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A Study on the Visual Attention of Theme Park IP Characters with Eye Tracking: Focusing on Fantawild & Disneyland IP

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Abstract

The soul and business core of theme parks are IP characters. However, in Chinese theme parks, such IP characters are currently underdeveloped and unknown, which leads to limited promotion of IP derivative products and severely restricts the industrial development of theme parks in China. This paper collects and processes the visual information of IP characters in Fantawild and Disneyland through digital quantitative data of eye-tracking. The research results can be used as a basic reference for IP role development and objective evidence for future related research.

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1. Introduction

Theme parks are not only an important part of urban public cultural space but also an important link in the development of national cultural tourism. In the past two decades, the theme park market in China has witnessed unprecedented development. According to the 2018 Global Theme Parks and Museums Report published by AECOM and Themed Entertainment Association, the Asia-Pacific region would become the largest theme park market in the world by 2020. Although China's theme parks have broad development prospects, their profitability is not optimistic which implies that there is a chance of improvement and innovation concerning the content and quality. There are many problems in actual construction and operation, such as blind investment, serious homogeneity and lack of experience in engineering construction, management and operation of parks (Dan Wu, 2021).

With the rapid development of the theme park industry, Chinese consumers have gradually increased their awareness of copyright. The more cultural contents and types they are exposed to the higher their requirements will be. At present, most scenic spots in China remain in the traditional way of combining natural scenery appreciation with commercial ancient street tours, which no longer meets the spiritual needs of tourists seeking cultural exposure. The grand opening of Shanghai Disneyland in June 2016 enabled Chinese tourists to experience large-scale cultural tourism products from overseas in China for the first time. It was their first chance to experience the fairy tale amusement world with real scenes. Compared with the tourism products developed in China, there is a significant gap between the two versions(Qiuyuan Lv, 2020).

Although China is also vigorously developing theme parks at present, compared with the mature development model of overseas developed countries, its shortcomings are apparent. Even though the Chinese government has formulated many policies and institutional measures to promote the development of theme parks, there is a significant gap between Chinese and foreign theme parks in some non-policy factors such as popularity of IP (Shuohan Yin & Sai Zhang, 2021).

To sum up, the main objective should be finding out how to improve the attraction and popularity of IP characters in theme parks and make them key factors to enhance the international influence and competitiveness of Chinese theme parks. Based on the eye-tracking technology, this paper conducts an experimental analysis and research on the visual attention of the IP characters of Fantawild and Disneyland from the perspective of consumers. By analyzing the differences of visual attention, their effect, and the main focused areas of visual attention, this paper provides a favorable reference model for the development of IP characters in Chinese theme parks.

2. Comparison of development models between Fantawild & Disneyland

In 1999, the first subsidiary company of Fantawild, Fantawild Intelligent, participated at the computer system integration and related application software development, independent research and development of virtual simulation, multi-screen synchronous playback, digital suspension imaging, the initial development of the world's first Fantawild 4D cinema and export to the United States. In 2001, Fantawild entered the field of high-tech culture tourism. In October 2007, Wuhu Fantawild Happy World, the first theme park in China, was completed and opened taking the culture and technology industry into the path of the group followed and officially laid out in the animation field. After more than 20 years of development, Fantawild has become a well-known leading

enterprise in the culture and technology in China. It has ranked in the Top 30 Cultural Enterprises in China for 10 times, as well as the national Key Enterprise of Cultural Export, National Demonstration Base of Culture and Science and Technology Integration and National Demonstration Base of Cultural Industry for 6 times. It has a number of national high-tech enterprises, the key software enterprises in the national planning and distribution and the national key animation enterprises as well. After more than 20 years of development, Fantawild group adopt the culture and the integration of science and technology development strategy while pursuing the cultural theme park with science and technology. Also, the special film and animation product were given a priority when performing arts and cultural content of products and services in the whole industry chain operations which has resulted into the four series, ten independent brands, and approximately 30 theme parks. The number of visitors of the theme park reached the world's fifth for four consecutive years. Fantawild animation has won many prizes granted by the China Central Television and its business expanded into more than 120 countries and regions. The total box office of the Boonie Bears series has exceeded 3.2 billion RMB. The Boonie Bears has become a far-reaching Chinese animation brand introducing Chinese animation to the world (Hui Pan, 2021).

