but also improves the rapid implementation of performance creativity enhancement strategy.

This experimental space is used to build a virtual performance parallel to the physical performance in real time. Through motion capture, we transfer different bone movement data to the interactive digital performance simulation platform to achieve rapid data update between physical space and virtual space. For the segments that cause the audience to have a lower level of attention in the performance, we influence the concentration by changing the different performance movements in the virtual performance. After repeated experiments, we obtained the audience focus data generated by different performance action schemes and determined a more appropriate performance action strategy.

The guidance and assistance to the physical performance according to the information returned from the virtual performance generation can improve the conversion efficiency of the performance information between the virtual and real forms. This method not only satisfies the standardized processing of the performance action data, but also improves the rapid implementation of the performance creativity enhancement strategy.

6. **Concentration Level Enhancement Method (CLEM).** The core idea of CLEM is to filter out the material clips marked by CL as Negative, and then use the performance creativity enhancement strategy to re-encode the material marked as negative emotion and generate emotion-induced video after creativity enhancement. The use of creative enhanced material allows the audience to re-evaluate and get new performance attention CL'. By comparing the CL' with the audience's evaluation result CL of the original emotion-induced video, the ways to improve the performance attention are as follows:

$$CLEM = \frac{CL' - CL}{2} \tag{16}$$

The above formula indicates that we can judge whether the performance attention is increased by CLEM. We compare the new performance attention CL' with the original performance attention CL in numerical value, and get the extent of the increase compared to the original performance attention. According to the distribution statistics of the experimental data, we define the strategy with a promotion range of $0 \leq CLEM < 15.76\%$ as " Invalid Enhancement Strategy (IES)". When the increase is $15.76\% \leq$

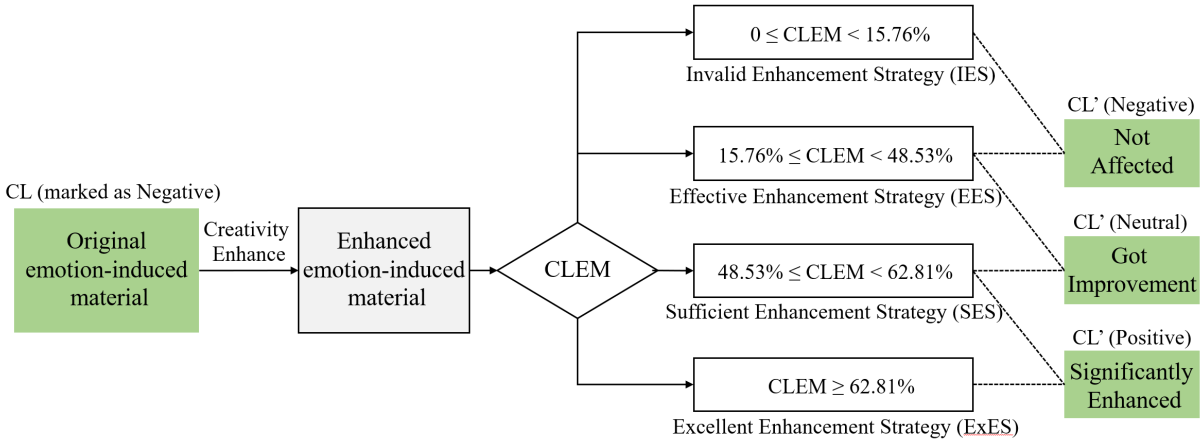

Figure 6. The process of enhancing the performance creativity by CLEM

$CLEM < 48.53\%$, the strategy is " Effective Enhancement Strategy (EES)". When the increase is $48.53\% \leq CLEM < 62.81\%$, the strategy is " Sufficient Enhancement Strategy (SES)". When $CLEM \geq 62.81\%$, the strategy is "Excellent Enhancement Strategy (ExES)". The detection mechanism is shown in Figure 6.

7. **Experiment of concentration level labelling.** In our experiment, we evaluated the material library (88 performance videos) and labeled the concentration level. The emotional data collection method of the audience includes the collection of multimodal physiological signal data and subjective evaluation data of the audience. Multimodal physiological signal data include eye tracking (ET) data, heart rate (HR) data and facial expression (FE) data. The subjective evaluation data include the quantitative data collected by the emotion quantitative table and the descriptive evaluation of the video content by the audience.

First of all, we collect three kinds of objective physiological signal data of eye tracking (ET), heart rate (HR) and facial expression (FE). We synchronize the time of the data acquisition equipment of three different modes, set the time synchronization trigger to trigger the acquisition equipment at the same time, and synchronize the time stamp of data acquisition on the three kinds of physiological signal data sequences. to ensure the timing synchronization and alignment of different modal data and performance content. In the process of data acquisition experiment, the physical interference factors such as noise, light, temperature and humidity in the data acquisition site are kept constant to avoid the impact of human interference or sudden events on the experimental process.

We use an eye movement meter to collect ET, which uses eye tracking technology based on pupil center and corneal reflex, supporting a maximum visual angle of 40 °and a sampling rate of 133Hz. This paper focuses on the fixation duration, scan duration, fixation order and return times in the eye movement data. The duration of gaze and scan reflect the audience's attention to the area of interest or individual performance elements [33]. The order of gaze reflects the different order in which the audience pays attention to the elements in a certain performance, and to a certain extent reflects the extent to which the audience attaches importance to each region or element. the area or element that is gazed first will contribute more to the audience experience than the latter. The number of times of looking back represents the area that has been cast to look at again or many times, and the more times of looking back can also mean that the elements of this area contribute more to the audience experience. As shown in Figure 7, the area without

Figure 7. Eye movement data hotspot map

color coverage represents the space that is not focused on, the red area represents the most times of eyeball fixation, the longest time to cast the eye, and the yellow represents the more times and the longer time to cast the eyeball. Finally, green represents the least number of gaze and the shortest time to cast an eye. The larger the area covered by red, the more attention the area receives during the audience watching the performance clip. HR is of great help in identifying positive and negative emotions [34, 35]. The HR

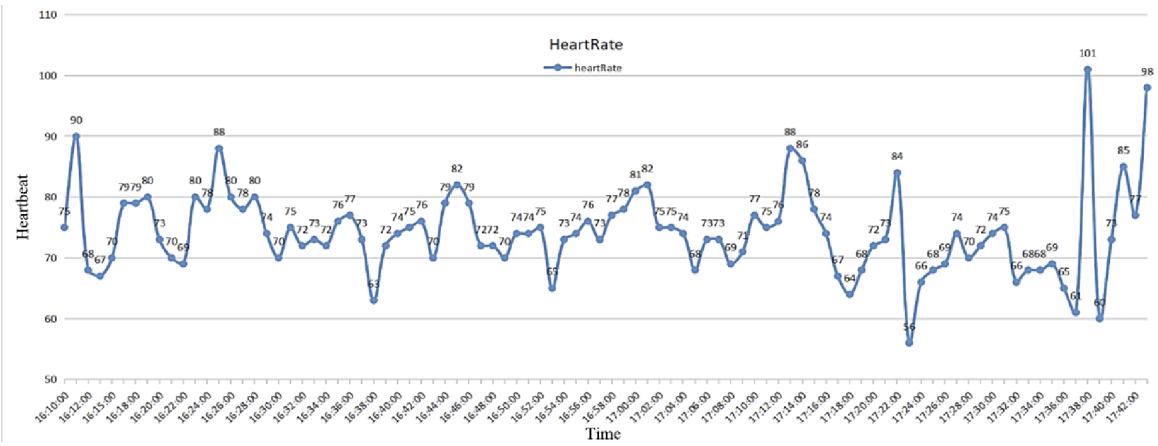

Figure 8. Partial heart rate changes in this experiment

collection uses a portable smart bracelet, measured by photo plethysmo graphy (PPG), and supports 24-hour heart rate monitoring. The sampling of heart rate changes in the experimental collection part is shown in Figure 8.

