



# “Where does product attachment come from? The effects of sight, hearing, and smell in the automobile market”

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# WHERE DOES PRODUCT ATTACHMENT COME FROM? THE EFFECTS OF SIGHT, HEARING, AND SMELL IN THE AUTOMOBILE MARKET

## Abstract

Sensory marketing is advantageous because it can help reduce the amount invested to yield such a high effect. However, the existing literature in this area is limited to services (restaurants, hotels, retail, tourism, etc.) and foods for which it is easy to have sensitive sensory experiences. This study aimed to clarify the influence of sensory stimuli on attachment in the Japanese and American automobile markets. An online survey was distributed through a Japanese research company to 1,000 car owners in their 20s to 60s (500 people from each country). The results of applying structural modeling to the survey data confirm the significant effect of sight ( $\beta = 0.336$ ,  $p$ -value  $< 0.000$ ), which consists of styling and colors in the exterior and interior, and hearing ( $\beta = 0.379$ ,  $p$ -value  $< 0.000$ ), which consists of driving sound, door sound, and startup sound. In contrast, the results indicate no effect of smell ( $\beta = -0.031$ ,  $p$ -value = 0.663). In addition, comparing the two countries, sight ( $\beta = 0.721$ ,  $p$ -value  $< 0.000$ ) was effective in Japan, and hearing ( $\beta = 0.741$ ,  $p$ -value  $< 0.000$ ) was effective in the United States. Practitioners should comprehensively evaluate sensory stimuli, understand their priorities, and deliver sensory experiences in multiple functions. This consistent embodiment can strengthen the consumer's attachment to the product.

**Keywords** brand management, five senses, product concept, sensory marketing, user experience

**JEL Classification** M31, L62

## INTRODUCTION

Today, as products and services are similar in functional attributes, consumer choices are increasingly influenced by sensory rather than rational factors. Furthermore, sensory marketing is advantageous because it can help reduce the amount invested to yield such a high effect. Compared to the development of the latest technology and large-scale advertising, creating sensory experiences is affordable. With this background, prior studies demonstrated the effects of sensory experiences through the five senses in many industries, including restaurants (Satti et al., 2022), tourist spots (Kastenholz et al., 2020), and retail (Lund, 2015). However, prior studies that integrate the five senses center on the service area. Product research is limited to the food and beverage industry, which provides the most multisensory experiences (Anetoh et al., 2020; Haase et al., 2020; Krishna & Elder, 2021). One possible reason for this state of the literature is that few products comprehensively stimulate the five senses.

However, while taste is less relevant in consumer durables, the other senses are also important. In particular, as automobiles have an interior space, not only sight and hearing but also smell are relevant fac-

tors. Nevertheless, research on the effects of integrating multiple senses is lacking in durable consumer goods. In addition, prior studies do not adopt the perspective of attachment as an objective variable. Therefore, there is a need to clarify the effects of sight, hearing, and smell on attachment in the Japanese and American automobile industries. In addition, it is vital to compare the differences between these countries.

## 1. LITERATURE REVIEW AND HYPOTHESES

Of the five senses, sight has a dominant influence on perceptions of interest and value. For example, in the coffee house context, sensory perception had a positive impact on brand experience, with visuals having the highest contribution (Haase et al., 2018). For automobiles, the visual design element is the most critical aspect of product appeal (Kato, 2021). The design has many components, such as color. Color, in particular, is a valuable resource for building perceived quality in industrial products (Piselli et al., 2018). Since the beginning of the 21st century, interest in color research in sensory marketing has proliferated (Labrecque, 2020). Color has significant meaning, affects people's emotions, and promotes purchase intentions (Tantanatewin & Inkarojrit, 2018) and willingness to pay (Marozzo et al., 2020). Its influence may exceed the objective content of the product.

