ORIGINAL ARTICLE

Differences in Ratings of Impressions between Japanese Calligraphic Styles and a Japanese Font

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Abstract: This study aims to investigate the differences in ratings of characters' forms or shapes between various Japanese calligraphic styles and a Japanese font. We used 11 pictures consisting of 10 calligraphic styles by a master of calligraphy and one Japanese font. Participants (N = 316) were asked to provide their impressions of each picture on a 20-point Likert scale, which was based on the semantic differential method. Exploratory factor analysis showed two common factors in the ratings of the different Japanese calligraphic styles and the font, namely, Comfort and Creativity. The results indicated that the font was rated highest on Comfort and Rounded calligraphic style was rated highest on Creativity. A detailed exploration of the differences in ratings between each style should be investigated in the near future.

Keywords: *Japanese calligraphic style, Font, Rating*

1. INTRODUCTION

There are currently 1650 types of Japanese fonts [1]. Japanese fonts are widely used in various fields (e.g., marketing) because of their usability and legibility. On the other hand, the recent ratings of Japanese calligraphic characters in logo designs have improved in the advertising field [2]. This fact could imply that Japanese calligraphic characters might have benefits that are different from those of Japanese fonts. A recent study has reported differences in impressions between Japanese calligraphic characters and fonts [3]. However, it is unclear what kinds of differences exist between them, because the ratings of the impressions have not yet been investigated in detail. Therefore, this study investigates the differences in ratings of characters' forms or shapes between various Japanese calligraphic styles and a Japanese font.

We selected the writing styles that are examined in the present study in the following way. There are five main kinds of traditional Japanese calligraphic styles: "Kaisho" (regular script), "Gyosho" (semi-cursive), "Sosho" (cursive), "Reisho" (clerical script), and "Tensho" (seal script). In addition, we checked which styles are used in combination in advertising. The results show that Kaisho and Tensho styles are hardly used in packaging [2]. Hence, we adopted the applied styles instead of the traditional Kaisho and Tensho styles. Regarding the font, as Gyosho was the most frequently used font [2], we selected "DFP Gyosho regular" (Dyna font, DynaComware Corporation) as our Japanese font to compare with the

Japanese calligraphic styles (Figure 1). In choosing the characters for this study, we were aware that many kanjis' ideogrammatic natures may trigger personal meanings and feelings. For this reason, we selected kanji characters that were not adjectives. When selecting a person to write in our selected styles, we took a recent study into account, which argued that there are differences in characters' forms or shapes between masters of calligraphy and ordinary people [3]. The characters used in this study were therefore written by a calligrapher and not by ordinary people. In deciding which writing instrument to use in the present study, we chose to use a brush in accordance with the fact that all above-described styles of writing are usually written with a brush in both classic and modern calligraphic materials. We sourced the pairs of adjectives for the Likert scale of this study from recent studies related to research on the ratings of advertising or products. In order to explore users' impressions of the characters' forms or shapes in detail, the semantic differential (SD) method [4] has been suggested as one of the most effective procedures. Many researchers have frequently used this method to select rating scale descriptors and to perform exploratory factor analysis (EFA) [5, 6].

We conducted a survey as a pilot study in order to investigate the differences in ratings of characters' forms or shapes between various Japanese calligraphic styles (i.e., the traditional style, its applied one) and a Japanese font (Figure 1). This survey asked participants to rate each character's form or shape using the SD method. The data was then compared to each participant's response and analyzed using EFA to investigate the differences in

Traditional styles

S1: Gyosho
(semi-cursive)

S2: Sosho (cursive)

S3: Reisho
(clerical script)

Applied styles

S4: Angular style
(based on Kaisho)

S5: Blurred style
(based on Gyosho)

S6: Partially-sparse style
(based on Gyosho)

C7: Rounded style
(based on Sosho)

C8: Skewed style
(based Sosho)

C9: Horizontay-
long style
(based on Reisho)

C10: Vertically-long
style (based on Tensho)

Font

S11: DFP Gyosho regular
(Dyna font)

Figure 1: Schematics of the 10 Japanese calligraphic styles
and font used in this study.

impressions of characters' forms or shapes between different Japanese calligraphy styles and the font. We subsequently considered whether (and how) factor structure differences were present.