In the aspect of FE capture, the motion camera GoPro9 is used to capture the facial expressions of the tested viewers. The video recording resolution of the equipment is 1080p, which can be recorded for 90 minutes, which can meet the needs of facial expression time and clarity.The emotional evoked materials watched by the subjects were selected by the subjects. Each subject watched 1 group (8 clips) of material, each material for about 5 minutes, and filled in a "post-collection questionnaire" after watching 1 material, then entered a 2-minute rest time. After the subjects recovered their emotional stability, they began to play the next video material. In the whole process of collection, the noise, light, air flow, temperature and other environmental factors of the experimental environment are kept constant.

We divide the video sequence into several different shot clips. Shot clip is defined as a series of interrelated sequence frames continuously taken by a camera (or position), which carries a continuous segment of performance content and describes continuous data information in time and space, so we regard Shot as the best computing unit that can

be used for higher-level content analysis, event detection and feature extraction. In this paper, the shot boundary detection algorithm [36, 37] is used to segment the emotion-induced video. Each emotion-induced video is divided into multiple shot, and then the shot is tagged. We split the performance video clips and got 8087 Shot, of which the total

Table 7. Statistics on the sampling number of clips marked as Negative in 9 types of performances

Performance type	DRA	OPE	DND	PAN	DAN	CPE	SOC	ADF	MOV
Shot	212	887	1354	245	1190	1308	1693	338	860
Negative	51	189	223	10	124	79	214	15	21
Samples	3	10	11	1	6	4	11	1	1

number of Negative labeled by CL was 926, accounting for 11.45% of the total number of video clips. We sampled the Shot marked Negative in 9 performance types according to 5%, and those with less than 1 Shot were sampled according to at least 1. As shown in Table 7, the total number of samples for 9 performance types is 48. A total of 29 emotional evoked materials were involved. Among them, the creative enhancement method based on performance content was tested on the opening ceremony of the 2022 Beijing Winter Olympic Games and the 2022 Beijing Winter Paralympic Games.

This experiment is based on the model of single creativity enhancement strategy (SCES), which means that only one creativity enhancement strategy is applied to the segments of Negative marked by CL. Compared with whether the current strategy can improve the performance attention, through the representation method of matrix multiplication, we can get the emotion-induced material matrix based on visual effects and creative enhancement:

$$V_{Original} = \begin{bmatrix} V^{DRA02} \\ V^{DRA04} \\ \vdots \\ V^{MOV09} \end{bmatrix} \tag{17}$$

$$V_{Strategy} = \begin{bmatrix} V_{Str_{c1}} & \dots & V_{Str_{e4}} \end{bmatrix} \tag{18}$$

$$V_{Scale} = \begin{bmatrix} V^{DRA02} \\ V^{DRA04} \\ \vdots \\ V^{MOV09} \end{bmatrix} \begin{bmatrix} V_{Str_{c1}} & \dots & V_{Str_{e4}} \end{bmatrix} = \begin{bmatrix} V_{Str_{c1}}^{DRA02} & V_{Str_{c2}}^{DRA02} & \dots & V_{Str_{e4}}^{DRA02} \\ V_{Str_{c1}}^{DRA04} & V_{Str_{c2}}^{DRA04} & \dots & V_{Str_{e4}}^{DRA04} \\ \vdots & \vdots & & \vdots \\ V_{Str_{c1}}^{MOV09} & V_{Str_{c2}}^{MOV09} & \dots & V_{Str_{e4}}^{MOV09} \end{bmatrix} \tag{19}$$

In the above formula, V_Original represents the original emotion-induced material matrix, V_Strategy represents the creativity enhancement strategy matrix, and V_Scale represents the emotion-induced matrix after creativity enhancement. In this experiment, 10 participants were randomly selected from 50 people who watched the original emotional evoked material, and then 10 subjects who had never participated in the experiment were added. A total of 20 people participated in the experiment. The male-to-female ratio of the subjects was 1:1, ranging in age from 22 to 28 years old. Twenty subjects evaluated the emotionally evoked materials after creative enhancement of color temperature, saturation, luminance and sound effect. After the experiment, we made a return visit to the subjects, and through the results of the return visit, we made a quantitative comparison of the subjective emotion of 29 video materials with performance attention CL marked as Negative before and after creative enhancement.

In this experiment, after completing the collection of physiological data, the subjective evaluation data of the audience were also collected. Our collection methods include two kinds, the first is that the audience scores the evaluation description through the subjective emotion quantization table, and the second is the audience makes a completely independent subjective evaluation of the performance content. In the course of the experiment, we recorded the subjective expression of the tested audience by recording and collated it into text data.

As one of the questionnaire methods, Likert scale method is widely used by researchers [38, 39]. In this paper, the subjective emotion data of the audience are collected mainly through the subjective emotion quantification table and independent evaluation. According to the emotion-induced materials used in the experiment, we designed the subjective emotion quantization table, which was refined from three dimensions: immersion, identity and pleasure. Among them, the sense of immersion refers to the satisfaction and on-the-spot feeling of the audience when watching the target scene. The sense of immersion mainly affects the viewing feeling through the performance elements such as the picture effect of the target scene, the telepresence of sound effects and the storyline. Identity refers to the audience's cultural identity and value judgment of the target situation. In the creative performance, the director mainly conveys the understanding of the cultural background and values of the performance works through the performance form and plot design. Pleasure refers to the degree to which the audience is physically and mentally happy about the color, lighting, and other overall performance effect of the performance.

