

Searching for Gestalt Rules Governing Aesthetic Arrangement

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Abstract: Morinaga [1] was the first to investigate experimentally the aesthetic arrangements of simple geometrical figures, and proposed two rules: (1) figures tend to be placed along the horizontal, vertical or diagonal line passing through the center of the background; and (2) the center of gravity in composition formed by preferred positions tends to coincide with the center of the background. Arnheim [2] also pointed out that we feel the best balanced state when the center of gravity in composition agrees with the center of the background, and formulated it as one of the features of the "structural map/skeleton". Mitsui & Noguchi [3] examined whether Morinaga's two empirical rules were harmonized with Arnheim's theoretical framework and confirmed that both were harmonious. However, the previous studies [1-3] were concerned only with aesthetic arrangements that were composed by participants, but not with aesthetic preferences or ratings. In the present study, in place of aesthetic arrangement, participants made aesthetic preferences for given figural arrangements with different figural structures such as symmetry, distance and direction. It was found that consistent with previous research, aesthetic preferences were higher for arrangements in rotation-symmetry than for those having other figural structures. In conclusion, this study, together with previous ones, suggests that aesthetic arrangements and preferences would be closely related to the Gestalt factors determining perceptual organization.

Key word: *aesthetic arrangement/aesthetic preference, balance, rotation-symmetry, rating method, perceptual organization*

1. Introduction

The drawings and pictures are composed of figural elements which are perceptually organized by Gestalt rules. Morinaga [1] investigated how aesthetic arrangements were influenced by figural positions or locations in the background, empirically. In his experiments, participants were asked to arrange most beautifully one, two or three black disks on the white rectangular background. It was found that the most beautiful arrangement was obtained when a single disk was placed at the center of background, when two disks were placed in symmetry and when three disks were composed in a triangular shape. Based on these results, Morinaga proposed two rules: (1) Figures tend to be placed along the horizontal, vertical or diagonal line passing through the center of the background ("the center-passing rule") (Figure 1a); (2) the center of gravity or fulcrum in composition formed by preferred positions of figures tends to coincide with the center of the background ("the gravity/background centers coincidence rule") (Figure 1b). However, Morinaga's study had no concern with the structural properties of the

background or framework.

On the other hand, Arnheim [2] argued that a “visual/psychological weight” or an impression of the weight depends on figural positions in the background, and that the structural features called the “structural map/skeleton” in the background determine the role of pictorial elements in the balance system of the whole (Figure 2). When some disks are located on a square background, we perceive forces that are attracted by four corners. When a single disk is placed at the center of the background and when two disks are placed in the symmetry, we feel a balanced state in the visual weight because of the best stability of the whole. However, Arnheim did not examine his notion empirically.

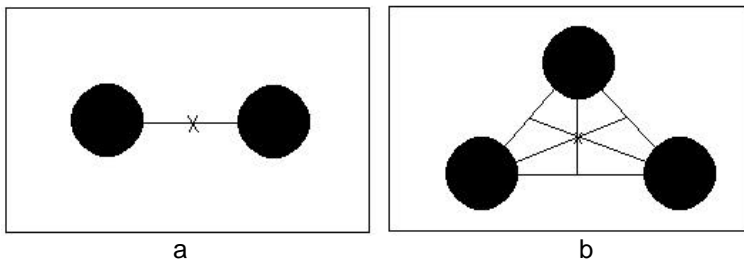


Figure 1 . Morinaga's rules
(a. the center-passing rule; b. the gravity/background centers coincidence rule)

