

# A perceptual study on face design for “Moe” characters in “Cool Japan” contents

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**Abstract:** The term “Moe” is one of the most important keywords in Cool Japan contents, i.e., Japanese animated movies, video games and cartoons. Moe has been discussed from viewpoints of philosophy, aesthetics or literature: Moe is a concept in which chiefly a male feels for a pretty female character, but it does not include direct sexual emotion. In the present study, a perceptual experiment was conducted using semantic differential method to reveal how we can design a Moe character. The results showed that a cute, showy and childlike character evokes Moe emotion. On the other hand, a cute, gentle and mature character is recognized as a beautiful woman but does not evoke Moe emotion. Moreover, the results suggested that there are tactics to design a Moe character.

**Keywords:** Moe, Anime, Video game, Face design, Semantic differential method.

## 1. INTRODUCTION

Animated movies (anime), video games and cartoons have been developed in Japan as a kind of subculture. However, in recent years, these contents have been called “Cool Japan,” and Cool Japan contents are recognized as an export-oriented manufacture of Japan. In fact, the Japanese Ministry of Economy, Trade and Industry supported overseas operations of Cool Japan contents under a supplemental budget of 34.4 billion yen in 2012 (Japanese Ministry of Economy, Trade and Industry, 2012).

“Moe” is one of the most important keywords in the Cool Japan contents. Moe characters play important roles in most of the contents of Japanese anime, video games and cartoons. Most of the Moe characters are pretty girls and they evoke Moe emotion in viewers of the contents. Sometimes Moe is misunderstood as a kind of immoral sexual emotion like paedophilia. However, Moe does not include direct sexual emotion. One of the most authoritative journals, “Kokubungaku (Japanese Literature)” published a special issue of Moe in 2008 (Kokubungaku, 2008). This issue contained fourteen papers which discussed Moe from viewpoints of philosophy, aesthetics and literature. To conclude their discussion, Moe contains an ambivalent emotion: One wants to be intimate with her (it) but recognizes that it is quite difficult to realize. Moreover, females can feel Moe for young female characters, and sometimes females and males may feel Moe for male characters, also. Similar philosophical and aesthetic discussion on Moe has frequently taken place in articles in books and magazines. However, no experimental study has been carried out on Moe.

We empirically know that we do not feel Moe for ugly characters, but sometimes we feel no Moe even for beautiful characters. Therefore, we requested a professional designer to provide face designs of a typical “beautiful” character and “Moe” character in the present study. Then we arranged various faces manipulating parameters of several components of the face. Using these faces as stimuli, a perceptual experiment was conducted.

## 2. EXPERIMENT

### 2.1. Stimuli

To construct faces, the character creation system in the PC game “PHANTASY STAR ONLINE 2” was used. Using this system, various components of the face (e.g. hair style, face shape, distance between eyes, eye opening and nose length) can be manipulated. In this system, hair style, type of pupils and type of makeup can be chosen from several alternatives. Except for these three components, each parameter can be varied from -100 to 100 degrees. Using this system, a professional character designer, who creates various anime and promotion videos for Hatsune Miku, provided two faces of characters: One is a typical Moe character. We call it Basic Moe Character (BMC). And the other is a typical character who is beautiful but we do not feel Moe for it. We call it Basic Beautiful Character (BBC). These two faces are shown in Figure 1.



**Figure 1:** Two basic characters designed by a professional designer.

Twelve characters were synthesized by morphing processes between the BMC and BBC. In one series, the hair style was fixed in “angel wings” (hair color was fixed in pink), which was used in the BMC. The type of pupils was also fixed for the BMC. The type of makeup was fixed as “no

makeup,” which was used both in the BMC and BBC. Using the parameters of the other components, the values of the parameters in the BMC were set at Step 1 and the values in the BBC were set at Step 5. Then, Steps 2-4 were synthesized by morphing with linear interpolation. Steps 6 and 7 were similarly synthesized by extrapolation. The face of the Step 5 was different from the BBC in the hair style and the type of pupils, but Step 1 was exactly the same as the BMC. Therefore six new faces were synthesized in this series. Similarly, the BBC was set at Step 1, and the BMC was set at Step 5. Then, the other six faces were synthesized using the same hair style and type of pupils as the BBC. In this series, hair style was fixed in dark-brown mid-length “suave.”