Hearing plays a vital role in the purchasing decision process and customer experience. Prior studies examined the components of the auditory sense from various perspectives, such as background music (Sunaga, 2018) and the pronunciation of product brand names (Pathak & Motoki, 2022). Product sound is one effective way to provide an emotional experience. As the noise problem has become serious with the development of industries such as automobiles, noise reduction has been a significant issue. In fact, automobiles account for an estimated 85% of noise in the city (Wang et al., 2014). In-vehicle noise also greatly affects the discomfort of users. Hence, engine noise reduction is a noteworthy research topic in the automotive industry. However, technological developments have solved the noise problem, so recent works emphasize the transmission of product information or sensory experience by product sound. Product sound is an effective means of conveying sensory information to consumers (Sanz Segura & Manchado Pérez, 2018). For example, driving

sound conveys a sporty appeal to consumers. The right sound design for the car door closing creates an impression of relief (Takada, 2019). In this way, product sound attracts attention for its sensuous effect of enhancing the attractiveness of products.

Humans associate smell and emotion closely; hence, marketing practitioners use scent to encourage product selection and enhance the quality of experience (De Luca & Botelho, 2020). Starbucks, for example, rolls out seasonal offerings (e.g., pumpkin spice lattes during Halloween) that allow consumers to form perceptions associated with smells. This is an easy-to-develop and low-cost method (De Luca & Botelho, 2021). The literature reports on the effects of smell on a variety of industries: food (Morrin & Tepper, 2021), retail (Dortyol, 2020), and advertising (Ruzeviciute et al., 2020). However, many studies also indicate that smell is less effective than sight and hearing (Biswas & Szocs, 2019; Mehraliyev et al., 2020). In practice, smell is an effective tool in automobile development. For example, Cadillac engineered a fresh smell.

Attachment and involvement have a strong relationship. Developing consumer involvement in products and services and strengthening emotional brand attachment are fundamental to strategic marketing efforts. In fact, much of the literature deals with involvement as a factor in attachment (Tao et al., 2022).

This study aims to clarify attachment factors by taking a bird's-eye view of multiple senses and focusing on durable consumer goods such as automobiles. Figure 1 illustrates the hypothetical model used in this study. The subjects of the survey are people in their 20s to 60s who own cars. This sample represents a large customer base in the automotive market. The results may provide the missing knowledge of sensory marketing in this area and offer useful suggestions for product development to practitioners. Following the liter-

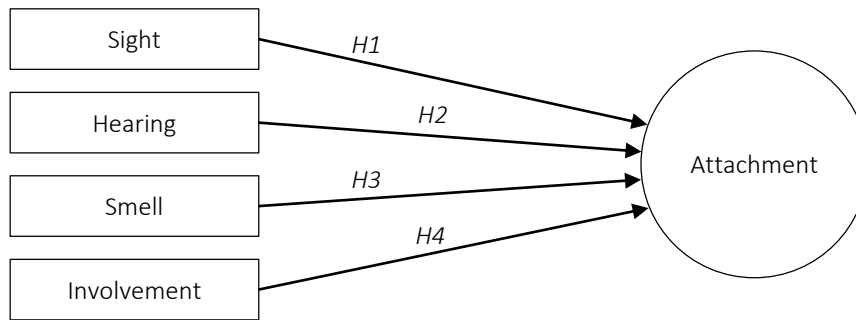


Figure 1. Hypothetical model

ature review, the study elaborates on the following hypotheses:

- H1: For automobiles, sight factors positively affect product attachment.
- H2: For automobiles, hearing factors positively affect product attachment.
- H3: For automobiles, smell factors positively affect product attachment.
- H4: For automobiles, car involvement positively affects product attachment.

## 2. METHOD

From May 26 to June 3, 2022, an online survey environment targeting car owners in their 20s to 60s was conducted in Japan and the United States. The survey was distributed to a Japanese research company’s panel. From each country, 500 people were surveyed, excluding respondents who did not own a car. The resulting sample size was 393 in Japan and 318 in the United States. Table 1 shows the distribution of respondents’ attributes.

