

The Role of Expectation on the Judgment of Vehicle Sound Quality

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Summary

The stimulation and the satisfaction of the customer's interests have an considerable influence on the quality judgment. Besides of the wide variety of vehicle types and models, the knowledge, the taste, the interpretation and the expectations of vehicle customers can differ strongly from each other. In some cases, different customer groups expect different product features and consequently different sounds from the same vehicle model or type. At the same time the meaning of sportiness or comfort can differ for different customer groups. The purpose of this study is to investigate the role of these expectations on the vehicle sound quality judgments. For this purpose an interview was conducted. In this interview, the participants are asked to describe their interpretation of different important vehicle features, such as sportiness, luxuriousness, etc. and their expectations for different vehicle types and models. Then the binaurally recorded sounds of 8 cars from different brands with different motorization and their variously modified versions were presented to the subjects and a semantic differential investigation was conducted. The results of the interview and semantic differential test will be discussed regarding the relationship between the expectations and the quality judgments.

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1. Introduction

Every now and then product designers face the fact that users behave differently than expected. Although product specification has been built on market research (i.e., on the situation and the extent of the demand) as well as product analysis, they fail to gauge the real demand for a product in the end. User expectations are not meet. One reason obviously is that market success is often built on tenets focused on product functionalism and safety of products and processes. An industrial product has to be appropriate for use (function): Performance, accessibility, practicability, reliability, creditability and safety are the main quality characteristics.

Without doubt, functionalism and safety are central design issues of industrial products. They can analytically be expressed as mathematical formulas, so the modes of description heavily rely on standardized formalisations. There are often catalogues of standard requirements specific to different types of products which serve as the expected norm. The task of the designer is to

create an object which fulfils all regulations with regard to functional requirements, capabilities and limitations in such a way that the product becomes an object of desire. The product becomes an object of desire when it is sensually appealing, when its form invites the customer to use it. In other words: the design goal is to create an object which – when it becomes an object of perception – stimulates and satisfies customer interests.

Sound quality evaluation of the vehicle sound is a complex process. Physical measures are not sufficient to describe and understand this process and they can only give superficial cues. Psychoacoustical parameters and measurements also do not allow a general description of the vehicle sound quality. Customers' quality evaluation is based on their perception, interpretation and expectations [1]. An important point is that the knowledge, the taste, the interpretation and the expectations of vehicle customers can differ strongly from each other. The expectation differences are very high between sporty car enthusiasts and luxurious limousine enthusiasts. Although both luxurious limousines and sport cars are prestige symbols and point out luxury, particularly high driving performance, driving pleasure and tight chassis suspension are emphasized in sporty cars.

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In this study, the relationship between the vehicle category preference and the vehicle sound quality evaluation is investigated. Therefore in the first step, an interview was conducted to characterize test participants' vehicle class preference. In the second step they evaluated different vehicle sounds.

2. Interview

2.1. Subjects

48 subjects (34 male and 14 female) participated in the interview. Their ages ranged from 25 to 55 years (mean 42). The subjects were paid on an hourly basis. The subjects were average customers who have no technical background or specific acoustic knowledge.

2.2. Methodology

The participants are asked to state their vehicle class preference and to describe their interpretation of different important vehicle features, such as sportiness, luxuriousness, etc. A list of common vehicle classes and some exemplary pictures of them are used for the assistance in the interview.

2.3. Results

The preference results of the participants are listed in Table 1.

Table I. Vehicle class preferences.

<i>Vehicle class</i>	<i>Number of participants</i>
City car	1
Small family car	2
Large family car	5
Executive car (Mid-size luxury)	2
Luxury car	19
Sports car	15
SUV (4x4)	4

3. Experiment

3.1. Subjects

A total of 34 subjects, who preferred luxury car and sporty car, participated in the evaluation experiment (26 male and 8 female). Their ages

ranged from 25 to 55 years (mean 38 years). The subjects were paid on an hourly basis.

3.2. Stimuli

The binaurally recorded sounds of 8 cars from different brands with different motorization and their variously modified versions (altogether 32 sounds) were presented to the subjects. The driving condition was engine start.

