Exploring Relationships between Product Aesthetics, Typicality and Preference

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Abstract:

In this research, we examined the joint influence of product aesthetics and typicality on preference responses by using the chair as the example product. We selected 88 chairs covering a wide range of forms as the stimuli, and used 3 sets of bipolar adjectives "beautiful-ugly" (operative on product aesthetics), "typical-unique" (operative on typicality), and "like-dislike" (operative on preference) to conduct an semantic differential survey. Sixty subjects participated in the study, of which 30 subjects are with design background, and 30 are without design background.

The results confirm that the relationship between preference and aesthetics is a linearly increasing function, where the most preferred chairs are those with high level of aesthetics; and that the relationship between preference and typicality is an inverted-U function, where the most preferred chairs are those with a moderate level of typicality. In addition, we found that the ranges of aesthetics-preference scores realized by stimuli depend on their typicality scores. Chairs with medium-level of typicality scores correspond to higher scores in aesthetics and preference; whereas highly typical or novel chairs near the two extremes on typicality correspond to lower scores in aesthetics and preference. These findings indicate that typicality, aesthetics and preference may form a crescent moon shaped, inclined surface in three dimensions. We also found that the two groups of subjects responded differently to the stimuli. Although the relationship between preference and typicality exhibits an inverted-U function for both groups, participants with design background are more amicable towards novel designs, than those without design background.

Key words: **Semantics, Aesthetics and Experience in Design (primary keyword),** ***Human Behaviors, Perception, and Emotion***

1. Introduction

Typicality may be considered as a referential basis for the design of a product. By introducing differences in the form, color and texture, designers seek to make a product new and original. Recently, Hekkert et al. (2003) investigated the relations between product typicality, novelty and aesthetic preference. He concluded that people preferred designs of the best combination of typicality and novelty, as the design principle "most advance yet

acceptable" advocated by Raymond Loewy. However, product aesthetics is also well recognized to play an important role in evoking preference responses towards product appearance (Veryzer & Hutchinson, 1998). In this research, we examine the joint influence of product aesthetics and typicality on preference responses, by using the chair as the example product.

We use the term "aesthetics" to refer to product aesthetics presented to the senses through the product appearance (Lewalski, 1988), and select the adjective-pair "ugly-beauty" for measuring aesthetics judgments (Jacobsen et al., 2004). We defined "typicality" as "goodness of example", the degree that a product represent the category, and select the adjective-pair "typical-novel" for measuring typicality judgments. Based on results of prior researches in the literature, we hypothesized that preference is a linear function of aesthetics, and that preference is an inverted-U function of typicality.

2. Method

2.1 Stimuli

We began by conducting a pilot study to obtain an operational definition of the shape of a "typical chair". We asked 34 sophomore students with industrial design major to draw sketches in response to the question "what is the image that comes out first in your mind as soon as the name 'chair' is mentioned?". The results are shown in Figure 1. An examination of the 34 sketches revealed that a majority of 25 chairs were similar in their forms: all had four legs, a flat seat, a vertical back, and all but one with no arms. The other 9 chairs were diverse in their shapes. Based on this pilot study, we designated the shape most commonly illustrated (Figure 1, upper right) as the "typical chair" for collecting stimuli.

