PAsCAL

Enhance driver behaviour & Public Acceptance of Connected & Autonomous vehicles

Grant agreement no.: 815098

[D3.1] – [User-centered recommendations]

Date of publication: [30-11-2020]

[D3.1] – [User-centered recommendations]			
Work package No.	3	**Comprehensive Assessment of Public Acceptance**	
Tasks involved in the reported results	• 3.1 and 3.2		
Deliverable owner	UMA		
Dissemination level	[PU]		
Due date	M18		
Delivery date	Nov 2020		

List of contributors		
Section	**Author(s)**	**Reviewer**
1	Celina Kacperski	Patrick van Egmond, Luc Vandenabeele
2	Yavor Paunov	Patrick van Egmond, Luc Vandenabeele
3	Yavor Paunov, Celina Kacperski	Patrick van Egmond, Luc Vandenabeele
4	Yavor Paunov, Celina Kacperski	Patrick van Egmond, Luc Vandenabeele
5	Florian Kutzner, Celina Kacperski, Haibo Chen	Patrick van Egmond, Luc Vandenabeele

Version History			
Version	**Date**	**Main author**	**Summary of changes**
0.1	**30/06/2020**	**Celina Kacperski**	Structure of deliverable, literature selection preparation, purpose and intended audience sections
0.2	**30/09/2020**	**Yavor Paunov**	Added survey description section, and “most important consequences” sections
0.3	**15/10/2020**	**Celina Kacperski**	Added literature, “improvements/worsening” sections,

			results summary and improved survey description
0.4	**25/10/2020**	**Florian Kutzner**	Added first draft of user recommendation section
0.5	**28/10/2020**	**Yavor Paunov**	Extended literature section
0.6	**30/10/2020**	**Celina Kacperski**	Added figure descriptions, extended user recommendation section
0.7	**06/11/2020**	**Haibo Chen**	Extended user recommendation section
1.0	**13/11/2020**	**Celina Kacperski**	Final integrations, sent out for review
1.1	**25/11/2020**	**Celina Kacperski**	Integration of review comments

List of acronyms	
Acronym	**Meaning**
EBU	European Blind Union
CAV	Connected and autonomous vehicles
PC	Personal Consequences
GC	General Consequences

Notice

This document complies with the European Blind Union's guidelines (http://www.euroblind.org/publications-and-resources/making-information-accessible-all) in order to be accessible to anyone, including blind and partially sighted people, and at the same time and at no additional cost.

Table of Contents

Table of Figures

List of tables

Executive summary

Focussing on the consequences of large-scale CAV adoption, D3.1 combines results from Tasks 3.1, 3.2 and 3.3 and presents the outcomes of the first survey conducted in WP3, embedded in the context of existing literature. The aim is to provide user-centered recommendations based on survey results and literature on CAV adoption consequences.

Results of the survey replicate and extend previous findings, both by employing a stratified sample across multiple countries (Germany, France, Italy and UK) and providing results from the subpopulations (car-sharing users, professional drivers, people with visual impairments, and road co-users).

We investigated which anticipated consequences are the most importantly rated by participants, and which tend to be seen favorably or unfavorably by respondents. Our results provide instructive information on how to design CAV systems.

While positive consequences were expected in the context of road safety, stress reduction, enjoyment and life quality, negative consequences were expected in the areas of privacy and driving fun. Environmental issues could be somewhat ambiguous, mostly due to the necessary distinction between CAV usage as private cars vs in public transport context of busses. Participation in social life turned out to rank at a relatively high importance for respondents across the board, though expectations for improvement due to CAV adoption were neutral.
While country differences were less pronounced, some differing expectations were uncovered in the subpopulations: An increase in cost was particularly worrisome for respondents with visual impairments, while the potential for social life and economic participation ranked particularly high in importance for them. Car-sharing users were sensitive to privacy consequences and the potential positive impact of CAVs on safety. Comfort improvements were more prominently featured in responses from professional drivers. Especially with regards to busses, respondents expected improvements for scenery and traffic congestion.

These aspects are discussed in the context of existing literature and policy recommendations.

1 Introduction

1.1 Purpose and organization of the document

The following document, D3.1, aims to provide an overview over user-centered research, both existing and employed within the PAsCAL project, and to discuss the recommendations that can be gained from this research. It will allow insights into potential impacts of interventions as well as help data collection related to connected and autonomous vehicles (CAVs).
In line with Tasks 3.1, 3.2 and 3.3, the document outlines the survey conducted in WP3 and presents descriptive results related to important issues in the context of existing literature on CAV acceptance.

Following the Introduction (section 1), the document is divided into four main sections:
In section 2, we will describe the literature for CAV acceptance across a variety of user groups and from various perspectives. The focus here will be particularly on motivators and barriers for CAV usage, heading towards garnering first recommendations for CAV integration into the road ecosystem.
In section 3 we will briefly summarise the first survey conducted in the context of WP3, including presentation of the items used, in particular those related to consequences of CAV introduction.
In section 4, we cover the most important consequences of CAV adoption, as judged by a variety of subpopulations such as a representative sample, car-sharing users, professional drivers, road co-users and visually impaired populations. We also describe those consequences in depth that survey participants felt would have the most positive or negative impacts on their lives and society.
Finally, in section 5, we combine literature and findings from our survey into a conclusion regarding recommendations and what policy makers should take into consideration when designing the political landscape around CAV integration.
An appendix with all items and their values, and literature are provided in sections 6 and 7.

1.2 Intended audience of this document

The audience for this document are (1) the consortium members of the PAsCAL project, specifically partners responsible for the different CAV trials, simulations, pilots, CAV training skills development and development of business cases, (2) policymakers, specifically those with an interest in creating a more participatory CAV introduction that suits the needs of a variety of subpopulations, and (3) researchers with an interest in CAV acceptance measures as well as motivators and barriers to CAV integration.

The wider research community is invited to use the overview to extend their research into appropriate CAV solutions based on the recommendations, in particular when approaching varying target groups.

The idea is to give an introduction to what various participants of our survey think about the consequences of CAV solution implementations, how this fits into the current literature on CAV acceptance, and some recommendations based on these judgements, through which they can achieve their set goals.

A main objective of the PAsCAL project is to move the focus towards a more user-centric design of CAV research, so an analysis of general expectations of end-users, and their motivators and barriers is paramount.

2 Literature overview user-centered research in CAVs

The adoption of autonomous and connected vehicles (CAVs) has the potential to reduce air pollution (Bansal et al., 2016; Anderson et al., 2014;), traffic accidents due to driver error (NHTSA, 2008), and to increase human mobility and safety (Anderson et al., 2014; Harper et al, 2016). Cost of human lives aside, summing up most of these estimated impacts on society suggests economic benefits (in savings) reaching 97.5 billion per annum, assuming half of the population starts using CAVs on a regular basis (Fagnant & Kockelman, 2015). Nevertheless, mass CAV adoption may also pose challenges related to driver safety due to equipment failure (Bansal et al., 2016), infringement on personal data privacy (Collingwood, 2017), and issues with legislative liability (Xu et al., 2018; NHTSA, 2016).

Hence, previous research is partially focused on whether the benefits of CAV adoption outweigh its potential risks (Liu, Ma, & Zuo, 2019; Liu, Yang, & Xu, 2019, Liu et al, 2019). Findings generally indicate that on the technological level, the current state of CAV technology cannot meet people's expectations regarding their personal safety (Liu et al., 2019) or the safety of others on the road (Hulse, Xie, & Galea, 2018). On the positive side, research reports a positive impact of CAV adoption on the environment in terms of less land use for parking spaces (Dia & Javanshour, 2017; Fournier et al., 2017) and dramatic reduction in greenhouse gas emissions (Greenblat & Saxena, 2015; Arbib & Seba, 2017).
However, as noted by Liu, Ma & Zuo (2019), the majority of studies on adoption forecasting are based on expert knowledge, and information presented in specialized journals. Therefore, researchers also focused on the *perceived* consequences of CAV adoption in order to predict CAV acceptance (Hegner, Beldad, & Brunswick, 2019). These can be broadly divided in two major categories: social consequences and personal consequences. The first category includes (among others) peoples' perceptions on the impact of CAV adoption on the environment in terms of pollution (Schoettle & Sivak 2014; Ipsos MORI, 2014), the job market (Taiebat et al., 2018), and land use (Soteropoulos, Berger, & Ciari, 2018; Dia & Javanshour, 2017).
Overall, evidence on people's opinion on the environmental and social impact of CAV technology is positive, and the majority of the population recognizes the potential of CAVs to reduce environmental pollution (Haboucha et al., 2017; Ipsos MORI, 2014), and to increase the availability

of parking spaces (Dia & Javanshour, 2017). However, some express concerns that the usage of CAVs might increase travel distance, therefore negating a potential positive effect on emissions (La Mondia et al., 2016). A game-theoretical approach to CAV parking behavior predicts a congestion problem as a result of reduced need of parking spaces (Mullard-Ball, 2019).

