

A Study on Efficient Animated Character Based on the Hunlock Effect

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ABSTRACT

Combined with expert interviews and questionnaire investigations, this paper aims at analyzing the different characteristics of the animated characters Spider-Man from *Spider-Man: Into the Spider-Verse* based on Hunlock Effect, in order to provide appropriate guidance for animation characters designers and limited inspiration for creative practices. First, *Spider-Man: Into the Spider-Verse* is chosen as the case to analyze 6 Spider-Man with different personalities, who appear at the same time. Then, Spider-Man's characteristics are analyzed through interviews with experts. At last, the key study focuses on the influence of environmental factors on the formation of Spider-Man's roles in the theory of Hunlock Effect, in light of the principle of personality formation in psychology. From the perspective of psychology, interdisciplinary study on animated characters provides scientific and effective support for animation character design, and increases the fascination of animation characters' personalities.

Key words: Hunlock Effect, Animated Character, Environmental Classification

1. INTRODUCTION

1.1 Background and Objectives

An animated character must conform to the animation plot, and it can draw audiences' attention through its interesting characteristics. Well-designed multimedia animated characters can inspire viewers and protect their mental health during COVID-19. Though the plots and characters are fictional, the mental experience gained by audiences is real. As a multimedia visual art, the intuitiveness and abstraction of animated characters enable the culture to spread between different countries, presenting the designer's worldview and values. The hero theme of Spider-Man opened a new creation of American heroes by using the plot that an ordinary man becomes a superhero after he's been bit by a spider being experimented.

Psychology believes that human behavior is the

result of the interaction between psychological mechanisms and the environment. Through multimedia communication, the animation uses modeling and background environment to reveal the character's personality. Animated characters originate from some artistic images created by gathering, refining, generalizing facts and figures in daily life. They are exquisite designs out of polishing and build-up. Audiences with different age, gender, education background and occupation will have different feelings to animation character's personality. The animators of Disney, a famous animation company, always put vivid and distinct personalities in the first place in the process of character creation. The distinct personality is the most attractive part of an animation character, which occupies the main position in audience and leaves a deep impression. This is one of the reasons why Disney animation is the most prominent and has

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been popular all the time. Based on Hunlock Effect, this paper analyzes Spider-Man's characteristics in social environment, family environment, and school environment in *Spider-Man: Into the Spider-Verse*. On the one hand, this analysis is made on the formation of Spider-Man's personalities with expert opinions, indicating the relation between the formation of personality and environmental influence in view of society personality formation theory. On the other hand, this paper states the proportion of which the different personalities of Spider-Man under different environments are favored by audiences, and gives reasons to it.

1.2 Research Content and Methods

The characters appeared in *Spider-Man: Into the Spider-Verse* are varied and fascinatingly characterized. This research analyzes personalities of 6 different Spider-Man that appeared in *Spider-Man: Into the Spider-Verse*. The different personalities of Spider-Man have a great impact on the plot and attraction of this animation. Each character has a different story in its own universe, and their personalities are also different. The animation creator designs the character's personality, pouring his ideas and understanding of people into it. Therefore, the animated characters reflect the feelings and emotions of human. Thus, good characters can complement the storyline while interacting with it, and at the same time, enrich the story content. Nowadays, in the research of animation character design, there are many researches on the personality of different types of animation characters. For example, American psychologists have designed different types of animation characters and invited the audience to carry out the selection experiment. South Korea has carried out the research on the personality of animation characters based on different psychological personalities. Patrick W. Galbraith studied the emotional response of virtual characters in Japan. While this thesis is to analyze the same type of animation

characters with different personalities in one animation film, which can provide new design reference for the industry.

For the above reasons, this study used the following methods :

- 1) Selecting 6 Spider-Man in *Spider-Man: Into the Spider-Verse* and analyzing their personalities.
- 2) Through the society personality formation theory of psychology, analyzing the connection between Spider-Man's personalities and the environments.
- 3) Analyzing Spider-Man's personalities based on Hunlock Effect theory.
- 4) On the basis of the interviews with the experts, extracting key words of Spider-Man's personalities to make personality classification.
- 5) Based on the audience's satisfaction, the questionnaire of fondness degree upon Spider-Man character is made, and the results of the questionnaire are analyzed.