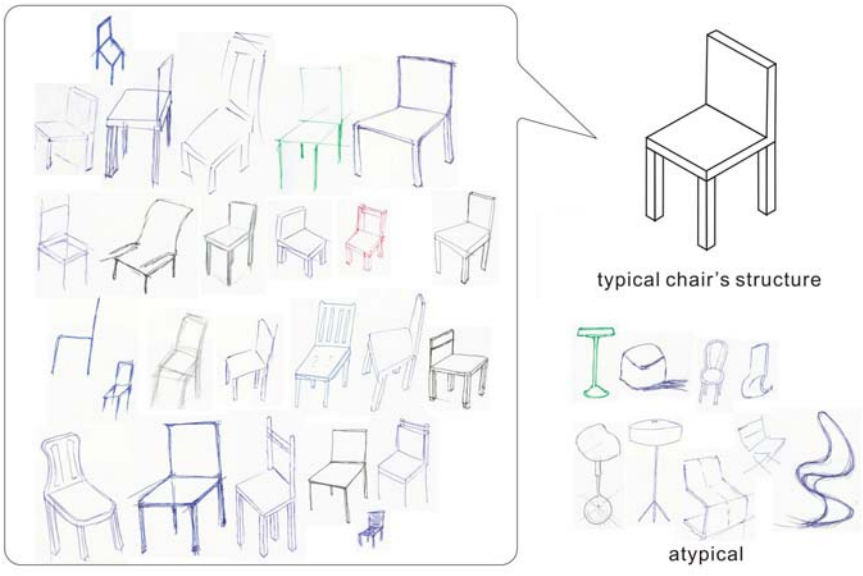


Figure 1. 34 sketches of the "typical chair"

Using the "typical chair" (Figure 1, upper right) as the basis, 523 photos of chairs were collected by using search engines, from websites of furniture companies, and from the book *1000 Chairs* (Fiell & Fiell, 1997) to cover a wide range of chairs from typical to unique. Two experienced designers (with more than 5 years of experience) examined the chairs and eliminated those similar in shape to reduce the total number to 213. Next, card sorting

and hierarchical clustering methods were employed to produce the final set of representative chairs. We asked 5 senior students with design background to independently sort the chairs into groups according to the chairs' similarities in shape. We then analyzed the sorting results by using the hierarchical clustering function in SPSS. Finally, we arrived at 88 representative chairs, of which, 41 are from the book *1000 Chairs* (produced between 1900 and 1997) and 47 from the internet (produced during the last two decades).

2.2 Participants

The participants were recruited from the student population of Ming-Chi University of Technology in Taiwan. Two groups of participants were recruited: thirty with design background and thirty without. The first group consists of senior students from Industrial Design Department (18 males and 12 females). The second group consists of sophomore students from Engineering (16) and Management (14) Departments (21 males and 9 females).

2.3 Procedure

Three adjective-pairs were selected as the rating scales to operationalize aesthetics, typicality and preference:

1. Aesthetics: ugly-beautiful
2. Typicality: typical-unique
3. Preference: dislike-like

At the beginning of the task, the participant familiarized with the range of stimuli by viewing the photos of the 88 chairs that were spread on the table. Next, the participant evaluated the chairs in three sessions. In each session, the participant divided the 88 chairs with respect to a pair of adjectives into 9 groups corresponding to a 9-poing rating scale. To reduce cognitive loading, the participant was first asked to divide the chairs into three groups representing low, medium and high levels, and then further divided each group into three subgroups to arrive at a total number of 9 groups. The number of chairs was allowed to be uneven or void in each group. Participants were also asked to review the grouping and to make adjustments where necessary. The participant performed the grouping tasks at his/her own pace, and completed the three sessions of grouping tasks in about one hour.

3. Results

3.1 Relationships among Typicality, Aesthetics and Preference

We obtained rating means for the stimuli for each pair of adjectives operationalizing on typicality, aesthetics and preference. We first tested the hypothesis that preference is an inverted-U function of typicality. By using the SPSS quadratic curve model, we found the best fitting quadratic curve for the relationship between typicality and preference. The results showed that the quadratic relationship is significant ($df = 85$, $F = 8.90$, $p = 0.000$), confirming our hypothesis. Figure 2 shows the scatter diagram and the inverted-U curve.