The second category contains personal concerns about travel safety (Bansal & Kockelman, 2018), personal comfort while driving (Kyriakidis, Happee, & de Winter, 2015), vehicle hacking (Kennedy, 2016; Tennant et al., 2017) and data privacy (Collingwood, 2017; Howard & Dai, 2014). While the public generally agrees that CAVs are safer than conventional modes of transportation (Liu, Yang, & Xu, 2019; Becker & Axhausen, 2017) they also worry about possible equipment failures (Seapine Software, 2014; Bansal et al., 2016) and lack of control over the vehicle (Fraedrich & Lenz, 2016). Other major concerns are the fear of hacking (Kyriakidis, Happee, & de Winter, 2015; Bansal et al., 2016), and issues about personal privacy (Glancy, D., 2012).

To sum up, the plethora of evidence on peoples' perceptions about the consequences from mass CAV adoption and personal use shows that opinions are mixed. Despite the fact, that the public's general opinion on CAVs is positive (Schoettle and Sivak, 2014; Kyriakidis et al., 2015), a variety of safety and privacy concerns remain.

We therefore decided to carry out a survey asking specifically about a variety of potential consequences, with the aim to analyze people's most important concerns, and gauge their opinions on whether CAVs might improve or worsen the current status of these issues. The survey is presented in the following section.

3 Survey summary

3.1 Survey description

In the following section, we will briefly describe the within WP3 conducted survey upon which the results and recommendations in sections 4 and 5 are based.
Participants were invited via either a panel service, which we employed to gather a stratified sample (by age, gender and for four countries), or via email and/or social media for the subpopulations, i.e. individuals with visual impairments, professional drivers and shared vehicle users.
Before starting the survey, respondents gave informed consent for voluntary participation, data use, and data storage in accordance with ethics requirements by the German psychology association (DGPS) and DGPR guidelines.
After that, the respondents were randomly assigned to one of three experimental conditions, varying the target solution:
In the first condition, the respondents read a short description of what autonomous and connected cars are (Figure 1, upper half), whereas in the second, the same text was accompanied by a description the anticipated effects from CAVs adoption for the environment, the road infrastructure, and for the general flexibility in transportation (Figure 1, lower half). You can see the entire intervention in Figure 1.

Autonomous and connected vehicles

In the following we will ask you some questions about **autonomous and connected vehicles (Connected Autonomous Vehicle, CAV for short)**. The distinctive feature of a CAV is that it is **not controlled by a human driver**. Instead, it is completely controlled by a computer system. The vehicle takes over all tasks and **automatically controls all actions, including steering, acceleration and braking**.

Here we are interested in **autonomous and connected cars**.

Autonomous and connected vehicles and their consequences

Bringing autonomous and connected cars (CAVs) onto the streets will have different effects. On the one hand, people using CAVs will be able to spend their time **more flexibly** than drivers of manually controlled cars.
In addition, CAVs will require **significant extensions to the current mobile communication networks** to function reliably [1] . The proliferation of CAVs will probably lead to an **increase in the number of kilometres driven**, so that in the long term more **congestion** [2] can be expected. It is unclear whether CAVs will help reduce **CO2 emissions** from traffic [3].
CAVs will also help **shift jobs from low-skilled to high-skilled occupations** [4].

---

1 z.B. Datta, S. K., Da Costa, R. P. F., Härri, J., & Bonnet, C. (2016). Integrating connected vehicles in Internet of Things ecosystems: Challenges and solutions. 2016 IEEE 17th International Symposium on A World of Wireless, Mobile and Multimedia Networks (WoWMoM), 1–6.
2 z.B. Milakis, D., Van Arem, B., and Van Wee, B., Policy and society related implications of automated driving: A review of literature and directions for future research, Journal of Intelligent Transportation Systems (2017) 1–25.
3 z.B. Pakusch, C., Stevens, G., & Bossauer, P. (n.d.). Shared Autonomous Vehicles: Potentials for a Sustainable Mobility and Risks of Unintended Effects. 258–245.
4 z.B. Pettigrew, S., Fritschi, L., & Norman, R. (2018). The Potential Implications of Autonomous Vehicles in and around the Workplace. International Journal of Environmental Research and Public Health, 15(9), 1876.

Figure 1. Information presented to respondents in condition 1 (top half) and condition 2 (entire text).

In a third condition, the participants received the same information as in the first, this time related to autonomous and connected buses. You can see the intervention presented in Figure 2.

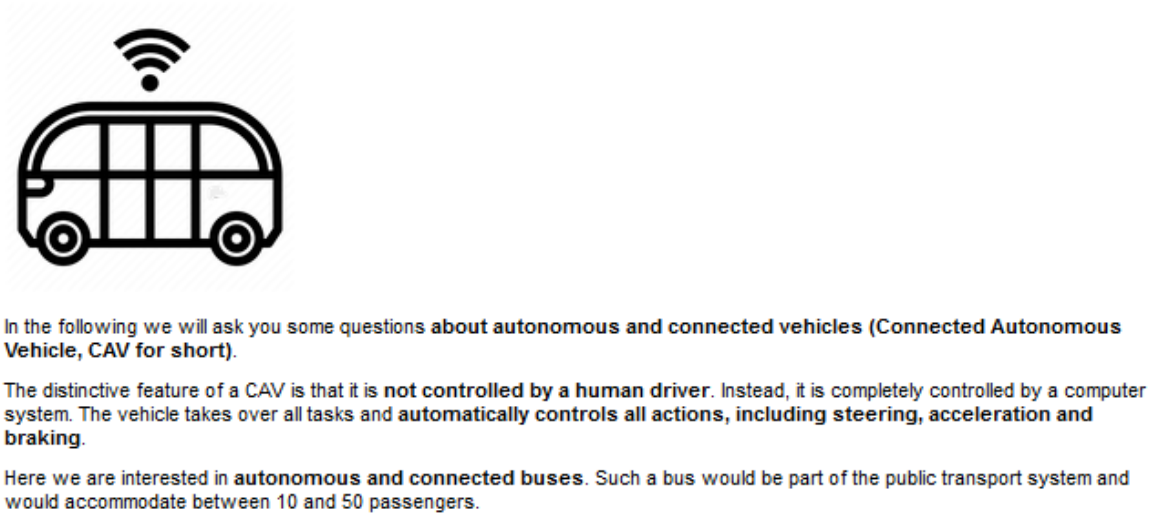


Figure 2. Information presented to respondents in condition 3.

In terms of content, participants first indicated their general assessment of autonomous cars/buses on 4 items (7-point Likert scales): They answered:

- Whether they find CAVs good/bad in general
- whether they find the thought of CAVs generally disconcerting or promising
- whether they would prefer CAVs or conventional vehicles as a means of transportation
- whether their spontaneous attitude towards CAVs was positive or negative.

After that, the respondents were prompted to list (free text) at least one reason for and against the introduction of CAVs in general.

The participants were then asked to imagine they used CAVs regularly, and to express their agreement with a list of 28 statements (7-point Likert). The statements were designed to assess the personal consequences, which the regular use of CAVs might have for the respondents. Each statement was paired with an item, which measured the degree to which the participants considered the respective consequence important. The following Figure 3. shows an example of a few sample pairs.

Now imagine that YOU would regularly use autonomous busses. What effect would that have on you?

	1	2	3	4	5	6	7	
If I used autonomous busses I would be... slower	○	○	○	○	○	○	○	faster.
Driving faster is... unimportant	○	○	○	○	○	○	○	important to me.

	1	2	3	4	5	6	7	
If I used autonomous busses, companies would have... higher	○	○	○	○	○	○	○	lower control over my behaviour.
The fact that companies do not control me is... unimportant	○	○	○	○	○	○	○	important to me.

	1	2	3	4	5	6	7	
If I used autonomous busses, I would be... more stressed	○	○	○	○	○	○	○	more relaxed during use.
Travelling in a stress-free way is... unimportant	○	○	○	○	○	○	○	important to me.

Figure 3. Sample statement and importance measure, condition 3.

A full list of the items is available in Section 3.3 of the present document. These items will be used to primarily evaluate expected consequences across different populations in the following sections.

Participants were also asked to imagine that large sections of the population use autonomous vehicles. Then they were prompted to express their agreement with 28 statements, which represent the general consequences of using CAVs. Each statement was again paired with an item, which measured the degree to which the participants considered the respective general consequence important. Samples can be viewed in Figure 4.

Now imagine that LARGE SECTIONS OF THE POPULATION use autonomous busses. What effect would that have?

	1	2	3	4	5	6	7	
If large sections of the population used autonomous busses, jobs in general would be... less secure	○	○	○	○	○	○	○	more secure.
Secure jobs are... unimportant	○	○	○	○	○	○	○	important to me.