3.3. Methodology

Stimuli were presented in random order. The questionnaire contained a list of thirty-six adjectives [2]. The subjects were asked to describe how they perceive the different attributes on a quasi continuous scale, for which Rohrman had tested the equidistance of neighbouring categories [3]. A graphical user interface was implemented for the evaluation experiments in Matlab (Figure 1).

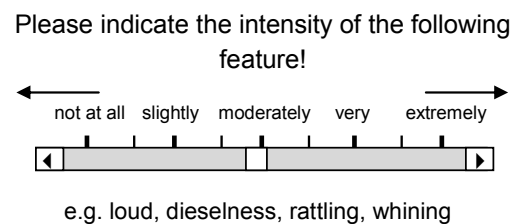


Figure 1. Assessment interface.

3.4. Results

The judgments for the attributes sportiness and pleasantness on different vehicle sounds are shown in Figure 2. The judgments were averaged for luxury and sports car groups separately.

4. Discussion and Conclusion

The results of the interview and the semantic differential experiment show that although the sportiness judgments of the participants, who prefer luxury cars and sports cars, are very similar, particularly the pleasantness judgments differ strongly. The participants, who prefer luxury cars, judge sporty sounds to be very unpleasant. The participants, who prefer sports cars, judge sporty sounds to be very pleasant.

So in conclusion, the taste, the interpretation and the expectations of vehicle customers play an important role on their judgment of vehicle sound quality.

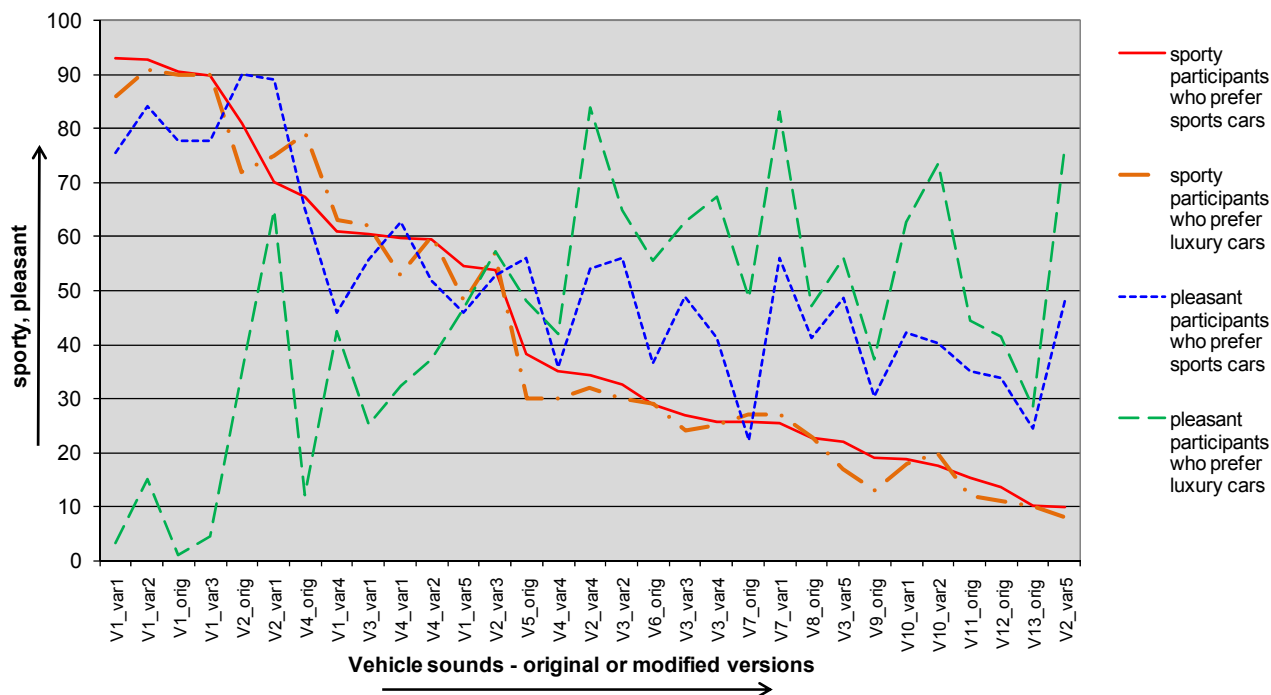


Figure 2. Sportiness and pleasantness judgments.

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