A Study on Design Practices with Tacit Knowledge

Consequences of consumer perception

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Abstract: It has been noted in many face perception researches that people reliably and automatically make personality inferences from facial expression despite little evidence for their accuracy. Because of that a facial expression is a silent social signal, influencing mate choice and other social judgment. The selective sensitivity of human to features in the human face that convey information on sex, age, emotions, and intentions. A recent study has reported that the human ability can be applied to not only conspecifics, but also artificial objects. S. Windhager et al. found that people tend to perceive the world primarily in social way, also that people actually ascribe characteristics concordantly for most of the dimensions analyzed. There remains a question: does gendered perception make a difference? In consumer researches, gender is introduced as key consideration when segmenting consumers along the transactional/relational continuum with culture. Consulting firm A. T. Kearney estimated that females determine 80% of consumption, purchase 60 % of cars and own 40% of all stocks as of 2008. Little wonder that female's consumption becomes more and more important in all over the industries. This subject deserves more than a passing notice. This paper builds on design practices with tacit knowledge aiming to explore whether gendered perception makes a difference on automotive fronts or not. One hundred thirty-nine models representing thirty-five brands automotive fronts were used as stimuli. The subject rated each stimulus on 2 traits relating with human face. Among the stimuli, twenty-six car fronts on the male-/female like trait and, sixteen on the adult-/child-like trait, showed the significant by gender. In other words, around 80% of the pictures did not revealed the significant. It remains an unsettled question: why gendered perception makes exceptions in the automotive fronts. To find the answer of this question will be the further direction of this research.

Key words: *Human behavioral, Perception and Emotion*

1. Introduction

The human face is a complex multi-signal system from which we can infer a great deal of information at no more than a glance-in other words, after only 100 ms of exposure (Willis, J., & Todrov, A., 2006). Such information refers to age, sex, attitudes, personality traits, and emotion (S. Windhager et al., 2008). Important components in facial expressions of emotions include the eyebrows, eyelids, and mouth. The movements from the global pattern of such widely recognized expressions as happiness, sadness, surprise, disgust, anger, and fear (Ekman, P., 1999). Accordingly, people often draw many inferences from the facial appearance of other people (S. Windhager et al., 2008). Owing to the evolutionary significance of decoding facial signals, humans seems to have developed a selective sensitivity to the relevant features, and configurations, even if presented in rather abstract ways (Thayer, S., & Schiff, W., 1969). Such information is encoded and perceived in car fronts (Desmet, P. M. A. et al., 2000). The idea that cars have faces has been proposed (Coss 2003; Erk et al. 2002), and has been investigated systematically (S. Windhager et al., 2008). Regarding the results of S. Windhager et al.'s research, more than 60%of their subjects indicate seeing a face at least 70% of the cars.

In the recent research on gender differences and emotion, females exceeded males in their ability to recognize emotions whether expressed by males or by females (Naomi, G. R. et al., 1998). Also, in the research by Cezarry B. et al. (2006), gender differences in the rated intensity were found. From the results of the research, for male subjects higher intensity ratings for dynamic than for static expressions were noted in the case of anger, whereas in the case of happiness, no differences were observed. For female subjects, however, differences for both anger and happiness were significant. The results suggest that the dynamic characteristic of facial display is an important factor in the perception of the intensity of emotional expressions. Its effect, however, depends on the subjects' gender and emotional valence. Furthermore, the important fact to stress that it is becoming apparent that males and females make differences of the automotive design in distinctive ways as car consumption by both males and females continues to grow.

This research builds on the former research investigated by W. Windhager et al., however, focus on gendered perception. This study is not to quantify and visualized the link between perception and the geometry of a car front and its constituent parts, but to investigate the consequences of consumer perception in gender with car fronts. In the experiment, the 2 traits (male-/female-, and adult-/child-like) were used as the evaluation values. The 2 traits considered as conveying information of human face, such as gender and age, also are triggering emotional reaction no matter people cognitive it or not. Our hypothesis is based on that automotive fronts possess cues from which we infer characteristics, such as gender (male-/female-like) or age (adult-/child-like). Human knowledge is complicate to be transffered to another person by writing or verbalizing. Products allow information to be percieved visually rather than interpreted verbally (G. Smets et al., 1994). It is hard to find enough information what people want only with interview or behavior observation. This research is deserved in proposing a design practices with tacit knowledge by explore the selective sensitivity is deserved to investigate.

2. Method

2.1 Subjects

15 male and 15 female undergraduates and graduates in the 20 to 32 yr age range (mean= 24.77, SD±4.25) participated in the study. The mean age of the male subjects was 22.87±1.64 (SD), and of the female subjects was 26.67±3.48 (SD).