In this study, we follow the process shown in Fig. 1.

2. THEORETICAL INVESTIGATION

2.1 Personality Formation Factors

Stephen Pinker, Professor of Psychology at Massachusetts Institute of Technology has stated that visual organs aim to convey sense of real shape and substance. Character's image building has an extremely important position in animation film production. Psychologist and philosopher William James has said that the strongest human desire is to gain a sense of identity from others. An animation film cannot touch the inner hearts of the audiences relying on only plot. It must shape the image of characters by endowing them with unique appearance, behavior, language, and distinctive personality. The process of the creation of animation character personalities should be con-

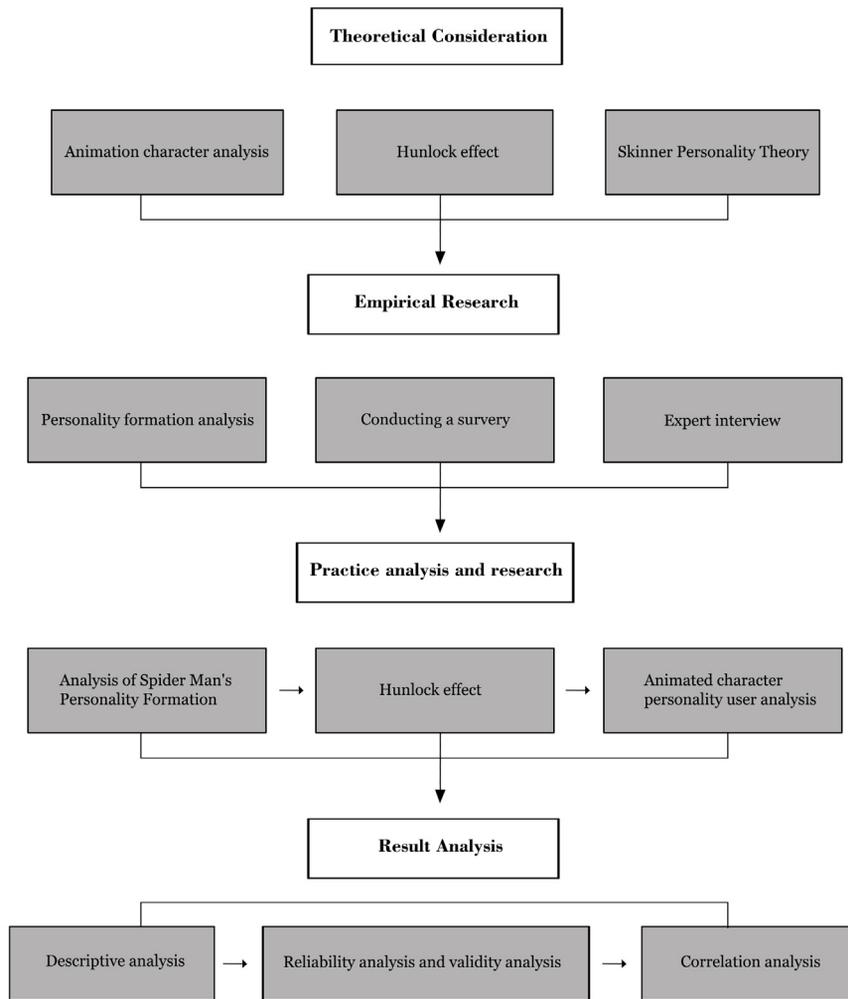


Fig. 1. Research process.

sistent with the development of the film’s plot, which is good for audiences’ understanding of the animation film.

Personality formation factors are divided into environmental factors and ego factors according to psychology. This paper selects environmental factors to analyze animated character’s personality formation so as to study animated characters scientifically and systematically. Academician Carl Ransom Rogers at American College of Arts and Sciences holds the view that education aims at cultivating healthy personality and creating positive growth environment. Stephen Pinker, Professor of

psychology at MIT and Harvard University believes people’s differences come from different life experiences, such as family education, growing emergency and so forth. These experiences dominate differences between people. Thus, this paper mainly discusses the influence of social environment, family environment, and school environment on the personality formation of animated characters (Fig. 2).