2. METHODS

2.1 Materials

We prepared 11 pictures for this study, comprised of 10 Japanese calligraphic styles and one Japanese font (i.e., DFP Gyosho regular). Figure 1 shows all 10 styles and the font used in this study. Of the 10 Japanese calligraphic styles, three kinds were in the traditional style and seven kinds were applied versions. The former is composed of Gyosho, Sosho, and Reisho. The latter is composed of applied styles, which were named for this study as follows: the Angular style (based on Kaisho), the Blurred and Partially-sparse styles (based on Gyosho), the Horizontally-long style (based on Reisho), the Vertically-long style (based on Tensho), and the Rounded and Skewed styles (both based on Sosho). Each character was written by a master of calligraphy in reference to classic calligraphy examples [7]. Characters of the blurred style were written with gray ink, while all others were written with black ink. All characters were written with a brush. Each picture consisted of 48 kanji characters. We adjusted all character sizes to appear as 62-point to ensure identical character sizes. Each character was placed in six rows, consisting of eight characters horizontally in each column,

and written at regular intervals. An 8 mm space was placed between the lines, and a 7 mm space was placed between the columns. These 11 pictures were edited as full-sized A4 images (1229 × 1653 pixels) with white backgrounds for individual presentation.

We chose the following 12 pairs of adjectives for this research from recent studies on the rating of advertising or products: two pairs relating to advertising, "Pleasant/Unpleasant" and "Familiar/Unfamiliar" [8]; nine pairs relating to products, "Likeable/Unlikeable" [9], "Beautiful/Ugly," "New/Old," "Unrestrained/Restrained," and "Clear/ Muddy" [10], "Reliable/Unreliable," "Comfortable/Uncomfortable," "Stable/Unstable," "Creative/Imitative," and "Gorgeous/Plain" [11]; and an additional pair, "Legible/Illegible."

The selected pictures and adjectives were projected in separate windows on a 17-inch monitor; they were shown in a randomized order to account for possible order effects.

2.2 Participants and procedures

The participants were consisted of 316 adults (156 men, 160 women, average age = 49.78, SD = 10.87, aged 30−69). The survey was conducted using the Internet survey company Macromill (Macromill Inc, Tokyo, Japan). We asked participants to rate each picture in terms of their impressions of the 13 adjectives on a 20-point Likert scale using the SD method.

3. RESULTS

3.1 Comparing each participant's response to each adjective

This study's survey reports that the following Japanese calligraphic styles and font were rated highest for each adjective by participants: DFP Gyosho regular in 10 adjectives (i.e., Comfortable/Uncomfortable, Likeable/Unlikeable, Beautiful/Ugly, Stable/Unstable, Legible/Illegible, Familiar/Unfamiliar, Reliable/Unreliable, Clear/Muddy, Pleasant/Unpleasant, and Gorgeous/Plain); Angular style in two adjectives (i.e., New/Old and Creative/Imitative); and Rounded style in one adjective Unrestrained/Restrained. We conducted the Friedman test on each participant's responses to compare the scores between the calligraphic styles and the font. The Friedman test for each of the 13 adjectives showed significant differences in all of the adjectives between all 10 styles and the font ($\chi^2 \geq 230.74$, df = 10, $p < .001$). Subsequently, we performed the Wilcoxon test for the two styles and the font (i.e., Angular style, Rounded style, and DFP Gyosho regular), which were rated the highest by participants,