Founded in 1922, the business of Disney entered into the film-oriented theme parks, real estate and entertainment in various fields. The operation of Disney theme parks is based on its film and television content and media channels. The cartoon characters are used to enhance the brand’s image. According to the public data, 60% of Disneyland's revenue comes from the secondary consumption such as derivative products developed from film characters including clothing, publications, musicals, toys, food and education. This is due to the Disney's application of content IP, animation image and sound management systems. Paul Noland, president of the International Association of Amusement Parks and Attractions,

once told "theme parks and IP will be a major trend in the future". IPs will allow visitors to realize the specific scene from original content and feel as if they are protagonists (Yi Wang, 2016).

Comparing the development model of Disneyland and Fantawild, it is apparent that Fantawild has received a lot of policies and institutional support in the development process, its market and IP influences are still limited to the internal market in China. The successful operation of Disneyland has made the Walt Disney Company a media conglomerate with strong global competitiveness. Not only its theme park concept but also various IP derivatives have become popular all over the world. The success of Disneyland lies in its successful grasp of the future theme park development trend.

On the other hand, theme parks in China mostly relied on ticket sales as the main income sources in the past. In addition, the lack of original IP characters resulted in a lack of the follow-through in the development of derivatives. Therefore, binding entertainment content of IPs to enhance core competitiveness has become the latest task in the development of theme park business in China (Yi Wang, 2016).

As shown in Figure 1, among many other theme park development projects in China, most of the business models mainly rely on tickets, accounting for 70% of the total revenue. Only the business model of Fantawild theme park is related to IP. It is evident that there is still a lot of development space for theme park IP in China. Although the business model of Fantawild is similar to that of Disneyland, there are still some differences. Statistically, Disneyland's business model is as follows: Theme Park + IP + Accommodation, whereas Fantawild's business model is: Theme Park + IP + Digital Films according to Frost Sullivan institute statistics (Frost Sullivan institute, 2019).

Figure 1. Cultural tourism industry integration of theme parks (Frost Sullivan institute, 2019)

3. IP business survey

3.1 Definition and business value of IP

According to the 2018 China Cultural IP Industry Development Report, 'IP refers to the connection and integration between cultural products, and is a cultural symbol with high identification, built-in traffic, strong cash ability and long cash cycle. Such cultural symbols are called "cultural IP". From the perspective of consumers, cultural IP represents a certain kind of label and cultural phenomenon, which can arouse interest and be sought after by users, which may be transformed into consumer behavior. From the perspective of operators, cultural IP represents a certain brand and intangible assets, which can be transformed into consumer goods and realized value through commercial operation and industrialization integration.'

3.2 Current status of IP characters

IP characters originally only derived from animations, games, picture books, such as Disney series IP, pokemon etc. But the traditional IP created great influence and commercial value beyond imagination. In recent years, the role of IP design has widely appeared in various fields, and gave birth to local IP design, such as the Japanese kumamoto prefecture kumamoto bear; IP of cultural and creative products, such as the Palace Museum Cat; enterprise IP, such as Zhihu's Liu Ganshan, Tencent Penguin, etc. With the development of online messaging apps, there are IP characters based on emojis, such as Line Friends and Kakao Friends in South Korea. There are also trendy toys and blind box IP favored by young people, such as Kwas, Molly, etc. (Ying Pan & Hui Hu, 2021).

3.3 IP character shaping and business value-addition model

In recent years, more and more IP characters have begun to reproduce new IP roles, and gradually formed a creative mode and product derivative mode that takes a specific IP as the core and regenerates "characters" from "characters". This value by the IP itself promoted the growth of a new value model, became a brand-new ecological community, and is closely linked to the industry. For example, from the animated film "Despicable Me", the IP role of “the Minions” was born, the movie "Ice Age" was born out of the IP role of “Scratch” the pinecone rat, the Japanese anime “Saint Seiya” created IP roles with “Gold Saint”. Among them, the original IP characters in the animated film “Minions” and “Despicable Me” together constitute an industrial ecological community, and different ecological communities overlap and blend with each other through the linkage mechanism to form a large IP ecological structure. This value-added development mode of IP has become an important driving force for the development of IP animation characters. Besides animation IP authorized

direct sales, the convergence media has changed the relationship between the members, past competition into today's cooperation, developed a new market this way content, and greatly reduced market competition and expanded the influence of all kinds of marginal cost, objectively formed a new work based on IP market value. The film “Ready Player One”, for example, combines IP characters from “Street Fighter”, “Overwatch”, “Tomb Raider”, “Gears of War”, and “StarCraft”. Therefore, the IP value of contemporary animation has entered a new stage, that is, in terms of the IP value of original creation, secondary development and value-addition through horizontal and vertical markets, or even multiple development and value-addition (Ximin Zhang, 2019).