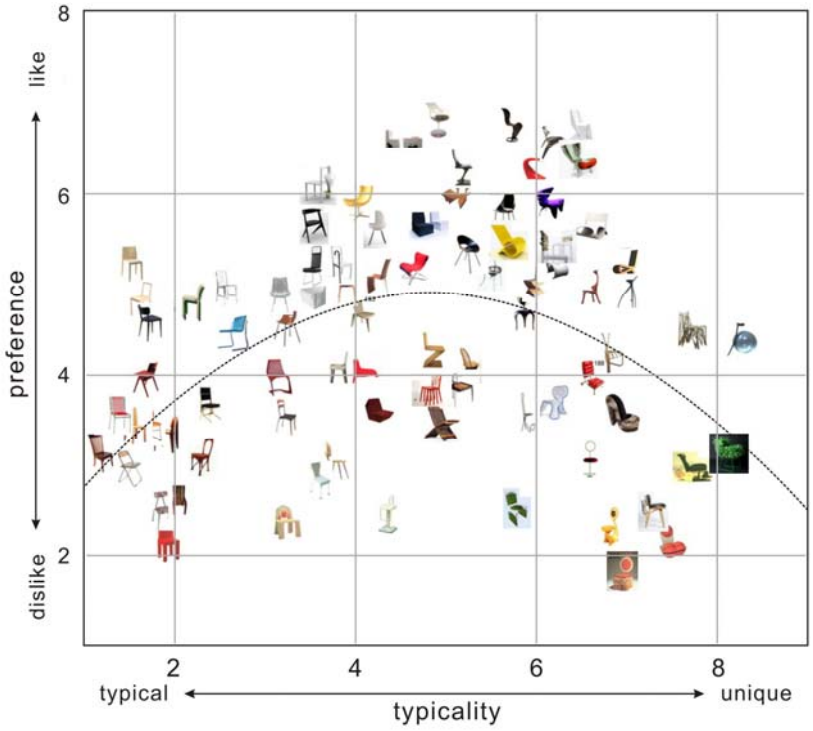


Figure 2. Scatter diagram of typicality and preference for all participants

To investigate the possible differences between participants with different backgrounds, we tested the quadratic curve relationship between typicality and preference for the two groups of participants with and without design background, respectively. The results, as exhibited in Figures 3 (left diagram) and 4 (left diagram), show that an inverted-U relationship exists between typicality and preference, for both cases (non-design background df = 85, F = 11.1, p = 0.000; design background df = 85, F = 6.91, p = 0.002).

Next, we tested the hypothesis that preference is a linear function of aesthetics by linear regression (Pearson-product moment correlations). The results are shown in Figure 3 (right diagram) and Figure 4 (right diagram). As expected, the results revealed that there were strongly positive correlation between aesthetics and preference, for both groups of participants (non-design background $r = 0.892$, $p<0.05$; design background $r = 0.911$, $p<0.05$).

These findings are in line with previous studies that the more beautiful is an object, the higher the preference. In addition, the distribution of stimuli for participants with design background appeared to scatter wider than that for participants without design background.

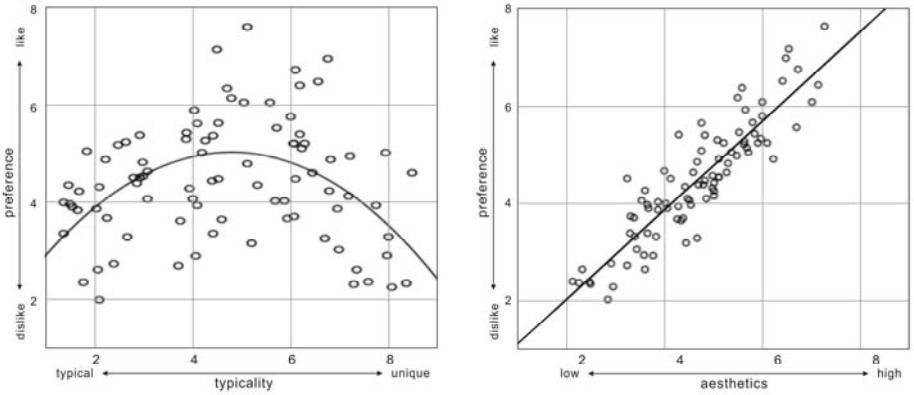


Figure 3. Scatter diagrams between typicality and preference, and between aesthetics and preference for participants without design background

