

자동차 핸들커버와 음료수병의 선호촉감 요소에 관한 연구

Preferred haptic factors for the steering wheel cover and beverage bottle

김현정*† · 정성환** · 양종열***

Hyun-Jung Kim*† · Sung-Whan Chung** · Jong-Yeol Yang***

전북대학교 대학원 디자인제조공학과*†

Dept. of Manufacturing of Chonbuk National University*†

전북대학교 산업디자인학과**

Dept. of Industrial Design of Chonbuk National University**

전북대학교 산업디자인학과***

Dept. of Industrial Design of Chonbuk National University***

Abstract : In this research, experiments were performed to focus on haptical factors among the emotional way of expression in design, and, find out what factors of preference influenced by haptic elements as surface material, grip senses and shape that considering clues when consumer has purchase intention. The questionnaire survey of beverage bottles in experiment extract to haptic elements were estimated in various surface of bottles and consumer preference through practical touch by managed objects themselves. The experimental groups for this survey, one is using sight and sense of touch both, the other groups are use sense of touch only without sense of sight. Therefore, to find out effective factors for design and functional matter as the kind of treating surface and properties derived from comparing two experimental groups have recognition in level of priority for each element related with haptical design sources. Finally, considering practical use schema with emotional approach based on haptical property to adopting design process.

Key words : haptical factors, design preference

요약 : 현재 디자인 분야에서는 감성에 관한 강한 필요성을 바탕으로 오감각과 인간의 의식 속에 잠재되어 있는 감성적 요소를 디자인에 반영하려고 노력하고 있다. 그러나 그러한 감성적 의미를 표현하기 위한 체계적인 연구에는 아직 미흡한 점이 많으며, 특히 오감각 중 시각적 요소를 중심으로

* 교신저자 : 김현정(전북대학교 디자인제조공학과)

E-mail : mosshyun@naver.com

TEL : 063-270-2236

FAX : 063-270-2237

한 디자인반영과 한정된 연구가 이루어지고 있다. 이러한 한계점을 극복하고 새로운 디자인과 감성적 이미지를 표현하기 위해서는 타 감각적 요소에 대한 깊이 있는 연구와 디자인에 접목시킬 수 있는 실증적 대안이 필요하다. 본 연구에서는 그러한 감성 이미지를 표현하기 위한 감각요소 중 촉각적 요소를 중심으로 연구를 진행하였으며, 현대인의 소비 행태에 있어서, 감성적 디자인 요소로서 촉각적 요인과 밀접하게 관련된 핸들 커버와 음료병 제품의 재질, Grip감, 형태 등이 선호요인으로 작용하는 정도를 알아보았다. 동시에 두 제품군의 각각 선호도와 제품의 촉각적 특성 관계를 비교한 결과 기능적 특성과 원인에 따라 디자인의 촉각적 선호요인의 차이를 보였고, 이는 디자인 시 제품 카테고리별 선호 촉감 요소의 차별적 반영이 필요함을 알 수 있었다.

주제어 : 촉각 요소, 선호 디자인

1. Introduction

Human response from the tactile stimulus appear external way on outside unconsciously and indirectly. It is very important factor caused the emotional response that have touching some objects or estimate by seeing at products and circumstances where we live.

Tactile information has cutaneous perception which means physiological information and haptic perception of tactile organism[1]. The study of haptic and tactile proceeding in virtual reality and 3D modeling and apply on researching for surface texture with intensive studying in many fields related of design.

In case of texture that people can percept as their eyes to natural, artificial, and make of metallic sources in various way of feeling. It sensed like soft or tender, flat, thick, rough with tactile sense to touch or seeing whatever people can feel. Tactile sense extracting from object's thickness, weight, temperature, surface etc.

For clothing and textiles estimate texture to use of notion as the sense of sight & touch[2]. The sense of sight & touch means one way of estimate texture and structure of objects with touching and seeing in experiment progressing.

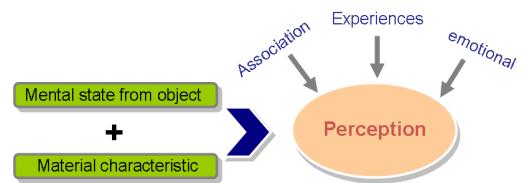


Fig.1 The process of perception

In pre-research, the questionnaire for importance of haptic elements has question to people, "what is the factor reason to feel good to touching?"