	1	2	3	4	5	6	7	
If large sections of the population used autonomous busses, the general quality of life would be... lower	○	○	○	○	○	○	○	higher.
High quality of life is... unimportant	○	○	○	○	○	○	○	important to me.

Figure 4. Sample statements and importance measure, condition 3.

Again, a full list of the statement pairs is available in Section 3.3.

Upon completing this part of the survey, the respondents indicated their agreement with three statements, designed to measure their mood when imagining that large sections of the population would use CAVs. Again, the respondents expressed their agreement with the statements on a 7-point Likert scale, anchored at “disagree/agree completely”. Two additional statements served as an attention check. A complete list of the items is in Section 3.3.

After that, the respondents indicated their agreement with 5 statements, which were represented different positive behaviours, associated with the availability and adoption of CAVs, as can be seen in Figure 5. Negative behaviours were assessed consequently, as seen in Figure 6

	disagree completely 1	2	3	4	agree completely 5	does not apply
I would be comfortable letting my relatives with physical disabilities use autonomous busses.	○	○	○	○	○	○
I think I could do well with autonomous busses.	○	○	○	○	○	○
I would let my children use autonomous busses.	○	○	○	○	○	○
I am willing to accept the effort to switch to autonomous busses (e.g. special courses).	○	○	○	○	○	○
If autonomous busses were available, I would use them.	○	○	○	○	○	○

Figure 5. List of positive behaviors.

	disagree completely 1	2	3	4	agree completely 5	does not apply
I can imagine that I would have problems using autonomous busses.	○	○	○	○	○	○
I would not allow my children to use autonomous busses.	○	○	○	○	○	○
I would hesitate to let my relatives with physical disabilities use autonomous busses.	○	○	○	○	○	○
I would not like to use autonomous busses.	○	○	○	○	○	○
The switch to autonomous busses is unacceptable.	○	○	○	○	○	○

	disagree completely 1	2	3	4	agree completely 5	does not apply
In my opinion, politics should prevent the introduction of autonomous busses.	○	○	○	○	○	○
I would try to disrupt autonomous busses actively if possible.	○	○	○	○	○	○
I would try to avoid autonomous busses as much as possible.	○	○	○	○	○	○

Figure 6. List of negative behaviors.

Upon completion, the respondents provided information regarding their current mobility status: number of miles covered per week, the means of transport they currently use, whether they had a driving licence, whether they use car sharing services and public transport. The participants also

rated their satisfaction with the means of public transportation in their region.
Next, the participants answered a series of questions, which measured their knowledge of autonomous vehicles, as can be seen in Figure 7.

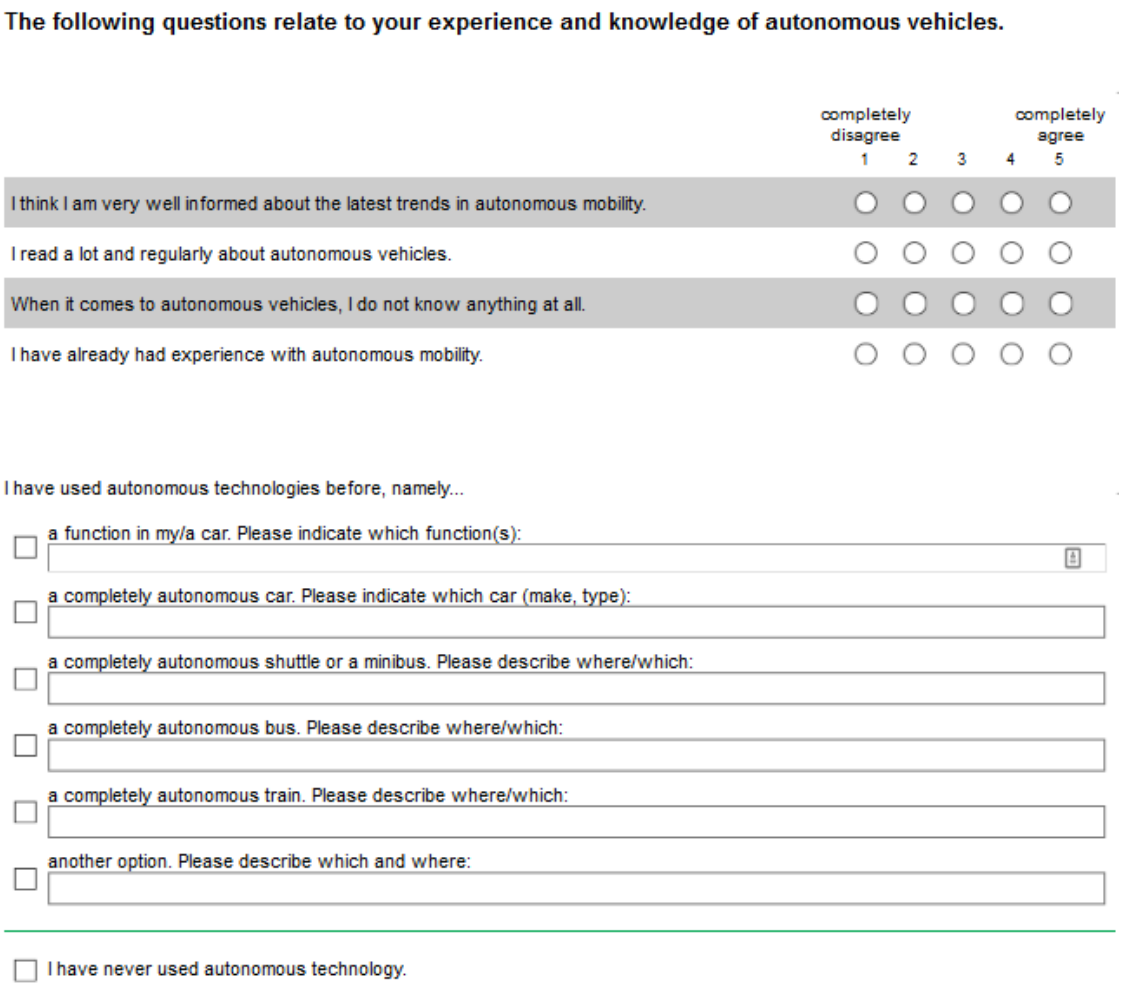


Figure 7. Measure of knowledge of autonomous vehicles.

After that, the respondents were asked to imagine that they were buying a new conventional car, and their willingness to pay more or less for the same car but equipped with fully autonomous technology was assessed. Similar questions measured the respondents' willingness to pay more (or less) for autonomous public transport per ticket and kilometre travelled.
A series of following questions assessed the importance of mobility for the respondents' work, whether they drove as a profession, whether they had a visual impairment, and whether they used a mobility tool when driving (e.g. GPS).

Demographic markers such as age, gender, income, location, etc. were collected.

3.2 Survey participant sample

1636 respondents took part in the survey. Valid entries amounted to 1461 after removal of all participants that had failed an attention test item within the questionnaire. 527 respondents were randomly assigned to the first experimental condition (receiving information about autonomous cars), 484 were presented with the same information, and additional details about the consequences of CAVs adoption (condition 2), and 450 respondents were received information on autonomous buses (condition 3).

The subpopulations that were chosen were defined in the DoA of PASCAL already with an eye towards feasibility and consortium partner interests. In the context of WP3, OPLY as a carsharing provider, the European Blind Union, and ACI and RED as connection to professional drivers helped with the data collection.
Within the survey, items asked participants about their status regarding these traits, i.e. we asked participants about their use of carsharing services, about their visual impairments, and about their job as professional drivers. We also asked them whether they used a non-motorized manner to cover most travel, i.e. whether they were pedestrians/bicycle users.

Based on these questions, the subsets that will be further explored were extracted from the entirety of the sample. This led to some overlap between participants in the samples, for example a blind person using a car sharing service would be included in both subsamples. This should be considered when interpreting the results.

Except for the panel population, the other samples were convenience samples and were not stratified based on any demographics. They can therefore not be considered representative and the results should be interpreted with care.

222 participants used a car-sharing service (most were recruited with the help of a car sharing service provider OPLY), 315 indicated a visual impairment (most had been recruited with the help of the European Blind

Union), and 63 were professional drivers (most were recruited with the help of driving schools ACI and RED). The remaining 861 participants did not fall into the abovementioned categories, as they were recruited via a panel.

288 respondents were Germans, 266 British, 212 French, and 295 were Italian. All respondents were recruited via the panel only and comprise stratified samples for these countries based on age and gender. We decided to analyse country differences due to the fact that various cultural influences might play a role in expectations derived from CAV introduction.

3.3 Survey items related to expected CAV consequences

This section contains the relevant statements, which served as basis for providing user-centred recommendations on the implementation of CAVs. Respondent agreement on the statement indicates people's opinion on the consequences, which the adoption of CAVs would have on their own lives, and on society in general. The statements were organised in 16 major categories, which represent important personal and general life aspects, such as job security, data privacy, personal comfort, etc.

