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Effects of Color of Clothes on the Impressions of a Male Character in a Video Game

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ABSTRACT

In the present study, 13 different colors were prepared to paint clothes of a virtual 3D male character, and the character with 39 different clothes were constructed as stimuli. Participants were requested to rate their impressions for the stimuli using 25 semantic differential scales. The results of the factor analysis showed that the impression space was spanned by activity, potency and evaluation factors. The stimuli with warm colors were perceived as active. In contrast, cool colors and achromatic colors were perceived as passive. Red and black clothes were perceived as powerful. In contrast, green-yellow, green and red-purple clothes were perceived as powerless. Among the achromatic colors, black was powerful, white was powerless and grey was intermediate. These results implied that the brightness of the color affected the potency. On the evaluation factor, white clothes were perceived as pleasant but purple-blue and purple were perceived as unpleasant. These results of the evaluation factor may reflect the cultural background.

Keywords: Impression, Color, Video game, Semantic differential method, Factor analysis

INTRODUCTION

Clothes are one of the important factors that express a character's personality. The two factors which construct the clothes are shape and color. Yamada, Yanagida and Yoneda (2015) and Oosawa and Yamada (2016) showed that the colors are the important factor to determine the impressions of characters (Bandai Namco Entertainment Inc., 2019; Oosawa and Yamada, 2016). Therefore, it is thought that the color of the clothes is a very important factor of determining the impressions of a character.

In the present study, a male character was selected from the 3D model characters in CODE VEIN (2019). CODE VEIN is a game software released by Bandai Namco Entertainment Inc. that allows players to customize the character design of the main characters. Using this function, how the impressions of a character changed by changing the color of the clothes of a male character was measured.

METHODS

Generally, the clothes of a character are painted in multiple colors. In the present study, the clothes were painted in one color to simplify and investigated the relation between the colors and the impressions. A male

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character who was constructed by a 3D model in the CODE VEIN was used as stimulus. Ten basic colors in the Munsell color system (Red, Yellow-Red, Yellow, Green-Yellow, Green, Blue-Green, Blue, Purple-Blue, Purple, Red-Purple) and three achromatic colors (White, Gray, Black) were prepared, and these 13 colors were used for painting the three types of cloths of a male character. In total, 39 experimental stimuli were constructed for the experiment. The stimuli were presented on the screen of Eizo Flex Scan SX2462W. Fifteen participants from Kanazawa Institute of Technology were requested to watch each of them and rate their impressions using 25 seven-step bipolar SD (semantic differential) scales. The participants were also requested to rate the degree of the preference for each stimulus. The experiment was conducted in a soundproof darkroom. The order of the stimuli was randomized for each participant.

RESULTS AND DISCUSSION

The rated scores were averaged over the participants, and factor analysis with the principal factor method and varimax rotation was performed using the mean scores. The results of the factor analysis showed that the cumulative contribution rate for the three factors reached to 78% (Table 1). The factors were labeled as activity, potency and evaluation after the scales which showed large values of loadings for the factors.

Table 1. SD scales and their factor loadings.

Scale	Activity	Potency	Evaluation
Mopey - Energetic	.979	-.086	.091
Dainty - Dynamic	.716	.495	-.232
Quiet - Active	.977	-.035	.044
Cold - Warm	.947	-.183	-.009
Shabby - Vivid	.875	.122	-.081
Dark - Blight	.801	-.343	.347
Lethargic - Ambitious	.980	-.045	.092
Gloomy - Cheerful	.952	-.170	.189
Sober - Flamboyant	.829	.075	-.001
Uncool - Cool	-.166	.723	.599
Powerless - Powerful	.602	.722	.004
Light - Heavy	-.309	.804	-.370
Weak - Strong	.285	.911	.139
Irresoinsible - Dependable	.262	.920	.179
Loose - Tight	-.206	.787	.351
Round - Sharp	-.173	.752	.222
Soft - Hard	-.239	.875	-.018
Dirty - Clean	.026	.192	.874
Unpleasant - Pleasant	.123	.276	.900
Uncute - Cure	.501	-.644	.359
Chirldish - Mature	-.669	.658	.161
Ubiquitous - Unique	.660	.104	-.285
Sordid - Fresh	-.605	-.365	.517
Dry - Moist	-.263	-.608	-.045
Cumulative contribution rate	.401	.703	.830

The colors of the stimuli were plotted on the three-dimensional impression space (Fig. 1). It was noticed that the plots on the activity-potency corresponded to the color circle. To test the significance of the color of the clothes on the impressions, one-way ANOVAs were performed (Table 2). Table 2 shows that the significance levels of the effects of the color are less than 5%. This implies that the color was significantly affected on the impressions. Figure 2 shows the centroids with standard deviations for each color.

