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# Study on Cultural Differences of Users' Perception towards Shape Characteristics

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**Abstract:** In the recent marketplace, it's necessary but no longer sufficient to offer a good functioning product. The emotional quality of products plays an important role for differential advantage. Particularly, globalized markets mean more intense competition than ever before. Understanding the users' real emotional needs in different cultures is becoming a key strategy for the adaptation of products in overseas market. This proposed study elicits insights on cultural differences between European and Asian values and investigates how these affect user's reaction to designed products. Two experimental studies of products' emotional quality are carried out on European and Asian participants via Semantic Differential Method: one case is conducted with the shape contours (pellet burners) represented by Europeans and South Asians (Indian) respectively for the investigation of their shape preferences; another case is organized with prototype model defined with geometrical design attributes (eyeglasses frames) represented by Europeans and East Asians (Chinese) respectively in order to reveal the structure of shape meaning comprehension. After conducting statistical analysis, the result of this study helps to improve user satisfaction both within national and overseas markets. It's useful for designers to identify and emphasize these shape features of new products which will stimulate the positive responses to required user preferences.

**Keywords:** cultural differences, Kansei Engineering, Semantic Differential Method, shape.

## 1. INTRODUCTION

Globalized markets and the increasing technological sophistication mean more intense competition

than ever before. Not only cultural variation is seriously conflicting with the uniformity principle of mass-production (Diehl & Christiaans, 2006), but also a good functioning product is sufficient any longer (Lu, 2013).

Considering that users from different cultures may employ different preferences and bias on a product, an effective design requires consideration of this cultural variation and should be planned to accommodate the needs of people with diverse cultural backgrounds. Understanding the users' real needs in different cultures is becoming a key strategy for the adaptation of products in overseas market.

Consumer research has shown that the emotional quality of products plays an important role for differential advantage in the marketplace (e.g. Dumaine, 1991). It is a challenge for design engineers to transfer consumers' emotional needs into technical and design specifications. Designers don't know how users react. A product's value can be perceived and interpreted in many different ways (Hsu et al., 2000). Conversely, users don't know what designers are up to (Crilly, 2011). This miscommunication can be particularly problematic when considering different cultural backgrounds or rather expensive for companies when not considering cultural backgrounds. Cultural differences strongly influence the understanding of product emotion (e.g., Uchida et al., 2004; Chandrasekaran and Tellis, 2008).

Nowadays product designers are seeking to satisfy user's emotional needs within product in several ways (Cho & Lee, 2005). According to Desmet & Hekkert (2007) the product shape has to express functionality, usability and pleasant feeling. The physical shape of a product plays a critical role in the perception of designed objects and its market success (Luo et al., 2012). The manipulation of product shape is therefore an important way through which designers communicate messages and elicit affective responses from users (Hsiao et al., 2006). However, the same shape could elicit totally different association between groups of individuals. Cultural context is usually side construct of consumer positive and negative product evaluation (Cho et al., 2011).

This proposed study elicits insights on cultural differences between European and Asian values and investigates how these affect a user's reaction to designed products. It carries out an experimental study of products' emotional quality towards shape in European and Asian markets. The proposed study is situated within the new product development research area called Kansei Engineering, often synonymously used with Design for Emotion.

In order to achieve the goal effectively, the structure of this study consists of two major parts with user's perception data. One is to investigate the shape preferences (angular and rounded), and the other is to understand the structure of shape meaning comprehension (combined shape characteristics). Results are a step towards helping designers to identify and emphasize these shape features of new products and improving product adjustments to overseas market. In this paper, we present the description of method in section 2, while the organization of experiments is described in section 3. In section 4, we present the analysis and discussion of the results. Finally, conclusions and perspectives are drawn in section 5.

## 2. METHODS

Although, several techniques have been developed to compose mapping and quantify Kansei qualities, the most common approach is Semantic Differential (SD) technique (Osgood et al., 1957). Originally, the Semantic Differential Method was proposed to analyze semantic structures and the

affective meaning of things. Relying on this methodology, Kuller (1975) developed for the first time semantic scales for product design, where 36 adjectives are validated and grouped into seven factors. Since the semantics and the emotional content of design have inseparable relationship with each other (Demirbilek & Sener, 2004), more than 30 years later it became one of the foundations of Kansei Engineering, and it is also used in the context of Affective Design.