Moreover, 38 faces were synthesized selecting one of the parameters of hair style, type of makeup, or type of pupils, based on the BMC and BBC. Thirty-one characters were also synthesized by varying value of one parameter of eye opening, distance between eyes, nose length or face shape from the BMC and BBC. In total 83 faces were prepared for the perceptual experiment as stimuli (Table 1).

**Table 1:** Stimuli used in the perceptual experiment.

| Varied component(s)   | # of stimuli |
|-----------------------|--------------|
| Base                  | 2            |
| Morphed               | 12           |
| Hair Style            | 14           |
| Makeup                | 8            |
| Pupils                | 16           |
| Eye Opening           | 8            |
| Distance between Eyes | 6            |
| Nose Length           | 9            |
| Face Shape            | 8            |
| Total                 | 83           |

## 2.2. Procedure

Eight students from the Kanazawa Institute of Technology, ranging from 20 to 25 years old, participated in the experiment. The participants looked at each of the 83 characters and then they were requested to rate the emotional features of them, using 19 seven-step bipolar scales listed in Table 2, e.g., “very showy”, “fairly showy”, “slightly showy”, ..., “very gentle” (C. E. Osgood, G. J. Suci, & P. H. Tannenbaum, 1957). The order of the scales was determined in a random way for each combination of character and participant. The participants were also requested to rate the degree of Moe, the degree of beauty of the character and rate the degree of preference to the character, using seven-step scales. The characters were presented through the 24.1-inch display (EIZO, FlexScan SX2462W). The distance between the eyes of the participants and the display was fixed at 70 cm.

## 3. RESULTS AND DISCUSSION

Numbers -3 to 3 were given for each of the seven categories on the SD scales. The mean value was calculated from the participants’ responses for each combination of scale and stimulus. Then factor analysis was performed for these mean scores with the principal factor method and varimax rotation. The results showed that a four-dimensional space accounted for 85% of data

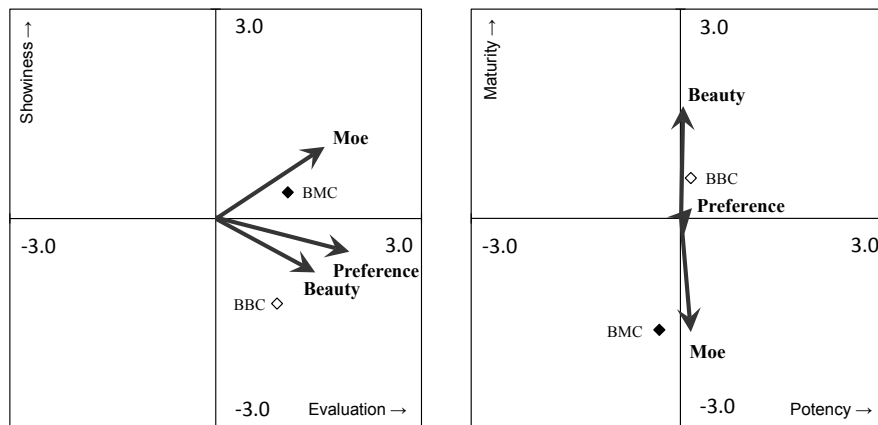
variance. Table 2 shows the resulting factor loadings for the 19 SD scales. The four factors are labeled “evaluation”, “showiness”, “potency” and “maturity” respectively, after the scales, which show large absolute values in the loadings for these factors. The characters were plotted on the “evaluation - showiness” and the “potency – maturity” planes. In Fig. 2 and 3, the white and black diamond marks show the BMC and BBC, respectively. In Fig. 3, the white circles show the stimuli based on the BMC, and the black circles show the stimuli based on the BBC. The arrows connected stimuli from low to high values in the components.