A total of 56 statements assessed the participants' opinion on the consequences CAV use and adoption may have. 18 statements represented the personal consequences of using CAVs on regular basis, and another 18 the consequences of mass CAVs adoption for society. Each statement was paired with an item, which measured the importance of each consequence, as judged by the respondents.

The following tables contain the exact wording of each statement and the respective importance items, organised by category and by the instruction, which the participants received before providing responses. Table 1 contains all statements related to the personal consequences of using CAVs, and Table 2 the consequences of mass CAVs adoption for society.

Table 1. Full list of personal consequences of using CAVs.

Instruction	**Now imagine that YOU would regularly use autonomous cars. What effect would that have on you?**
Statement Category	**Personal consequences from using autonomous cars and buses**

JOB SECURITY	If I used [an autonomous car or bus], my job would be... less secure/more secure.
JOB SECURITY	Having a secure job is... unimportant/important to me.
JOB SECURITY	If I used [an autonomous car or bus], my opportunities on the job market would be... less/more.
JOB SECURITY	Good opportunities on the job market are... unimportant/important to me.
JOB PERFORMANCE	If I used [an autonomous car or bus] my work would be... more cumbersome/easier.
JOB PERFORMANCE	The fact that I can do my work without any problems is... unimportant/important to me.
JOB PERFORMANCE	If I used [an autonomous car or bus], I would be... less productive/more productive at work.
JOB PERFORMANCE	Being productive at work is... unimportant/important to me.
DATA PRIVACY	If I used [an autonomous car or bus], my personal data would be... less secure/more secure.
DATA PRIVACY	A high level of security for my personal data is... unimportant/important to me.
DATA PRIVACY	If I used [an autonomous car or bus], there would be a... higher/lower risk that my personal data would be misused.
DATA PRIVACY	The fact that my data is protected against misuse is... unimportant/important to me.
FREEDOM	If I used [an autonomous car or bus] I would be less free/more free in my decisions.
FREEDOM	To decide freely what to do is... unimportant/important to me.
FREEDOM	If I used [an autonomous car or bus], I would be... more dependent/more independent of other people.
FREEDOM	To be independent from other people is... unimportant/important to me
ENJOYMENT	If I used [an autonomous car or bus] my driving fun would be... lower/higher.
ENJOYMENT	Driving fun is... unimportant/important to me.
ENJOYMENT	If I used [an autonomous car or bus] my driving pleasure would be... lower/higher.
ENJOYMENT	Driving pleasure is... unimportant/important to me.
COMFORT	If I used [an autonomous car or bus] my travel comfort would be... lower/higher.
COMFORT	A high level of travel comfort is... unimportant/important to me.
COMFORT	If I used [an autonomous car or bus], my travelling would be... less pleasant/more pleasant.
COMFORT	Travelling in comfort is... unimportant/important to me.
SOCIAL LIFE	If I used [an autonomous car or bus], my attendance at events (e.g. concerts, parties) would be... less frequent/more frequent.
SOCIAL LIFE	Frequent visits to events are... unimportant/important to me.
SOCIAL LIFE	If I used [an autonomous car or bus], meetings with friends (e.g. friends, family)... would be less frequent/more frequent.
SOCIAL LIFE	Frequent meetings with acquaintances are... unimportant/important to me.
ROAD SAFETY	If I used [an autonomous car or bus], my personal risk of accident would be... higher/lower.
ROAD SAFETY	A low risk of accident is... unimportant/important to me.
ROAD SAFETY	If I used [an autonomous car or bus], traveling on the road would be... more dangerous/safer for me.
ROAD SAFETY	A high level of safety while travelling is... unimportant/important to me.
TRAVEL TIME	If I used [an autonomous car or bus], my travel time would be on average... longer/shorter.
TRAVEL TIME	A short travel time is... unimportant/important to me.
TRAVEL TIME	If I used [an autonomous car or bus] I would be... slower/faster.
TRAVEL TIME	Driving faster is... unimportant/important to me.
TRAVEL COSTS	If I used [an autonomous car or bus], my costs per journey would be... higher/lower.
TRAVEL COSTS	Low travel costs are... unimportant/important to me.
TRAVEL COSTS	If I used [an autonomous car or bus], my total mobility costs would be... higher/lower.
TRAVEL COSTS	Keeping my overall mobility costs down is... unimportant/important to me.

LIFE QUALITY	If I used [an autonomous car or bus] my quality of life would be... lower/higher.
LIFE QUALITY	A high quality of life is... unimportant/important to me.
LIFE QUALITY	If I used [an autonomous car or bus] my life satisfaction would be... lower/higher.
LIFE QUALITY	High life satisfaction is... unimportant/important to me.
AFFECT	If I used [an autonomous car or bus], my travelling experience would be... less pleasant/more pleasant.
AFFECT	A pleasant travelling experience is... unimportant/important to me.
AFFECT	If I used [an autonomous car or bus], I would be... more stressed/more relaxed during use.
AFFECT	Travelling in a stress-free way is... unimportant/important to me.
SUBJECTIVE NORM	If I used [an autonomous car or bus] my reputation in society would be... lower/higher.
SUBJECTIVE NORM	A good reputation in society is... unimportant/important to me.
SUBJECTIVE NORM	If I used [an autonomous car or bus], my friends would find it.. bad/good.
SUBJECTIVE NORM	The fact that my acquaintances like what I do is... unimportant/important to me.
DATA COLLECTION	If I used [an autonomous car or bus], the control over my behaviour by companies would be... higher/lower.
DATA COLLECTION	The fact that companies do not control me is... unimportant/important to me.
DATA COLLECTION	If I used [an autonomous car or bus], monitoring by third parties (e.g. companies, government agencies) would be... more/less.
DATA COLLECTION	The fact that I am not monitored by third parties is... unimportant/important to me.

Table 2. Full list of general consequences of using CAVs.

Instruction	**Now imagine that LARGE SECTIONS OF THE POPULATION use autonomous cars. What effect would that have?**
Statement Category	**General consequences from using autonomous cars and buses**
JOB SECURITY	If large sections of the population use [autonomous cars or buses], jobs in general would be... less secure/more secure.
JOB SECURITY	Secure jobs are... unimportant/important to me.
JOB SECURITY	If large sections of the population use [autonomous cars or buses], the opportunities on the job market would be... lower/higher.
JOB SECURITY	Good opportunities on the job market are unimportant/important to me.
ENVIRONMENT GENERAL	If large sections of the population use [autonomous cars or buses], the environment would be... more polluted/less polluted.
ENVIRONMENT GENERAL	Low environmental pollution is... unimportant/important to me.
ENVIRONMENT GENERAL	If large sections of the population use [autonomous cars or buses], the environment would be... worse/better.
ENVIRONMENT GENERAL	The fact that the environment is doing well is... unimportant/important to me.
EMISSIONS	If large sections of the population use [autonomous cars or buses], greenhouse gas emissions would be... higher/lower.
EMISSIONS	Low greenhouse gas emissions are... unimportant/important to me.
EMISSIONS	If large sections of the population use [autonomous cars or buses], the pollution caused by exhaust gases and particles would be... higher/lower.
EMISSIONS	Low exposure to fine particles is... unimportant/important to me.

CONGESTION	If large sections of the population use [autonomous cars or buses], traffic congestion would be... higher/lower.
CONGESTION	Low traffic congestion is... unimportant/important to me.
CONGESTION	If large sections of the population use [autonomous cars or buses], finding a parking space would be... more difficult/easier.
CONGESTION	Finding a parking space easily is not important/important to me.
CIVIL LIBERTY	If large sections of the population use [autonomous cars or buses], civil liberties would be... lower/higher.
CIVIL LIBERTY	Civil liberties are... unimportant/important to me.
CIVIL LIBERTY	If large sections of the population use [autonomous cars or buses], the internal security in my country would be... lower/higher.
CIVIL LIBERTY	Internal security is... unimportant/important to me.
CIVIL LIBERTY	If large sections of the population use [autonomous cars or buses], state control would be... lower/higher.
CIVIL LIBERTY	The fact that the state controls the citizens a little is... unimportant/important to me.
ROAD SAFETY	If large sections of the population use [autonomous cars or buses], travel for all citizens would be... more dangerous/less dangerous.
ROAD SAFETY	Safe travel for all is... unimportant/important to me.
ROAD SAFETY	If large sections of the population use [autonomous cars or buses], the number of traffic accidents would be... higher/lower.
ROAD SAFETY	Low accident figures are... unimportant/important to me.
TRAVEL TIME	If large sections of the population use [autonomous cars or buses], the driving speed of the citizens would be... slower/faster.
TRAVEL TIME	High driving speeds are... unimportant/important to me.
TRAVEL TIME	If large sections of the population use [autonomous cars or buses], the travel time of the citizens would be... longer/shorter.
TRAVEL TIME	Short travel times are... unimportant/important to me.
ECONOMY	If large sections of the population use [autonomous cars or buses], the economic output in my country would be... lower/higher.
ECONOMY	A high economic output is... unimportant/important to me.
ECONOMY	If large sections of the population use [autonomous cars or buses], the economic output in Europe would be... worse/better.
ECONOMY	A good economic output in Europe is... unimportant/important to me.
PUBLIC HEALTH	If large sections of the population use [autonomous cars or buses], the citizens would be... less healthy/more healthy.
PUBLIC HEALTH	Healthy citizens are... unimportant/important to me.
PUBLIC HEALTH	If large sections of the population use [autonomous cars or buses], the health burden for the population would be... higher/lower.
PUBLIC HEALTH	A low health burden on the population is... unimportant/important to me.
HOMEAREA INFRASTRUCTURE	If large sections of the population use [autonomous cars or buses], the city and landscape would be... uglier/more beautiful.
HOMEAREA INFRASTRUCTURE	A beautiful city and landscape is... unimportant/important to me.
HOMEAREA INFRASTRUCTURE	If large sections of the population use [autonomous cars or buses], the infrastructure would be... worse/better.