2.2 Hunlock Effect

American psychologist E. B. Hunlock has done a group of psychological experiments. The results

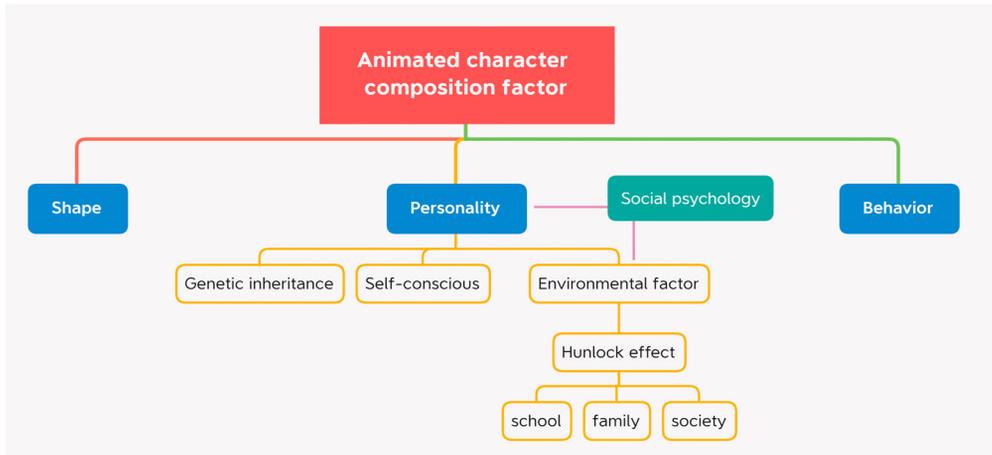


Fig. 2. Analysis on the Formation Factors of Animated Character's Personality.

are shown in Fig. 3. In his experiments, 126 subjects were divided into four groups, and they were asked to complete the same task in four different environments.

The first group is the motivation group in which testers are praised and encouraged after work;

The second group is the reprimand group in which testers are reprimanded after work;

The third group is the ignore group in which testers are not be evaluated and are will only be allowed to listen to the praise and criticism of the other two groups;

The fourth group is the control group. Let the testers be isolated from the first three groups without any evaluation.

The Hunlock Effect efficiency table shows that the four groups that perform the same task in dif-

ferent environments have significant work efficiency over time.

1. The motivation group performed the best, while the control group performed the worst.

2. With time, the working efficiency of the motivation group has been on the rise.

3. Reprimand Group is not as good as the motivation group, but it is making progress. Appropriate praise is obviously more effective than criticism, and criticism is more effective than no evaluation.

The Hunlock Effect experimental efficiency table proves that timely feedback on valuable results and behaviors can increase people's enthusiasm for the same task and explains that human development is related to the external environment.

There are plenty of efficient and successful cases in professional management and education concerning about Hunlock Effect. In the art of film, broken-hearted plots are impressive, and healing ones can help people regain their passion for life. Animation practitioners can create animated character personalities on the basis of Hunlock Effect to make people feel amused and warm, to reduce the audiences' psychological pressure and fatigue, and to help them find positive motivation to face difficulties.

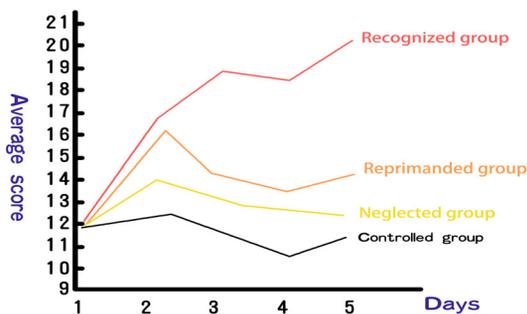


Fig. 3. Hunlock Effect experiment efficiency table.

3. EMPIRICAL RESEARCH

3.1 Character Design of Spider-Man

Before the screening of *Spider-Man: Into the Spider-Verse*, the main trend in commercial 3D animation character design was to pursue a visual sense of reality, and the design of animated character took the sense of reality as goal, in the hope of bringing audience vivid and unique visual effect and immersive animation viewing experience.