At present, the research on IP role is mainly qualitative research, and the contents are mostly culture + business model research, while the specific experimental papers related to character design or IP development are relatively insufficient.

4. Eye Tracking

4.1 The principle of eye tracking

The importance of eye movements to the individual’s perception of and attention to the visual world is implicitly acknowledged as it is the method through which we gather the information necessary to negotiate our way through and identify the properties of the visual world. The unique geometric, photometric, and motion characteristics of the eyes also provide important visual cues for face detection, face recognition, and understanding facial expressions (Hansen et al., 2009).

To see an object in the real world, we have to fixate our gaze at it long enough for the brain’s visual system to perceive it. Fixations are often defined as pauses of at least 100 ms, typically between 200 and 600 ms. Eye tracking refers to the process of tracking eye movements or the absolute point of

gaze (POG)-referring to the point the user's gaze is focused at in the visual scene (Majaranta et al., 2014).

During any one fixation, we only see a fairly narrow area of the visual scene with high acuity. To perceive the visual scene accurately, we need to constantly scan it with rapid eye movement, so-called saccades. Saccades are quick, ballistic jumps of 2° or longer that take about 30–120 ms each. (Majaranta et al., 2014), (Jacob & Robert JK, 1993).

With the emergence of eye tracking technology, research can be done in a natural state, by recording the people's eye movements to analyze the operation of the interface in the moment of visual information processing, including interest or attention on the screen space position and pay attention to the transfer process. The traditional test method is a beneficial supplement (Hongting Li et al., 2007).

4.2 Eye tracking measurement method

Four eye tracking techniques have been the focus of most studies in this field and in developing novel eye tracking applications. They are the scleral search coil technique, infrared oculography (IOG), electrooculography (EOG), and video oculography (VOG) (Ahmad F. Klaib et al., 2020).

4.3 Eye tracking literature review

Eye tracking devices are scientific methods to record human eye tracking accurately. These devices first appeared in the field of psychology in the 1950s, and began to be applied in various fields as a measurement and analysis method for people's attention in the 1970s (Shuohan Yin et al., 2019).

Review on the Evaluation of Web Usability by Eye-tracking Technology (Hongting Li et al., 2007), Eye tracking and eye-based human-computer interaction (Majaranta et al., 2014), Eye Tracking Algorithms, Techniques, Tools, and Applications with an Emphasis on Machine Learning and Internet of Things Technologies (Ahmad F. Klaib et al., 2020), Driver

Situation Awareness and Perceived Sleepiness during Truck Platoon Driving-Insights from Eye-tracking Data (Sarah Maria Castritius et al., 2021), The Effect of Consumer Concern for the Environment, Self-Regulatory Focus and Message Framing on Green Advertising Effectiveness: An Eye Tracking Study (Diego Gómez Carmona et al., 2021), Eye tracking based dyslexia detection using a holistic approach (Boris Nerušil et al., 2021), etc.

As can be seen from previous studies, most of them are limited to web design, computer interaction, machine learning and Internet of Things technology, car driving, advertising, and dyslexia and other aspects, and Objective and empirical studies on visual attention to IP characters has not been a focal point in any of these studies, therefore being an analytical gap to fill.

5. Research Question & Research hypothesis

The purpose of this research was to investigate the differences in visual attention of IP characters in Fantawild and Disneyland theme parks, and to measure the visual attention degree of IP characters and the concentrated area of visual attention through eye tracking.

Research question 1. What are the differences between the two groups of theme park IP characters?
Research hypothesis 1. Disneyland's IP characters may have higher visual attention than Fantawild's IP characters.
Research question 2. What are the main factors affecting differences in visual attention in IP characters?
Research hypothesis 2. Color may be the main factor in the difference in visual attention.
Research question 3. Where are the main areas of visual attention in IP characters?
Research hypothesis 3. The primary area of visual attention in IP roles may be concentrated in the head.

6. Methods

6.1 Participants

Twenty-six participants (6 male/17 female, 20-26 yrs) were enrolled from Zhejiang Normal University. All are naïve to the purpose of the experiment and are with normal or corrected-to-normal vision.