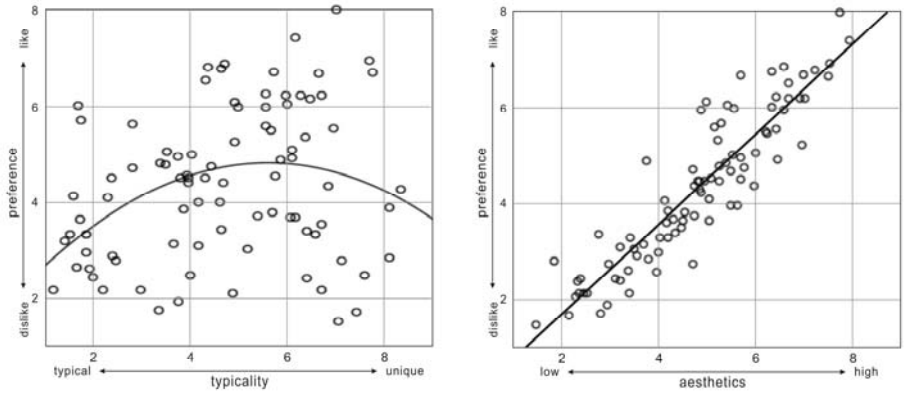


Figure 4. Scatter diagrams between typicality and preference, and between aesthetics and preference for participants with design background

We further examined the joint influence of product aesthetics and typicality on preference responses, for the two groups of participants with and without design background, respectively. For each group of participants, we divided the stimuli into 8 sections according to their typicality levels from low to high by using k-means clustering. We then tested the hypothesis that preference is a linear function of aesthetics by linear regression for each section of stimuli with similar levels of typicality. As shown in Tables 1 and 2, the results indicate that there are strongly positive correlation between aesthetics and preference, for each section of stimuli with similar level of typicality.

Table 1. Relationship between aesthetics and preference for 8 sections of typicality for participants without design background (**p<0.01)

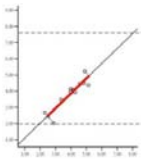
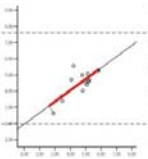
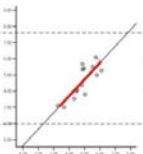
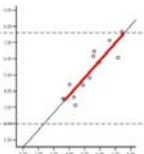
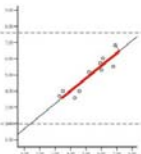
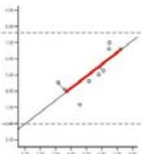
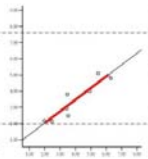
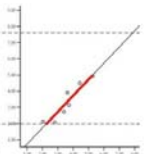
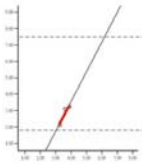
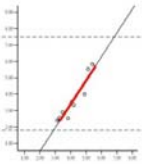
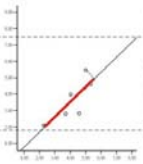
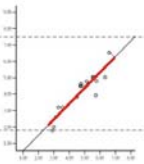
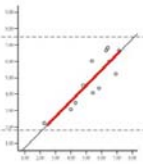
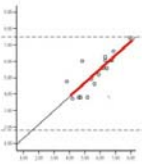
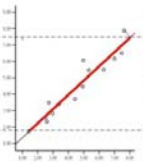
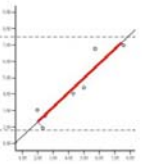
							
Typicality=1.68 df=11 F=59.73** b0=0.1821 b1=0.9213	Typicality=2.7 df=12 F=16.41** b0=1.2685 b1=0.6953	Typicality=4 df=12 F=21.82** b0=-0.3954 b1=1.0246	Typicality=4.85 df=10 F=38.55** b0=-0.5518 b1=1.0753	Typicality=5.87 df=8 F=39.17 ** b0=0.8999 b1=0.7782	Typicality=6.43 df=8 F=13.6** b0=1.2281 b1=0.7364	Typicality=7.18 df=6 F=32.41** b0=0.5831 b1=0.7201	Typicality=8.09 df=5 F=32.3** b0=-0.2746 b1=1.0009