The questionnaire first asked the following five attributes: response device, gender, age, type of

Table 1. Distribution of respondent attributes in each country

Item	Content	Japan		US	
		Number of Respondents	Ratio	Number of Respondents	Ratio
Response device	Personal computer	180	45.8%	41	12.9%
	Smartphone	213	54.2%	277	87.1%
Gender	Male	226	57.5%	151	47.5%
	Female	167	42.5%	167	52.5%
Age	20s	59	15.0%	59	18.6%
	30s	79	20.1%	80	25.2%
	40s	80	20.4%	70	22.0%
	50s	90	22.9%	53	16.7%
	60s	85	21.6%	56	17.6%
Type of car	Micro	121	30.8%	11	3.5%
	Compact	83	21.1%	40	12.6%
	Minivan	93	23.7%	22	6.9%
	SUV	43	10.9%	111	34.9%
	Sedan	53	13.5%	134	42.1%
Purchasing emphasis point	Manufacturer brand	28	7.1%	43	13.5%
	Product concept	18	4.6%	5	1.6%
	Design	71	18.1%	56	17.6%
	Usability	107	27.2%	50	15.7%
	Driving	35	8.9%	57	17.9%
	Fuel	57	14.5%	51	16.0%
	Safety	18	4.6%	14	4.4%
	Price	28	7.1%	26	8.2%
	Others	31	7.9%	16	5.0%

**Table 2.** Question list

Variable	Question (five-point Likert scale)	Mean	SD	Median
<b>Involvement</b>				
Involvement_Important	To me, a car is important.	4.131	0.994	4
Involvement_Useful	To me, a car is useful.	4.301	0.905	5
Involvement_Valuable	To me, a car is valuable.	3.956	0.978	4
<b>Attachment</b>				
Attachment_Beloved	In my consciousness, my car is "my beloved car."	3.603	1.073	4
Attachment_Meaning	My car has a special meaning to me.	3.498	1.114	4
Attachment_Connection	I feel emotionally connected to my car.	3.323	1.109	3
<b>Senses</b>				
<b>I find my car attractive for the ...</b>				
Sight_Exterior_Styling	exterior styling	3.556	0.967	4
Sight_Exterior_Color	exterior color	3.550	1.001	4
Sight_Interior_Styling	interior design	3.546	0.992	4
Sight_Interior_Color	interior color	3.511	0.939	3
Sight_View	view from the driver's seat	3.591	0.949	4
Hearing_Startup	sound while starting the car	3.453	0.976	3
Hearing_Door	sound of the door opening and closing	3.269	1.003	3
Hearing_Engine	sound of the engine/motor while driving	3.373	1.009	3
Hearing_Silence	silence in the car cabin	3.473	1.012	3
Hearing_Audio	audio system	3.502	0.996	3
Smell_New	fresh fragrance of the new car	3.518	1.046	3
Smell_Cabin	fresh fragrance in the car cabin	3.488	1.028	3
Smell_Air_Conditioner	low odor from the air conditioner	3.536	0.989	4
Smell_Gas	low odor of the exhaust gas	3.557	0.965	4
Smell_Sheet	no odor transfer to the sheet	3.505	0.974	3

owned car, and purchasing emphasis point. At this point, respondents who did not own a car were forced to complete the survey. After, as shown in Table 2, respondents were asked three questions each about involvement and attachment and five questions each about sensory factors. All options are on a five-point Likert scale (from 1: Strongly disagree to 5: Strongly agree). In total, the survey had 26 questions. The questions were adapted based on existing studies in terms of involvement (Park & Yoo, 2018) and attachment (Japutra et al., 2018). Since survey items for sight, hearing, and smell targeting automobiles do not exist in existing research, the design was based on the literature related to the industry (Kato, 2021; Sanz Segura & Manchado Pérez, 2018; Takada, 2019; Wang et al., 2014). Table 2 provides the list of questions.

Structural equation modeling was used to verify the hypotheses. In the analysis procedure, the factors were first extracted by exploratory factor analysis (EFA). Next, confirmatory factor analysis (CFA) was performed to confirm the goodness of fit of the factor structure. The following four representative fit indices were adopted: comparative fit index (CFI), goodness of fit index (GFI),

standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA). Then, the influence of each factor on attachment was evaluated by structural equation modeling. In addition, multiple group structural equation modeling was applied to confirm the difference in effects between Japan and the United States. The analysis environment is R, a statistical analysis software. Structural equation modeling used the SEM function from the Lavaan package.