To this questionnaire they answered first factor of make people feel good is texture, and hardness is a secondary cause, others are temperature and shape. The rate of answered "very important" to each factor which is that 68% of texture, 35% of hardness, 31% of temperature, and 26% of shape[2]. These four elements are basic as haptic sense and significant matter of emotional design issues in recently.

Tactile sense and sight of sensibility processed as a whole with related each section of interchanging information.

Surface and shapes are basic object to touch and see in both as a stimulation effected on human feeling or emotion included mental responds. Human sense and mental responds worked as one in a sort of task and simulation. In that means, sense of touching and seeing progressed together to express as emotional images[4].

2. Method

Considering for estimate object as include haptic element to applying actual design process make experimental subject to wheel cover possible to handle and touch given them indirect operating as in practical experience. And also, set another object to beverage bottles use in ordinary but selected several items as representative shape and material and surface.

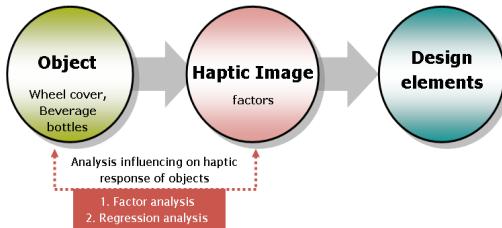


Fig.2 The Frame of research

In this study, experiments were performed through two methods to survey what element effect on consumer's preference and way of applying four factors of haptic sense use in design. In the first experiments, influential haptic factors in wheel covers and bottles studied to what important factors related with each categories by factor analysis. In the second experiments, the haptic factors cause to consumer's preference were extracted through regression analysis.

Before conduct to two of experiments, gathering adjective words related in haptic sense of information of object with activity to handle them as regarding four haptic factors. To these adjective words, make questionnaire with seven point of scale, then ask to respondent's feeling and judgment with seeing and touching under given haptic information.

Table.1 Adjective words of four factors

Haptic factors	20 adjective words for haptic factors
texture	rugged-smooth, rough-soft, complex-simple, transparent-opacity, irregularity-regular, artificial-natural, glossy-dull,
weight	hard-tender, light-heavy, thick-thin, elastic-inelastic
shape	symmetry-asymmetry, rectilineal figure-curved line, big-small, stabilized-nonstabilized, hard to grip- easy to grip, typical-atypical, stillness-dynamic
temperature	cool-warm, humid-dry

Stimuli of Survey	7 wheel cover, 10 Beverage bottle
Subjects of Survey	80 male and female in 20s and 30s, including majored& non-majored
Method of Survey	1:1 personal interview
Period of Survey	June ~ July 2007

Fig.3 Questionnaire

The scale of componential analysis as adjective words with haptic sense are material, weight(degree of light and heavy), shape and temperature settle as degree of own property. In that means, feels from touching objects to percept as rough or soft, light or heavy with level of degree for feeling. Related adjective words are following these (Table 1).

3. Analysis

3.1. Factor Analysis

The objects in experiments are seven wheel cover and ten bottles pick up at market many people visit in. Make questionnaire 20 items as adjective scale about haptic elements(Fig.4). Respondents aged from 20 to 40 who has car and have drinks or beverage

sometimes.

First, to find out main element effected on perception of haptical responds have factor analyze to wheel covers and beverage bottles both. Result of analysis, there are 4 groups categorized 20 items for wheel cover and bottles. In case of wheel cover have factors of shape, preference, warm-cool images of emotional way of thinking and fourth factor is matter of surface that is glossy or non-glossy(Table.2).



Fig.4 Samples of wheel covers and bottles

Table.2 Factor analysis influencing on haptic response of
Wheel covers

haptic adjective	1	2	3	4
complex/simple	0.58534	-0.03692	0.264482	-0.07248
light/heavy	0.566958	0.048171	-0.59257	-0.12555
big/small	0.779918	-0.01152	-0.01329	0.080395
stillness/dynamic	0.607146	0.399384	-0.06569	0.125917
stabilized/non-stabilized	0.125521	0.560803	0.076467	0.200352
hard to grip/easy to grip	0.038478	0.765567	0.09553	-0.01228
preferred/non-preferred	0.002573	0.768691	-0.00901	0.018866
hard/tender	-0.04149	0.021849	0.778679	0.18264
cool/warm	0.04873	0.106163	0.677717	-0.05414
glossy/dull	-0.13559	0.098263	-0.31337	0.694078