**Table 2:** Semantic differential (SD) scales and there factor loadings.

| SD scale                  | Factor     |           |         |          |
|---------------------------|------------|-----------|---------|----------|
|                           | Evaluation | Showiness | Potency | Maturity |
| Healing - Irritating      | -.965      | .143      | -.002   | .008     |
| Agitated - Calm           | -.958      | -.095     | -.076   | .119     |
| Cute - Uncute             | -.946      | -.001     | -.004   | .156     |
| Fascinating - Boring      | -.940      | -.174     | -.068   | .050     |
| Eye pleasing - Ugly       | -.910      | .121      | .105    | -.205    |
| Stylish - Loutish         | -.747      | -.010     | .085    | -.500    |
| Unique - Banal            | .276       | -.876     | -.172   | .049     |
| Showy - Gentle            | -.119      | -.854     | -.194   | .298     |
| Unreal - Real             | -.066      | -.789     | -.012   | .377     |
| Impressive - Unimpressive | .256       | -.784     | -.311   | -.008    |
| Elegant - Rustic          | -.324      | -.769     | -.142   | .310     |
| Frail - Burly             | -.237      | .010      | .913    | .048     |
| Imposing - Cowardly       | -.033      | -.141     | -.898   | -.092    |
| Powerful - Powerless      | .029       | -.276     | -.878   | .113     |
| Active - Quiet            | .059       | -.365     | -.821   | .248     |
| Sharp - Round             | -.066      | .258      | .166    | -.851    |
| Mature - Childlike        | .046       | .427      | -.050   | -.813    |
| Mixed - Neat              | .690       | -.339     | .000    | .502     |
| Bright - Dark             | -.403      | -.003     | -.692   | .145     |
| Contribution Rate         | .315       | .210      | .202    | .127     |

In the next step, multiple-regression analyses were applied to investigate the differences between Moe and beauty. Factor scores of the “evaluation”, “showiness”, “potency”, and “maturity” were used as explanation variables, and each degree of Moe, beauty and preference was used as a criterion variable in each analysis. The results showed that the coefficient of determination, R<sup>2</sup> was larger than 0.9, for the degree of Moe, beauty and preference, respectively.

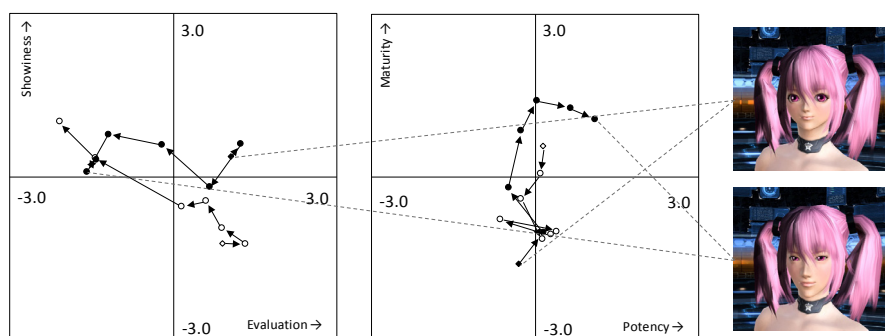
Figure 2 shows the multiple-regression lines for the degrees of Moe, beauty and preference as vectors. Figure 2 shows that degrees of Moe, beauty and preference increase along with the value of the evaluation. In fact, the BMC and BBC both show high values on the evaluation axis. This implies that a “cute” face is preferred and evokes Moe emotion or is recognized as a beautiful woman. However, Fig. 2 also indicates the factors which differentiate Moe and beautiful faces: If a “cute” character is also perceived as “showy” and “childlike,” it is recognized as a Moe character. On the other hand, if a “cute” character is perceived as “gentle” and “mature,” it is recognized as a beautiful woman. The BMC and BBC are both cute, but there are large differences in “showiness” and “maturity”.



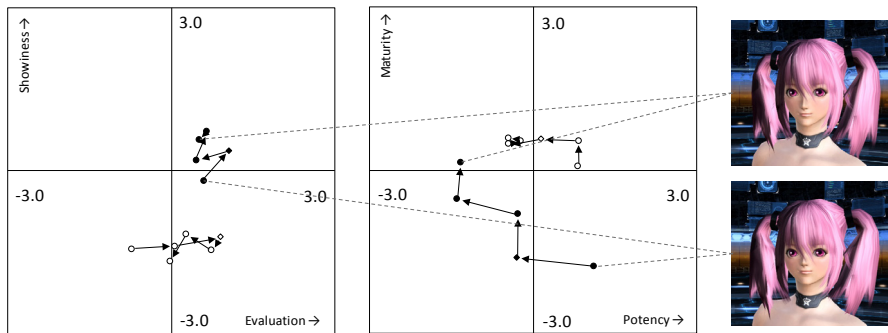
**Figure 2:** The results of multiple-regression analyses. The vectors show the relations between four factors of evaluation, showiness, potency and maturity vs. the degrees of Moe, beauty, and preference.