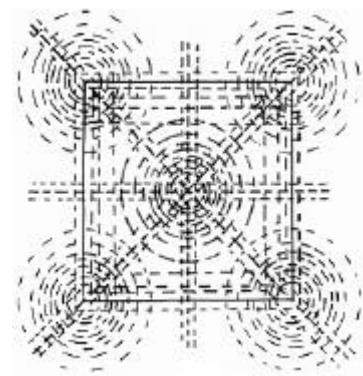


Figure 2 . Structural Map/Skeleton

Mitsui & Noguchi [3] attempted to integrate the center-passing rule, the gravity/background centers coincidence rule and “structural map/skeleton” for aesthetic arrangement of two disks, experimentally. In their experiment, under the condition in which the relative size of figures (disks) and background and the size combination were systematically varied, aesthetic arrangements made of two disks obtained coincided with predictions by the center-passing rule and “structural map/skeleton”. Moreover, when the size combination was equal, aesthetic arrangements of two disks supported not only the center-passing rule, “structural map/skeleton”, but also the gravity/background centers coincidence rule. This finding means that aesthetic arrangement made by two disks has the rotational symmetry. However, Morinaga's study and Mitsui & Noguchi's study were concerned only with aesthetic arrangements that were made by participants [1, 3]. And also, they did not examine the distance between disks and the direction of disks in aesthetic arrangements. In our preliminary experiment, the task of aesthetic “preference” instead of “arrangement” was given to participants for a series of figural arrangements. The results showed that figural arrangements in which two disks were placed in the rotational symmetry were highly rated.

Based on our preliminary experiment, the present study attempts to examine how participants make aesthetic preferences for disk arrangements using by a rating method. Then, we discuss whether the similar aesthetic structures are obtained, in spite of the change in the experimental task. Also, we investigate how aesthetic preferences are influenced by the distance and direction of two disks in the background.

2. Method

2.1. Participants

Thirty undergraduate students from Nihon University participated in the experiment. All had normal or corrected-to-normal acuity, and all were naïve to the purposes of the experiment.

2.2. Test patterns and procedure

Based on the result of our preliminary experiment, 46 disk arrangements were generated by Illustrator as test patterns. These test patterns were classified into 3 conditions as follows: In Condition 1, the structure in disk arrangements was varied in 2 ways: the rotation-symmetry (12 slides) and other structures (34 slides); In Condition 2, the distance between disks was changed in 3 steps: 20 cm (16 slides), 60 cm (16 slides) and 100 cm (14 slides) on the background, 120 cm high x 194 cm wide; In Condition 3, the direction of disks was changed in 3 ways: 0° (13 slides), 30° (or 150°) (18 slides), and 90° (15 slides). Figure 3 shows examples of test patterns. Table 1 presents the combinations of 3 Conditions (stimulus variables).

A total of 46 slides as test patterns consisting of 18 levels (2 positions x 3 distances x 3 directions), as mentioned in detail above, were presented randomly to participants on a screen. For each test pattern, participants were asked to rate aesthetic preference using a 7-category scale.

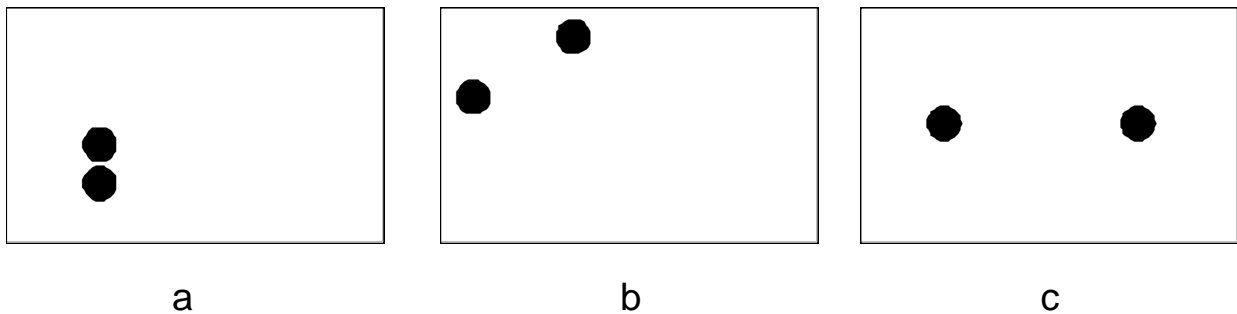


Figure 3 . Examples of test patterns

- a. Test pattern without rotation-symmetry (Others).
- b. Test pattern without rotation-symmetry (Others).
- c. Test pattern with rotation-symmetry (R-S).