Table.3 Factor analysis influencing on haptic response of
Beverage bottles

haptic adjective	1	2	3	4
light/heavy	0.876203	0.159139	0.057922	0.001017
thick/thin	0.8299	0.141407	0.082095	-0.13287
rugged/smooth	0.126571	0.738913	-0.12159	0.208882
stabilized/non-stabilized	0.166507	0.671184	0.205352	-0.01669
artificial/natural	0.039721	-0.08167	0.595228	0.076879
rectilinear figure/curved line	-0.24498	0.120901	0.675315	-0.11737
big/small	0.019909	-0.06839	0.620539	0.042274
stillness/dynamic	-0.02178	-0.45875	0.582412	-0.02549
rough/soft	-0.19586	0.234468	0.050635	0.715778
glossy/dull	0.030804	-0.08557	-0.13042	0.763846
preferred/non-preferred	-0.13513	0.087315	0.24307	0.636736

As beverage bottle have four kind of main factors are matter of weight of light-heavy and thick-thin, second, factors with feeling comfortable and next, matter of volume thing like shapes are rectilinear figure or curved line(Table.3). The other factor of beverage bottles is preference means into opacity and softness or rough as surface like wheel covers have.

3.2. Regression Analysis

3.2.1. The case of wheel cover

Analyze relationship to each haptic factor and preference through regression analysis. For this, case of wheel cover, the matter of grip as comfortable and easy mainly effect to preference, and also as wheel shape to feel stillness-dynamic effect on(Table.4).

As surface treatments as rugged or smooth were influential factor of preference in beverage bottle. Wheel cover mainly use grip and handle to operate

so haptic factor as grip with hand were decisive reason in preferred or not.

Other items not involve at preference conspicuously, case of wheel is due to functional property using directly with hands. And this means to grip wheels regarding safety and feeling comfortable from easy to grip or touch.

It gives important and basic information that considering grip and shape of easy to touch rather than applying color and texture in wheel cover design progress. And shape design of wheel cover need to be dynamic and feels like body as organic structure was preferred.

Table.4 Regression analysis for the case of Wheel cover

model		Unstandardized coefficients		standardized coefficient Beta	t	Sig.
		B	Std. Error			
1	(constant)	-.513	1.254		-4.09	.683
	rugged/smooth	.214	.098	.188	2.182	.031
	complex-simple	-.024	.078	-.025	-.311	.756
	transparent-opacity	.052	.114	.037	.459	.647
	irregularity-regular	-.140	.085	-.135	-.164	.103
	artificial/natural	.073	.091	.059	.798	.427
	hard/tender	-.049	.092	-.047	-.533	.595
	light/heavy	.005	.116	.004	.039	.969
	thick/thin	.140	.113	.121	1.245	.216
	elastic-inelastic	.124	.095	.104	1.305	.195
	rectilinear figure/curved line	.060	.106	.042	.569	.571
	big/small	-.225	.101	-.198	-.222	.028
	stabilized/non-stabilized	-.009	.100	-.008	-.095	.925
	hard to grip/easy to grip	.493	.093	.445	5.308	.000
	typical-atypical	.006	.088	.006	.072	.943
	cool/warm	-.092	.092	-.079	-.999	.320
	humid/dry	-.027	.089	-.022	-.307	.759
	stillness/dynamic	.321	.105	.272	3.070	.003
	rough/soft	.167	.093	.154	1.795	.075
	glossy/dull	-.019	.099	-.014	-.189	.850

3.2.2. The case of Beverage bottle

Table.5 Regression analysis for the case of Beverage bottle

model		Unstandardized coefficients		standardized coefficients Beta	t	Sig.
		B	Std. Error			
1	(Constant)	7.194E-02	1.234			.058 .954
	rugged/smooth	-.103	.072	-.118	-1.425	.156
	complex-simple	-.082	.079	-.088	-1.046	.297
	transparent-opacity	-.035	.068	-.040	-.518	.605
	irregularity-regular	.114	.088	.096	1.291	.198
	artificial/natural	2.720E-02	.068	.029	.397	.691
	hard/tender	8.744E-02	.087	.085	1.009	.314
	light/heavy	7.759E-02	.104	.084	.749	.455
	thick/thin	-.021	.099	-.022	-.211	.833
	elastic-inelastic	2.104E-02	.084	.022	.250	.803
	rectilinear figure/curved line	7.398E-03	.084	.007	.088	.930
	big/small	.174	.095	.136	1.838	.068
	stabilized/non-stabilized	-.056	.097	-.044	-.578	.564
	hard to grip/easy to grip	9.968E-02	.074	.086	1.338	.183
	typical-atypical	1.292E-02	.084	.012	.153	.878
	cool/warm	-.033	.073	-.031	-.446	.656
	humid/dry	-.060	.078	-.050	-.777	.438
	stillness/dynamic	9.433E-02	.089	.085	1.062	.290
	rough/soft	.479	.074	.478	6.468	.000
	glossy/dull	.168	.078	.164	2.151	.033