Semantic differential (SD) technique has been successfully applied to find the semantic structure of designs. It consists of defining a list of attributes, and carrying out user-tests in which the user must assess the product on measurement scales. The attributes, usually called Kansei words, are often defined by pairs of antonymous adjectives, which lie at either end of a seven point qualitative scale. A semantic space, Euclidean and multidimensional, is then postulated. After gathering SD data and analyzing them statistically (univariate or multivariate analysis), engineer makes suggestions to the designer to amend his design.

This initial research employed two cross-cultural surveys with European and Asian participants based on Semantic Differential Method, aimed to study and compare members of two different culture groups who speak different languages that might lead to significant differences in shape preference and comprehension.

## 3. EXPERIMENTS

### 3.1. Experiment 1 – shape preference

We carried out an experiment on European and South Asian students comparing their preferences toward angular and rounded shape contours, to investigate their shape preference. According to Zhang et al. (2006) research finding from comparison experiment conducted with American and Asian participants, individuals with independent self-construal should perceive angular shapes as more attractive, whereas individuals with interdependent self-construal should find rounded shapes more attractive. We assume two hypotheses as follows:

H1.1: South Asians will have greater mean towards rounded shape in comparison to Europeans by all Kansei words.

H1.2: Europeans will have greater mean toward angular shape in comparison to South Asians by all Kansei words.

#### 3.1.1. Contour shape samples

The survey was conducted on 2 samples of contour shapes. In this experiment we intentionally did not associate the shape with any shape symbolism. The basic idea was to create an angular and rounded contour shapes based on real product design form characteristic. Selected images of pellet burners were transformed into 2D geometric shape contours which are shown on Figure 1.

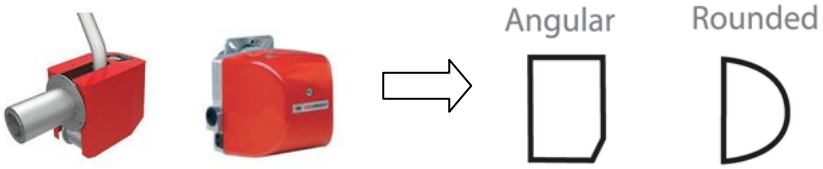


**Figure 1:** 2D contour shapes: Angular and Rounded (based on two real Pellet Burners).

#### 3.1.2. Selection of Kansei words

There were several criteria for Kansei words collection and selection. Crucially, Kansei words

have to be common and daily used and they have to be clearly understandable or familiar to all participating students. Therefore, the most representative and general Kansei words were selected and included in questionnaire for further evaluation: beautiful-ugly, simple-complex, reliable-unreliable and comfortable-uncomfortable.

#### 3.1.3. Subjects and procedure

Working with the hypothesis, the experiment 1 was carried out involving Hungarian, Croatian, Slovenian and Indian participants, represent for European and South Asian groups. A total of 106 students (25 females and 81 males) were invited to take part, including 16 Hungarians, 19 Croatians, 18 Slovenians and 53 Indians. They are undergraduate, master and PhD students, aged between 25 and 40, who have similar educational background: mechanical engineering, industrial design engineering and product design.

The research was performed using paper questionnaires in English language so all students had the same evaluation forms. Surveys were conducted in the classroom during the daily light. The participants received clear instructions about the test. Test was made using semantic deferential procedure. Subjects had to fulfill a blank point on 5-level likert chart where for example was “1-very complex, 5-very simple”.

### 3.2. Experiment 2 – shape meaning comprehension

Another experiment is organized with prototype model (eyeglasses frames) defined with geometrical design attributes, represented by Europeans and East Asians (Chinese) respectively in order to reveal the structure of shape meaning comprehension. We assume two hypotheses as follows:

H2.1: Europeans and E. Asians will have different mean towards these eyeglass frames by all Kansei words.

H2.2: Europeans and E. Asians will have different shape comprehension towards specific shape characteristic.

#### 3.2.1. Geometrical prototype samples

To illustrate the approach, we propose to study eyeglass frames, which are very interesting products from a design perspective. An eyeglass frame is a complex product that not only integrates functionality, but also aesthetics, individuality and transmits to the owner a controlled affective image (Inoue et al., 2004; Yanagisawa & Fukuda, 2004; Huang et al., 2010).