Table 8. Evaluation results of creativity enhancement based on color temperature

Clips	CL	CL'		**Clips**	CL	CL'		**Clips**	CL	CL'	
		Str_c1	Str_c3			Str_c1	Str_c3			Str_c1	Str_c3
1	-0.97	0.83	-0.13	17	-0.93	0.36	-0.90	33	-1.00	-0.96	-0.92
2	-0.94	-0.29	-0.17	18	-0.93	0.32	-0.98	34	-0.91	-0.96	-0.86
3	-0.80	-0.95	-0.27	19	-0.93	0.14	-0.98	35	-0.90	-0.22	-0.94
4	-0.86	-0.91	-1.00	20	-0.99	-0.52	-0.52	36	-0.85	-0.89	0.04
5	-0.89	-0.80	-1.00	21	-0.87	-0.28	0.16	37	-0.83	-0.90	0.00
6	-0.92	-0.80	-0.13	22	-0.98	-0.59	-0.97	38	-0.96	0.14	-0.98
7	-0.96	-0.21	-0.80	23	-0.84	0.76	-0.87	39	-0.92	0.50	-0.97
8	-0.89	-0.14	-0.75	24	-0.89	0.35	-0.87	40	-0.98	0.00	-0.92
9	-0.91	-0.54	-0.39	25	-0.87	-0.20	-0.97	41	-1.00	-0.93	-0.94
10	-0.96	-0.20	-0.50	26	-0.92	-0.84	-0.99	42	-0.87	0.07	-0.81
11	-0.87	-0.87	0.04	27	-0.86	-0.68	-1.00	43	-0.83	0.50	0.40
12	-0.93	-0.75	-0.96	28	-0.89	-0.97	-0.83	44	-0.99	-0.40	0.42
13	-0.98	-0.73	-0.20	29	-1.00	0.7	-0.39	45	-0.95	-0.24	-0.98
14	-0.84	-0.61	-0.09	30	-0.96	-0.21	-0.89	46	-0.86	-0.78	0.97
15	-0.95	0.34	-0.93	31	-0.97	0.72	0.20	47	-0.91	0.06	-0.94
16	-0.87	-0.98	-0.80	32	-0.84	-0.36	-0.82	48	-0.83	-0.81	-0.85

Table 9. CLEM statistical results of creative enhancement strategy based on color temperature

Strategy	CL'	CLEM	Level	Num.	Percentage
Str_c1	Promote	$0 \leq$ CLEM <15.76%	IES	13	27.08%
		15.76% $\leq$ CLEM <48.53%	EES	15	31.25%
		48.53% $\leq$ CLEM <62.81%	SES	6	12.50%
		CLEM $\geq$ 62.81%	ExES	7	14.58%
	Decline			7	14.58%
Str_c3	Promote	$0 \leq$ CLEM <15.76%	IES	15	31.25%
		15.76% $\leq$ CLEM <48.53%	EES	11	22.92%
		48.53% $\leq$ CLEM <62.81%	SES	4	8.33%
		CLEM $\geq$ 62.81%	ExES	3	6.25%
	Decline			15	31.25%

Table 10. Evaluation results of creativity enhancement based on color saturation

Clips	CL	CL'		Clips	CL	CL'		Clips	CL	CL'	
		Str_s1	Str_s4			Str_s1	Str_s4			Str_s1	Str_s4
1	-0.97	-0.83	-0.85	17	-0.93	-0.96	-0.95	33	-1.00	0.46	-0.44
2	-0.94	-1.00	-0.49	18	-0.93	-0.10	-0.59	34	-0.91	-0.87	0.40
3	-0.80	0.34	0.46	19	-0.93	0.41	-0.80	35	-0.90	-0.94	-0.95
4	-0.86	0.51	0.12	20	-0.99	0.20	-1.00	36	-0.85	-0.88	0.22
5	-0.89	-0.93	0.01	21	-0.87	-0.93	0.14	37	-0.83	-0.93	-0.87
6	-0.92	-0.53	-0.80	22	-0.98	-0.79	-0.94	38	-0.96	-0.81	0.28
7	-0.96	-0.08	-0.86	23	-0.84	-0.98	-0.58	39	-0.92	-0.96	0.77
8	-0.89	-0.91	0.55	24	-0.89	-0.97	0.21	40	-0.98	0.23	-0.81
9	-0.91	-0.88	0.77	25	-0.87	-0.37	-0.27	41	-1.00	-0.94	-0.82
10	-0.96	0.25	0.73	26	-0.92	-0.96	0.27	42	-0.87	-0.82	-0.95
11	-0.87	-0.40	-0.89	27	-0.86	-0.39	-0.98	43	-0.83	0.41	0.34
12	-0.93	-0.99	-0.46	28	-0.89	-0.98	-0.80	44	-0.99	-0.15	-0.65
13	-0.98	-0.66	-0.79	29	-1.00	-0.92	0.46	45	-0.95	-0.98	-0.97
14	-0.84	-0.02	-0.91	30	-0.96	-0.98	-0.83	46	-0.86	-0.43	-0.57
15	-0.95	-0.90	0.97	31	-0.97	-0.65	0.15	47	-0.91	0.42	-0.54
16	-0.87	-0.99	-0.89	32	-0.84	-0.44	-0.18	48	-0.83	-0.52	-0.81

Table 11. CLEM statistical results of creative enhancement strategy based on color saturation

Strategy	CL'	CLEM	Level	Num.	Percentage
Str_s1	Promote	$0 \leq$ CLEM $<$15.76%	IES	10	20.83%
		15.76% $\leq$ CLEM $<$48.53%	EES	11	22.92%
		48.53% $\leq$ CLEM $<$62.81%	SES	5	10.42%
		CLEM $\geq$ 62.81%	ExES	4	8.33%
	Decline			18	37.50%
Str_s4	Promote	$0 \leq$ CLEM $<$15.76%	IES	13	27.08%
		15.76% $\leq$ CLEM $<$48.53%	EES	10	20.83%
		48.53% $\leq$ CLEM $<$62.81%	SES	8	16.67%
		CLEM $\geq$ 62.81%	ExES	7	14.58%
	Decline			10	20.83%

8. **Result analysis.**

8.1. **Result analysis 1: Contrast of Creativity Enhancement Based on Visual Effect.**

The experimental results are analyzed from four creative enhancement strategies: color temperature, saturation, luminance and sound effect.

8.1.1. *Evaluation results of creativity enhancement based on color temperature.* The evaluation results of color temperature-based creativity enhancement for 48 segments labeled Negative are shown in Table 8. From the table, we can see that when using strategic Str_c1, the creative enhanced performance attention CL' increases by 29.16% compared with the original performance attention CL, and when strategic Str_c3 is adopted, the creative enhanced performance attention CL' increases by 18.06% compared with the original performance attention CL. From the results of the overall data, the warm color temperature can attract the attention of the audience more than the cool color temperature, and can play a more positive effect and role in the performance creativity.

According to our definition of CLEM, we compare CL' with CL to get a more detailed data distribution as shown in Table 9.

We can see from Table 9 that the performance attention of the strategy Str_c1 is more significant than that of the strategy Str_c3. The effective enhancement strategy of Str_c1 is 8.33% more than that of Str_c3, and the high-quality enhancement strategy is 8.33% more than that of Str_c3. The performance attention of the strategy Str_c3 is 16.67% lower than that of the strategy Str_c1, which indicates that the color temperature warming strategy is stronger than the color temperature cooling strategy in enhancing the performance creativity.