### 3. RESULTS AND DISCUSSION

First, EFA extracted the factors with eigenvalues greater than 1.0. As Table 3 reports, it consists of five factors: smell, sight, hearing, attachment, and involvement. All Cronbach's  $\alpha$  values are 0.8 or higher, indicating high reliability. Next, the CFA results showed generally good validity (CFI 0.960, GFI 0.933, SRMR 0.042, and RMSEA 0.064).

Accordingly, structural equation modeling using this factor structure was applied. The results in Table 4 indicate significant effects of sight, hearing, and involvement on attachment. To sum up,

**Table 3.** Exploratory factor analysis

Variable	Standardized Factor Loadings					Cronbach's $\alpha$
<b>Factor 1: Smell</b>						
Smell_Air_Conditioner	0.741	0.243	0.248	0.107	0.168	0.899
Smell_Cabin	0.705	0.210	0.310	0.206	0.153	
Smell_Gas	0.671	0.264	0.225	0.126	0.146	
Smell_New	0.643	0.199	0.279	0.299	0.119	
Smell_Sheet	0.627	0.252	0.302	0.148	0.177	
<b>Factor 2: Sight</b>						
Sight_Interior_Styling	0.255	0.791	0.199	0.176	0.130	0.885
Sight_Interior_Color	0.288	0.689	0.187	0.169	0.147	
Sight_Exterior_Styling	0.168	0.615	0.280	0.270	0.168	
Sight_Exterior_Color	0.216	0.603	0.271	0.202	0.201	
Sight_View	0.245	0.561	0.288	0.193	0.141	
<b>Factor 3: Hearing</b>						
Hearing_Engine	0.339	0.237	0.728	0.186	0.093	0.889
Hearing_Door	0.332	0.252	0.642	0.216	0.117	
Hearing_Startup	0.288	0.290	0.610	0.284	0.092	
Hearing_Silence	0.323	0.311	0.600	0.114	0.124	
Hearing_Audio	0.382	0.352	0.494	0.120	0.126	
<b>Factor 4: Attachment</b>						
Attachment_Meaning	0.193	0.223	0.195	0.776	0.207	0.893
Attachment_Connection	0.201	0.202	0.176	0.774	0.152	
Attachment_Beloved	0.167	0.262	0.185	0.720	0.258	
<b>Factor 5: Involvement</b>						
Involvement_Important	0.156	0.141	0.100	0.188	0.854	0.872
Involvement_Useful	0.144	0.142	0.061	0.102	0.851	
Involvement_Valuable	0.169	0.200	0.153	0.264	0.636	

the results support H1, H2, and H4 but reject H3. Finally, Table 5 summarizes the multiple group structural equation modeling to analyze the difference in sensory effect between Japan and the United States. The findings indicate a common significant effect for involvement. Sight was significant in Japan, and hearing was significant in the United States.

Many prior studies on sensory marketing integrated multiple senses to clarify their influence on attitudes toward products or services. Among them, this study expands the existing theory from three viewpoints. The first is target expansion. The existing literature focused on services (restaurants, hotels, retail, tourism, etc.) and foods (Anetoh et al., 2020; Haase et al., 2020; Kastenholz et al., 2020; Krishna & Elder, 2021; Lund, 2015; Satti et al., 2022). However, sensory stimulation is also crucial for durable goods. In particular, automobiles have an interior space that relates not only to sight and hearing but also to smell. Therefore, the present study extends the application of sensory marketing targeting multiple senses to automobiles.

The second is the analysis of the effects on attachment. Existing studies adopted various indices, such as purchase intention (Jürkenbeck & Spiller, 2021) and brand engagement (Ahn & Back, 2018). However, like these factors, attachment is essential for brand establishment. The third is a comparison of differences in effects between countries. Although many studies deal with a single country, this study confirmed that the factors that affect attachment to one product vary by context by comparing Japan and the United States. Japanese culture emphasizes interdependence, paying attention to and harmonizing with others (Markus & Kitayama, 1991). Therefore, it is likely that people tend to take a cautious attitude toward sounds that affect others and prioritize self-contained designs. On the other hand, American culture is individualistic and emphasizes the internal reference frame, so one can infer that sound evaluation is relatively easy to increase.