In the animation character modelling design, *Spider-Man: Into the Spider-Verse* provides 6 totally different Spider-Man images. This film was awarded 16 animation awards and high box office. Every Spider-Man has his or her own distinctive external image and personality. For the detailed analysis method of external modeling, please refer to the paper published in the Spring International Academic Conference of foundation modeling Association in 2020. It was the first time that so many derivative characters exist in one animation film. It is of great study value due to its breaking of previous rule of character creation and its planting of new concept, with which it can enlighten animation practitioners on how to design and differentiate same-type animated characters in one animation.

3.2 Spider-Man Personality Research Methods

1) Considering prior studies and animation character design principles, the animated character is divided into two elements: modeling design and personality.

2) Based on the psychological personality formation theory, the factors affecting the formation of animated characters are divided into genetic factors, environmental factors, and self.

3) This survey invited 10 animation industry experts to collect industry experts' views on Spider-Man's character through multiple rounds of interviews; According to the design characteristics of

the animated character's character and "Hunlock Effect," the Spider-Man character's personality were grouped.

4) The user questionnaires were designed based on user satisfaction, animation character design principles, and psychology and social personality formation theory to prove effective decision-making in the process of animation character design.

5) According to the result of the questionnaire, environmental influences on animated character's personalities are analyzed by using Hunlock Effect. In order to testify the effectiveness of the study, reliability analysis, effectiveness analysis, and correlation analysis are carried out. Finally, the conclusion is proved using the experimental results of the above empirical studies.

3.3 Personality-classification of Spider-Man

According to the interview results of the experts, six Spider-Man were analyzed from the perspective of personalities by using the Hunlock Effect principle. According to the plot of the animated film and the background design of the six Spider-Man, we can know that Miles Morales and Spider-Woman meet in the same high school, and the plot begins. Therefore, Miles Morales and Spider-Woman are divided into the school environment group; The role of Peter B, Parker is set as unemployed, divorced, lonely, and decadent. His background is about family, so Peter B, Parker is divided into family groups. As for Peni-Parker and Spider-Man Noir, Spider-Ham, the film emphasizes their story description of social background, so they are divided into social group. Miles Morales (Fig. 4) and Peter B, Parker (Fig. 5) were taken as the research subjects to analyze the Spider-Man's personalities in different environments. Through the personality characteristics of the environment to convey the animation character's emotion, the audience can more directly feel the change of the character's emotional characteristics.

Environmental classification	family environment	social environment	school environment
Herlock effect grouping			
Recognized group	Happy	cheerful	friendly
Reprimanded group	Conservative	anxious	introverted
Neglected group	Uneasy	Fear	Reckless
Control group			

Fig. 4. Miles Morales Personality Analysis.

Environmental classification	family environment	social environment	school environment
Herlock effect grouping			
Recognized group	Confident	Sense of accomplishment	
Reprimanded group	Cold	Sense of responsibility	
Neglected group	recoil	undisciplined	
Control group			

Fig. 5. Peter B, Parker Personality Analysis.

3.4 Hunlock Effect on Spider-Man’s Environmental Impact

A conclusion of environment grouping of Spider-Man is drawn as the following based experts’ interviews from the perspective of Hunlock Effect.

1. Miles Morales, the new Spider-Man, becomes brave and responsible after receiving appropriate praise and help, and he grows up significantly-quickly.

2. Peter B, Parker, Spider-Man, loses self-confidence and becomes depressed and has a low sense of responsibility after the death of his loved ones, divorce from his wife, investment failure and loneliness. However, after being criticized, he gradually regains his confidence and sense of responsibility and helps Miles Morales become a qualified Spider-Man.

3. Those who gained no praise or criticism in

Spider-Man: Into the Spider-Verse, Spider-Woman, Peni-Parker, Spider-Man Noir, and Spider-Ham witness Miles Morales’ growth into Spider-Man. In the end, in order to protect the stability of the city, they fight against the villain, and gain the experience of 6 different Spider-Men fighting together.

4. According to Spider Universe, there are 56 Spider-Men. The 50 other Spider-Man, Which are never mentioned in *Spider-Man: Into the Spider-Verse*, are fighting regular battles in their own world.

Cinematography can be memorable for its sad storylines and scripts, but healing stories can give people the power of rebirth.

