

Elderly females and vehicle cockpit design – a questionnaire analysis

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Abstract

The described investigation had the objective to identify the requirements on vehicle design for elderly female drivers (aged 50 and older) and compared them with those of a smaller control-group of elderly male drivers. Therefore a survey questionnaire was developed, based on existing literature concerning elderly women and their buying decision. The questionnaire contained 37 main questions about four topics: safety, practical aspects, vehicle design and cockpit design. A total of 217 questionnaires were returned (178 women and 49 men). Safety and reliability are identified to be the most important criteria for old female drivers when buying a car. Elderly female drivers rate the importance of practical criteria significantly higher than the elderly male drivers. Whereas elderly men judge the importance of driver information and assistance systems significantly higher compared to elderly women.

Keywords: experimental, elderly, gender, vehicle design

1. Introduction

The aim of this investigation is to identify what are the requirements on vehicle design for elderly female drivers (aged 50 and older). The interest in this topic is due to the fact that, on one hand, women's role in society has dramatically changed and, on the other hand, elderly people are an increasing part of the economy [1]. A study in the US found out that the number of women will rise as a result of increased life expectancy and immigration [2]. Elderly women will depend more and more on her own vehicles for transportation: "tomorrow's elderly women will have smaller families with fewer children to provide social and transportation support, aided by high divorce rates among today's younger and middle-aged women" [2]. This gives some examples why this topic is of a crucial importance especially for automotive manufacturers.

The investigation aims to develop a survey questionnaire essentially based on literature and to

distribute them to women. To identify the peculiarities of women in comparison to men, it was decided to have a small control group of elderly men.

2. Literature findings

The literature research was concentrated on existing literature and information concerning elderly women and their buying decision. The research was focused on one side on the women and on the other side on the elderly people. Therefore national and international literature was analyzed corresponding to the two different topics.

2.1 Female drivers

Nearly all investigations come to the conclusion that driving safety is the most important feature for a woman in her buying decision [3, 4, 5]. Especially

airbags are of crucial importance [6]. Concerning the personal safety women are interested in a locking system and in case of emergency (e.g. driver is in danger or ill) a system that calls for help [6]. Moreover women prefer good visibility conditions.

Another criterion is fuel consumption that many women consider to be one of the most important aspects after safety [5, 3]. A survey about car use showed that 81% of the interviewed women pay attention to fuel consumption [7]. Moreover female drivers expect environment-friendly and technology-friendly materials [8].

While engine performance and similar technical details are not that important for female driver, reliability appeared to be a crucial aspect [9].

However the body design is not unimportant [8]. The women driving a car want to appear sportive and elegant: therefore the car should support this opinion [10].

Women appreciate practical aspects of a car and do not care about technical details. So they are looking for a low car boot edge and enjoy having easily washable seat cushion [3]. Rather future features of a car could be the automatically opening of the doors when the female user approaches the car with e.g. shopping bags in her hands she can put the bags in vehicle without dropping them off [10]. Moreover women put value on getting easily into and out of the vehicle.

Furthermore female car driver require enough storage space. They need space to store their shopping bags easily [11]. In addition women want to put away their handbags while driving.

Women want a convenient interior design, so one article recommends creating the interior as a living room [12]. Also interesting for women are ergonomically designed seats [10]. Regarding the cockpit women prefer simple operability and reachability [9].

2.2 Elderly drivers

With increasing age the body functions change, however, the driver's tasks stay the same. In order to examine the problems arising from this fact it should be first clarified what exactly is changed in the body. In the next step, the influence of the changes on the driving task should be analyzed. Some of them can possibly become "critical" and will be summarized below [13]. For example older people have more difficulties to distinguish the figures on the visual display so that, they are longer distracted, and thus not

being able to pay attention to the road, while trying to read the figures on the display. Acoustic information may either not be perceived at all or too late. Since warning signals are most of the times passed on acoustically, this can lead to dangerous situations. Possibly other road users in front of, behind or next to the person's car are either perceived too late or not at all. The perception of the current situation on the road as well as traffic signs gets more difficult. The right estimation of distances to cars driving ahead, road boundaries, parking cars or cars on other lanes is more difficult. The assessment of relative speed gets more frequently incorrect. When driving a long distance some actions are executed slower since the ability to drive a long distance decreases. Unknown roads require the ability to change quickly the direction which requires quick reactions. This ability is not longer given. Input devices at a greater distance can only be reached with more difficulty.