Although an eyeglass frame is a product with a limited number of parts, there are still a lot of geometrical details. In our study, we selected the common and ordinary full-frame samples. In order to facilitate the CAD modelling, the digital model of the eyeglass frame has been simplified. We supposed that the bridge and the two rims are flat and in the same plane rather than cambered in the space. Referred to the research findings for eyeglass frame form generation (Lo & Chu, 2009), four shape factors with different levels to control the design variables with a general digital model are defined as follows: frame leg width (Factor A), rim profile (Factor B), rim aspect ratio (Factor C), and rim thickness (Factor D). An experimental design with 22 samples size was proposed, which we consider of reasonable size to limit the fatigue of the subjects. The 22 digital models of the eyeglass frame were defined with CATIA V5R19, which information of material, color or texture are irrespective, so that the participants could focus the their attention on shape only (Lu & Petiot, 2012), shown in Figure 2.

| Factors | Level Settings |
|---|---|
| A: frame leg width | A1: wide A2: narrow |
| B: rim profile | B1: B2: B3: B4: B5: B6: B7: B8: |
| C: rim aspect ratio | C1: 0.75 (high) C2: 0.5 (wide) |
| D: rim thickness | D1: thick D2: thin |

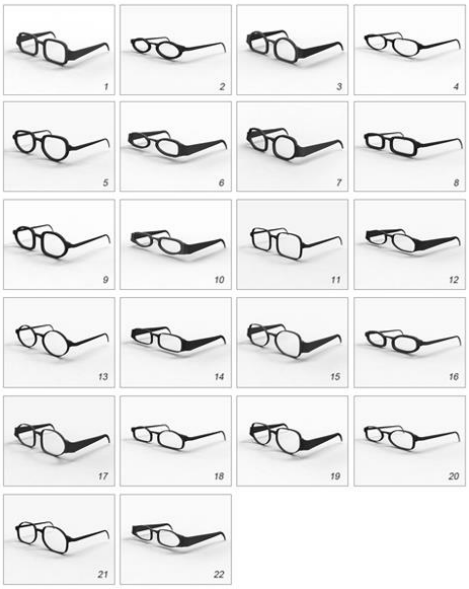

**Figure 2:** Product space defined with four design factors

### 3.2.2. Selection of Kansei words

The choice of the semantic attributes for this experiment was made by analysing previous papers in Kansei Engineering, in particular on the perception of eyeglass frames (Inoue et al, 2004; Lo and Chu, 2009). Eight pairs of Kansei words were selected, shown in Table 1, with their English translations listed.

**Table 1:** List of Kansei words in Experiment 2

| No. | Adjectives |
|---|---|
| 1 | feminine – masculine |
| 2 | common – special |
| 3 | original – dull |
| 4 | delicate – rough |
| 5 | funny – serious |
| 6 | obedient – rebellious |
| 7 | modern – retro |
| 8 | smart – ordinary |

### 3.2.3. Subjects and procedure

Eighty-eight college students (22 French, 22 Slovenians, and 44 Chinese) participated in this survey. They are between the ages of 18 and 30, with 21 females and 67 males. They are undergraduate, master and PhD students, who have similar educational background: mechanical engineering and industrial design.

The experiment was conducted in a calm computer room to avoid any external disturbance. In a short introduction, the subjects were informed about the purpose of the experiments and an explanation of the functioning of the interfaces was given. Three different language versions of the Kansei words were provided, in French, Slovenian, and Chinese. Subjects were advised that they could take their time to make the assessment on an unstructured scale (0-100), but that an intuitive and quick response was preferable. The presentation order of the eyeglass frames used a Williams

Latin Square in order to control the order and carry-over effects. The experiment was fully balanced because had 22 products and 88 subjects. In order to make the task of the test as user-friendly as possible, Matlab graphical interface was designed, shown in Figure 3.


**Figure 3:** Interface of the Experiment 2

## 4. RESULTS AND DISCUSSIONS

### 4.1. Experiment 1 – shape preference

In order to get clearer information, we run descriptive statistic, see table 2.

**Table 2:** Descriptive statistics of observed participants

| | **Europeans** | | | **S.Asians** | | | **Europeans** | | | **S.Asians** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Angular** | | | **Angular** | | | **Rounded** | | | **Rounded** | | |
| | **Mean** | **SD** | **SE** | **Mean** | **SD** | **SE** | **Mean** | **SD** | **SE** | **Mean** | **SD** | **SE** |
| Beautiful-ugly | 2.70 | 1.07 | .147 | 2.79 | 1.01 | .138 | 3.64 | 1.15 | .157 | 4.08 | .958 | .132 |
| Simple-complex | 4.09 | .925 | .127 | 3.89 | 1.05 | .144 | 3.75 | 1.19 | .164 | 4.13 | 1.11 | .153 |
| Reliable-unreliable | 3.53 | 1.25 | .172 | 2.98 | 1.39 | .190 | 3.15 | 1.39 | .191 | 3.34 | 1.39 | .190 |
| Comfortable-uncomfortable | 2.51 | 1.22 | .167 | 2.92 | 1.39 | .191 | 3.89 | 1.12 | .154 | 3.68 | 1.37 | .188 |