Each panel in Figure 3 shows the relation between each component and impression of the face. In most of the panels, the plots of the faces are divided largely into two groups; one group is based on the BMC and the other is based on the BBC. This result implies that the impression of the character is not changed significantly, even if only one parameter of a facial component is varied. In Panel (a), it is shown that the position of a stimulus moves largely on the evaluation dimension through the morphing process. This suggests that the balance of the facial components is important for the evaluation factor. In Panels (c) and (d), the position of a stimulus moves largely on the evaluation dimension by varying the eye opening and the distance between eyes. This implies that these two parameters are very important to determine whether a face is recognized as cute or uncute.

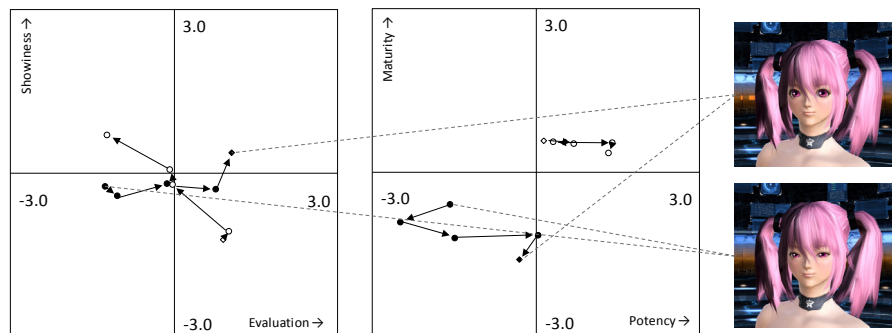
The positions of the stimuli also showed that the hair color and the iris color changed the showiness greatly. These results implied that the showiness is deeply correlated with colors, i.e., a character with showy colors on her hair and irises tends to be perceived as showy. On the potency dimension, the impression of a character varied systematically with the eye opening, nose length and face shape. These results suggested that a character with big eyes, a round face and a short nose tends to be perceived as powerful. On the maturity dimension, it was suggested that a character with a sharp face and small pupils tends to be recognized as mature, and vice versa.



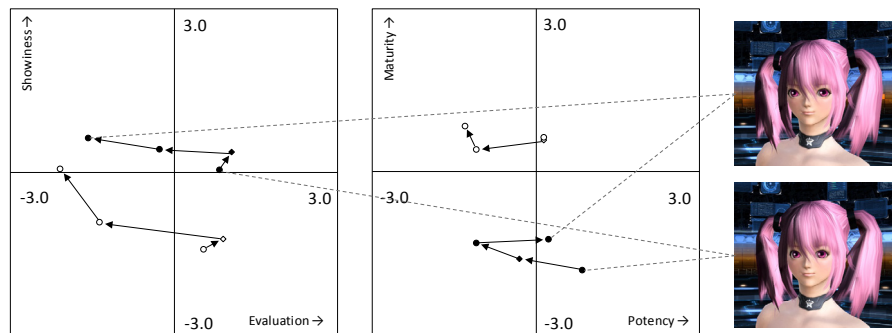
(a) Change of the viewers' impressions by morphing processes.



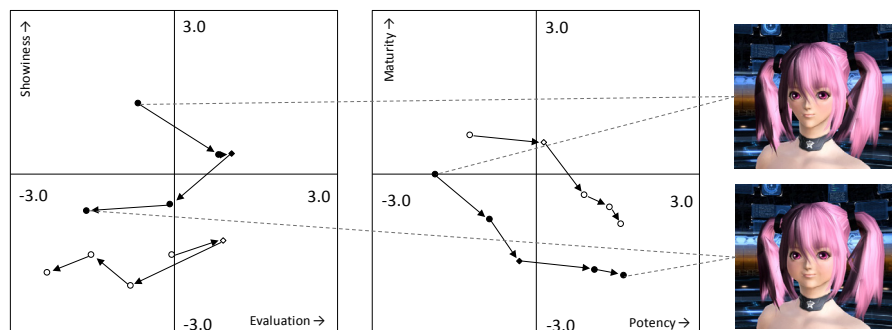
(b) The effect of the nose length on the viewers' impressions. The arrows direct from short to long noses.