Table 1 . The 46 test patterns

Direction	Distance					
	Short		Middle		Long	
	Position/Structure					
	R-S	Others	R-S	Others	R-S	Others
Vertical	1	4	1	4	1	2
Horizontal	1	4	1	4	1	4
Diagonal	2	4	2	4	2	4

3. Results and Discussion

The mean scale values of aesthetic preference for 3 Conditions (position, distance, and direction) are shown in Figures 4, 5 and 6, respectively.

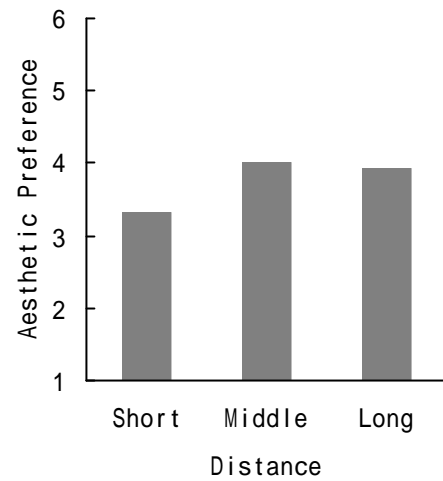
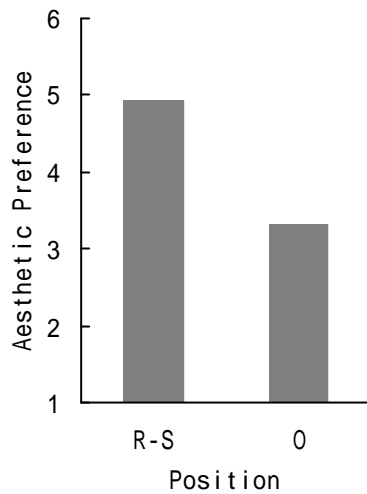


Figure 4 .The mean scale values of aesthetic preference for Condition 1 (position).

Figure 5 .The mean scale values of aesthetic preference for Condition 2 (distance).

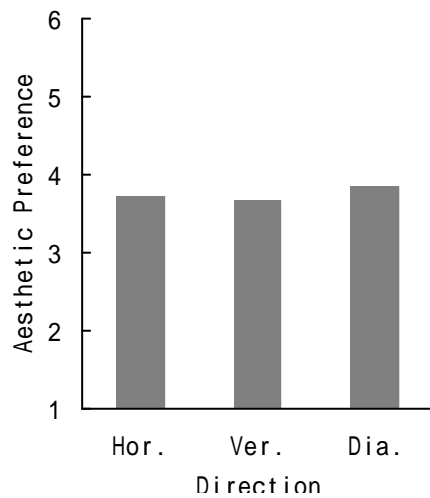


Figure 6 . The mean scale values of aesthetic preference for Condition 3 (direction).

The results of three-way analysis of variance revealed that the main effects of position and distance were significant ($F(22, 2737) = 827.72, p < .001$ for position; $F(22, 2737) = 75.38, p < .001$ for distance). But, the main effect of direction was not significant. The interaction between distance and direction was significant ($F(22, 2737) = 2.61, p < .05$).

As shown in Figure 4, aesthetic preference was higher when disks were placed in rotation-symmetry than in other structures. This finding seems to be similar to the results obtained under the condition where two disks with the same size were used and, instead of rating method, the placement method was employed [3]. That is, aesthetic preferences were high under the following conditions: when two disks having rotation-symmetry were placed

along the horizontal, vertical or diagonal line passing through the center of background; and when the center of gravity of disk composition having horizontal, vertical or diagonal direction coincides with the center of background. In this sense, aesthetic arrangements having rotation-symmetry can be described by the center-passing rule and the gravity/background centers coincidence rule [1, 3]. And, aesthetic arrangements having rotation-symmetry correspond to disk arrangements determining the balance system [2].

As shown in Figure 5, aesthetic preference was higher when disks were placed at middle or long distance than at short distance. As shown in Figure 6, there is no significant difference among the three different directions.