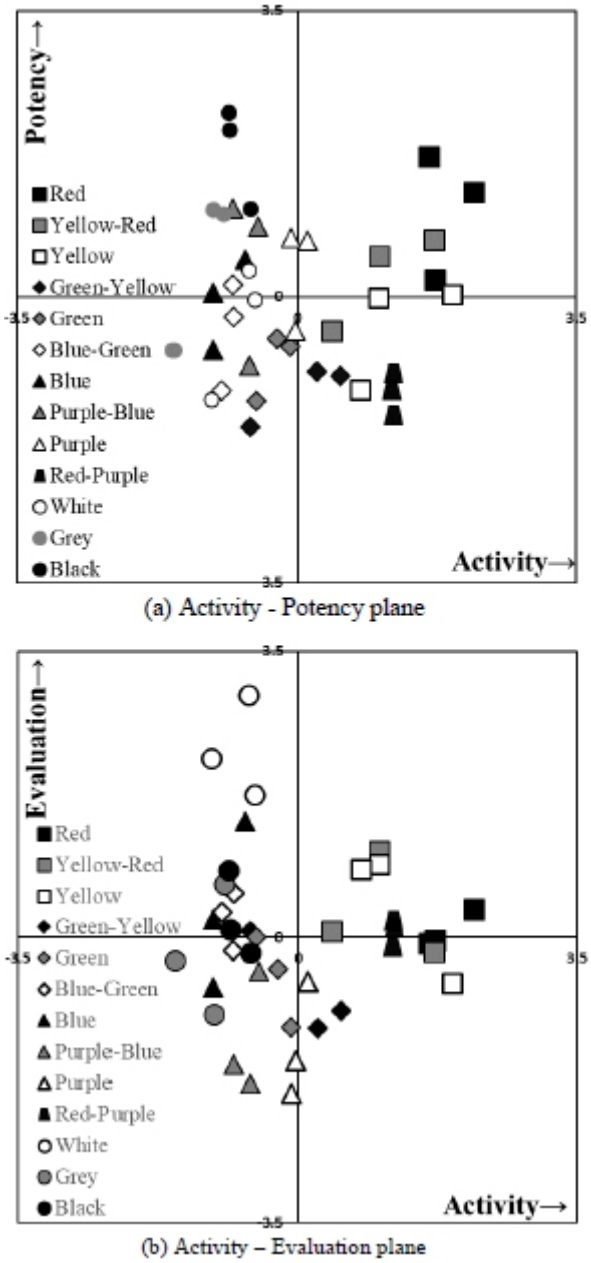


Figure 1: Impressions of the stimuli.

Table 2. Results of the ANOVAs.

	Factor	df	*F*	*P*
color	activity	12	24.858	.000
	potency	12	4.633	.001
	evaluation	12	5.900	.000

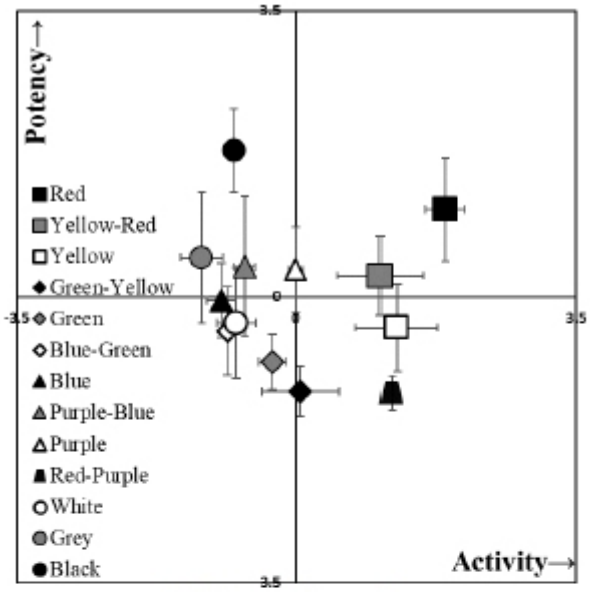
Figure 2 shows that Red, Yellow-Red, Yellow, and Red-Purple clothes are perceived as active, while Blue-Green, Blue, White, Gray, and Black are perceived as inactive. This implies that the clothes with a warm color is perceived as active, while a cool color and an achromatic color is perceived as inactive.

Figure 2 shows that the impression of the activity does not change largely among the achromatic colors. This suggests that the brightness of the colors does not affect the activity largely. The three attributes of the colors are brightness, saturation and hue, so saturation and/or hue should affect the activity. In Fig. 2, only one pair of an inactive chromatic color, Green and an achromatic color, Gray showed a significant difference in the activity, and no significant difference was observed in the other pairs in the significance level of 5%. This suggested that hue is more largely affected the activity rather than the saturation.