We used independent t-test to compare means. The independent t-test assumes the variances of the two groups you are measuring to be equal. First we assessed homogeneity of variance using Levene's Test for Equality of Variances. There were all variances equal except in one case. Further, a special interpretation of that case (Figure 4) was provided:

- **Kansei pair (beautiful-ugly)**: Regard on descriptive analysis, there was no significant difference with t(104) =.468, p=.641 between Europeans and S. Asians towards angular shape contour, which was perceived to be ugly by both groups. Rounded contour shape was perceived to be beautiful by both groups. At this case, S. Asians have higher mean in comparison to Europeans which is statistically significant with t(104)= 2.116, p=.037.

- **Kansei pair (complex-simple)**: Both Europeans and S. Asians found angular shapes to be simple so there was no statistically significant difference in their means with t(104)= -1.080, p=.283. Similarly, rounded shapes were found to be simple with no statistical significant difference with t(104)=1.691,p=.094.
- **Kansei pair (unreliable-reliable)**: Statistically significant difference was discovered at reliability of angular contour shape with t(104)=-2,123, p=.036. Europeans found angular contour shape to be reliable while S. Asians were neutral at this point. There was no statistical significant difference found at rounded shape perception with t(104)=.699, p=.486. Both Europeans and S. Asians think that rounded shape contour is reliable.
- **Kansei pair (uncomfortable-comfortable)**: Similar perception of angular and rounded shape towards Kansei word “comfortable-uncomfortable” was discovered. Both Europeans and S. Asians perceive angular shape as uncomfortable so there is no statistically significant difference in means with t(104)=1.634, p=.105. Special case where Levene’s Test for Equality of means was significant happened to be rounded shape at Kansei pair “comfortable-uncomfortable”. At this particular case we should consider that equality of variances was not assumed. Thus, both participants perceived rounded shape as comfortable so there is no statistically significant difference as well with t(104)=-.854, p=.395.