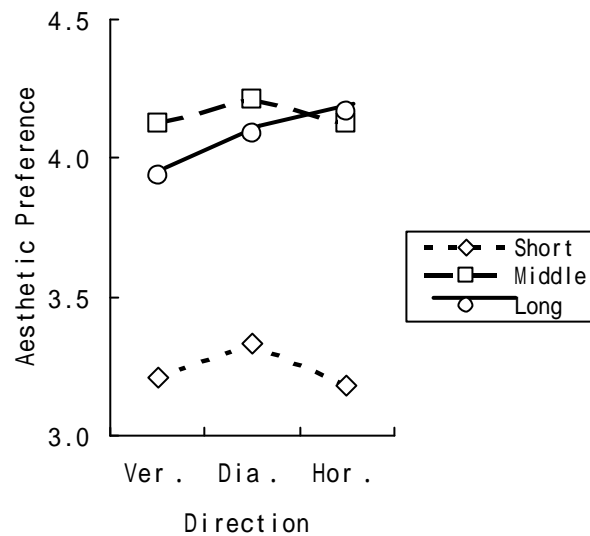


Figure 7 . The mean scale values of aesthetic preference for changes in distance and direction.

Only under the condition where disks were placed in the vertical direction, the higher scale values were seen when disks were placed at the middle distance, but not at the short and long distances (Figure 7). The finding that the scale values of aesthetic preference are low when two disks are placed at the short distance corresponds to Arnheim’s suggestion that when two disks are placed too close together, they are repelling each other and unstable. That aesthetic preference is high when two disks are placed at the long distance in the horizontal and diagonal directions might have been due to the shape of the background which was the horizontally elongated rectangle.

Even though the experimental task was changed from placement to rating, the results of the present study were similar to those obtained by the placement method [3]. Therefore, it can be generalized that when figures such as disks are equal in size, aesthetic arrangement and aesthetic preference follow the center-passing rule, the gravity/background centers coincidence rule and “structural map/skeleton” (Figure 8a). It should be further examined whether this can be applied to the case where figures are different in size (Figure 8b) and other attributes [6].

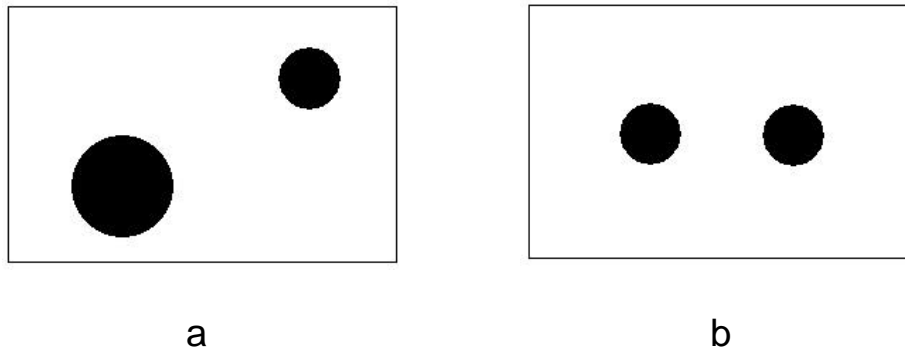


Figure 8 . Examples of aesthetic arrangements (Mitsui & Noguchi, 2002)

4. Concluding Remarks

We examined how people make aesthetic preferences for disk arrangements using the “rating method”, instead of the “placement method” which was used in the most previous research [3] and discussed whether similar results could be obtained despite the change in the method of measuring aesthetic impressions, including aesthetic arrangement and preference. The results of the present study was consistent with the previous studies [1, 3] using the placement method in which participants arranged disks most beautifully in the background or framework. From the present and previous studies, it is clear that both aesthetic arrangements and ratings are relatively high when the figural composition formed by disks with equal size is in rotation-symmetry. In this concern, the relationship between these findings and relevant concepts such as “balance” [2] and “symmetry” [5] should be made clear. This poses a new problem to be solved by perceptual psychologists and designers: What kinds of Gestalt rules for perceptual organization does aesthetic preference determine?

References

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At least, as far as the aesthetic arrangement is concerned, the rules mentioned above are applicable to figures having different sizes [3].