HOMEAREA INFRASTRUCTURE	A good infrastructure is... unimportant/important to me.
LIFE QUALITY	If large sections of the population use [autonomous cars or buses], the general quality of life would be... lower/higher.
LIFE QUALITY	High quality of life is... unimportant/important to me.
TERRORISM	If large sections of the population use [autonomous cars or buses], my fear of hacker attacks would be... higher/lower.
TERRORISM	A low danger of hacker attacks is... unimportant/important to me.
TERRORISM	If large sections of the population use [autonomous cars or buses], the danger of terrorism would be... higher/lower.
TERRORISM	Low danger of terrorism is... unimportant/important to me.
LUDDISM	If large sections of the population use [autonomous cars or buses], the risk of vehicles being willfully damaged would be... higher/lower.
LUDDISM	The fact that vehicles are not willfully damaged is... unimportant/important to me.

4 Consequences of CAV adoption, listed by population

4.1 Common important consequences for stratified panel sample

In this section, we will describe the consequences of CAV introduction, as judged by the stratified panel sample we collected, as a “representative” opinion of European populations today. This can be seen as the general, most commonly occurring perception of CAVs, and will be relativized later when we provide more specific opinions of subpopulations that might disagree with a representative sample population.

The section will be structured into two parts: first, we will discuss a few of the most important consequences for the panel population, i.e. what issues panel respondents agreed were most pressing, and, in detail, whether they thought these issues would worsen or improve with CAV introduction.

In a second part, we will discuss further issues that are considered important by the population, where we observe majority opinions towards either improvement or worsening, i.e. we will present those issues where people think CAV introduction will definitely affect the situation in either a positive or a negative way (as opposed to the status quo remaining unaffected).

4.1.1 Most important consequences of CAV introduction, presented by solution

Figure 8, Figure 9 and Figure 10 present heat map style graphs.

Heat maps are a visual representation of the importance, which the current car-sharing users assign to the different consequences from adopting autonomous cars and buses: both for themselves, and for the general public. The maps are divided by experimental condition: the first map Figure 8 shows the order of consequences from CAV adoption, when the respondents imagined they used autonomous cars regularly, and that CAVs are adopted by a large portion of the general population (condition 1). The second one Figure 9 represents the same importance ratings, but from the experimental condition where the respondents received

additional information on the consequences from CAV adoption, in addition the general description of CAVs (condition 2). The last map Figure 10 shows the respondents' opinion about the importance of the personal and social consequences from using and adopting autonomous buses (condition 3).
The maps are ordered by the mean of the importance (sorted by importance, i.e. second column in the graphic) and the importance score for each consequence is colour coded: the most important consequences are at the top and have the deepest colour shade.

Where consequences are ordered by importance for the car solution, it can be observed that consequences such as "attending social parties", "number of accidents" and "social status" are the most important ones in the basic CAV condition.

The same division by condition and the same colour coding is applied for all following participant groups (the visually impaired respondents, the non-drivers, and the driving professionals).

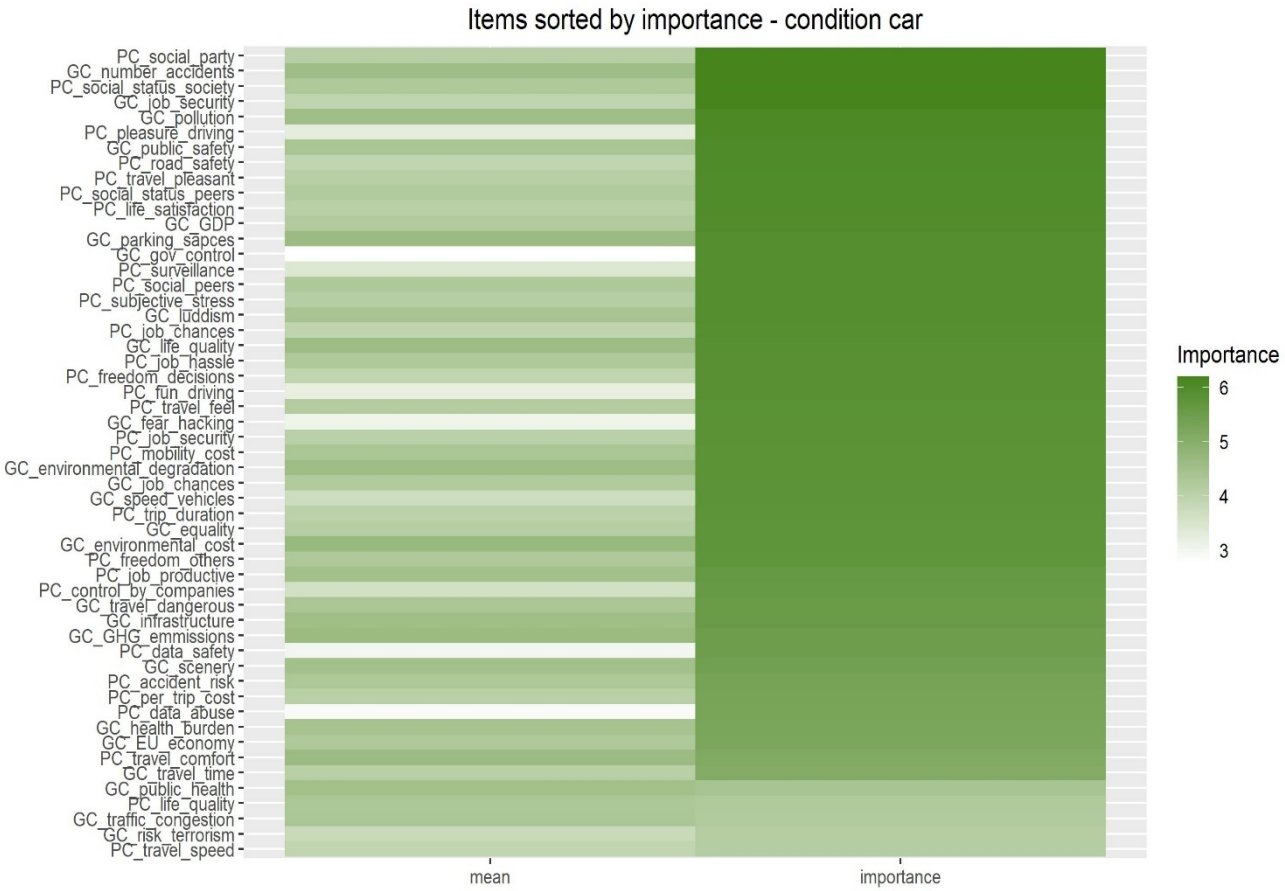


Figure 8. Consequences of autonomous car adoption condition 1.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

Figure 9 shows the most important survey consequences for the bus solution. Here, social status among peers, surveillance, and pollution rate higher in the order of importance.