Table 2. Relationship between aesthetics and preference for 8 sections of typicality for participants with design background (**p<0.01)

							
Typicality=1.29	Typicality=1.69	Typicality=2.46	Typicality=3.85	Typicality=4.66	Typicality=5.85	Typicality=6.76	Typicality=7.92
df=1	df=7	df=6	df=16	df=10	df=15	df=12	df=5
F=5.89	F=49.8**	F=16.31**	F=92.15**	F=29.89**	F=32.4**	F=121.0**	F=35.73**
b0=-3.703	b0=-2.3873	b0=-0.1518	b0=-0.4346	b0=-0.2246	b0=0.4593	b0=0.4632	b0=-0.5325
b1=1.8142	b1=1.4467	b1=0.9148	b1=0.9604	b1=0.948	b1=0.8441	b1=0.8729	b1=0.8877

In addition to establishing the linear relationships, we highlight the range of aesthetics-preference values realized by the stimuli in red color. For participants without design background (Table 1), we observed that, highly typical and novel stimuli correspond to lower level of aesthetics and preference; and stimuli with medium level of typicality correspond to higher level of aesthetics and preference. On the other hand, for participants with design background (Table 2), only highly typical stimuli correspond to low level of aesthetics and preference; stimuli with medium level to high level novelty can realize high level of aesthetics and preference. Thus, participants with design background are more amicable towards novel designs, than participants without design background.

These findings indicate that typicality, aesthetics and preference may form a crescent moon shaped, inclined surface in three dimensions as shown in Figure 5. Chairs with medium-level of typicality scores correspond to higher scores in aesthetics and preference; whereas highly typical or novel chairs near the two extremes on typicality correspond to lower scores in aesthetics and preference. Diagrams shown in Tables 1 and 2 can be considered as cross-sections of this three-dimensional surface in Figure 5.

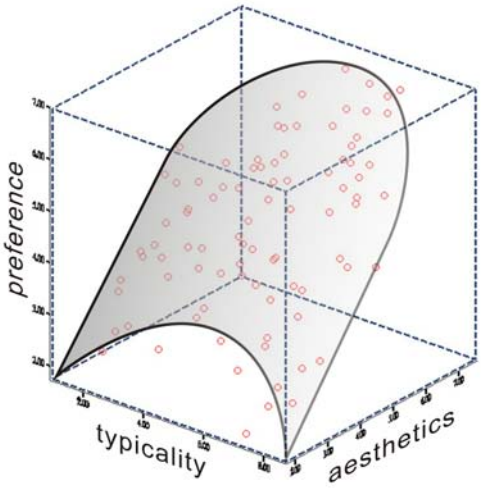


Figure 5. Relationships between typicality, aesthetics and preference

3.2 Design Characteristics Influencing Aesthetics and Typicality Judgments

How do the participants evaluate the levels of aesthetics and typicality for the stimuli? We first classified the stimuli into a 3x3 grid structure, with 3 levels of typicality and 3 levels of aesthetics for the two groups of participants, respectively. We then select only those stimuli whose aesthetics and typicality were judged similarly by the two groups of participants, and eliminate those stimuli with inconsistent judgments, to produce Figure 6.