To verify the results of our research on the personalities of animated characters, we conducted a questionnaire survey with 281 randomly-selected viewers who had watched *Spider-Man: Into the*

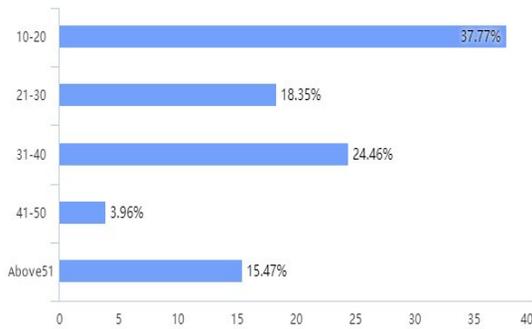


Fig. 6. Age Distribution.

Spider-Verse.

3.5 Animated Character Personality User Analysis

The main subject of this study is the audiences of the animated film.

Empirical research - empirical subjects

1. Animation research invited 10 animation industry experts and conducted multiple rounds of interviews with 10 experts. These expert groups include film directors, storyboard animators, original artists, animation character designers, scene designers, and animation film technology developers.

2. A total of 281 audiences who have watched Spider-Man: Into the Spider-Verse were randomly selected for the questionnaire survey. The questionnaire was designed based on the user situation analysis, psychological "Social Support Rating Scale" and users' liking of the Spider-Man animated movie.

Spider-Man: Into the Spider-Verse animation film is targeted at all age groups. According to the

research results of developmental psychology and child psychology on children's development, children from 7-12 years old start to have logical thinking, are able to understand and sympathize with others, learn to put themselves in others' shoes, consider others' feelings and interests and have social awareness. Therefore, we choose the median age of 10 as the lowest point of user age in this study but do not set an upper age limit (Fig. 6).

3.6 Analysis of Users' Preference for Spider-Man with Different Personalities

The results were analyzed through the questionnaire survey, and the acceptance and preference of six Spiderman animation characters were compared. Combined with the "Hunlock Effect," the reasons were analyzed. This analysis provides a more specific reference for the follow-up animation character personality research and analysis.

Of the 281 tested users, 173 (61.57%) say that in Spider-Man: Into the Spider-Verse the characters of Spider-Man are interesting, 168 (59.79%) say the appearance of the Spider-Man are good, 115 (40.93%) say Spider-Man's armors are creative, 129 (40.93%) say the Spider-Man's action design is very attractive, and 93 (33.1%) say that they share the same feeling with the Spider-Man. According to the questionnaire survey, statistics prove that the various components of the animated character will affect the viewer's viewing experience. The audiences who like the personality of the Spider-Man character accounted for the largest

Questionnaire questions : Why do you like this spiderman character?		
Options	Subtotal	proportion
1.The character design is perfect	168	59.79%
2. Interesting personality	173	61.57%
3. The Spiderman Battle gear is very creative	115	40.93%
4. The character action design is cool	129	45.91%
5. Certain situations of the character can resonate with you	93	33.1%

Fig. 7. Questionnaire Answer Case.

proportion (Fig. 7).

4. ANALYSIS OF RESEARCH RESULTS

4.1 Questionnaire Analysis

The questionnaire survey is divided into four parts (Fig. 6). Part one includes the audience’s gender, age, education background, their attitude towards *Spider-Man: Into the Spider-Verse*, and whether they want the animated characters to be similar to their reality. Part two of the questionnaire is based on the theory of the Hunlock Effect and social psychology theory. Social Support Rating Scale (SSRS) psychological test is applied. SSRS has 10 items in 3 dimensions: objective support (i.e., actual support received by the tested user), subjective support (i.e., emotional support of the tested user experience), support utilization degree, and the higher the score rate, the better the social support degree. The first part of the scale indicates support from socializing and rate of friends offering help, which shows: None: 24 (8.54%), 1-2: 95 (33.81%), 3-5: 87 (30.96%), 6 or above: 75 (26.69%). The results of this test will be used to analyze human emotional responses and personality traits in different society environments. Part three is Customer Satisfaction (CAST). CAST is the most classic user satisfaction scale for evaluat-

ing a particular event experience. It includes a five-point scale to measure user preferences. The 6 Spider-Man animated characters are evaluated by users of animated movies. Part four is analysis of character background and environment. In order to understand users’ emphasis on the story background of animated characters, the matrix scale is used for investigation and evaluation, verification, and extraction.