In case of bottle highly related on surface and gloss, only focused on surface cause to own property as low effect on handle it and have any necessity of operating to do in wheel cover used(Table.5). So, beverage bottle should be designed by considering how to express in appearance based on using material and configure to surface.

There are no distinct clues preparing with highly preferred and low preferred, but characteristic of highly preferred have more glossy appearance and smooth then low preferred bottles, and feel soft to touch and have good looking as people like. Low preferred products have unfamiliar shape and surface treatment is rugged(Fig.5).



Fig.5 Characteristic of Highly and low preferred bottles

Highly preferred items are no.2, no.3, no.9 in that group have distinguished clues within other items that have smooth body and surface with highly glossy and brightening than the others. And also, in no.2 bottle highly preferred has very smooth body type and typical shape preparing others.

3.2.3. Preparing between case of wheel cover and beverage bottle

Characteristic for group of wheel cover preferred of low one has irregular pattern in surface and cheap cost of material and other wheel cover has using atypical texture with rough matter over it make bad feeling to grip.

Preparing wheel cover and beverage bottle to result that both of preference common factor is a degree of rough and soft of material, it means that softness due to instantly stimulation and deep effect to feeling good and comfort as we live on. Finally, one of reason of preference related to price that as more preferred as more expensive. It is matter of material and in-depth of design in level of detail.

Fig.6 Characteristic of Highly and low preferred bottles

4. Results and Discussions

Each preference group of wheel cover and beverage bottle have characteristic factors which are mainly considered functional problems to grip objects and handle them by respondents in wheel cover. Therefore, if offering the chances to consumer touching and handling a wheel cover in market place, improve good impression for those products and people can get more information of wheel cover(Fig.7).

In this regard, designer should be considered a matter of grip to object in easily and make feel comfortable, shapes are preferred by bring in dynamic items related on driving situation actually.



Fig.7 Characteristic of Highly and low preferred bottles

Highly preferred wheel cover look as shape of grip parts with hands it considered that fit to each fingers in place properly by have regular rugged forms with soft leather.



Fig.8 Characteristic of Highly and low preferred bottles

Rugged part of wheel cover gives people to feel safe in driving and make comfortable as functional design. Also, using hand with wheel cover in driving spend more time then handle to bottle bring on have highly frequency of stimulation of seeing object and judging outside of bottles then touching.

Three items in group of preferred as bottles on top

have characteristic things due to very glossy and smooth, soft rather than rugged or opaque opacity(Fig.8).

5. Conclusions

Tactile and haptic in design comes to have chance in approaching various design sources and close enough to human emotional value. Elements of haptic senses take to design without considering human living style. So it demanded studying of lifestyle at the same time.

Result of this research, there are several suggestion involve design that object was perceived by touching and seeing as a whole but not only haptic factors one by one. Shown as the factor analysis, most of respondents recognize to some properties of haptic adjective words as one group as less one meaning and it is different as categorizes products.

For this, it is possible to assume as property of products have their own haptic factors with following each functional matters. In this means goes to wheel cover related on shape of grip to easy among the haptic factors, as case of beverage bottle related on texture with matter of rough-soft and glossy-dull.

To design of applying haptical items understanding product's peculiarity and usability first and should be carry out potential needs of touching and feeling people always wanted.

Reference

- [1] Hyun Woo, Nahm "A study on sensorial interface in virtual reality ", Korea Digital Design Council, Vol.2, p.21, 2001
- [2] Seung Moo, Yang, "Tactual/Intuitive User Interface Design", Research on MOCIE,

p.101, 1999

- [3] Onda Koji, Kikuchi Tsukasa, Okazaki Akira
"Visualization and Expression for Sense of Touch of Invisible Objects Using CG",
Takushoku University, Bulletin of JSSD Vol.52, No.3, 2005.
- [4] Berbaum, K.T., Bever, T. & Chung, C.S.,
"Extending the Perception of Shape From known to unknown shading," Journal of Experimental Psychology, Vol.10(2), 1984.

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