2.2 Materials

One hundred thirty-nine models that varied in automotive front face were selected from thirty-five brands. The perspective of the front pictures was the same, right front of car. All pictures were filtered in gray scale to avoid from color effect. And license plates erased, although brand logos were retained. Finally, all the pictures rendered at 580*370 pixels. Experiment screen was at 550*500 pixels. On screen slider was scale from 1(extreme left) to 381(extreme right).

2.3 Procedure

We used an event related design, in which pictures were displayed in counter-balanced, and therefore unpredictably. All instruction was in Japanese. Subjects were told that this was an experiment about Semantic Differential with automotive fronts. The subjects carried 2 times pre-test before conducting main-experiment. The stimuli for the pre-test were selected on different view and way to main-experiment's. In main-experiment, one hundred thirty-nine automotive front pictures were used as the stimuli, and showed on a computer monitor. Those were evaluated using onscreen slider below the stimuli [Figure 1]. The evaluating traits were 2, male-/female-like and adult-/child-like. After evaluating, subject could go to the next page using the arrow button on the computer monitor.

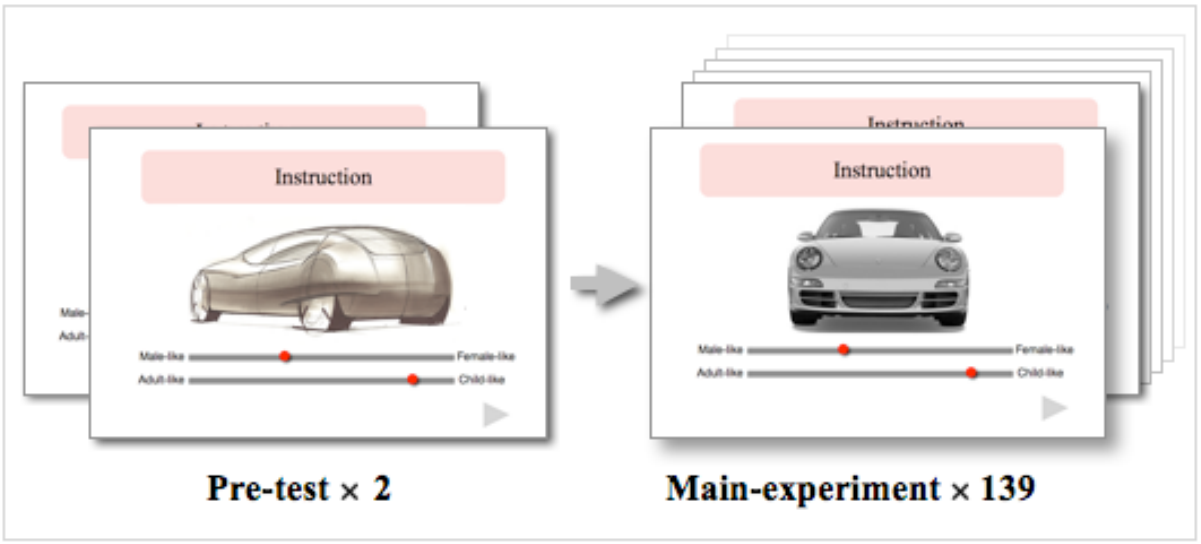

Figure 1: The flow of the experiment

3. Results

The data were analyzed using one way-ANOVA to know the distribution of Y (response) for each X (factor) modeling types determines analysis. In this study, Y were the evaluated-results of 139 pictures, X was subject gender. Also, we did each pair student's t and all pairs turkey HSD to compare the means in gender difference. With this analysis, we were to investigate whether or not subject gender affects the 139 evaluating results.

Trait 1: male-/female-like

Table 1 shows the significant results which p value was less than .05 on the male-/female-like trait.

Table 1

Number of picture	P value	R square	Number of picture	P value	R square
2	< 0.008	0.23	58	< 0.017	0.19
7	< 0.041	0.14	70	< 0.023	0.17

15	< 0.047	0.13	74	< 0.005	0.25
16	< 0.002	0.30	81	< 0.024	0.17
22	< 0.008	0.22	103	< 0.023	0.17
24	< 0.039	0.14	104	< 0.003	0.28
29	< 0.028	0.16	106	< 0.015	0.19
35	< 0.003	0.28	113	< 0.0001	0.48
36	< 0.019	0.18	115	< 0.008	0.22
39	< 0.001	0.31	118	< 0.011	0.21
41	< 0.008	0.23	123	< 0.034	0.15
44	< 0.038	0.15	135	< 0.002	0.29
52	< 0.039	0.14	139	< 0.014	0.20

Table 2 shows the means of males and females subject on the male-/female-like trait. The results were threshold at $p < .05$, as shown in Table 1.