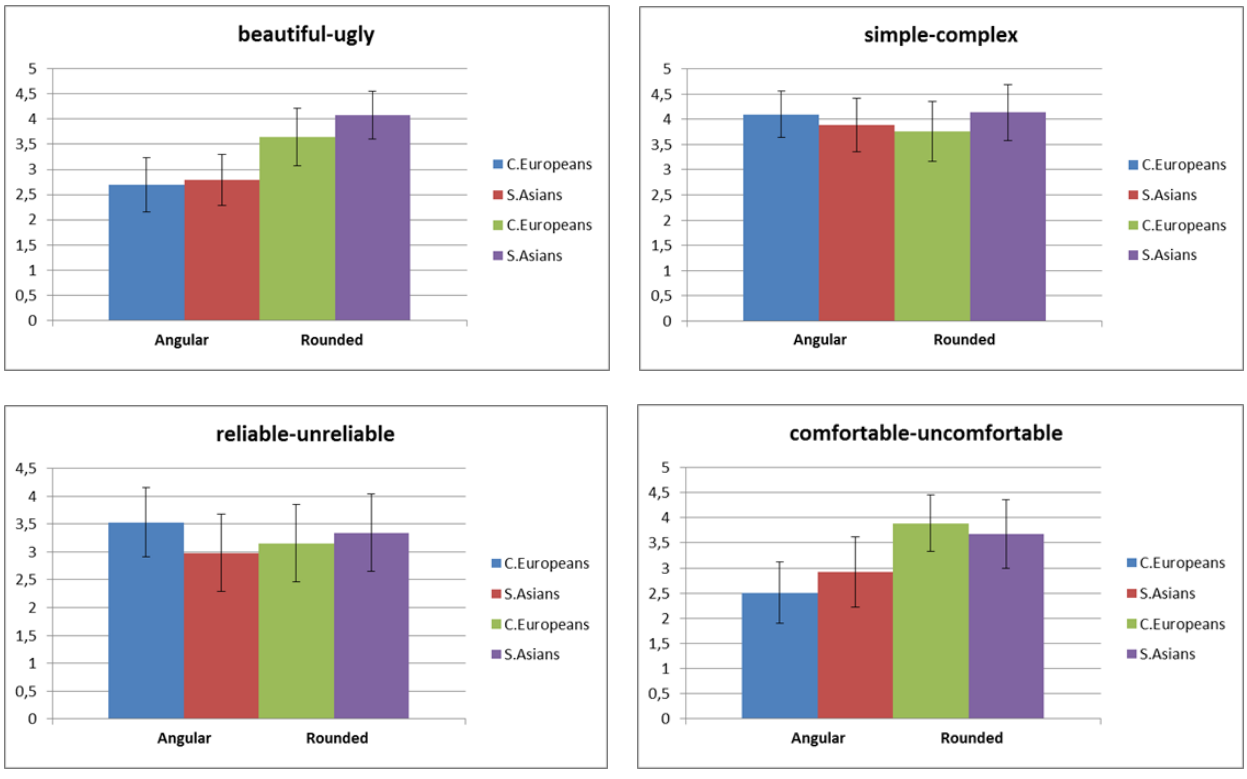


**Figure 4:** Comparison of Europeans and S.Asians means towards Angular and Rounded shape contour

Generally, there were discovered some minor differences between Europeans and S. Asians participants. Within first Kansei pair (beautiful-ugly) and rounded shape a difference in mean between S. Asians and Europeans was discovered. S. Asians found rounded shape slightly more beautiful than Europeans. Another, difference was found at Kansei pair (reliable-unreliable) and angular shape. Europeans perceive angular shape to be reliable or have higher mean in comparison to S. Asians which were neutral. Hence, even thought we did find some statistically

significant differences between both groups, we can't confirm our hypothesis 1.1 and 1.2 for all Kansei pairs. Regard on results for both cultures angular shape was perceived to be ugly, simple and uncomfortable. Contrary, rounded shape was perceived as beautiful, simple, reliable and comfortable.

## 4.2. Experiment 2 – shape meaning comprehension

### 4.2.1. Comparison of mean value

We calculated the mean values of each group, shown in Table 3. The mean values of European group are informative, revealing the tendency of their shape comprehension towards specific shape characteristic. Unfortunately, the mean values of E.Asian group are around the median value (50), although the individual evaluations are diversity.

**Table 3:** Mean values of European group and E.Asian group

| European | feminine - masculine | common - special | original - dull | delicate - rough | funny - serious | obedient - rebellious | modern - retro | smart - ordinary |
|---|---|---|---|---|---|---|---|---|
| P01 | 73 | 47 | 56 | 69 | 59 | 42 | 58 | 46 |
| P02 | 26 | 53 | 52 | 51 | 47 | 43 | 48 | 47 |
| P03 | 58 | 73 | 39 | 51 | 32 | 54 | 50 | 57 |
| P04 | 43 | 31 | 57 | 47 | 67 | 36 | 47 | 35 |
| P05 | 55 | 54 | 52 | 49 | 51 | 46 | 58 | 47 |
| P06 | 34 | 61 | 46 | 48 | 55 | 55 | 44 | 48 |
| P07 | 55 | 70 | 39 | 54 | 38 | 54 | 52 | 53 |
| P08 | 66 | 34 | 63 | 61 | 68 | 38 | 42 | 32 |
| P09 | 49 | 68 | 38 | 44 | 35 | 52 | 55 | 51 |
| P10 | 40 | 51 | 50 | 52 | 61 | 45 | 38 | 46 |
| P11 | 69 | 51 | 56 | 57 | 57 | 37 | 70 | 49 |
| P12 | 40 | 47 | 51 | 51 | 55 | 37 | 42 | 47 |
| P13 | 54 | 49 | 56 | 54 | 47 | 36 | 69 | 45 |
| P14 | 64 | 38 | 61 | 56 | 65 | 42 | 40 | 37 |
| P15 | 53 | 64 | 41 | 48 | 36 | 50 | 54 | 48 |
| P16 | 36 | 53 | 45 | 46 | 60 | 51 | 48 | 48 |
| P17 | 60 | 63 | 42 | 51 | 33 | 49 | 54 | 55 |
| P18 | 41 | 52 | 47 | 42 | 53 | 42 | 50 | 41 |
| P19 | 59 | 58 | 42 | 49 | 47 | 51 | 57 | 50 |
| P20 | 41 | 42 | 51 | 50 | 63 | 41 | 47 | 36 |
| P21 | 62 | 55 | 49 | 49 | 47 | 47 | 60 | 50 |
| P22 | 46 | 54 | 47 | 47 | 53 | 51 | 35 | 48 |

