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The Age Factor in Ride Comfort: Comparing Younger and Older Passengers' Perspectives

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SUMMARY

This questionnaire study examined the influence of age on factors contributing to overall passenger ride comfort in cars. In total, 1,115 individuals participated, including 269 respondents aged 20–30 years and 260 aged 60–83 years. The questionnaire included two multiple-choice questions about the most and least important factors for front-seat passenger comfort, with eleven factors to choose from. Respondents could provide free-text explanations for their choices. Descriptive statistics quantified selected factors, while thematic analysis explored differences in free-text responses. The results showed that younger and older passengers shared similar preferences, identifying a comfortable seat and feeling safe with the driver as the most important factors. However, preferences differed in the perceived importance of safety features, climate, and functional design, due to variations in life experiences and activity preferences. The findings highlight a shared baseline of factors affecting ride comfort, while also revealing age-specific differences in passenger perception.

KEYWORDS

Ride comfort, car passenger, older adults, younger adults

Introduction

Passenger comfort in cars is crucial, particularly for safety reasons. If the seat and seat belt system cause physical discomfort, such as tensed muscles and static loadings, it may lead to improper use of the protective systems. This increases the risk of injuries during a crash, especially for older adults, who are more vulnerable. Studies have shown that older adults experience greater discomfort from seat belts than younger individuals (Bohman et al., 2019), which may result in misuse of the safety systems (Osvalder et al., 2019). Additionally, the age-related changes in body shape and BMI have shown to impact the seat belt fit and the usage of accessories to mitigate discomfort (Osvalder et al., 2019; Makris et al., 2023a; Makris et al., 2024). Few studies have examined the relationship between car passengers' age and other aspects of physical comfort, such as perceived discomfort due to noise, vibrations or air quality. However, Kwak et al. (2023) studied age-related thermal comfort under different cooling and heating conditions. The results showed that older passengers had different thermal responses compared to younger ones, often feeling less comfortable at equivalent temperature settings. However, comfort is a multidimensional concept that encompasses not only physical, but also psychological and functional factors (Vink & Hallbeck, 2012), which all contribute to the overall ride comfort experience. Functional comfort relates to the ease of use and performance, such as the ability to use the seat and seat belt in a satisfactory manner. Psychological comfort involves aspects such as traveling in a car that feels safe or having a trustworthy driver.

Even though, age-related aspects appear to influence the physical comfort of car passengers, particularly concerning seating ergonomics and seat belt fit, their impact on the overall experience of car ride comfort remains less clear. A questionnaire study was therefore conducted to increase the understanding of passengers' overall ride comfort. The purpose of the analysis presented in this paper was to explore the relationship between age and car ride comfort by comparing the most and least important factors contributing to ride comfort for older and younger front-seat car passengers.

Method

The data was collected through a web-based questionnaire which was distributed to individuals residing in Sweden via an advertisement on the university's social media channels over a three-week period in September 2024. The sole inclusion criterion was that the respondents must have experience travelling in the front passenger seat in a car. The questionnaire comprised two multiple choice questions: "What is most important for you to feel comfortable as a front-seat passenger?" and "What is least important for you to feel comfortable as a front-seat passenger?". For each question, respondents were given the same eleven factors to choose from, covering physical, psychological, and functional aspects of comfort; (i) to be seated comfortably in the seat, (ii) that the seat belt fits comfortably, (iii) to have good visibility out the window, (iv) that the interior is functional so that I can perform the activity I desire (e.g. reach settings and storage), (v) low noise level in the car, (vi) pleasant climate, (vii) feeling safe with the driver, (viii) that the car model feels safe, (ix) few bothersome vibrations, (x) that the interior is spacious so that I have enough space, and (xi) other. Two or three factors could be selected for the first question and one or two factors for the second question. The respondents could also provide free-text answers explaining their choices for the most and least important factors. Demographic data such as age, gender and anthropometrics were also collected.

In the questionnaire analysis, the younger age group was defined as respondents between 20-30 years, while the older age group comprised respondents aged 60-83 years. This classification aligns with Soebarto et al. (2019), who defined older adults as those aged 65 years and above and younger adults as approximately 30 years old to investigate potential age-related psychological differences affecting thermal. Asua et al. (2022) included 15 younger adults with an average age of 29 years and 15 older adults with an average age of 69 years to capture experiences of driving styles and vehicle dynamics to evaluate comfort and motion sickness.