Firstly, we use SPSS to conduct reliability analysis on the questionnaire. According to Cronbach’s a coefficient which measures the reliability of the sample, the a coefficient value is 0.8, indicating that the overall reliability of the research subject is good, and the survey data can be used for effective research. Secondly, KMO and Bartlett tests are carried out to prove that reliable data could be used for the next step of research and analysis. The KMO and Bartlett SPSS analysis result is 0.9 which meets $KMO > 0.6$ and $P < 0.05$. According to the Hurlock Effect and the animated film’s plot, the six Spider-Man characters are grouped into environmental groups (Table 2).

4.2 Analysis Result

After validity analysis and credibility analysis, according to the three environmental factors set by the theory of social personality environment for-

Table 1. Questionnaire reliability and validity.

Questionnaire reliability analysis	Cronbach’s Alpha		Number of items
	.800		60
Questionnaire validity analysis	Kaiser-Meyer-Olkin metric		.908
	Bartlett’s sphericity test	Approximate chi-square	3352.854
		df	153
		sig.	.000

Table 2. Spider-Men Environment Grouping.

Environment	Spider-Man
School Environment	Miles Morales, Spider-Woman
Family Environment	Peter B, Parker
Society Environment	Peni-Parker, Spider -Man Noir, Spider-Ham

mation, and through the user questionnaire, three different environments of Spider-Man’s personality preferences, using variance analysis to study the school environment, family environment, and society environment were set to study the difference among the three groups of environment.

Data analysis results show that in *Spider-Man: Into the Spider-Verse*, the character influenced by school environment has the highest average score of satisfaction (4.10), the character influenced by family has the lowest average score of satisfaction (3.40), and the character influenced by society has the middle average score of satisfaction (3.75). $P < 0.05$ indicates that there exists a significant difference. In this study, $P < 0.01$ indicates a highly significant difference.

4.3 Post Multiple Comparative Analysis

As shown in Table 4, the overall ranking of satisfaction of different audience groups on the characters of Spider-Man formed under the school environment, family environment and society environment is: School Environment > Society Environment > Family Environment.

In the three environments, comparing school environment with the family environment, two points are found out. First, in the school environment, we can have a richer emotional experience, such as

friendship, pure love, and getting along with classmates and teachers. Second, according to the information collected by the questionnaire, audiences all have different levels of school learning experience, so the audiences are more capable to share the same feeling to increase the spiritual interaction and immersive experience with the animated characters.

Comparing school environment with society environment, the following points are found out. First, school environment is relatively simpler than society environment. Second, both environments have rich emotional experience, but the positive emotional experience in school environment is more than the positive experience in society environment. Third, the negative emotional experience in society environment is more serious. The audiences are more likely to feel uncomfortable.

Comparing family environment with society environment, the conclusion is as follows. First, because there are few family members of the characters in the film, the emotional communication is relatively single and fixed, while the sociality environment contains more emotion experience and rounder characters. Second, in *Spider-Man: Into the Spider-Verse*, four Spider-Man lost their parents, and one lost all their relatives. Such an environment setting will make some viewers who have

Table 3. Variance Analysis Table.

Dependent Variable	Group	N	Mean	F	Sig.
	School Environment	281	4.10	20.496	.000
	Home Environment	281	3.40		
	Society Environment	281	3.75		

Table 4. Analysis of Variance of Environmental Satisfaction.

Dependent Variable: Degree of Satisfaction					
(I) Group	(J) Group	MD (I-J)	Std. Error	Sig.	Multiple Comparisons
School Environment (1)	Home Environment (2)	.705	.110	.000	1>2
School Environment (1)	Society Environment (3)	.342	.110	.002	1>3
Home Environment (2)	Society Environment (3)	-.363	.110	.001	2<3

lost their loved ones empathize with their unfortunate lives and increase their psychological burden.