Table 2

Number of picture	male-/female-like score		Number of picture	male-/female-like score	
	Males	Females		Males	Females
2 150.	6	58.8	58	130.9	68.6
7 238.	4	176.3	70	204	122.7
15 1	18.2	112.9	74	216.8	113.3
16 267.	3	158.8	81	136.7	81.9
22 256.	7	141.3	103	186.9	118.3
24 106.	9	44.5	104	176.3	99.1
29 214.	1	119.5	106	232.1	152.5
35 135.	3	59.3	113	274.1	133.1
36 199		103.1	115	257.2	174
39 261.	6	175.3	118	209.6	127.1
41 276.	9	193.9	123	115.8	177.4
44 177.	3	101.9	135	233.8	125.7
52 100.	3	53.4	139	227.7	141.8

- While male subjects saw male-like image in #7, #39 pictures, female subjects saw female-like in those pictures.
- While male subjects saw female-like image in #16, #22, #29, #70, #74, #106, #113, #115, #118, #135, #139 pictures, female subjects saw male-like in those pictures.
- Male subjects saw relatively stronger male-like image in #15, #123 pictures than female subjects did in those pictures.
- Female subjects saw relatively stronger male-like image in #2, #24, #35, #44, #52, #58, #81, #104 pictures than male subjects did in those pictures.
- While male subjects felt neutral in #36, #103 pictures, female subjects saw male-like image in those pictures.
- While female subjects felt neutral in #41 picture, male subjects saw female-like image in the picture.

While 26 pictures showed the significant in gender differences [Table 1], 113 pictures did not. Around 20% of automotive fronts were affected by gendered perception. Considering the results mentioned above, we conclude

that subject gender is unlikely to be due to chance on the stimuli #2, #7, #15, #16, #22, #24, #29, #35, #36, #39, #41, #44, #52, #58, #70, #74, #81, #103, #104, #106, #113, #115, #118, #123, #135, and #139. However, also we know that the gender difference of the subject is likely to be due to chance on the other stimuli. The twenty-six models which showed the significant as follows: Dodge Viper, Scion TC, Aston Martin DB7, Chrysler Concorde, Ferrari 360 Modena, Lutus Etise, Jaguar XK-series, Aston Martin DB9, Aston Martin V8 Vantage, Buick Lucerne, Jaguar XK-series, Pontiac Solstice, BMW M3, Cadillac DTS, Ford Mustang, Honda S 2000, Infiniti G37, Mercedes-Benz SLK-class, Mercury Milan, Mitsubishi Eclipse, Pontiac G8, Porsche 911, Porsche Cayman, Subaru Impreza, Honda S2000, Mitsubishi Eclipse.

Trait 2: adult-/child-like

Table 3 shows the significant results which p value was less than .05 on the adult-/child-like trait.

Table 3

Number of picture	P value	R square		Number of picture	P value	R square
41	< 0.006	0.24		77	< 0.032	0.15
43	< 0.049	0.13		79	< 0.02	0.18
49	< 0.009	0.22		81	< 0.01	0.21
53	< 0.022	0.17		114	< 0.009	0.22
63	< 0.007	0.24		121	< 0.007	0.23
64	< 0.004	0.27		124	< 0.012	0.21
75	< 0.009	0.22		126	< 0.036	0.15
76	< 0.001	0.34		129	< 0.01	0.21

Table 4 shows the means of males and females subject on the male-/female-like trait. The results were threshold at $p < .05$, as shown in Table 3.

Table 4

Number of picture	adult-/child-like score			Number of picture	adult-/child-like score	
	Males	Females			Males	Females
41 121.	4	217.1		77	153.1	219.4
43 81.	5	138.7		79	217.5	281.2
49 240		310.3		81	215.6	291
53 215.	8	292.7		114	109.6	206.2
63 137		237.1		121	162.7	237.8
64 151.	7	250.9		124	160	245.7
75 134.	4	218.6		126	162.8	218.1
76 144.	1	228.1		129	175.3	256.6

- While male subjects saw adult-like image in #41, #63, #114, #121, #124 pictures, female subjects saw child-like in those pictures.
- While male subjects saw child-like image in #64, #77 pictures, female subjects saw adult-like in those pictures.
- Male subjects saw relatively stronger adult-like image in #43 picture than female subjects did in the picture.
- Female subjects saw relatively stronger child-like image in #49, #79, and #81 pictures than male subjects did in those pictures.

- Male subjects saw stronger child-like image in #53 picture than male subjects did in the picture.