Descriptive statistics were used to quantify the factors that younger and older age groups chose as the most and least important for feeling comfortable as a front-seat passenger. A thematic analysis was conducted on the free-text responses to explore and understand potential differences between the age groups. First, the free-text responses regarding factors that varied in importance between older and younger adults were reviewed and categorized into themes. These themes were then compared to merge similar themes together. Subsequently, the themes of the older group were compared to the themes of the younger group to identify similarities and differences between groups.

Findings

A total of 1,115 individuals answered the questionnaire, with 269 respondents aged 20–30 years and 260 aged 60–83 years. Both groups chose 'a comfortable seat' and 'feeling safe with the driver' as the most important factors (Figure 1). However, the third most important factor differed between the groups, where the older group chose 'the car model feels safe', while the younger group chose 'climate'. Regarding the least important factors, both groups chose 'a functional interior,'few vibrations', and 'low noise levels' as the least important factors (Figure 2). Furthermore, the analysis revealed differences between the age groups' ratings of five comfort factors; 'car model

feels safe' - in ratings of both most important (Younger = 16% vs Older = 35%) and least important (Younger = 16% vs Older = 5%) factors, 'climate' - most important (Younger = 42% vs Older = 27%), 'spacious' - most important (Younger = 28% vs Older = 20%), 'low noise level' - least important (Younger = 22% vs Older = 18%), and 'functional interior' - least important (Younger = 40% vs Older = 56%).

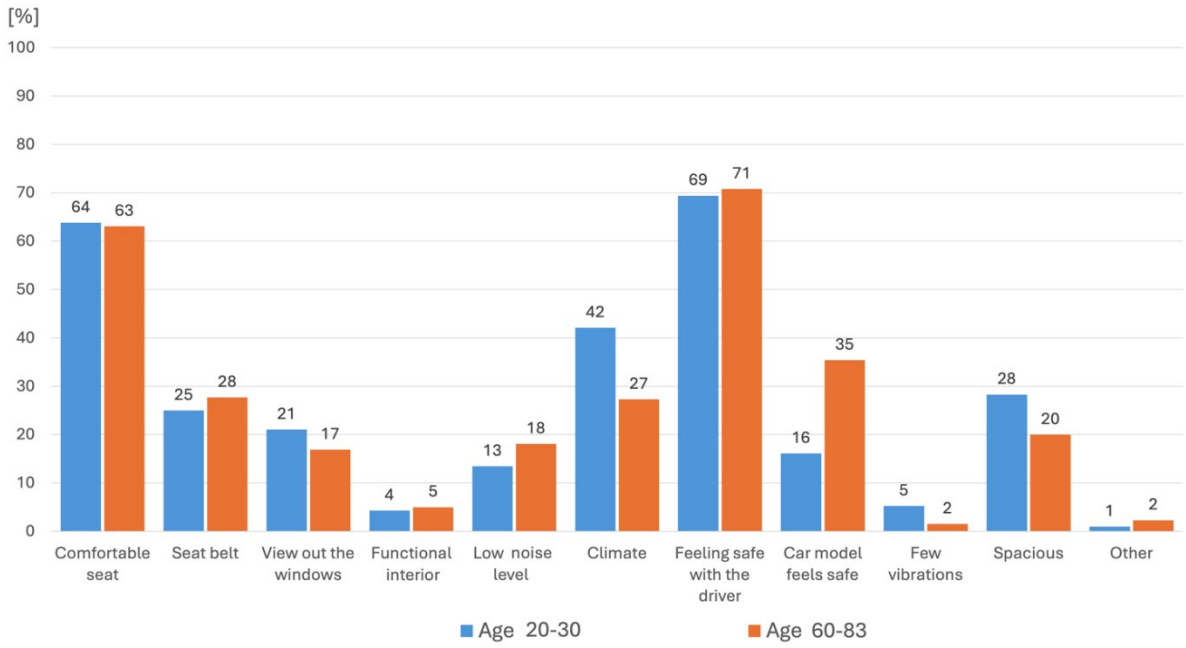

Figure 1. Questionnaire results of the most important factors for feeling comfortable as a front-seat passenger, showing the percentage of respondents in each group who chose the factor as one of the most important.