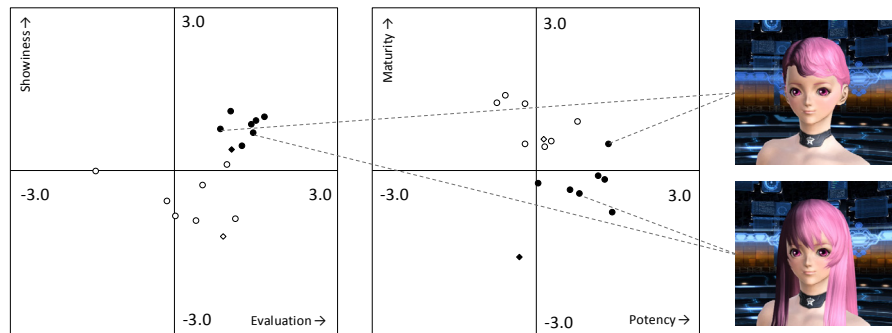
(c) The effect of the eye opening on the viewers' impressions. The arrows direct from a narrow to wide openings.



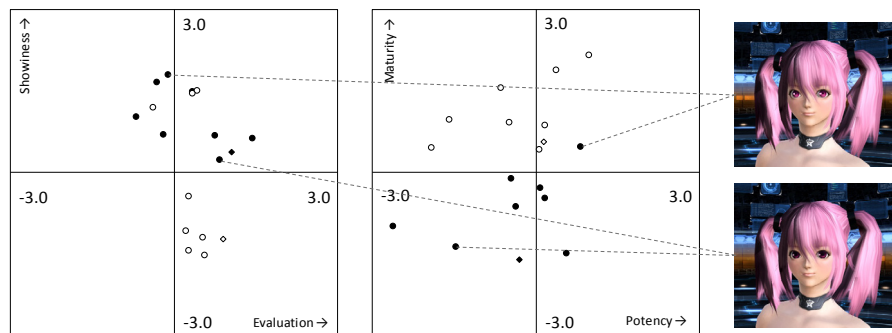
(d) The effect of the distance between eyes on the viewers' impression. The arrows direct from short to long distances.



(e) The effect of the face shape on the viewers' impression. The arrows direct from a shape to round shapes.



(f) The effect of the hair style on the viewers' impressions.



(g) The effect of the type of pupils on the viewers' impressions.

**Figure 3:** Effects of facial components on the viewers' impressions.

## 4. CONCLUSION

In the present study, it was shown that a cute, showy and childlike character evokes Moe emotion. On the other hand, a cute, gentle and mature character is recognized as a beautiful woman but does not evoke Moe emotion. The results of the perceptual experiment also suggested that there are tactics to design a Moe character as follows: First, choose showy colors for the hair and irises. Then, set her face shape round and set the size of her pupils large. Finally, balance the other parameters of the character until she is recognized as cute.

In the next stage, the correlation between the parameters which construct a face and the impression perceived for the face should be quantified.

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## **BIOGRAPHY**

Yuki Wada was born in Niigata in 1990. He received B. E. degree from the Kanazawa Institute of Technology in 2013. He is currently a master student in the Graduate School of Engineering, Kanazawa Institute of Technology, since 2013. His research interests include face design for “Moe” characters. He is a member of the JSKE.

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Masashi Yamada received his M. Design and Ph. D. from the Kyushu Institute of Design in 1987 and 1998, respectively. He worked for the Osaka Univ. of Arts from 1987 to 1994 and joined the Kanazawa Institute of Technology in 1994 as an Associate Professor and is currently a Professor. The Acoustical Society of Japan awarded him the Sato Paper Prize in 1999 and 2014. His research interests include music psychology and entertainment engineering.