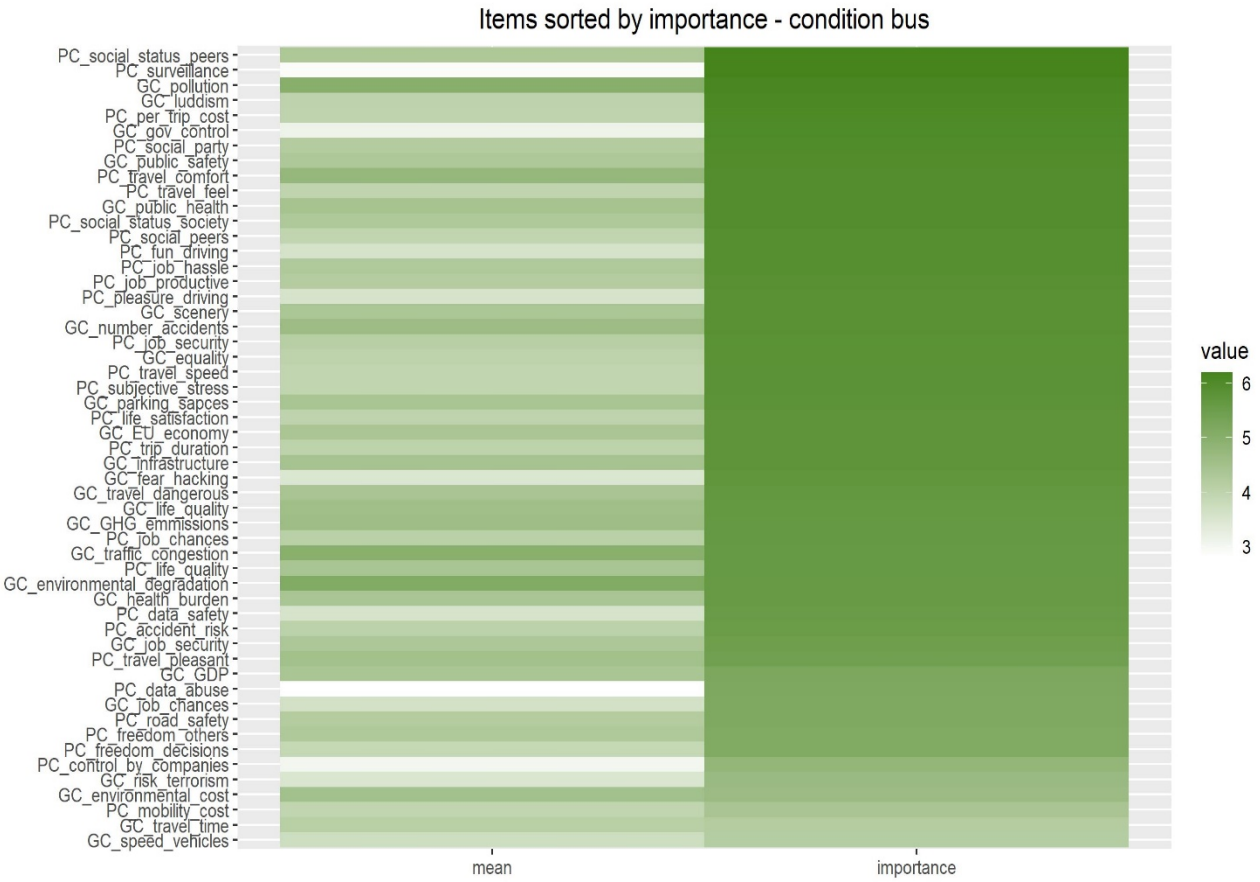


Figure 9. Consequences of autonomous bus adoption condition 3.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

Figure 10 showcases the survey consequences ordered by importance for autonomous cars, but when consequences were presented as well. Here, social peer acceptance, availability of parking spaces, and life quality are at the top.

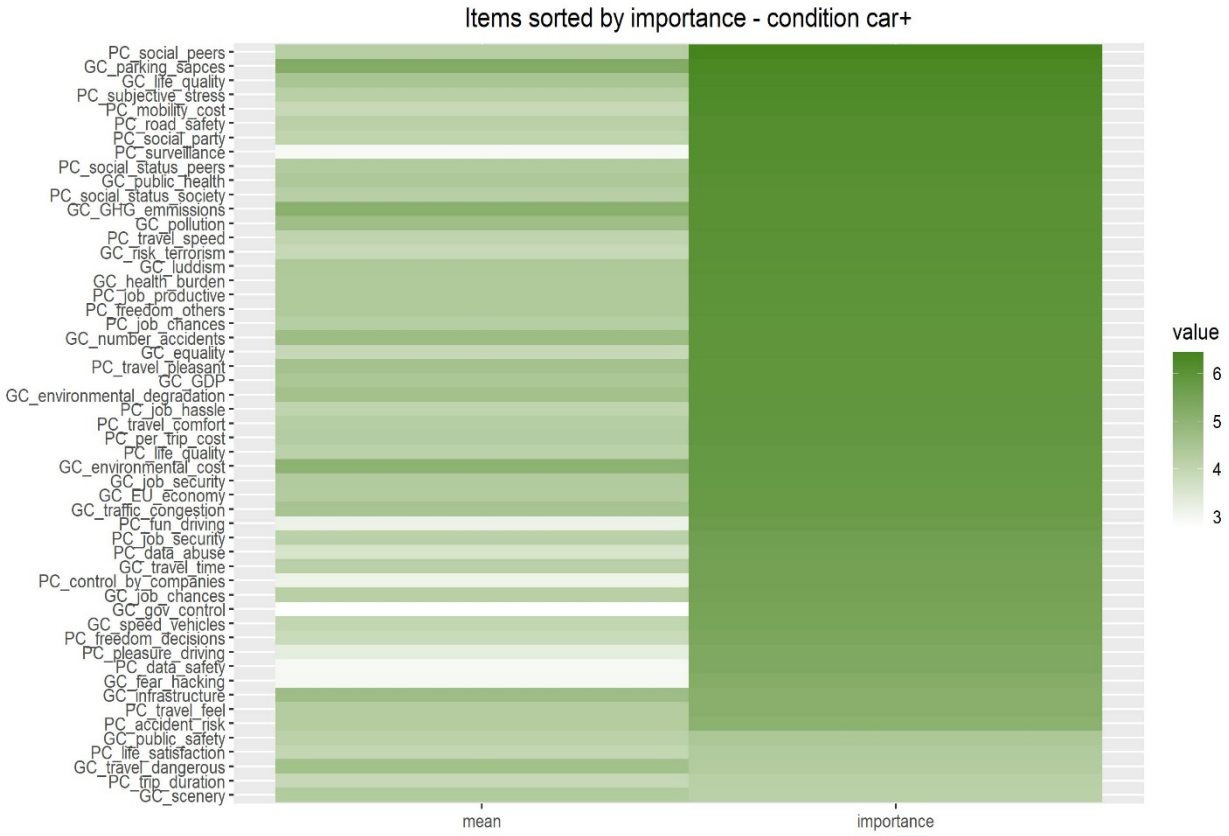


Figure 10. Consequences of autonomous car adoption condition 2.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

In the following, more specific information about important CAV consequences will be presented. We will present Figure charts that will represent the distribution of judgement for each important item. This means that we will present what percentage of this population thought that the CAV solution would contribute to a worsening or an improvement in this selected issue.

Connected and Autonomous Private Car. If the panel participants received only general information about CAVs, most important was the impact from using an autonomous car regularly on the number of times the respondents would be able to attend social events (Figure PC_social_party).

While most of the participants believed that they would attend as many as they did with conventional vehicles (54%), over a quarter (27%) thought

that using a CAV will allow them to socialize more often. 18% of the respondents thought that CAVs would make it more difficult to attend social events.

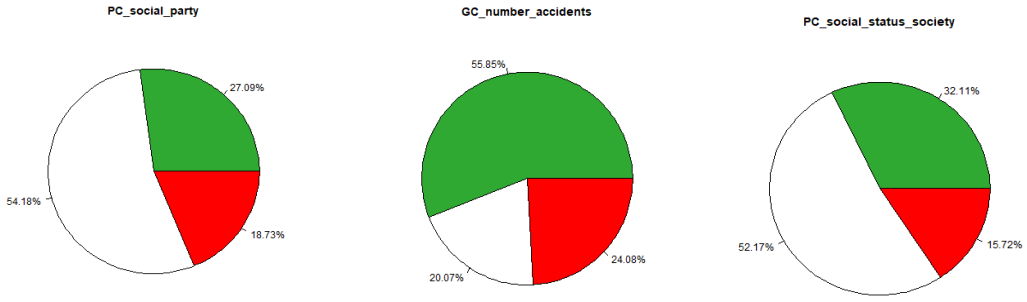


Figure 11. Panel: top 3 most important consequences for cars.

Next in importance came the number of accidents on the road because of mass CAV adoption (Figure GC_number_accidents). More than half of the respondents (55%) believed that road accidents would be less common once large portions of the population start using CAVs. The opposite opinion was shared by fewer participants, though about a fourth (24%) anticipates that there would be more accidents.
Last in the top three concerns in this condition was people's reputation in society as a consequence from using a CAV regularly (Figure PC_social_status_society). Roughly half of the respondents believed it would remain unaffected (52%), and 32% thought that using a CAV will improve their social reputation.

When the participants received additional information on the consequences from CAV adoption before responding, the most important issue was the frequency of meeting friends and acquaintances as a consequence from using an autonomous car regularly (Figure PC_social_peers). Roughly half of the respondents (55%) believed CAVs would not affect the number of times they meet with friends, and more than 30% thought that using a CAV would help them to do so more often.