Table 12. Evaluation results of creativity enhancement based on luminance

Clips	CL	CL'		Clips	CL	CL'		Clips	CL	CL'	
		Str_l2	Str_l3			Str_l2	Str_l3			Str_l2	Str_l3
1	-0.97	0.28	-0.51	17	-0.93	-0.14	-0.86	33	-1.00	-0.87	0.06
2	-0.94	0.50	-0.48	18	-0.93	-0.09	-0.34	34	-0.91	-0.77	0.36
3	-0.80	-0.86	-0.93	19	-0.93	-0.21	-0.43	35	-0.90	-0.16	-0.90
4	-0.86	-0.40	-0.87	20	-0.99	0.38	-0.18	36	-0.85	-0.28	-0.76
5	-0.89	-0.87	0.98	21	-0.87	-0.92	0.52	37	-0.83	-0.61	0.13
6	-0.92	-0.84	-0.89	22	-0.98	-0.89	-0.97	38	-0.96	-0.91	-0.27
7	-0.96	0.07	0.48	23	-0.84	-0.94	-0.88	39	-0.92	-0.95	-0.69
8	-0.89	0.31	-0.97	24	-0.89	-0.25	-0.98	40	-0.98	-0.96	-0.87
9	-0.91	-0.92	0.13	25	-0.87	0.30	0.44	41	-1.00	-0.68	-0.71
10	-0.96	-0.91	0.19	26	-0.92	0.41	-0.87	42	-0.87	0.43	0.53
11	-0.87	-0.99	-0.17	27	-0.86	-0.86	-0.91	43	-0.83	-0.92	-0.69
12	-0.93	-0.88	-0.84	28	-0.89	0.06	-0.85	44	-0.99	-0.12	0.00
13	-0.98	-0.25	-0.98	29	-1.00	-0.80	-0.90	45	-0.95	-0.62	-0.83
14	-0.84	0.24	-0.95	30	-0.96	-0.97	0.29	46	-0.86	-0.96	-0.32
15	-0.95	-0.83	0.48	31	-0.97	-0.96	0.15	47	-0.91	-0.88	-0.54
16	-0.87	-0.29	-0.36	32	-0.84	-0.86	0.90	48	-0.83	-0.63	-0.95

8.1.2. *Evaluation results of creativity enhancement based on color saturation.* . The evaluation results of creativity enhancement based on saturation are shown in Table 10 from the table, we can see that when using strategy Str_s1, the performance attention CL' after creativity enhancement increases by 18.08% compared with the original performance attention CL, and when using strategy Str_s4, the performance attention CL' after creativity enhancement increases by 27.72% compared with the original performance attention CL. From the results of the overall data, the increase of saturation can have a better effect on the performance creativity than the decrease of saturation. The comparison of CLEM is shown in Table 11.

From Table 11, we can see that the full enhancement strategy of policy Str_s4 is 6.25% more than that of Str_s1, and the high quality enhancement strategy is 6.25% more than Str_s1. The performance attention of strategic Str_s1 is 16.67% lower than that of strategic Str_s4. Obviously, there are more full enhancement and high quality enhancement strategies of strategy Str_s4 than Str_s1, and there are also many strategy Str_s4 in the number of CL' decline, which shows that strategy Str_s4 can cause large emotional fluctuations of the audience, and plays an obvious role in improving and reducing CL'. In the specific application of creativity enhancement, we need to use this strategy carefully according to the actual situation.

8.1.3. *Evaluation results of creative enhancement based on luminance.* The evaluation results of luminance-based creativity enhancement are shown in Table 12. It can be observed from the table that the performance attention CL' after creativity enhancement increases by 4.81% compared with the original performance attention CL when using strategy Str_l2, and when using strategy Str_l3, the performance attention CL' after creativity enhancement is increased by 22.83% compared with the original performance attention CL. From the results of the overall data, brightening than dimming can attract the attention of the audience, and can play a more positive effect and role in the creative performance. The comparison of CLEM is shown in Table 13.

We can see from Table 13 that the performance attention of strategic Str_l3 is better than that of strategic Str_l2. The full enhancement strategy of strategic Str_l3 is 2.08% more than that of Str_l2, and the high-quality enhancement strategy is 8.34% more than Str_l2. The performance attention of the strategy Str_l2 is 4.16% lower than that of the strategy Str_l3. The results show that the brightness brightening strategy has a very obvious advantage over the brightness dimming strategy in enhancing the creativity of the performance.

Table 13. CLEM statistical results of creativity enhancement strategy based on Luminance

Strategy	CL'	CLEM	Level	Num.	Percentage
Str_l2	Promote	0 ≤ CLEM <15.76%	IES	16	33.33%
		15.76% ≤ CLEM <48.53%	EES	13	27.08%
		48.53% ≤ CLEM <62.81%	SES	5	10.42%
		CLEM ≥ 62.81%	ExES	4	8.33%
	Decline			10	20.83%
Str_l3	Promote	0 ≤ CLEM <15.76%	IES	15	31.25%
		15.76% ≤ CLEM <48.53%	EES	11	22.92%
		48.53% ≤ CLEM <62.81%	SES	6	12.50%
		CLEM ≥ 62.81%	ExES	8	16.67%
	Decline			8	16.67%

Table 14. Evaluation results of creativity enhancement based on sound effect

Clips	CL	CL'				Clips	CL	CL'				Clips	CL	CL'			
		Str_e1	Str_e2	Str_e3	Str_e4			Str_e1	Str_e2	Str_e3	Str_e4			Str_e1	Str_e2	Str_e3	Str_e4
1	-0.97	-0.83	-0.84	-0.84	-0.90	**17**	-0.93	-0.97	-0.85	0.85	0.52	**33**	-1.00	-0.93	-0.89	-0.51	-0.39
2	-0.94	-0.60	-0.88	-0.86	-0.76	**18**	-0.93	-0.84	-0.39	-0.83	-0.93	**34**	-0.91	-0.81	-0.19	0.32	-0.80
3	-0.80	-0.95	-0.85	-0.94	-0.84	**19**	-0.93	-0.82	-0.69	-0.80	-0.94	**35**	-0.90	-1.00	-0.84	-0.95	-0.71
4	-0.86	0.45	-0.81	0.82	-0.90	**20**	-0.99	-0.54	-0.03	-0.51	-0.03	**36**	-0.85	-0.65	-0.91	-0.67	-0.53
5	-0.89	-0.84	-0.26	0.29	0.20	**21**	-0.87	0.15	-0.94	0.85	-0.97	**37**	-0.83	-0.80	-0.80	-0.69	-1.00
6	-0.92	0.18	-0.81	-0.02	-0.15	**22**	-0.98	0.24	-0.92	-0.90	-0.81	**38**	-0.96	-0.82	-0.95	-0.80	0.74
7	-0.96	-0.86	-0.50	-0.69	-0.83	**23**	-0.84	0.00	-0.97	0.77	0.51	**39**	-0.92	-0.06	-0.91	-0.95	-0.99
8	-0.89	-0.96	-0.94	-0.02	0.94	**24**	-0.89	-0.95	-0.95	0.39	-0.99	**40**	-0.98	0.39	-0.85	0.02	-0.84
9	-0.91	-0.10	-0.84	0.06	-0.17	**25**	-0.87	-0.64	-0.94	0.30	-0.12	**41**	-1.00	-0.22	-0.85	-0.99	-0.08
10	-0.96	-0.95	-0.60	-0.86	-0.90	**26**	-0.92	-1.00	-0.81	-0.89	-0.44	**42**	-0.87	-0.82	-0.89	-0.17	-0.85
11	-0.87	1.00	-0.89	-0.97	-0.36	**27**	-0.86	0.22	-0.98	-0.83	-0.51	**43**	-0.83	-0.64	-0.29	-0.79	-0.18
12	-0.93	-0.92	-0.91	0.16	-0.89	**28**	-0.89	-0.82	-0.82	-0.92	-0.15	**44**	-0.99	-0.92	-0.28	-0.24	-0.95
13	-0.98	0.91	-0.80	0.53	0.05	**29**	-1.00	-0.89	-0.39	-0.96	-0.81	**45**	-0.95	-0.99	-0.88	-0.24	-0.43
14	-0.84	-1.00	-0.91	-0.95	-0.59	**30**	-0.96	-0.44	-0.83	-0.92	-0.68	**46**	-0.86	0.46	-0.08	-0.82	0.52
15	-0.95	0.50	-0.01	-0.42	0.30	**31**	-0.97	-0.78	-0.86	-0.73	-0.86	**47**	-0.91	-0.88	-0.99	-0.36	-0.93
16	-0.87	0.57	-0.95	-0.31	-0.90	**32**	-0.84	-0.83	-0.26	-0.23	-0.72	**48**	-0.83	-0.93	-0.89	0.43	-0.20