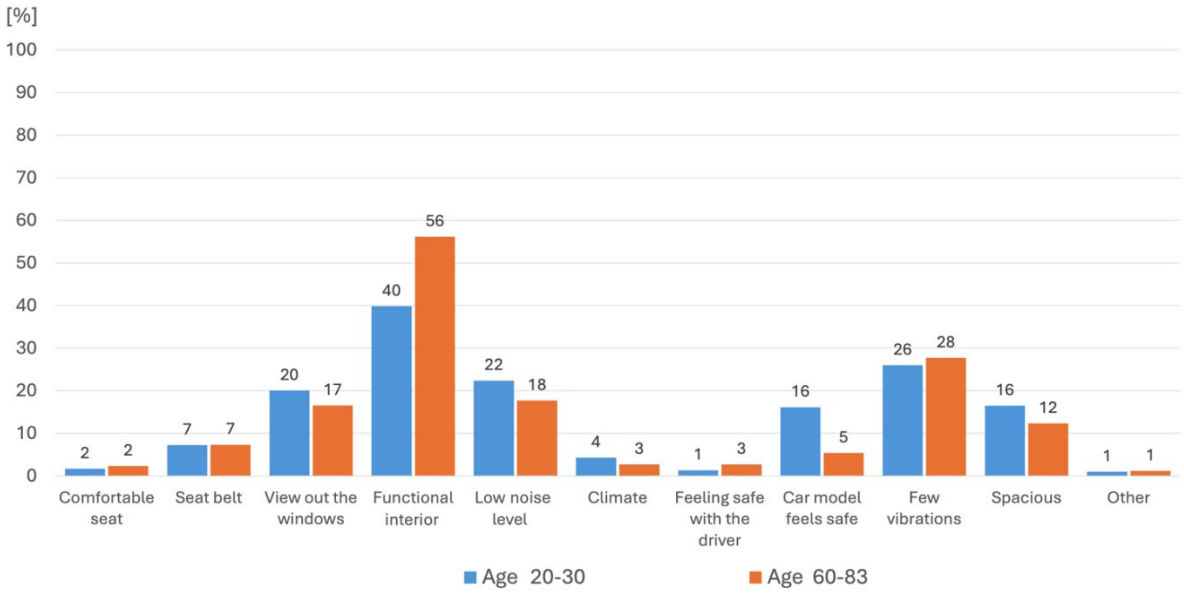

Figure 2. Questionnaire results of the least important factors for feeling comfortable as a front-seat passenger, showing the percentage of respondents in each group who chose the factor as one of the least important.

Similarities and differences in descriptions of comfort factors

For the most important comfort factors, 56% of younger respondents (n=150) and 48% of older respondents (n=126) provided a free-text response explaining their choices. For the least important comfort factors, 47% of younger respondents (n=126) and 36% of older respondents (n=94) also submitted a free-text answer. The analysis of the free text answers showed that in many respects, both older and younger passengers highlighted similar explanations for why they considered certain factors to be the most or least important. However, their descriptions diverged on some points. Regarding 'car model feels safe', which was considered as less important by younger respondents, younger respondents more frequently emphasized specific safety features as essential for feeling secure and relaxed. One respondent explained: "*That the car model feels safe is very important, especially with features like automatic braking if one has been inattentive, as well as ABS and stabilizers."* At the same time, some mentioned safety as an expected baseline standard, for example one respondent stating: *"One thinks that all car models sold should be sufficiently safe so that one does not have to think about it when sitting in the car.*" In contrast, some older respondents referred to their life experiences, such as previous accidents, and noted the importance of a car's safety in reducing the risk of severe injuries during a potential collision. One respondent that referred to a specific previous incident stated that *"I have been in an accident. I survived thanks to the seatbelt",* and another respondent highlighted specific situations where they found it especially important with a safe car: *"It feels calmer with a safe car, especially on roads with a risk of collision with animals or high traffic intensity."*

When describing the reason for choosing 'functional interior', younger respondents more often mentioned technical functionalities, such as infotainment systems, that enable activities during the journey. However, it was also mentioned that such features are often used infrequently, one respondent, for example, described that less significant: *"rarely need to reach for things or handle controls, and besides, you only do it for a short time, so it becomes less important."* Older respondents, on the other hand, more often described that they as passengers rarely perform tasks requiring access to controls, emphasizing instead that functional design is more critical for the driver, one respondent stating that *"the only activity I usually perform during car rides are talking to my fellow passengers and looking out"* and another respondent emphasized that *"If I am a passenger, I should not touch any controls. It is the driver's responsibility."*

When referring to the importance of 'climate', younger respondents often associated it with immediate comfort, focusing on sensations such as avoiding sweating or feeling cold. They placed less emphasis in their responses on potential long-term effects of an unsuitable temperature. For example, one respondent explained that *"It is uncomfortable to be in a car that is too hot or too cold, so having a functioning air conditioning and a comfortable temperature feels important"* and another described that *"I feel nauseous if it is too warm and easily feel cold if it is too cold."* Older respondents, however, tended to incorporate well-being and the long-term impact of climate on the overall travel experience into their reasoning, emphasizing how it affects the journey as a whole. One respondent described that a good climate makes *"The journey becomes comfortable and prevents the body from becoming too stiff… reducing the risk of headaches and motion sickness"* while another stated that climate is important because *"I don't like it when it's drafty, and I don't want to get a backache."*