| E.Asian | feminine - masculine | common - special | original - dull | delicate - rough | funny - serious | obedient - rebellious | modern - retro | smart - ordinary |
|---|---|---|---|---|---|---|---|---|
| P01 | 63 | 49 | 51 | 53 | 51 | 51 | 49 | 51 |
| P02 | 41 | 58 | 46 | 45 | 45 | 53 | 44 | 48 |
| P03 | 57 | 49 | 49 | 51 | 46 | 45 | 44 | 46 |
| P04 | 40 | 47 | 46 | 43 | 40 | 43 | 46 | 45 |
| P05 | 52 | 53 | 45 | 43 | 41 | 46 | 50 | 47 |
| P06 | 45 | 52 | 44 | 38 | 46 | 45 | 38 | 45 |
| P07 | 58 | 45 | 46 | 43 | 54 | 46 | 51 | 49 |
| P08 | 53 | 49 | 45 | 43 | 47 | 46 | 41 | 47 |
| P09 | 58 | 60 | 44 | 39 | 45 | 44 | 47 | 47 |
| P10 | 48 | 48 | 47 | 48 | 50 | 43 | 44 | 48 |
| P11 | 58 | 51 | 49 | 41 | 45 | 53 | 53 | 49 |
| P12 | 52 | 53 | 52 | 46 | 44 | 56 | 44 | 50 |
| P13 | 54 | 52 | 41 | 41 | 41 | 44 | 53 | 47 |
| P14 | 59 | 46 | 57 | 48 | 58 | 43 | 52 | 52 |
| P15 | 59 | 48 | 46 | 44 | 47 | 48 | 49 | 50 |
| P16 | 47 | 58 | 45 | 44 | 40 | 48 | 42 | 46 |
| P17 | 55 | 56 | 45 | 48 | 42 | 44 | 46 | 48 |
| P18 | 48 | 55 | 40 | 43 | 42 | 45 | 45 | 51 |
| P19 | 57 | 54 | 50 | 44 | 49 | 48 | 51 | 49 |
| P20 | 40 | 47 | 54 | 49 | 48 | 39 | 41 | 50 |
| P21 | 51 | 58 | 43 | 50 | 43 | 50 | 46 | 51 |
| P22 | 46 | 52 | 48 | 47 | 48 | 54 | 42 | 54 |

The results indicated that the two groups have totally different mean values, so that the people from these two locations have different interests and evaluations towards the same designed products. Although hypothesis 2.1 is verified, the flattened mean values of E.Asian group are uninformative. Thus, poor results with Chinese subjects don't allow an efficient characterization of the differences and similarities of the eyeglass frames. Moreover, whether any of the shape factors has statistically significant effect in changing the participant's affective responses to the eyeglass frames cannot be identified with statistical analysis (e.g., Analysis of Variance). We consider that there are three main causes driving this:

- **Value conflict**: In comparison with European consumers, the Chinese consumers are just at a crossroads of modernism and traditionalism, faced with both traditional Chinese culture and other cultures. Obviously, while changes to traditional cultures are occurring, the traditional segments and values still remain. In China, some people are satisfied in the fashionable society with rapid changes, while some people cling to conservative values.
- **Increased individuality**: The presence of this young Chinese generation (college students), children of the "one child policy", who received special attention from doting parents and grandparents, explains the rise of individualism and conspicuous consumption (Hawkins & Mothersbaugh, 2011). They prefer distinctive identity rather than concerns with in-group norms, which lead to the discrepancy in the evaluation.
- **Regional disparity**: Given China's expanses and large population, it has strong regional cultures (e.g. the rich coastal area; western depressed area), as well as sharp differences in urban and rural cultures, associated with income, dialect, and custom. Although the

participants are college students at similar ages, they are from different regions with different backgrounds, which cause variation assessments, even opposite views and interests.

### 4.2.2. Comparison of Coefficient of Variation

In order to observe the degree of dispersion and the diversity of shape comprehension, we calculated the Coefficient of Variation (CV) for each product sample on each Kansei pair, see Table 4 and 5. Obviously, European group has lower CV values than E.Asian group, thus it's easier for Europeans to reach a consensus than E.Asians.