over all other styles and the font. The results revealed that DFP Gyosho regular was significantly rated highest of all styles for seven adjectives, $p < .001$ (i.e., A1-7 in Table 1). Regarding Clear/Muddy, DFP Gyosho regular was rated significantly higher than Gyosho, $p < .01$, and the other nine styles, $p < .001$ (i.e., S2-10 in Figure 1). As for Pleasant/Unpleasant, DFP Gyosho regular was rated significantly higher than nine styles, $p < .001$ (i.e., S1-6, and S8-10 in Figure 1). However, there was no significant difference with Rounded style, ns. With respect to Gorgeous/Plain, DFP Gyosho regular was rated significantly higher than Gyosho, $p < .05$, Blurred style, $p < .01$, Partially-sparse style, $p < .01$, and the other seven styles, $p < .001$ (i.e., S2-4, and S7-10 in Figure 1). With regard to New/Old, Angular style was significantly rated higher than Rounded style, $p < .01$, and the other eight styles and the font, $p < .001$ (i.e., S1-3, 5, 6, and S8-11 in Figure 1). As for Creative/Imitative, Angular style was rated significantly higher than eight styles and the font, $p < .001$ (i.e., S1-3, S5-7, and S9-11 in Figure 1). However, there was no significant difference with Skewed styles, *ns*. Finally, regarding Unrestrained/Restrained, Rounded style was rated significantly highest of all styles and the font, $p < .001$ (i.e., S1-6, and S7-11 in Figure 1).

Table 1: Factor loadings for exploratory factor analysis on the ratings for 10 Japanese calligraphic styles and a font.

Item		F1	F2	Communality
A1:	Comfortable/Uncomfortable	**.91**	.03	.83
A2:	Likeable/Unlikeable	**.91**	.09	.83
A3:	Beautiful/Ugly	**.89**	-.05	.79
A4:	Stable/Unstable	**.85**	-.11	.73
A5:	Legible/Illegible	**.81**	-.04	.65
A6:	Familiar/Unfamiliar	**.80**	.13	.66
A7:	Reliable/Unreliable	**.76**	-.27	.65
A8:	Clear/Muddy	**.72**	-.24	.58
A9:	Pleasant/Unpleasant	**.68**	.10	.47
A10:	Gorgeous/Plain	**.53**	.16	.31
A11:	New/Old	.16	**.61**	.40
A12:	Creative/Imitative	-.20	**.54**	.34
A13:	Unrestrained/Restrained	.03	**.45**	.20
Cumulative proportion		48.90	57.16	
Correlations between response dimensions				
F1		1		
F2		-.36*	1	
Cronbach's alpha		.93	.53	

Notes. Factor loadings > .40 are in boldface.
　　　　Item identifiers: F1, Comfort; F2, Creativity.
　　　　* $p < .05$

3.2 Factor structure

　We conducted EFA using principal factor solution without rotation method to investigate: 1) whether or not the 13 adjectives could explain the differences in ratings of characters' forms or shapes between various Japanese calligraphic styles and the font; 2) how many factors could be relevant. The results show that all values of the initial communality regarding the 13 items exceed .17. The resulting scree plot indicates that two factors might be relevant for this study. Hence, we assumed two common factors that differentially rate the Japanese calligraphic styles and font, using all of the 13 adjectives. We then performed EFA using principal factor solution by means of the varimax rotation method, assuming two factors to investigate the differences in ratings of characters' forms or shapes between the calligraphic styles and the font. The results indicate that all values of communality regarding the 13 items exceed .20. As Table 1 shows, EFA revealed a two-factor solution that accounted for 57.16% of the variance. We named each factor as follows: Factor 1 "Comfort ($\alpha = .93$)" including 10 adjectives; Factor 2 "Creativity ($\alpha = .53$)" including three adjectives (see Table 1). There was a significant negative-positive correlation between these two factors ($r = -.36$, $p < .05$). Finally, we conducted the Friedman and the Wilcoxon tests on each participant's responses to compare the factor scores of the 10 styles and the font. The results reveal that DFP Gyosho regular had the highest score in Comfort, ($p < .001$); Rounded style had a higher score than Skewed style ($p < .05$) and all other styles and the font in Creativity ($p < .001$).