3. Questionnaire development

Based on the previous literature research the hypotheses for the development of the survey questionnaire has been generated, which should show the basic preferences of elderly female drivers. The hypotheses were divided into different parts. Some of them concentrate on the safety and the practical aspects, the others on the vehicle's design in general and the cockpit design.

On the basis of the hypotheses the next step was to develop a questionnaire that should help to verify the hypotheses.

The questionnaire comprises 37 main questions and its structure is as follows: There are five groups covering the topics "personal information" (11 questions), "motorisation and type" (1 question), "functionality" (1 question), "design" (14 questions) and "further particulars about one's personal situation" (10 questions), whereas the focus is "design". The questions about functionality and location of displays and control elements are divided into many sub items. In order to prevent confusion the format of questions and answers remains the same throughout the questionnaire.

Most of the hypotheses are related to at least one question in the questionnaire though most of them have more than one related question. This improves the quality of the evaluation.

Structured response format questions (close-ended questions) were used but in many cases it was possible

for the interviewed persons to add their own wishes, opinions etc. There were four categories of answers from important to unimportant.

3. Results

3.1 Respondent's description

Questionnaires were distributed to elderly women. A smaller percentage of the questionnaires were given to a male control-group. A total of 217 questionnaires were returned: 178 women and 49 men. The age of the respondents was 59 on average and ranged between 48 and 72.

The three most important criteria when deciding to purchase a car were for men and women price, look and safety. 60 percent of asked men and women drive their car every single day and 30 percent use it several times per week. While all men drive their own car, nearly 10 percent of the women do not possess her own car. The year of construction of their own car was on the average 1998 (SD=4,6 years). A car represents for the responded persons locomotion, independence and time saving. Fun and prestige were less important.

3.2 Safety and practical aspects

When classifying the buying criteria as shown in figure 1 according to their importance for car buying the same order of criteria for women and men was obtained. There was a significant difference between safety and reliability (the second most important criterion) what proves that safety is effectively the most important criterion when buying a car. But there is not a significant difference between men and women.

There are few differences between elderly women and men rating the importance of functional aspects of the car for the buying decision (see Fig. 2). Elderly female drivers rate the importance of practical criteria such as good visibility of the vehicle boundary, low car boot edge, from inside lockable and rain sensor significant higher than the elderly male drivers. Elderly men rate driver information and assistance systems such as navigation system, cruise control, steering wheel with multiple functions and radio significant higher than the older women.

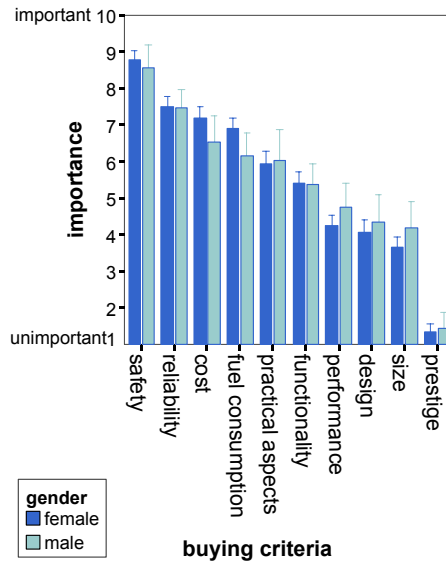


Fig. 1: Middle weighting of buying criteria for women (n=175) and men (n=46) with 95% confidence interval

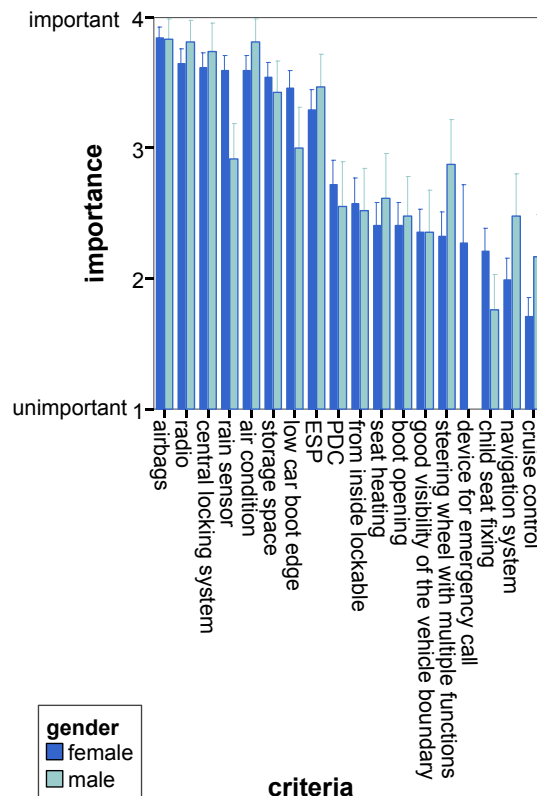


Fig. 2: Middle weighting of buying criteria regarding functional aspects for women (n=178) and men (n=49) with 95% confidence interval

3.3 Vehicle design

Figure 3 shows the importance of several areas of the car for the buying decisions of women and men.