This study suggests two practical implications. First, even in developing durable consumer goods such as automobiles, practitioners should consider



**Table 4.** Structural equation modeling results

Paths	Standardized Estimate	p-value	Hypothesis
Sight → Attachment	0.336	0.000***	H1
Hearing → Attachment	0.379	0.000***	H2
Smell → Attachment	-0.031	0.663	H3
Involvement → Attachment	0.286	0.000***	H4

Note: \*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05.

**Table 5.** Multiple group structural equation modeling results

Country	Paths	Standardized Estimate	p-value
Japan	Sight → Attachment	0.721	0.000***
	Hearing → Attachment	0.075	0.379
	Smell → Attachment	-0.008	0.923
	Involvement → Attachment	0.249	0.000***
US	Sight → Attachment	0.024	0.800
	Hearing → Attachment	0.741	0.000***
	Smell → Attachment	-0.093	0.451
	Involvement → Attachment	0.268	0.000***

Note: \*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05.

sensory value rather than functional value, such as durability and advanced technology. For example, functional value evaluations would aim to objectively measure the noise of driving noise and bring it as close to zero as possible. However, from the user’s perspective, hearing no sound at all may cause discomfort or make it difficult to feel the speed of the vehicle. These factors cannot be understood only by measuring sound objectively. Thus, it is crucial to match sensory stimuli with product functions after identifying effective sensations. Second, for automobiles, designers should value sight and hearing more than smell. Manufacturers care about new car odors, but two other sensory stimuli should

be investigated further. The weak effect of smell compared to the other senses aligns with existing research (Biswas & Szocs, 2019; Mehraliyev et al., 2020). For sight, styling and color are essential for both the exterior and interior. This result is consistent with Piselli et al. (2018). Hearing should be developed with a focus on driving sounds, door opening and closing sounds, and starting sounds. There is also a need for more studies on these sounds in isolation (Takada, 2019), but this alone limits the understanding of fragmentary experiences. As this study shows, it is necessary to provide consistent sensory stimuli that cover all the critical elements involved.

## CONCLUSION

This study clarified the influence of sensory stimuli on attachment in the Japanese and American automobile markets. The results of applying structural modeling to data gathered through an online survey confirm the significant effect of sight, which consists of styling and colors in the exterior and interior, and hearing, which consists of driving sound, door sound, and startup sound. In contrast, the results indicate no effect of smell. In addition, comparing the two countries, sight was effective in Japan, and hearing was effective in the United States.

This study has some limitations. First, the results are limited to the Japanese and American automobile markets. Future research can generalize the results by extending the analysis to national and other consumer durable goods. Second, this study does not consider differences in effects due to consumer attributes besides country of residence. Third, the analysis herein does not include the mutual effects of multiple senses and the effective conditions. For example, in food products, a round visual design enhances product evaluation for products aiming to make consumers perceive sweetness. Fourth, there is

a concern that the questionnaire-based survey does not adequately evaluate the effects of scent. This is because scent has a subconscious effect, so it is difficult to imagine the situation at the time of the survey. Hence, it is ideal to conduct the survey immediately after using the vehicle for a certain period. These are potential future research topics.

## AUTHOR CONTRIBUTIONS

Conceptualization: Takumi Kato.  
Data curation: Takumi Kato.  
Formal analysis: Takumi Kato.  
Funding acquisition: Takumi Kato.  
Investigation: Takumi Kato.  
Methodology: Takumi Kato.  
Project administration: Takumi Kato.  
Resources: Takumi Kato.  
Software: Takumi Kato.  
Supervision: Takumi Kato.  
Validation: Takumi Kato.  
Visualization: Takumi Kato.  
Writing – original draft: Takumi Kato.  
Writing – review & editing: Takumi Kato.

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