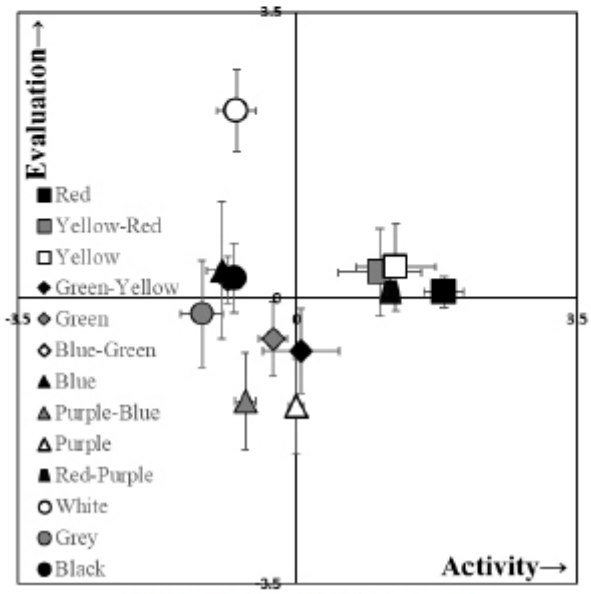
In Fig. 2, Red and Black showed high degrees of the potency, while Green-Yellow, Green, Red-Purple showed low degrees of the potency. The degrees of the potency were White < Gray < Black for the achromatic colors. This suggested that the brightness affects the potency. To confirm whether this was also true for chromatic colors, a point on the clothes was sampled and the brightness was measured on the monitor screen for all clothes. The point was selected under the conditions; "not where the light is hitting," "not where the shadow is falling," and "not where the wrinkles are." The resulting positions were similar for all clothes. The colors of the sample points were projected on the screen and the brightness of them were measured using a color luminance meter Konica Minolta CS-100A. The luminance Y measured by the CS-100A corresponds to the brightness in the L*a*b* color space. In this way, the brightness was determined. Table 3 shows five stimuli which possess the highest degrees of the potency and five stimuli which possess the lowest degrees of the potency. Table 3 also shows the luminance Y for each stimulus. Table 3 shows that the stimulus with high potency indicate a low value of the luminance Y, and vice versa. This implied that the brightness largely affected the potency.

Figure 2(b) shows that White possess high degrees of evaluation, while Purple-Blue and Purple showed low degrees. The SD scales of "beautiful-ugly" and "pleasant-unpleasant" showed high factor loadings for the evaluation factor. The evaluation factor may correlate with the cultural background. The color of White, which showed high degrees of evaluation, are used for white coats of doctors. The participants might associate the cleanliness with White. On the other hand, Purple-Blue and Purple associates with poison in Japanese community, therefore these colors might lead the ugly and unpleasant impressions. In the series of "Disney Villains" films produced by Walt Disney Studio, the color of purple is used as a symbol of magic. When the

colors of a costume include purple, a character who wear the costume always uses magic to do bad things. This also might associate the Purple-Blue and Purple with ugly and unpleasant impressions. Fig. 2(b) shows that Yellow-Green also possess a low degree of evaluation. In the "Disney Villains" series, the yellow-green color is used to show an evil magician uses magic.



(a) Activity - Potency plane



(b) Activity – Evaluation plane

Figure 2: Centroids of the impressions for different colors.

Table 3. Brightness of the colors of the clothes.

Ranking	# of stimulus	Color	Y
1	26	Black	10.6
2	13	Black	0.5
3	1	Red	14.5
4	14	Red	17.9
5	8	Purple-Blue	3.6
35	32	Blue-Green	22.4
36	37	White	67.7
37	31	Green	24.2
38	36	Red-Purple	27.8
39	30	Green-Yellow	40.8

In the final step of the present study, the preferable colors for the clothes of the male character was investigated. A multiple regression analysis was performed using the factor scores of each factor as independent variables and the degree of the preferences as the dependent variable. The results showed a high value of the coefficient of determination as 0.74. The multiple regression coefficients showed that a character with beautiful and powerful clothes is preferred. Table 4 shows five stimuli which possess the highest degrees of preference. Table 4 shows that achromatic colors are preferred. In the present study, the clothes are painted in single colors. Black or white clothes are popular in the real world, but clothes with a single chromatic color is rarely seen. This may lead the unfamiliar feeling for them, and not preferred.

Table 4. Preferred stimulus.

Ranking	# of stimulus	Color
1	26	Black
2	24	White
3	13	Black
4	14	Red
5	39	Black

CONCLUSION

In the present study, a male character wore three different shapes of clothes painted in 13 single colors. The results showed that the impressions were significantly affected by the color than the shape. The impression space was spanned by three factors; activity, potency and evaluation. The activity was largely affected by hue. The potency was largely affected by the brightness. The evaluation might be largely affected by cultural background.

REFERENCES

Bandai Namco Entertainment Inc. (2019); Code Vein, PLJS-36037.

Oosawa, S., Yamada, M. (2016); Impressions of characters in the Japanese magical girl anime metaseries, "Pretty Cure," Advances in Affective and Pleasurable Design: Proceedings of International Human Factors and Ergonomics Conference, pp. 165–170.

Yamada, M., Yanagida R., Yoneda, R. (2015); A study on impressions of monster design in Pokemon, Proceedings of International Symposium of Affective Science and Technology, pp. 1–6.