Table 15. CLEM statistical results of creative enhancement strategy based on sound effect

Strategy	CL'	CLEM	Level	Num.	Percentage
Str_l2	Promote	0 ≤ CLEM <15.76%	IES	16	33.33%
		15.76% ≤ CLEM <48.53%	EES	13	27.08%
		48.53% ≤ CLEM <62.81%	SES	5	10.42%
		CLEM ≥ 62.81%	ExES	4	8.33%
	Decline			10	20.83%
Str_l3	Promote	0 ≤ CLEM <15.76%	IES	15	31.25%
		15.76% ≤ CLEM <48.53%	EES	11	22.92%
		48.53% ≤ CLEM <62.81%	SES	6	12.50%
		CLEM ≥ 62.81%	ExES	8	16.67%
	Decline			8	16.67%
Str_l2	Promote	0 ≤ CLEM <15.76%	IES	16	33.33%
		15.76% ≤ CLEM <48.53%	EES	13	27.08%
		48.53% ≤ CLEM <62.81%	SES	5	10.42%
		CLEM ≥ 62.81%	ExES	4	8.33%
	Decline			10	20.83%
Str_l3	Promote	0 ≤ CLEM <15.76%	IES	15	31.25%
		15.76% ≤ CLEM <48.53%	EES	11	22.92%
		48.53% ≤ CLEM <62.81%	SES	6	12.50%
		CLEM ≥ 62.81%	ExES	8	16.67%
	Decline			8	16.67%

8.1.4. *Evaluation results of creativity enhancement based on sound effect.* The evaluation results of creative enhancement based on sound effects are shown in Table 14. From the table, we can see that when strategic Str_e1 is adopted, the performance attention CL' after creativity enhancement is 19.66% higher than that of the original performance CL. When strategic Str_e2 is adopted, the performance attention CL' is 12.02% higher than that of CL. When strategic Str_e3 is adopted, CL' is 27.09% higher than CL. When using

the strategy Str_e4, CL' increased by 24.03% compared with CL. From the results of the overall data, birdsong in the forest can play a more positive effect and role in the creative performance. The comparison of CLEM is shown in Table 15.

We can see from Table 15 that when using strategy Str_e2, the performance attention decreases to 29.17%, accounting for the largest proportion of the four strategies. When adopting strategy Str_e2, the number of full enhancement strategy and high quality enhancement strategy is the least. From the overall comparison results, strategy Str_e3 and strategy Str_e4 are better than strategy Str_e1 and strategy Str_e2 in enhancing performance creativity, strategy Str_e1 is less than strategy Str_e2 in reducing performance attention, and the number of invalid enhancement strategies of strategy Str_e2 and strategy Str_e1 is almost the same.

8.2. **Result analysis 2: Contrast of Creativity Enhancement Based on Stage Art.** In the same way as the experimental method of creativity enhancement based on visual effects, we compared the two performances of Negative's "2022 Beijing Winter Olympic Games opening ceremony" (SOC07) and "2022 Beijing Winter Paralympic Games opening ceremony" (SOC08) marked by CL in four main aspects (10 strategies): background video, actor's costume, stage lighting and performance movements. The experimental process is all carried out on the interactive digital performance simulation platform. The results of the evaluation of creative enhancement based on stage art are shown in Table 16.

Table 16. Evaluation results of creativity enhancement based on stage art

Clips	CL	CL'									
		Str_v1	Str_v2	Str_d1	Str_d2	Str_i1	Str_i2	Str_m1	Str_m2	Str_m3	Str_m4
1	-0.92	0.70	0.24	0.38	0.61	0.37	0.90	0.78	0.11	0.94	0.61
2	-0.95	0.97	0.00	-0.73	0.38	-0.07	0.90	0.13	-0.75	0.40	0.74
3	-0.85	0.29	-0.79	-0.98	-0.41	-0.36	0.24	0.13	-0.42	-0.56	0.38
4	-0.86	-0.28	-0.81	-0.86	-0.67	-0.98	-0.44	-0.30	-0.99	-0.83	0.35
5	-0.95	-0.82	-0.96	-0.97	-0.94	-0.84	-1.00	-0.86	-0.94	-0.98	-0.45
6	-0.89	-0.85	-0.86	-0.80	-0.89	-0.94	-0.96	-0.92	-0.96	-0.87	-0.97

Table 17. CLEM statistical results of creative enhancement strategy based on background video

Strategy	CL'	CLEM	Level	Num.	Percentage
Str_v1	Promote	$0 \leq$ CLEM <15.76%	IES	2	33.33%
		15.76% $\leq$ CLEM <48.53%	EES	1	16.67%
		48.53% $\leq$ CLEM <62.81%	SES	1	16.67%
		CLEM $\geq$ 62.81%	ExES	2	33.33%
	Decline			0	0.00%
Str_v2	Promote	$0 \leq$ CLEM <15.76%	IES	3	50.00%
		15.76% $\leq$ CLEM <48.53%	EES	1	16.67%
		48.53% $\leq$ CLEM <62.81%	SES	1	16.67%
		CLEM $\geq$ 62.81%	ExES	0	0.00%
	Decline			1	16.67%

8.2.1. *Evaluation results of creativity enhancement based on background video.* We can analyze from Table 16 that when using strategic Str_v1, the performance attention CL 'after creativity enhancement increases by 45.25% compared with the original performance attention CL, and when using strategy Str_v2, the performance attention CL' after creativity enhancement increases by 18.67% compared with the original performance attention CL. From the results of the overall data, the polychromatic background change can attract the

attention of the audience more than the monochromatic background change. According to the definition of CLEM, the following statistical results are shown in Table 17.