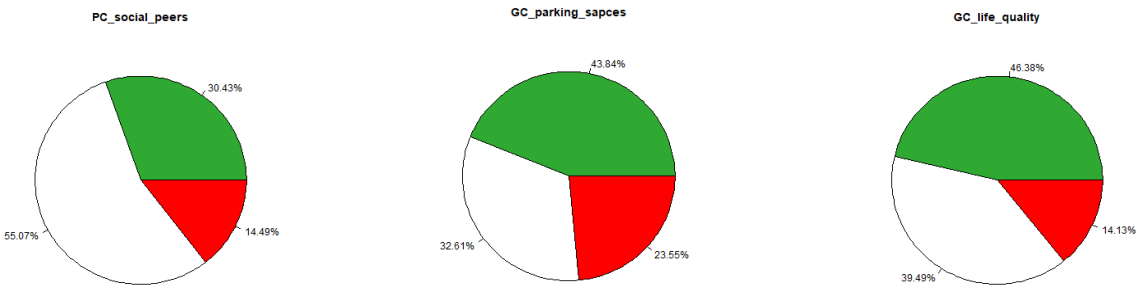


Figure 12. Panel: top 3 most important consequences for cars with additional information.

Next, the respondents were concerned with the availability of parking spaces, once autonomous cars are adopted by large sections of the population (Figure GC_parking_spaces). Notably, almost half of the participants (43%) believed CAV adoption would make finding a parking space easier, while only 23% believed the situation would become worse. Last from the top three important issues were the consequences from mass CAV adoption for people's general quality of life (Figure GC_life_quality). Almost half of the respondents (46%) believed that if large sections of the population used autonomous cars, the general quality of life would be higher. Another 39% believed that CAVs would not affect quality of life in a significant manner.

Connected and Autonomous Public Bus. In the last condition, the participants received only general information on CAVs, and were instructed to consider the consequences from using autonomous buses regularly, either by themselves, or by large sections of the population.

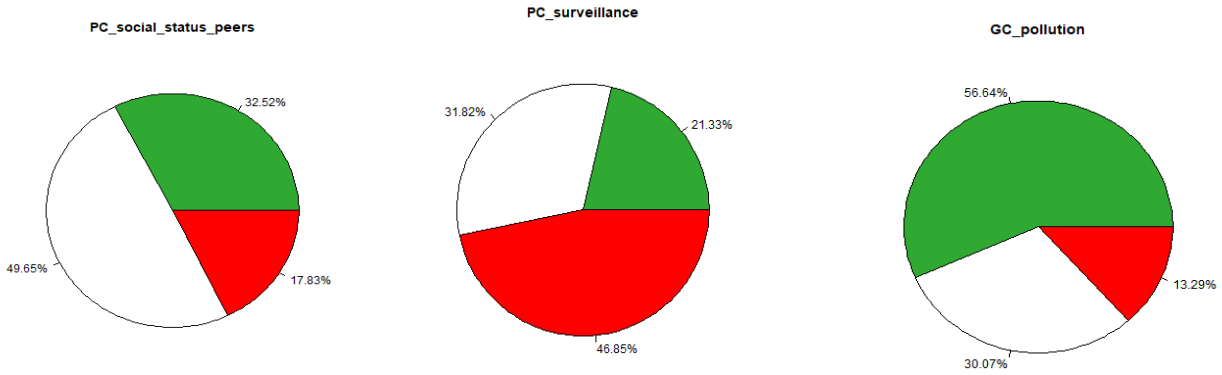


Figure 13. Panel: top 3 most important consequences for busses.

In this condition, the opinion of others was most important (Figure PC_social_status_peers). When the respondents imagined that they used autonomous buses regularly, 49% believed this would not make others think better or worse of them. Another 32% thought their friends and acquaintances would approve if they used an autonomous bus.
Next came concerns regarding personal data privacy (Figure PC_surveillance). Almost half of the participants (46%) believed that if they used autonomous buses regularly, third parties (e.g. companies, government agencies) would monitor them more frequently. Another 31% of the respondents thought not much would change, and 21% believed that using an autonomous bus might reduce surveillance.
Last from the top three most important issues came the impact from mass autonomous bus adoption on the environment, in particular pollution (Figure GC_pollution). More than half of the respondents thought that if large sections of the population used CAVs, the environment would be less polluted, while only 13% believed the opposite.

In summary, social life is considered an important issue to many participants; while most respondents do not feel that CAVs will change their experience of social life majorly, about a third of participants do hope that it will improve with CAV introduction.

4.1.2 Major improvement or worsening expected from CAV introduction

In this section, we will present an overview over major improvement or worsening expected from CAV introduction; for this purpose, only those Figure charts will be presented which showcase that over 40% of the

population agree that an issue is positively or negatively impacted by CAVs.

Areas where people expect a positive development due to CAV introduction are life quality, sustainability, public health and parking space availability (see Figure 14). In particular, anticipated stress due to the usage of autonomous busses is highly polarizing, with a large proportion of participants expecting less stress, but also a large proportion expecting stress to increase.

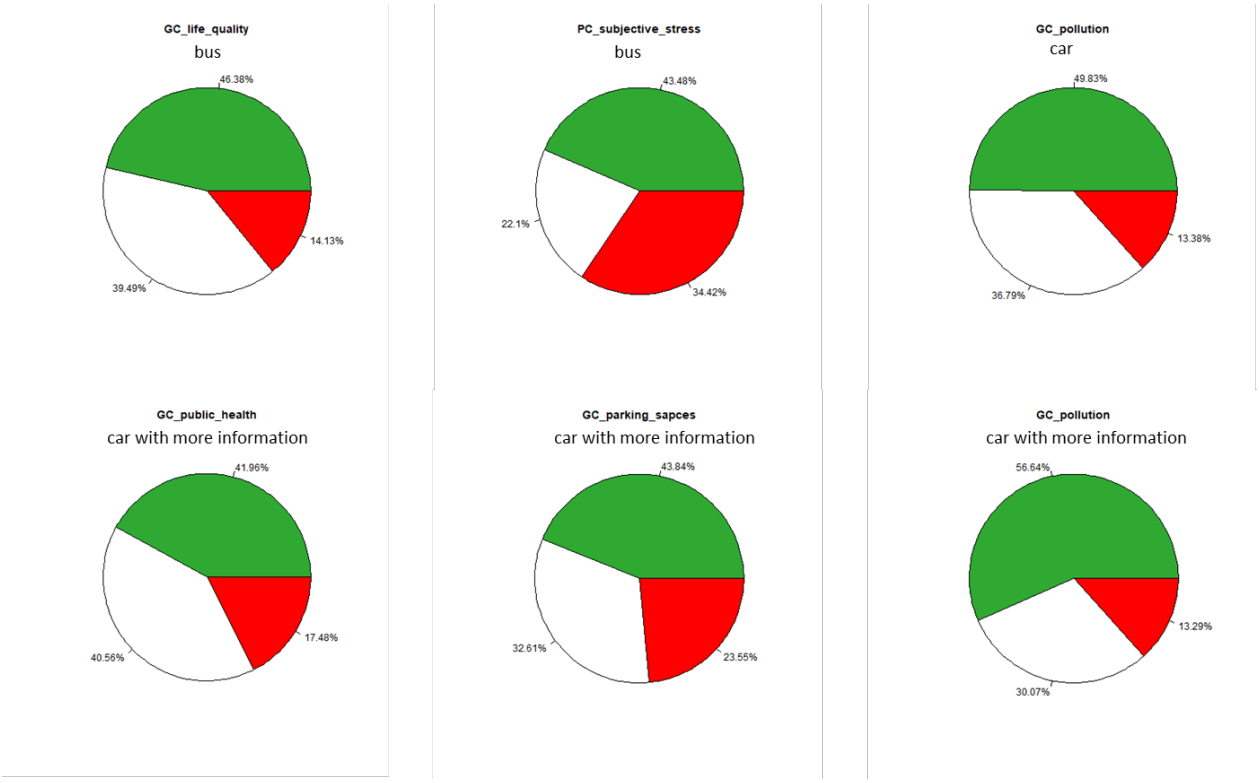


Figure 14. Panel: Infrastructural and life quality improvements.

Another important aspect for participants was privacy – here, surveillance and government control were considered some of the most important issues, and were judged to worsen with the introduction of CAVs, as can be seen in Figure 15. Only a fifth of participants or less estimated that it would improve.