While 16 pictures showed the significant in gender differences [Table 3], 123 pictures did not. Around 10% of automotive fronts were affected by gendered perception. Considering the results mentioned above, see Table from 1 to 4, we conclude that the difference of subject gender is unlikely to be due to chance on the stimuli #41, #43, #49, #53, #63, #64, #75, #76, #77, #79, #81, #114, #121, #124, #126, and #129. However, also we know that the gender difference of the subject is likely to be due to chance on the other stimuli, see Table 3, 4 and Figure 3.

The sixteen models which showed the significant as follows: Jaguar XK-series, Pontiac Solstice, Audi S5, BMW X3, Chrysler 300, Chrysler Aspen, Hyundai Accent, Hyundai Elantra, Hyundai Santa Fe, Hyundai Veracruz, Infiniti M35, Mercury Sable, Pontiac G6, Porsche 911, Porsche Cayenne, Saturn Astra.

4. Discussions and Conclusions

In the experiment, we asked subjects to evaluate car fronts subjectively in 2 traits (male-/female-like, adult-/child-like) to investigate whether gendered perception linked to the subjective evaluations or not. Results appear in Tables 1, 2, 3, and 4. The results told that gender differences weekly impacted on the evaluating with some stimuli. In the male-/female-like trait, around 20% of the car fronts showed significant in gender differences. In the adult-/child-like trait, almost 90% of the pictures did not revealed the significant, even though some car fronts were evaluated as the contrary images by gender difference. With the findings, there can be no doubt that gender was not statically significant in the subjective evaluations with the male-female-like and adult-/child-like values. However, there must be considerable doubt as to why about 20% in male-/female-like trait, also about 10% in adult-/child-like trait showed the significant by gendered perception? Our discussions have concern with the question: Why did the subjects can show the different images only from around 10~20% car fronts? Two reasons might explain this. One of the possible reasons is the property of the traits. In this research, subjects evaluated on male-/female-like and adult-/child-like traits, which were considered as human facial physical traits. In the research of Cezarry B. et al. (2006), gender differences were found in the rated intensity. For male subjects higher intensity ratings for dynamic than for static expressions were noted in the case of anger, whereas in the case of happiness, no differences were observed. For female subjects, however, differences for both anger and happiness were significant. The results suggest that the dynamic characteristic of facial display is an important factor in the perception of the intensity of emotional expressions. Its effect, however, depends on the subjects' sex and emotional valence. Perceived maturity had dominance, arrogance, anger, and hostility. Likewise, along this same trajectory, masculinized male (and female) faces obta in higher ratings in perceived dominance, masculinity, and age (Perrett et al. 1998). It is a good illustration of the reason why gendered perception was weak to the 2 traits. With the sex and emotional expression related researches, gender can make a difference. In this research, however, we used physical traits of human face: male-female-like (sex) / adult-child-like (age), not emotional expression traits. Second, it might explain by reward. Face perception evoked activation in a distributed network that included regions in the visual cortex, limbic system, prefrontal cortex, and reward circuitry (F. Krants, A. Ishal, 2006). Recent studies have reported that facial beauty evokes activation in the reward circuitry (Aharon, I. et al, 2001, O'Doherty, J. et al., 2003). A research by H. Kawabata et al., the

perception of different categories are associated with distinct and specialized visual areas of the brain, that the orbito-frontal cortex was differentially engaged during the perception of beautiful and ugly stimuli, regardless of the category of painting, and that the perception of stimuli as beautiful or ugly mobilizes the motor cortex differentially. Regarding the results of beauty and reward related researches, it sound reasonable considering what people want or need from the objects. This is considerable validity to explain the results of this research. There is room for argument on this point. In the line with attractive-ness, certain extremes can be slightly more attractive than average traits (McArthur, L. A., & Berry, D. S., 1987, Perrett, D. I. et al., 1994, Perrett, D. I. et al, 1998, Rhodes, G. et al, 2000). However, this does not alter the fact that average faces are attractive or reduce the need to understand the basis of their appeal (G. Rhodes et al., 2003). If averageness is attractive, then there should be a corresponding shift in what looks attractive (MacLin, O. H., & Webster, M. A., 2001). It is well known that exposure increase liking (Bornstein, R. F., 1989), and exposure to faces can increase their attractiveness (Zanjonc, R. B. 1968). It shows the same results come with artificial objects? Halberstadt and Rhodes (2000) found a strong relationship between averageness and attractiveness also for nonface objects like drawings of dogs, birds, and watches. It brings us to consider about.

If subjects were asked about emotional traits, such as dominance or pleasant, gendered perception could show the significant? Or, if subject felt extra motivation related with reward in tasks, our hypothesis could be clarified? It is a question we will address in further study.

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