From Table 17, we can see that the performance attention of the strategy Str_v1 is more significant than that of the strategy Str_v2, and the quality enhancement strategy is 33.33% more than the Str_v2. The number of performances with strategy Str_ v2 is 16.67% lower than that with strategy Str_ v1, which indicates that the strategy of monochromatic background change is better at enhancing performance creativity.

8.2.2. *Evaluation results of creativity enhancement based on clothing design.* We can analyze from Table 16 that when using strategic Str_d1, the performance attention of enhanced creativity CL 'increases by 12.17% compared with the original performance attention CL, and when strategic Str_d2 is adopted, the average increase of creative enhanced CL' compared with CL is 29.17%. From the overall situation, the national style clothing can attract the attention of the audience more than the large color block simple style clothing. The statistical results of CLEM are shown in Table 18. As can be seen from

Table 18. CLEM statistical results of creative enhancement strategy based on clothing design

Strategy	CL'	CLEM	Level	Num.	Percentage
Str_d1	Promote	$0 \leq$ CLEM <15.76%	IES	3	50.00%
		15.76% $\leq$ CLEM <48.53%	EES	0	0.00%
		48.53% $\leq$ CLEM <62.81%	SES	0	0.00%
		CLEM $\geq$ 62.81%	ExES	1	16.67%
	Decline			2	33.33%
Str_d2	Promote	$0 \leq$ CLEM <15.76%	IES	3	50.00%
		15.76% $\leq$ CLEM <48.53%	EES	1	16.67%
		48.53% $\leq$ CLEM <62.81%	SES	0	0.00%
		CLEM $\geq$ 62.81%	ExES	2	33.33%
	Decline			0	0.00%

Table 18, the performance attention of the strategy Str_d2 is significantly higher than that of the strategy Str_d1. The strategy Str_d2 is 16.67% more than the strategy Str_d1 effective enhancement strategy and the high quality enhancement strategy, and the strategy Str_d1 is 33.33% lower than the strategy Str_d2.

Table 19. CLEM statistical results of creative enhancement strategy based on lighting design

Strategy	CL'	CLEM	Level	Num.	Percentage
Str_i1	Promote	$0 \leq$ CLEM <15.76%	IES	1	16.67%
		15.76% $\leq$ CLEM <48.53%	EES	2	33.33%
		48.53% $\leq$ CLEM <62.81%	SES	0	0.00%
		CLEM $\geq$ 62.81%	ExES	1	16.67%
	Decline			2	33.33%
Str_i2	Promote	$0 \leq$ CLEM <15.76%	IES	0	0.00%
		15.76% $\leq$ CLEM <48.53%	EES	1	16.67%
		48.53% $\leq$ CLEM <62.81%	SES	1	16.67%
		CLEM $\geq$ 62.81%	ExES	2	33.33%
	Decline			2	33.33%

8.2.3. *Evaluation results of creativity enhancement based on lighting design.* It can be observed from Table 16 that when using strategy Str_i1, the performance attention CL 'after creativity enhancement increases by 21.67% compared with the original performance attention CL, and when strategy Str_ i2 is adopted, the performance attention CL' after

creativity enhancement increases by an average of 42.17% compared with the original performance attention CL. On the whole, the lighting design with changing color can attract the attention of the audience more than the lighting design with changing light and shadow, and can play a more positive effect and role in the creative performance. The comparison of CLEM is shown in Table 19.

As can be seen from Table 19, the quality enhancement strategy of strategic Str_i2 is 16.67% more than that of Str_i1, and the performance attention of strategic Str_i2 is slightly better than that of strategic Str_i1.

8.2.4. *Evaluation results of creativity enhancement based on performing action.* It can be concluded from Table 16 that when using strategy St_m1, the performance attention of enhanced creativity CL 'increases by 36.50% compared with the original performance attention CL. When using strategy Str_ m2, CL' increases 12.25% compared with CL. When using strategy Str_m3, CL 'increases 29.33% compared with CL. When using strategy Str_ M4, CL' increases 50.67% compared to CL. On the whole, the performance action of folk dance style has the most obvious advantage in the enhancement of performance creativity. The statistical results of CLEM are shown in Table 20.

From Table 20, we can see that the high-quality enhancement strategy using strategy Str_m3 and Str_m4 reached 66.67%, accounting for the most of the four strategies; the full enhancement strategy using strategy Str_ m1 and Str_m4 reached 33.33%; when using strategy Str_m2, the performance attention decreased by 33.33%. From the overall comparison results, the performance of strategy Str_m4 in enhancing the creativity of performance is better than the other three strategies.

Table 20. CLEM statistical results of creative enhancement strategy based on performing action

Strategy	CL'	CLEM	Level	Num.	Percentage
Str_m1	Promote	$0 \leq$ CLEM <15.76%	IES	1	16.67%
		15.76% $\leq$ CLEM <48.53%	EES	1	16.67%
		48.53% $\leq$ CLEM <62.81%	SES	2	33.33%
		CLEM $\geq$ 62.81%	ExES	1	16.67%
	Decline			1	16.67%
Str_m2	Promote	$0 \leq$ CLEM <15.76%	IES	2	33.33%
		15.76% $\leq$ CLEM <48.53%	EES	1	16.67%
		48.53% $\leq$ CLEM <62.81%	SES	1	16.67%
		CLEM $\geq$ 62.81%	ExES	0	0.00%
	Decline			2	33.33%
Str_m3	Promote	$0 \leq$ CLEM <15.76%	IES	3	50.00%
		15.76% $\leq$ CLEM <48.53%	EES	0	0.00%
		48.53% $\leq$ CLEM <62.81%	SES	0	0.00%
		CLEM $\geq$ 62.81%	ExES	2	33.33%
	Decline			1	16.67%
Str_m4	Promote	$0 \leq$ CLEM <15.76%	IES	0	0.00%
		15.76% $\leq$ CLEM <48.53%	EES	1	16.67%
		48.53% $\leq$ CLEM <62.81%	SES	2	33.33%
		CLEM $\geq$ 62.81%	ExES	2	33.33%
	Decline			1	16.67%

This paper validates the creative enhancement method based on performance content in the performance of the opening ceremony of the 2022 Beijing Winter Olympic Games and the Beijing Winter Paralympic Games, focusing on the comparison of the two core performances in the opening ceremony. Among them, the opening ceremony of the Winter Olympic Games intercepted the performance of "IceCube", and the opening ceremony of the Winter Paralympic Games intercepted the performance of "Emotional Atories

of Families with Disabilities". The two performances have the same characteristics in form, that is, both rely on the background video of the ground screen to enhance the performance content, so this chapter uses the above core performance links for comparative experiments.

According to the Shot-boundary method and the labeling rules for CL, we mark the concentration level of the above two performance links after creativity enhancement, and get the results shown in Figure 9. the figure is based on shot, the red data point is the collected multi-sample CL value, and the yellow marked point is the average value of CL in the current shot unit.