6.2 Stimuli and Apparatus

Figure 2. IPs used in the current study

The experimental stimuli in this research are: finding the most representative IP characters from Fantawild and Disneyland. There are a total of 24 experimental stimuli, including 12 colored pictures and 12 gray scaled pictures. The image size is 800 X 800 pixels. Resolution: 300dpi, background: R.G.B.(180.180.180), browsing time: 5s, total time: 4 minutes, the experiment gave the subjects two cycles of random

stimulation to understand the immediate response of the subjects.

The stimuli were generated on a DELL workstation with an "NVIDIA GeForce GTX 970" graphics card at a frame rate of 59 Hz and presented on a DELL monitor (19 inches) with a resolution of 1440 x 900 pixels. Participants' eye movements were monitored using the "SR Research EyeLink 1000 Plus system" with high spatial resolution and a sampling rate of 1000 Hz. A head and chin rest stabilized the head with a viewing distance of 60 cm. Although the viewing was binocular, only the left eye was monitored.

6.3 Procedure

During each trial, a 500-ms fixation was first presented, followed by a 5-second stimulus display. Participants were asked to freely view the picture, and their eye-movements were recorded. There are four conditions: two IP companies (Disneyland vs. Fantawild) × two Color configurations (Color vs. Gray Scale). Each condition contained six pictures, each picture was repeated two times. A total of 48 trials were included which were randomly presented in the experiment. The whole experiment lasted for about 5 minutes.

6.4 Data Analysis

We calculated the average fixation number, fixation duration, the median and standard deviation of the horizontal and vertical fixation positions. For each dependent variable, one 2 IP company (Disney vs. Fantawild) × 2 Color configuration (Color vs. Gray) repeated ANOVA analysis was conducted.

7. Results

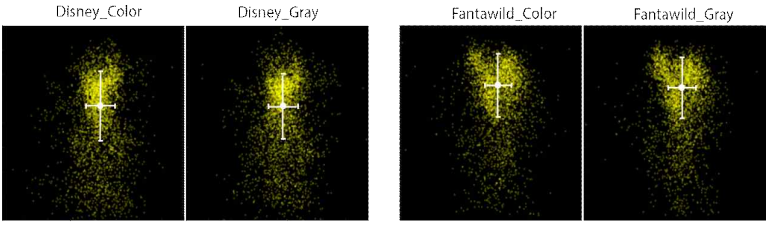

Figure 3. Hot-map of fixation positions. The yellow dots represent the positions of all fixations. The white dot represents the median position of fixations. Error bar shows the standard deviation of fixation positions.

Figure 3 plots the fixation position on the pictures, which are shown via the yellow dots. The lighter area indicates that more fixations are at that position. The white dot shows the median position of fixations; the error bar represents the standard deviation of fixation positions. It clearly shows that the vertical median of the fixation position of Fantawild IP is higher than that of Disney IP.

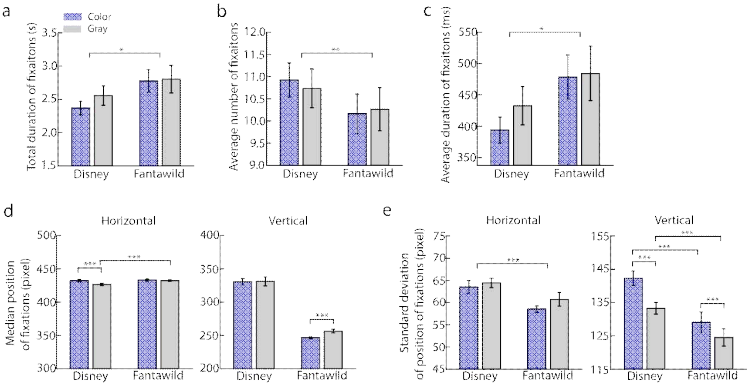

Figure 4. Eye-movement results of the current experiment. (a) The total duration of fixations; (b) Average number of fixations; (c) Average duration of fixation; (d) Medial position of fixations along with the horizontal and vertical directions; (e) Standard deviation of fixations along with the horizontal and vertical directions. *, 0.05<p<0.01; **, 0.01<p<0.001; ***, p<0.0001

For each dependent variable, one 2 IP company (Disney vs. Fantawild) × 2 Color configuration (Color vs. Gray) repeated ANOVA analysis was conducted. The results showed that the total and average fixation duration of Disneyland IP (Mean±SE: 2.46 s ± 1.18 s; 411 ms ± 20 ms) was shorter than that of Fantawild IP (2.79 s ± 1.71 s; 465 ms ± 29 ms) ($F(1,27)=6.63$, $p=0.016$, $\eta2=0.20$; $F(1,27)=6.63$, $p=0.016$, $\eta2=0.20$). The average fixation number of Disneyland IP (10.83 ± 0.40) was larger than that of Fantawild IP (10.21 ± 0.45) ($F(1,27)=9.76$, $p=0.0042$, $\eta2=0.27$). The main effect of Color configuration and its interaction with IP companies on these variables were all insignificant (ps>0.30). As shown in Figures 3a-3c.