**Table 4:** CV values of European group

| CV of European Group | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | feminine - masculine | common - special | original - dull | delicate - rough | funny - serious | obedient - rebellious | modern - retro | smart - ordinary | |
| P01 | 0.25 | 0.56 | 0.46 | 0.28 | 0.42 | 0.55 | 0.53 | 0.48 | **0.44** |
| P02 | 0.70 | 0.48 | 0.46 | 0.39 | 0.48 | 0.49 | 0.51 | 0.37 | **0.48** |
| P03 | 0.32 | 0.21 | 0.53 | 0.46 | 0.57 | 0.37 | 0.52 | 0.27 | **0.41** |
| P04 | 0.39 | 0.55 | 0.32 | 0.39 | 0.22 | 0.46 | 0.43 | 0.49 | **0.41** |
| P05 | 0.35 | 0.38 | 0.37 | 0.41 | 0.40 | 0.42 | 0.37 | 0.35 | **0.38** |
| P06 | 0.53 | 0.35 | 0.41 | 0.44 | 0.34 | 0.36 | 0.51 | 0.39 | **0.42** |
| P07 | 0.42 | 0.24 | 0.40 | 0.39 | 0.44 | 0.30 | 0.36 | 0.29 | **0.35** |
| P08 | 0.26 | 0.54 | 0.27 | 0.32 | 0.23 | 0.52 | 0.39 | 0.48 | **0.38** |
| P09 | 0.46 | 0.25 | 0.51 | 0.48 | 0.61 | 0.47 | 0.36 | 0.33 | **0.43** |
| P10 | 0.45 | 0.37 | 0.36 | 0.37 | 0.27 | 0.42 | 0.50 | 0.33 | **0.38** |
| P11 | 0.31 | 0.54 | 0.48 | 0.45 | 0.47 | 0.62 | 0.29 | 0.41 | **0.45** |
| P12 | 0.42 | 0.46 | 0.33 | 0.37 | 0.32 | 0.44 | 0.52 | 0.36 | **0.40** |
| P13 | 0.44 | 0.54 | 0.45 | 0.44 | 0.57 | 0.66 | 0.32 | 0.39 | **0.47** |
| P14 | 0.24 | 0.58 | 0.27 | 0.31 | 0.27 | 0.49 | 0.48 | 0.55 | **0.40** |
| P15 | 0.41 | 0.23 | 0.36 | 0.41 | 0.42 | 0.29 | 0.32 | 0.36 | **0.35** |
| P16 | 0.60 | 0.33 | 0.39 | 0.41 | 0.33 | 0.41 | 0.43 | 0.37 | **0.41** |
| P17 | 0.33 | 0.30 | 0.49 | 0.41 | 0.57 | 0.40 | 0.43 | 0.28 | **0.40** |
| P18 | 0.44 | 0.35 | 0.36 | 0.50 | 0.33 | 0.44 | 0.44 | 0.38 | **0.40** |
| P19 | 0.39 | 0.32 | 0.48 | 0.50 | 0.46 | 0.45 | 0.50 | 0.37 | **0.43** |
| P20 | 0.55 | 0.43 | 0.38 | 0.36 | 0.29 | 0.41 | 0.44 | 0.46 | **0.42** |
| P21 | 0.34 | 0.40 | 0.42 | 0.46 | 0.47 | 0.44 | 0.38 | 0.29 | **0.40** |
| P22 | 0.38 | 0.38 | 0.48 | 0.44 | 0.29 | 0.38 | 0.49 | 0.42 | **0.41** |
| | **0.41** | **0.40** | **0.41** | **0.41** | **0.40** | **0.44** | **0.43** | **0.38** | |

Max
Min
Mean

For European participants, the Kansei pair "obedient-rebellious" is the least understood, while the Kansei pair "smart - ordinary" is the most unified. According to the CV values, the extreme samples of European group are introduced in Figure 5. Europeans have identical ideas towards eyeglass frame samples P07 and P15, which have big rim with wide frame leg, considered as neutral, special, original and funny design. The eyeglass frame samples P02 and P13 (round rim profile with narrow frame leg) are most controversial, typically "feminine-masculine" for P02 and "obedient-rebellious" for P13. Although Experiment 1 verified that rounded shape was perceived as beautiful, simple, reliable and comfortable for both western and eastern people, the sophisticated of designed product (multifactor with interactions) are much more difficult to understand. The change of a single factor even evoke opposite view.


**Figure 5:** Extreme samples of European group

For E.Asian participants, they tend to diversity attitudes towards the same designed product for the CV values are high. Comparatively, the assessments on Kansei pair "feminine-masculine" and

“common-special” are more consistent, while the assessment on Kansei pair “modern-retro” is the most controversial item. This can be explained by the value conflict of the Chinese consumers, who have conflict views of modernism and traditionalism.