Discussion

This paper compared the factors contributing to overall ride comfort for older and younger front-seat car passengers. Two factors that stand out are 'a comfortable seat' and 'feeling safe with the driver', which were considered as most important by most respondents in both groups. The

importance of feeling safe with the driver has been highlighted in other studies, which state that car passengers tend to feel more comfortable with a safe driver due to several factors related to human psychology and physiology. Safe driving minimizes sudden accelerations, decelerations, and sharp turns, which can reduce the likelihood of motion sickness and discomfort caused by vehicle vibrations (Dacova, 2021). Asua et al. (2022) found that minimizing abrupt maneuvers significantly reduces motion sickness and improves passenger comfort. Additionally, Wang et al. (2020) demonstrated that maintaining a steady speed and smooth driving style significantly enhances passenger comfort by reducing anxiety and providing a sense of security. Furthermore, Mims et al. (2023) highlighted that passengers feel most uncomfortable in situations with distracted drivers or vehicles following too closely, emphasizing the importance of safe driving practices for overall comfort.

Furthermore, both groups pointed out that a comfortable seat is crucial for comfort perception for passengers in cars. A comfortable seat significantly enhances the overall travel experience by reducing fatigue and discomfort, especially during long journeys (Phillips, 2024). Ergonomically designed seats provide proper lumbar support, adjustable features, and high-quality materials that help maintain good posture and minimize strain on the spine. Research has shown that well-designed seats can prevent the onset of musculoskeletal issues and improve passenger well-being by ensuring a stable and supportive seating position (Gracia, 2025). Additionally, comfortable seating contributes to better focus and reduced stress, which are essential for both driver and passenger safety (Robertsen et al., 2022). Makris et al., (2023a) and Makris (2023b) have also discussed the need for ergonomically designed seats and properly fitted seat belts to prevent discomfort and ensure passenger well-being.

Thus, the factors considered most important did not differ substantially. However, this does not necessarily imply that what is considered, for example, a safe driver or a comfortable seat is the same for both groups, even if the factors are rated as equally important. For example, in a study by Osvalder and Bohman (2019) the conclusion was that older passengers require more ergonomic seat and belt designs than younger passengers to accommodate their unique physical characteristics and enhance comfort and safety. The findings revealed that older adults often experienced non-optimal belt fit due to age-related changes in body composition and posture, such as increased kyphosis and altered body shape. This resulted in the shoulder belt being positioned closer to the neck or suprasternal notch, which can cause discomfort and reduce safety.

However, for some factors, the two groups differed in how important or unimportant they considered them. Analysis of the free-text answers showed that while both groups frequently provided similar explanations for why certain factors were considered most important or least important, their reasoning also diverged. The results showed that the older respondents found feeling safe with the car model more important than younger respondents. A possible explanation is that older people have more experience with unsafe cars compared to younger people due to the longer span of their driving history, which includes periods when vehicle safety standards were not as advanced as they are today. Older drivers have witnessed significant changes in automotive safety technology, from the introduction of seat belts and airbags to modern advanced driver-assistance systems (ADAS). This experience can make them more aware of the importance of safety aspects related to the car model. They are also more vulnerable to injuries in the event of a crash due to age-related physical fragility (Ayuso et al. 2019; Alrumaidhi & Rakha, 2022) which may also explain a higher focus on safety.

Another difference was that younger respondents placed more importance on a functional interior compared to older respondents. This can partly be explained by the difference in expectations of what the passenger should be able to do and what functions are necessary to use. Younger participants more frequently highlighted different functions in their explanations, while many older

respondents stated that they as passengers rarely perform tasks requiring access to controls. These differences in reasoning may help explain why they prioritized these factors differently, leading to the variation in factors chosen by each group. This emphasises the importance of experiences and expectations in shaping passengers' subjective comfort experience, as also described by Naddeo and colleagues (2015).

Conclusions

The overall conclusion of this questionnaire study is that both younger and older respondents share similar preferences regarding the factors that contribute most (feeling safe with the driver and sitting comfortably in the seat) and least (functional interior and few vibrations) to overall passenger ride comfort in cars. This suggests that there is a baseline set of factors considered particularly important for front-seat passengers, regardless of age. However, notable differences were observed in the perceived importance of certain factors, particularly the significance of feeling safe with the car model, where older respondents found this a more important factor than younger ones. These differences can partly be explained by variations in experience over time as car passengers and the activities respondents wish to engage in as passengers.

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