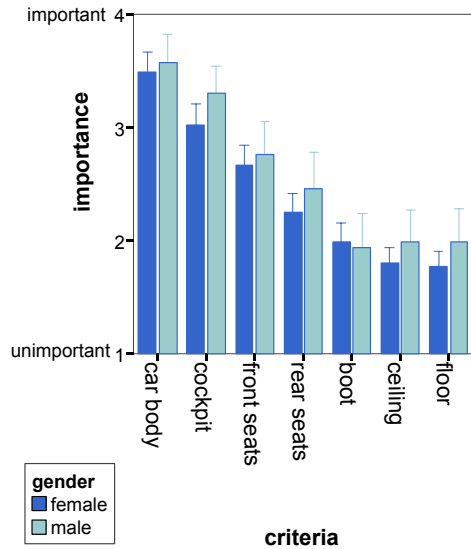


Fig. 3: Middle weighting of buying criteria regarding design for women (n=178) and men (n=49) with 95% confidence interval

Body design is significantly ($p < 0,01$) more important for women than cockpit design. The men find significantly ($p < 0,01$) cockpit design more important than women.

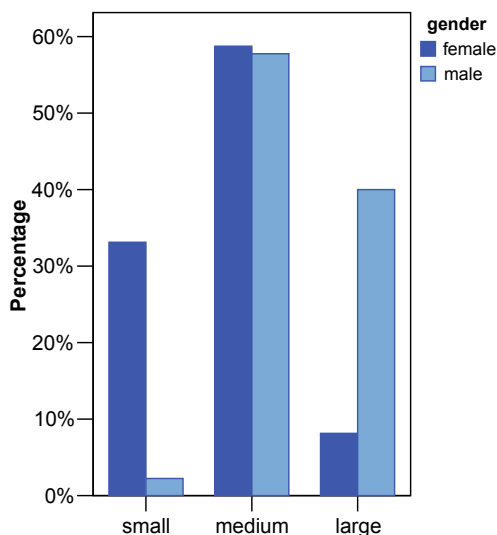


Fig. 4: Percentage of women (n=160) and men (n=45) who prefer small middle and big cars

It was asked which size of cars people prefer (see Fig. 4). It appears that women prefer cars with a medium size. The difference between small and large cars is significant ($p < 0,01$). Contrary to women men like large cars. The compared difference between men and women who prefer large cars is significant ($p < 0,01$).

3.4 Cockpit design

Concerning the question about analogue or digital indications most women prefer an analogue indication speedometer and the difference is significant ($p < 0,01$). The same result was obtained for the tachometer: women prefer significantly ($p < 0,01$) an analogue indication. But it isn't the case for the clock: women prefer significantly ($p < 0,01$) a digital indication.

The question about positive and negative contrast showed that women prefer significantly ($p < 0,01$) negative contrasts. For men the same trend exists.

A large proportion of women prefer leather for the material of their steering wheel. The difference between leather and synthetic material is significant ($p < 0,01$). The proportion of men who prefer leather seems to be higher than this of women. But the difference is not significant ($p = 0,47$).

Elderly women prefer grey for the exterior of the cars. Then they like red, blue and black. Old men prefer grey. Then, they like blue and white. Elderly women prefer the grey colour for the interior of the car. Then come black, dark and blue colours. Elderly men have the same preferences as women.

Regarding changes of the location of information displays (dashboard behind the steering wheel and instrumentation panel in the middle of the cockpit) and changes of the temporal kind of indication (permanent, on command of the driver, if critical values are achieved) the elderly drivers could not imagine any modifications.

4. Discussion

The analysis of questionnaires indicates that safety and reliability are the most important criteria for elderly female drivers when buying a car. Practical aspects are less important. Maybe elderly women find that there are nowadays too many ease elements in the cars what made them complicated to use. Concerning cockpit design most women prefer analogue indications except for the clock. Differences between

female and male elderly drivers exist in the preferred size of cars and the preferred colour for the exterior as well as for the interior of the car. There are also differences between elderly female and male drivers regarding the importance of practical criteria.

In a further, more comprehensive investigation it could be interesting to compare elderly female drivers with younger female drivers to understand how the age influences the preferences in comparison to the gender.

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