5. CONCLUSION

According to social psychology, individual behavior is influenced by the social environments, such as individual identity, individual status, education, and behavior mode. Society identity can be divided into personal identity and social identity. An individual can be aware of the specific social group he belongs to, as well as the emotion and value meaning that group identity brings to him. 6 Spider-Man in *Spider-Man: Into the Spider-Verse* have different identities, different education, different behavior patterns, and different values, but they share the same goal of maintaining social stability, protecting the world, and reducing harm. Six personalities are held by one single character, so it is vital to divide the group since each personality represents in detail, making it easier for the audience to distinguish their individual identity and thought, behavior pattern, and the capability of saving society. Hunlock Effect can be used to group the environment of all the characters conveniently and effectively, arrange the background of the characters and improve the design efficiency and set the characters in a scientific way.

According to the user questionnaire, the personalities of animated characters in the *Spider-Man: Into the Spider-Verse* are favored by the audiences, which are exhibited together through the external modeling, behavior, and action environment of the animated characters. The personality of the animation character is set according to the animation plot. Not only the composition of the story is widely resonated by the audience, but also an important element of the animation that can bring box office success. Through the interview with 10 experts in animation industry, it can be known that the character's personality reflects the creator's cognition and understanding of society.

If carefully analyze the personality of the characters in animation, one can more scientifically carry out the behavior of the characters in animation. In this way, the actions of the characters are interconnected, the content of the story is richer, the audience's acceptance is higher, and the audience of different countries can more easily understand the creative intention of the animation creators. In animated films, the personality of animated characters is displayed together through the external modeling, behavior, and environment of animated characters. The characters in different environments are different. In the classification of school, family, and society, the animation character personality with interesting and happy adolescence created in a school environment is the most popular. followed by animation character personality shaped through family warm environment and relatively simple family beloved relationship. Because of the variability of the social environment, the emotional experience of some audiences will have uncertainty. Therefore, when animation practitioners need to provide animation characters with a positive emotional experience for the audience, they can first consider shaping the character's personality based on the school environment, followed by family environment and social environment. Vivid and interesting animated characters can make the audience remember more deeply, increase the popularity of animated films, and encourage the audience to face life. The flaw of this thesis is that there are many aspects that affect audience satisfaction for characters while this thesis only analyzes the characters from the perspective of characters' personalities. In the subsequent research, analysis of the actions of animated characters will be continued to form a complete series of studies on animated characters.

REFERENCE

[1] A.W. Damerall, "The Visual Working Memory

- Demands of Processing Conventional Metaphoric Language,” *American Journal of Psychology*, Vol. 134, No. 1, pp. 13-29, 2021.
- [2] T. Lee and Y.S. Lee, “Emotional Influence of Attribute Patterns of Movement in Interaction Form,” *Archives of Design Research*, Vol. 34, No. 1, pp. 69-82, 2021.
- [3] J.J. Li, “Research for The cognitive Properties of Zombie Game Character,” *Journal of Korea Multimedia Society*, Vol. 24, No. 5, pp. 717-726, 2021.
- [4] S.K. Kim, “Affective Computing Among Individuals in Deep Learning,” *Journal of Korea Multimedia Society*, Vol. 7, No. 2, pp. 115-124, 2020.
- [5] A. Ratajska, M.I. Brown, C.F. Chabris, “Attributing Social Meaning to Animated Shapes: A New Experimental Study of Apparent Behavior,” *American Journal of Psychology*, Vol. 133, No. 3, pp. 295-312, 2020.
- [6] S. Jian and S.Y. Mi, “Length-shot language research in animation,” *The Korean of Society Science*, Vol. 38, No. 1, pp. 83-96, 2020.
- [7] H. Zhe and L.H. Seok, “Study of User Reuse Intention for Gamified Interactive Movies upon Flow Experience,” *Journal of Korea Multimedia Society*, Vol. 7, No. 4, pp. 281-293, 2020.
- [8] S. Pinker, *Enlightenment Now: The Case for Reason, Science, Humanism, and Progress*, Duke University Press, London, 2019.
- [9] P.W. Galbraith, *Evolutionary Psychology, Otaku and the Struggle for Imagination in Japan*, Durham, 2019.
- [10] L.S. Jie, “Personality and Behavior Analysis of the Characters in Naruto – With focus on Enneagram Type,” *Korean Society of Cartoon and Animation Studies*, Vol. 43, No. 1, pp. 23-46, 2016.
- [11] D.M. Buss, *Evolutionary Psychology: The New Science of the Mind*, East China Normal University Press, Shang Hai, 2007.



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