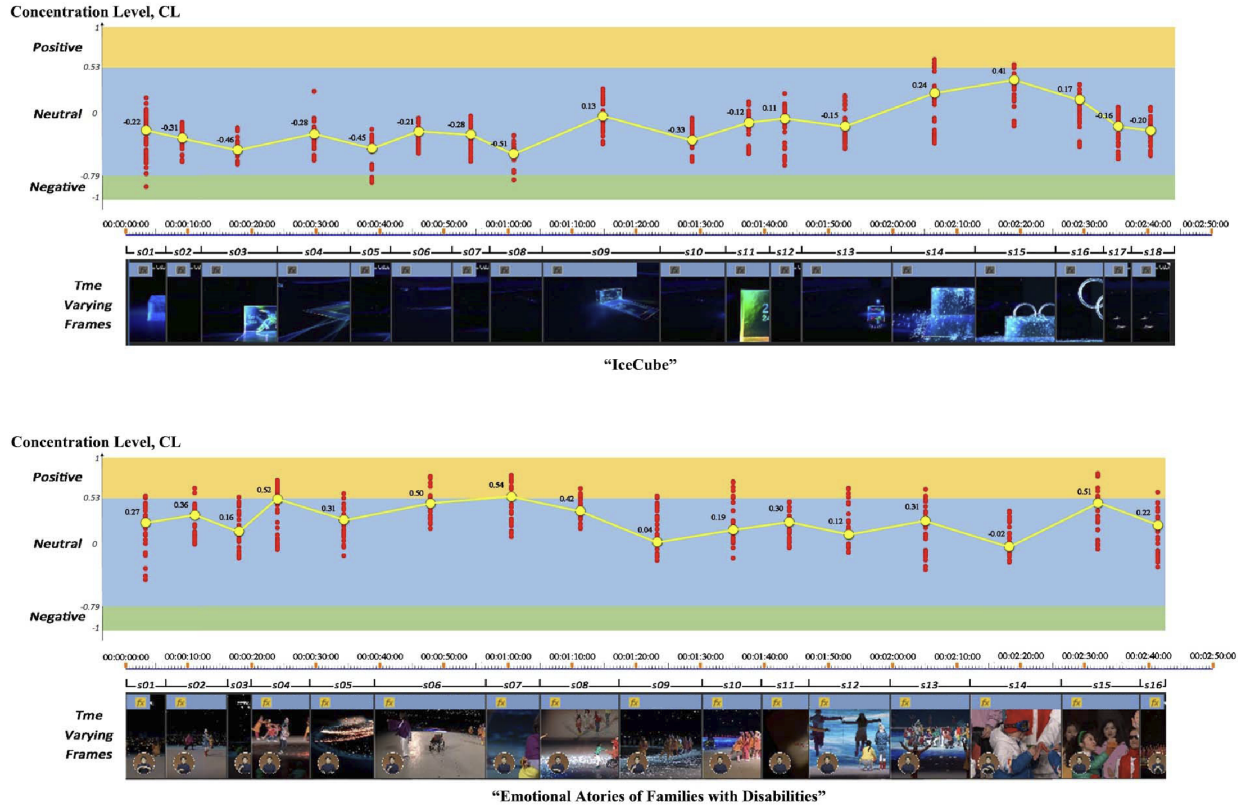

Figure 9. A comparison of audience concentration levels between "IceCube" and " Emotional Atories of Families with Disabilities"

As we can see in Figure 9 (IceCube), the concentration of IceCube does not change much over a period of 2 minutes and 45 seconds, and only shows a significant upward trend at the three time points when the lens schedule changes greatly (00:01:10:09, 00:02:07:13) and when the Ice rings begin to be carved gradually (00:02:19:21). From the overall change trend, we can see that the key creative point of the Ice Cube performance (the carving of the five rings of the ice) has successfully caused a significant change in the audience's concentration level, meeting the setting off of the ceremony and meeting the basic requirements of the atmosphere rendering of the opening ceremony. however, in terms of content, the use of IceCube performance for background video only focuses on the effect of light and shadow rendering, without the shaping of specific images or the development of the storyline.

As can be seen in Figure 9 (family emotional stories of disabled people), the concentration level of family emotional stories of disabled people varies more richly during the

period of 2 minutes, and it can be seen that the overall trend is higher than that of IceCube performance. The whole performance showed rich changing trends at many time points, such as "Hope in the red lantern "(00:00:10:11), "video leads to the family of three" (00:00:24:21), "the mother and daughter hug each other in tears" (00:01:02:06), "the grandpa of the leg prosthesis comes sonorously and forcefully" (00:01:43:07), "the wings flying to hope appear on the ground screen" (00:02:05:01), "All the families come together to gather strength" (00:02:32:08),and so on. The overall trend maintains a high score. As shown in Table 21, over a period of 2 minutes and 45 seconds, the average

Table 21. Performance attention statistics of "IceCube" and " Emotional Atories of Families with Disabilities" within 2 minutes

Performance Name	CL								
IceCube	S01	S02	S03	S04	S05	S06	S07	S08	S09
	-0.22	-0.31	-0.46	-0.28	-0.45	-0.21	-0.28	-0.51	0.13
	S10	S11	S12	S13	S14	S15	S16	S17	S18
	-0.33	-0.12	0.11	-0.15	0.24	0.41	0.17	-0.16	-0.20
Emotional Atories	S01	S02	S03	S04	S05	S06	S07	S08	S09
	0.27	0.36	0.16	0.52	0.31	0.50	0.54	0.42	0.04
of Families	S10	S11	S12	S13	S14	S15	S16		
with Disabilities	0.19	0.30	0.12	0.31	-0.02	0.51	0.22		

concentration level of IceCube performance is (- 0.15), and that of family emotional stories of disabled people is (0.29). From this, it can be seen that although the family story performance of the disabled is a micro emotional performance, through the series and contrast of the background video on the ground screen, it shows that the director deeply interprets the performance creativity by lighting up the light, conveying hope, loving encouragement and cohesion. The multicolor changes of the ground screen video create ripples on the stage, skillfully connecting the storyline and emotional state of families with multiple groups of disabled people, fully enhancing the performance effect of disabled actors, and carrying out rich and full expression of performance creativity, so that the emotional stories of families of disabled people can be exquisitely expressed and accurately interpreted.

8.3. **Result analysis 3: Open Questionnaire Evaluation.** After each application of different creative enhancement strategies, we quantitatively evaluate the subjective emotion of the audience. Quantitative evaluation is refined from three dimensions: immersion, identity and pleasure. Among them, the sense of immersion refers to the satisfaction and on-the-spot feeling of the audience when watching the target scene. The picture effect of the target scene, the telepresence of sound effects and the performance elements such as the storyline will have an impact on the sense of immersion. Identity refers to the audience's cultural identity and value judgment of the target situation. In the performance creativity, the director conveys the cognition of the cultural background and values of the performance works through the performance form and plot design. Pleasure refers to the degree to which the audience is happy about the color, lighting, and other overall performance effect of the performance.