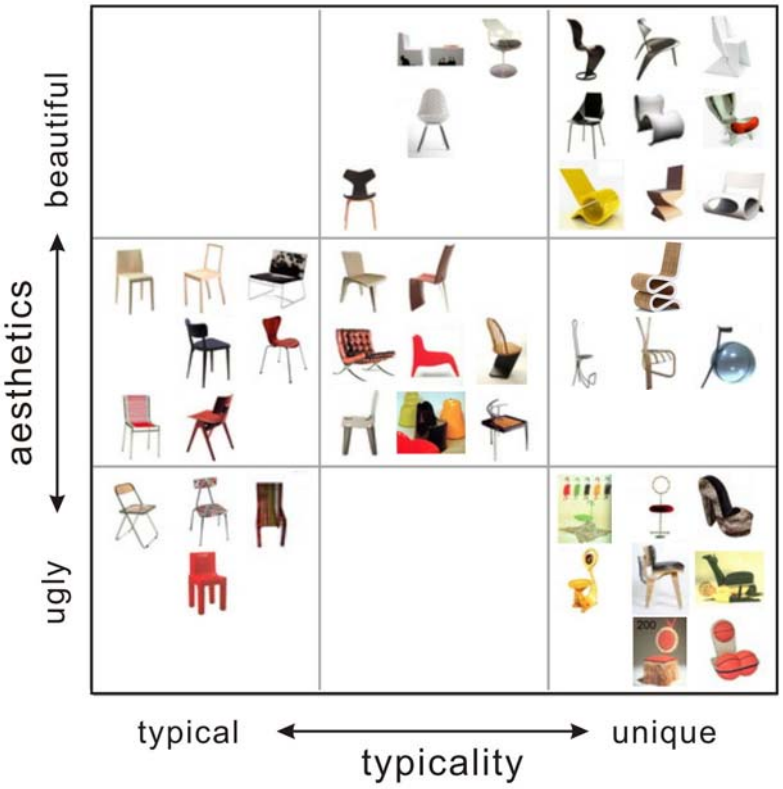


Figure 6. Common stimuli within identical sections between groups among three levels of aesthetics and typicality

By observing how the shape of the chairs changes from one cell to the next in the grid structure, we can gain a preliminary understanding about the design characteristics that influence the participants' aesthetics and typicality judgments.

We first note that there are no common stimuli for the cell "beautiful/typical" and the cell "ugly/medium-typical" in the grid structure. This observation corresponds to our findings that aesthetics-preference scores realized by stimuli depend on their typicality scores. Chairs with medium-level of typicality scores tend to score higher in aesthetics and preference; whereas highly typical chairs tend to score lower in aesthetics and preference.

In the left column of Figure 6, the forms of most chairs closely resemble the "typical chair" in Figure 1, with four legs, a flat seat, and a vertical back. From the bottom cell to the middle cell, the main differences between low and medium levels of aesthetics of chairs lie in the material textures and feature details. In the right column

of Figure 6, chairs in the bottom cell are more complex and make use of metaphors, such as high-heels, basketball or cultural patterns; whereas chairs in the top cell are more unified and make us of abstract shapes. In the middle row of Figure 6, chairs with a medium level of aesthetics show gradual change in their structures from the left cell to the right cell. Chairs in the right cell have structures of a "typical chair". Chairs in the middle cell might have three legs or have the back and the seat merged into a single piece. Finally, chairs in the right cell which are considered to be novel, have all elements of a typical chair merged into a single piece, without a clear distinction between the back, the seat and the legs.

Through the above observations, we conjecture that aesthetics judgments are influenced by surface textures and detailed features, while typicality judgments are influenced by changes in product structures, such as the addition or subtraction of elements, as well as abstraction or concretion of product appearance.

4. Conclusions

We examined the joint influence of product aesthetics and typicality on preference responses by using the chair as the example product. The results confirm that the relationship between preference and aesthetics is a linearly increasing function, where the most preferred chairs are those with high level of aesthetics; and that the relationship between preference and typicality is an inverted-U function, where the most preferred chairs are those with a moderate level of typicality. In addition, we found that the ranges of aesthetics-preference scores realized by stimuli depend on their typicality scores. Chairs with medium-level of typicality scores correspond to higher scores in aesthetics and preference; whereas highly typical or novel chairs near the two extremes on typicality correspond to lower scores in aesthetics and preference. These findings indicate that typicality, aesthetics and preference may form a crescent moon shaped, inclined surface in three dimensions. We also found that the two groups of subjects responded differently to the stimuli. Although the relationship between preference and typicality exhibits an inverted-U function for both groups, participants with design background are more amicable towards novel designs, than those without design background.

We noted that our studies were conducted using photos of chairs, rather than the actual products. Thus, the judgments might be different from the judgments with actual products. In addition, as the participants are all from Taiwan, the results might also reflect differences in terms of cultural and social background.

6. References

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