The interaction between IP company and color configuration was significant on the medial horizontal and vertical fixation position ($F(1,27)=8.81$, $p=0.0062$, $\eta2=0.25$; $F(1,27)=5.56$, $p=0.026$, $\eta2=0.17$). As shown in Figure 4d. Post hoc analysis showed that the median horizontal fixation position of colored Disneyland IP (Mean ± SE: 432.28 ± 1.59) was right to that of gray Disneyland ($p<0.001$), not for colored Fantawild IP and gray Fantawild IP ($p = 0.26$); the median horizontal fixation position of gray Disneyland IP was left to that of gray Fantawild IP ($p < 0.001$), but not for both colored Disneyland and Fantawild IP ($p = 0.35$). The differences in the median vertical fixation position were significant between any two pairs (ps < 0.001), except between colored Disneyland IP and colored Fantawild IP ($p=0.89$).

The standard deviation of the horizontal fixation position was significant larger for Disney IP (Mean ± SE: 63.99 ± 1.23) than Fantawild IP (59.64 ± 1.10) ($F(1,27)=23.30$, $p<0.001$, $\eta2=0.45$); and the standard deviation of the horizontal fixation position was significantly smaller for colored IP (61.02 ± 0.90) than gray IP (62.61 ± 1.26) ($F(1,27)=12.23$, $p=0.0016$, $\eta2=0.31$). The interaction between IP company and Colored configuration was insignificant ($F(1,27)=0.71$, $p=0.041$, $\eta2=0.026$). As shown in the left panel of Figure 4e.

The interaction between IP company and Color configuration was significant on the standard deviation of the vertical fixation position ($F(1,27)=12.15$, $p=0.0017$, $\eta 2=0.31$). Post hoc analysis showed that the differences in the standard deviation of the vertical fixation position were significant between any two pairs ($p < 0.001$).

8. Conclusion

In this paper, eye movement tracking technology used to design experiments from the standpoint of consumers was analyzed in relation to the conducted scientific quantitative analysis on the differences in consumers' visual attention to the theme park IP characters. This has been done with the goal to understand the concentrated area of consumers' visual attention to theme park IP characters and what factors affect visual attention.

The purpose of this research is to guide and understand which areas and elements need to be focused on and strengthened in the IP design and development process to avoid adding too many subjective elements in the IP character product development process, which makes it hard for IP products to attract consumers and hinders product promotion and cultural communication, resulting in high economic losses. Its goal is to improve IP characters' product quality and market competitiveness.

The duration of each fixation reflects the attention. The longer, the more attention. The more the fixation number. Attention is more dispersed. Through data analysis, more fixation indicated more features in the IP image. Additionally, the standard deviation of vertical direction is larger for Disney IP than Fantawild IP, indicating that our attention is more disperse for Disney IP than Fantawild IP. These variables all suggest that the features are more in Disney IP than Fantawild IP.

The results of this research are as follows:

(1) Disneyland IP characters have higher visual attention than Fantawild IP characters. Prove that hypothesis 1 is correct.

(2) Color is not the main factor affecting the difference of visual attention in IP characters. Prove that hypothesis 2 is not correct.

(3) The area of visual attention in the IP role is mainly concentrated in the head. Prove that hypothesis 3 is correct.

In the course of this study, it became apparent that there is more Disneyland IP Visual attention than Fantawild IP Visual attention, but Disneyland IP Visual attention is more dispersed. From the image features of IP characters, Disneyland IP has more design elements than Fantawild IP. Perhaps design elements cause differences in visual attention, but design elements in Disneyland IP characters are not unified, and their positions are not fixed. In order to further explore the main factors affecting visual attention in IP characters and the degree to which these factors influence consumers' visual attention, it is necessary to further analyze and mine the visual information of IP characters, reprocess experimental stimuli, and design experiments according to the existing research results. Scientific research methods could be used to investigate what kind of IP characters can truly attract consumers.

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