There are 6 evaluation descriptions in the above three dimensions. The participants rated these evaluation descriptions according to their actual feelings. With reference to the Likert scale, we set a quantitative level of 9 components because of the rich types of performances and great differences in the cognitive degree of the audience. We hope that the audience can measure their views in a more fine-grained manner. The evaluation results obtained by this method are more accurate, the labeling accuracy of the experimental data is higher, and it can also increase the ability of the model to identify emotions. There are two common ways to express the problems in the Likert scale. One

is the expression of extreme emotion, such as "very", "extreme", "special", "very" and so on, and the other is the expression without extreme emotion, which does not reflect obvious emotional color. In this paper, when designing the specific problem expression of subjective emotion quantification table, words with extreme emotions are added with reference to the above two ways, such as "shocking", "high", "strong", "prominent", "profound" and so on. The score of the emotion quantification scale ranges from 1 to 9, indicating that the degree of approval for the problem ranges from strong opposition to strong approval. The details of the questionnaire are shown in Figure 10.

We compare the application of each strategy to 48 Shot labeled Negative, calculate the percentage increase of each strategy relative to the original total score of each Shot, and finally calculate the average percentage increase as follows:

$$I = \frac{\left(F_{video}^{h_1 TotalScore} - F_{video}^{OriginalTotalScore}\right) + \ldots + \left(F_{video}^{h_{10} TotalScore} - F_{video}^{OriginalTotalScore}\right)}{48} \tag{20}$$

$$h \in \{Str_{c1}, Str_{c3}, \cdots, Str_{e4}\} \tag{21}$$

$$v \in \{DRA02, DRA04, \cdots, MOV09\} \tag{22}$$

Dimension	Description	Disagree → Agree								
		1	2	3	4	5	6	7	8	9
Immersion	Q1. High degree of immersion									
	Q2. The sound effect enhanced the reality of the scene.									
	Q3. Exquisite composition									
	Q4. The plot is attractive.									
	Q5. The visual impact is very strong.									
	Q6. The actors have excellent acting skills.									
Pleasure	Q7. Performance form is easy to accept.									
	Q8. The plot is easy to understand.									
	Q9. Identify with the values in the performance									
	Q10. Arouse cultural resonance									
	Q11. Eager to share the performance with others									
	Q12. Looking forward to the follow-up performance.									
Identity	Q13. Colors set off the theme of the performance.									
	Q14. The lighting design creates a good stage effect.									
	Q15. The fashion design is impressive.									
	Q16. Rich design of performing movements									
	Q17. Actors' performance highlighted the character's personality.									
	Q18. Actors have a tacit understanding.									

Figure 10. Subjective emotion quantification table

As shown in Figure 11, the dark color is the average percentage increase in the evaluation based on subjective emotion quantification, and the light color is the average percentage increase in CL 'relative to CL based on CLEM contrast. From the evaluation results of the two methods, the improvement ability of different strategies compared with the original evaluation results is basically the same, but also verified the accuracy of the CLEM comparison results. As shown in Figure 12, the open questionnaire of creative

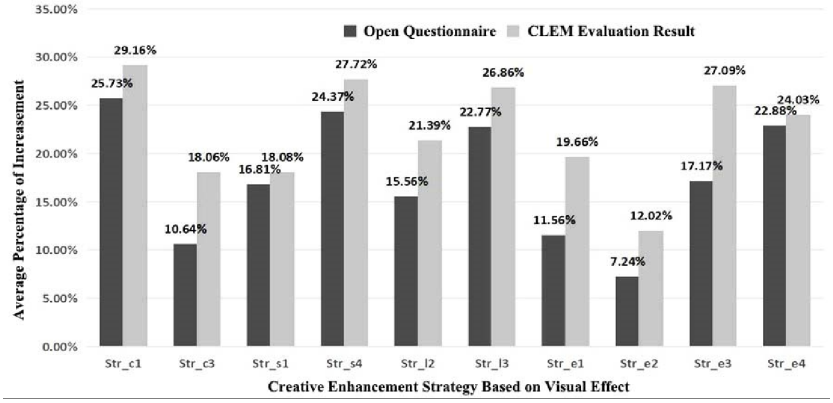

Figure 11. Comparison of the results of open questionnaire and visual effect-based CLEM evaluation

enhancement strategy based on performance content is compared with the evaluation results of CLEM, and the evaluation conclusion is the same as that based on visual effects, which verifies the effectiveness and accuracy of CLEM.

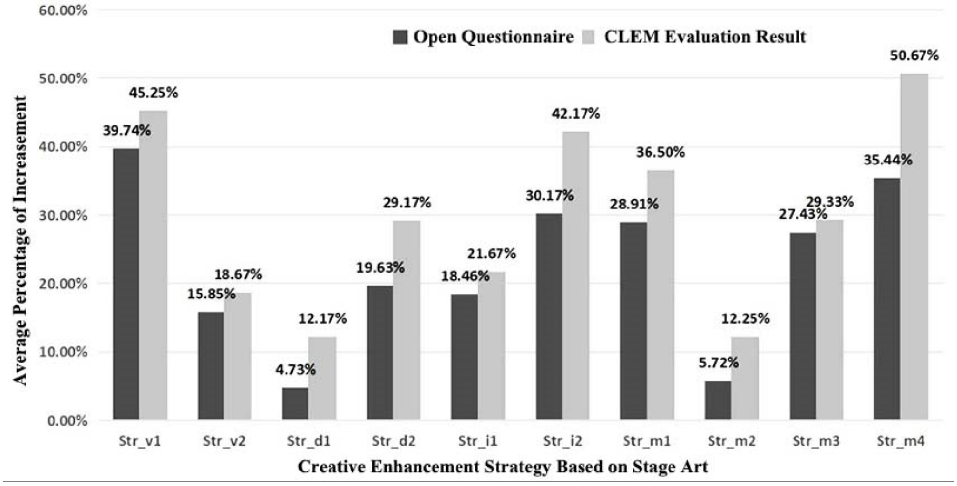

Figure 12. Comparison of the results of open questionnaire and stage art-based CLEM evaluation

9. **Conclusion.** The purpose of this paper is to explore ways to enhance the creativity of performance. We quantify the concentration of the audience when they appreciate the performance. On this basis, we study the systematic approach from creativity evaluation to performance creativity optimization. In order to achieve this goal, we have designed the creative enhancement rules of performance elements, established two creative enhancement methods based on "visual effect" and "stage art", and formed a performance creativity enhancement strategy. We propose a concentration level enhancement method (CLEM). By comparing the changes of the audience's concentration before and after creativity enhancement, this method selects strategies that can effectively enhance performance creativity, and provides directors with quantifiable performance creativity enhancement feedback to achieve the purpose of performance creativity improvement.

We have experimented with two creative enhancement methods: "based on visual effects" and "based on stage art". After analyzing the experimental results, we find that the performance creativity enhancement strategy can effectively induce significant changes in

audience emotion, and our CLEM can accurately screen out the performance creativity enhancement strategies that significantly improve the performance attention. We also use the form of open questionnaire to investigate and evaluate the effect of performance creativity enhancement, and verify the effectiveness of the CLEM proposed in this paper from the subjective evaluation of the audience.

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