4. DISCUSSION

　By comparing each participant's response to each of the 13 adjectives, we found the following: the Japanese font was rated significantly higher than the Japanese calligraphic styles concerning impressions of comfort, i.e., nine adjectives (A1-8, and 10 of F1 in Table 1); some of the Japanese calligraphic styles, i.e., Angular style and Rounded style, were rated significantly higher than the Japanese font concerning impressions of creativity, i.e., 3 adjectives (A11-13 of F2 in Table 1). By performing EFA, we found two common factors in participants' ratings of the Japanese calligraphic styles and the font, namely, Comfort and Creativity (Table 1). The results indicate that the Japanese font was rated significantly highest in Comfort; Rounded style was rated significantly highest in Creativity.

5. CONCLUSIONS

This study aimed to explore the differences in ratings of characters' forms or shapes between various Japanese calligraphic styles and a Japanese font (see Figure 1). Our findings suggest that there might be two main differences in the ratings of impressions between the Japanese calligraphic styles and the font. The first is that the font used in this study might have generated a more comfortable impression than the Japanese calligraphic styles. The second is that one calligraphic style used in this study (i.e., Rounded style) might have generated a more expansive impression than the font.

With reference to this study's limitations, we should state that we could only use a single font in order to reduce the burden of the research participants. Future studies should compare other additional fonts. Moreover, as a recent study has shown [3], there is a difference in the character height-width ratio between calligraphers' characters and the font in our study. This may imply that differences in character height-width ratio could impact people's impressions of various characters. Therefore, a detailed study to explore the differences in ratings of characters' forms or shapes between various Japanese calligraphic styles and fonts should be conducted in the near future.

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REFERENCES

1. H. Komiyama; Classification of Japanese Fonts. In; Editorial Department for Idea (Ed.) Sample Collection of Basic Japanese Typefaces: OpenType version, Seibundo Shinkosha Inc, 2008 (in Japanese).
2. Japan Package Design Association; The Japanese package design's yearbook, Rokuyosha, Tokyo, 1985-2013 (in Japanese).
3. T. Saiki, A. Hayashi, and K. Sato; Comparisons of circumscribed quadrangle of handwritten and word-processed characters in vertically Japanese sentences: To realize new word-processed printing with feature of handwriting, Journal of Japan Ergonomics Society, 43(3), pp.111-116, 2007 (in Japanese).
4. C. E. Osgood, G. J. Suci, and P. H. Tannebaum; The measurement of meaning, University of Illusion Press, Urbana, 1957.
5. P. W. Henderson, J. L. Giese, and J. A. Cote; Impression Management Using Typeface Design, Journal of Marketing, 68(4), pp.60-72, 2004.
6. S. H. Hsu, M. C. Chuang, and C. C. Chang; A semantic differential study of designers' and users' product form perception, International Journal of Industrial Ergonomics, 25(4), pp.375-391, 2000.
7. C. Fushimi; Kadokawa Chinese and Japanese Calligraphy Character Dictionary (219th ed.), Kadokawa Corporation, 1977 (in Japanese).
8. Z. J. C. Sanabria; The role of familiarity and creativity in the generation of affective responses to advertising: proposal and evaluation of a pairing-congruity method, University of Tsukuba, 2012.
9. S. Mukai, and G. Miyazaki; Factorial Invariance In Evaluation of Impressions Between Fonts and Package Designs Using Structural Equation Modeling, Bulletin of Japanese Society for the Science of Design, 61(5), pp.107-110, 2015.
10. P. Dalton, C. Maute, A. Oshida, S. Hikichi, and Y. Izumi; The Use of Semantic Differential Scaling To Define The Multidimensional Representation of Odors, Journal of Sensory Studies, 23(4), pp.485-497, 2008.
11. K. A. Hsiao, and L. L. Chen; Fundamental dimensions of affective responses to product shapes, International Journal of Industrial Ergonomics, 36(6), pp.553-564, 2006.

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