**Table 5:** CV values of E.Asian group

| CV of E.Aisan Group | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | feminine - masculine | common - special | original - dull | delicate - rough | funny - serious | obedient - rebellious | modern - retro | smart - ordinary | |
| P01 | 0.33 | 0.44 | 0.48 | 0.46 | 0.47 | 0.48 | 0.49 | 0.49 | **0.46** |
| P02 | 0.60 | 0.45 | 0.59 | 0.54 | 0.53 | 0.49 | 0.56 | 0.52 | **0.53** |
| P03 | 0.39 | 0.52 | 0.46 | 0.44 | 0.50 | 0.53 | 0.56 | 0.47 | **0.48** |
| P04 | 0.58 | 0.53 | 0.57 | 0.55 | 0.61 | 0.62 | 0.58 | 0.54 | **0.57** |
| P05 | 0.48 | 0.48 | 0.58 | 0.59 | 0.59 | 0.56 | 0.58 | 0.56 | **0.55** |
| P06 | 0.63 | 0.52 | 0.55 | 0.59 | 0.58 | 0.57 | 0.63 | 0.55 | **0.58** |
| P07 | 0.45 | 0.54 | 0.52 | 0.55 | 0.45 | 0.48 | 0.47 | 0.50 | **0.50** |
| P08 | 0.46 | 0.51 | 0.57 | 0.52 | 0.50 | 0.57 | 0.54 | 0.47 | **0.52** |
| P09 | 0.37 | 0.36 | 0.57 | 0.58 | 0.56 | 0.56 | 0.54 | 0.52 | **0.51** |
| P10 | 0.55 | 0.51 | 0.55 | 0.51 | 0.46 | 0.60 | 0.57 | 0.49 | **0.53** |
| P11 | 0.46 | 0.51 | 0.58 | 0.62 | 0.63 | 0.49 | 0.53 | 0.53 | **0.55** |
| P12 | 0.48 | 0.46 | 0.49 | 0.55 | 0.60 | 0.46 | 0.59 | 0.50 | **0.52** |
| P13 | 0.51 | 0.53 | 0.61 | 0.58 | 0.62 | 0.56 | 0.58 | 0.59 | **0.57** |
| P14 | 0.44 | 0.58 | 0.43 | 0.52 | 0.47 | 0.50 | 0.58 | 0.47 | **0.50** |
| P15 | 0.40 | 0.52 | 0.55 | 0.53 | 0.52 | 0.48 | 0.51 | 0.47 | **0.50** |
| P16 | 0.58 | 0.42 | 0.51 | 0.50 | 0.53 | 0.47 | 0.60 | 0.55 | **0.52** |
| P17 | 0.45 | 0.45 | 0.60 | 0.52 | 0.62 | 0.57 | 0.53 | 0.54 | **0.54** |
| P18 | 0.52 | 0.43 | 0.60 | 0.55 | 0.52 | 0.53 | 0.57 | 0.45 | **0.52** |
| P19 | 0.40 | 0.46 | 0.51 | 0.53 | 0.51 | 0.49 | 0.51 | 0.51 | **0.49** |
| P20 | 0.61 | 0.53 | 0.45 | 0.47 | 0.49 | 0.52 | 0.56 | 0.47 | **0.51** |
| P21 | 0.44 | 0.43 | 0.61 | 0.45 | 0.57 | 0.47 | 0.57 | 0.52 | **0.51** |
| P22 | 0.57 | 0.46 | 0.54 | 0.52 | 0.44 | 0.41 | 0.58 | 0.44 | **0.50** |
| | **0.49** | **0.48** | **0.54** | **0.53** | **0.54** | **0.52** | **0.56** | **0.51** | |

Max
Min
Mean

These related results show that Europeans and E. Asians have different shape comprehension towards specific shape characteristic, although the complexity connections between shape characteristics and affective responses are different to fully reveal. The hypothesis 2.2 can be verified as well.

## 5. CONCLUSIONS

In this paper, two experimental studies of products’ emotional quality towards shape characteristics are carried out on European and Asian participants via Semantic Differential Method. The experiment 1 indicated that there is no special preference for western or eastern culture towards angular and rounded contour shapes. Both cultures appreciate rounded shape to be beautiful, simple, reliable and comfortable rather angular shape. The Experiment 2 uncovered that the shape meaning comprehensions are totally different for European and Asian participants. Unfortunately, the connection between shape characteristics and affective responses cannot be predicted due to the flattened mean values of E. Asian group. The main reasons are summarized as the value conflict, increased individuality and regional disparity of Chinese participants.

This initial study shows that cultural backgrounds influence users’ attitudes and comments towards designed products, and strongly suggest that awareness of cultural cognitive style is necessary for the improvement of product adaption in overseas market. The results of the two experiments can help designers to identify and emphasize shape features of new products which will stimulate the positive responses to required user preferences. Moreover, the results provide guide points for further study on cross-cultural identification on product shape.

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