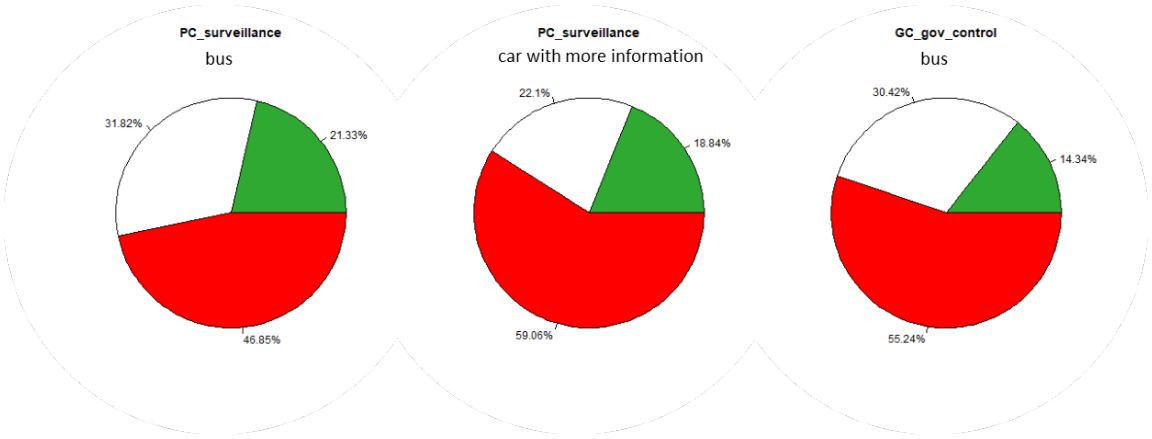


Figure 15. Panel: Negative effects on privacy.

A third aspect was road safety. Most participants agree, as can be seen in Figure 16, that the number of accidents will most likely go down; however, general road safety is more divisive - while over 40% of participants estimated that road safety in general would improve, a sizeable percentage also felt that the opposite might be the case.

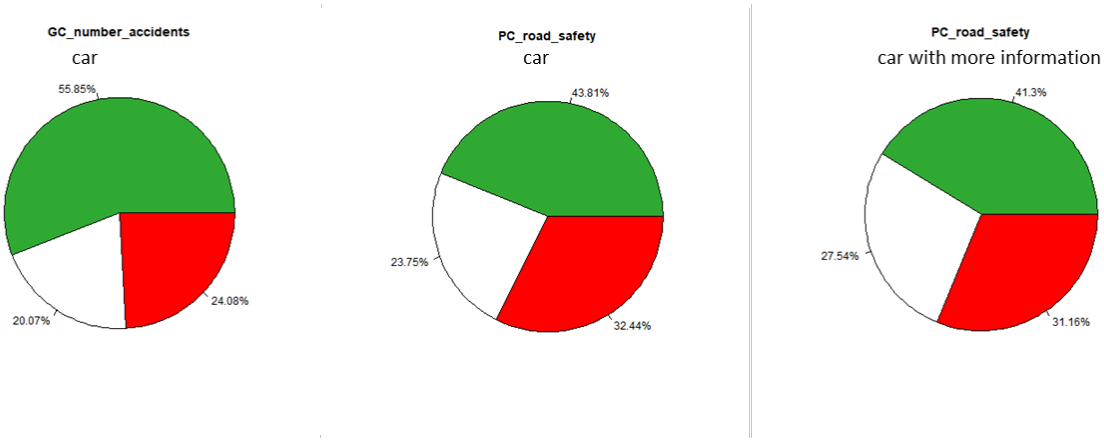


Figure 16. Panel: Road safety improvements.

Finally, an interesting picture emerged when considering the act of driving by itself; as can be seen in Figure 17, while over half the respondents thought that the actual pleasure of driving, i.e. the fun of steering the wheel, would worsen via the introduction of CAVs, when asked about whether the trip itself would be more pleasant, the same percentage agreed that CAVs would indeed improve this part.

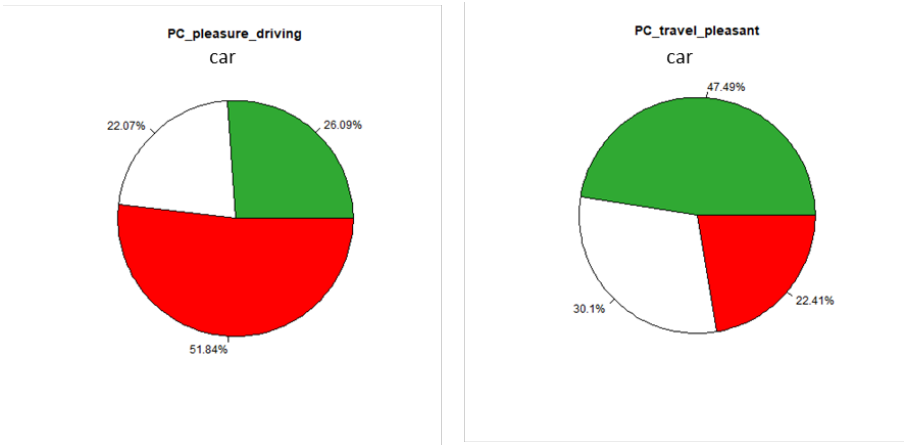


Figure 17. Panel: Positive and negative effects on driving pleasure and travel comfort.

4.2 Current car-sharing users

In the following section, we will discuss the reported opinions of car sharing users as one specific subpopulation and contrast their expected consequences with those of the panel population.

4.2.1 Most important consequences of CAV introduction, presented by solution

Figure 18, Figure 19, and Figure 20 show the distribution of consequences as discussed before, again presented for the three conditions, sorted by importance.

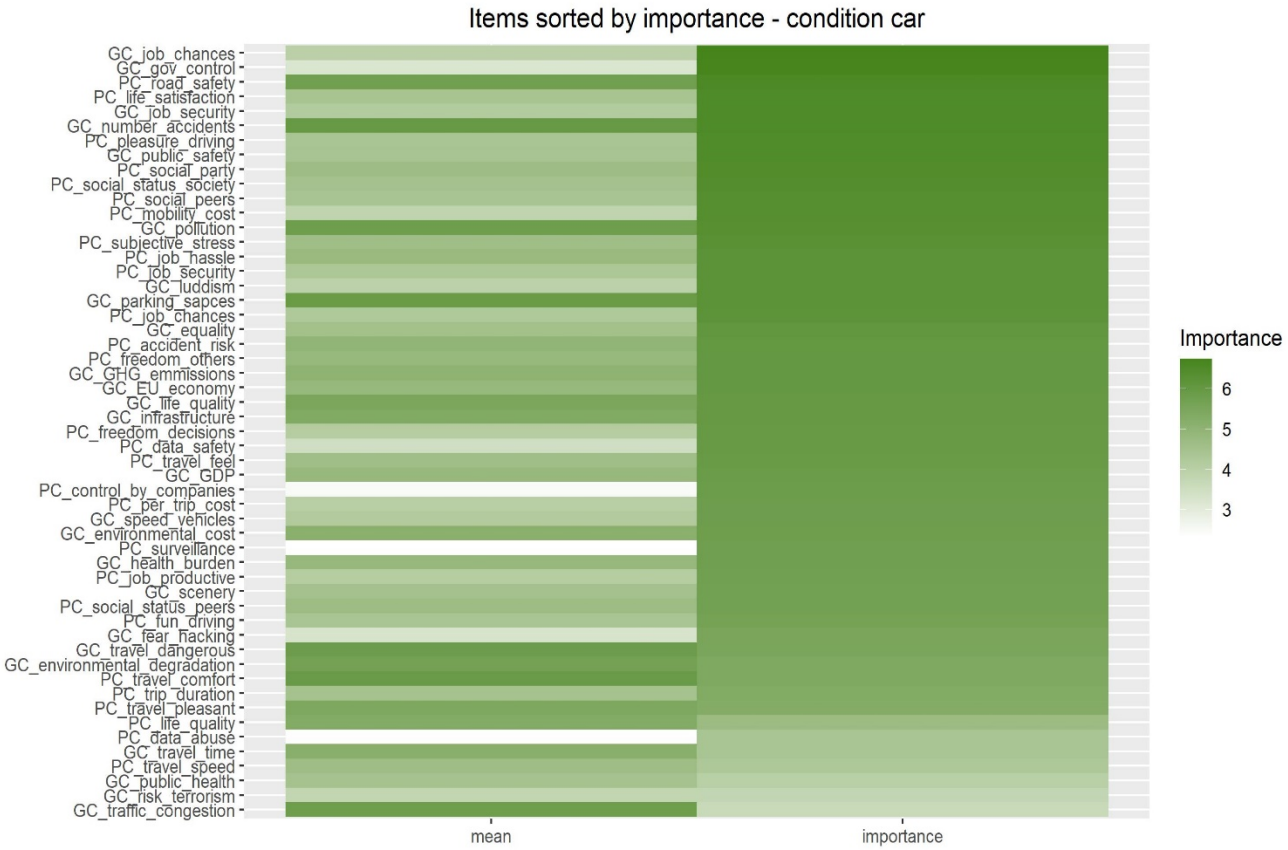


Figure 18. Consequences of autonomous car adoption condition 1.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

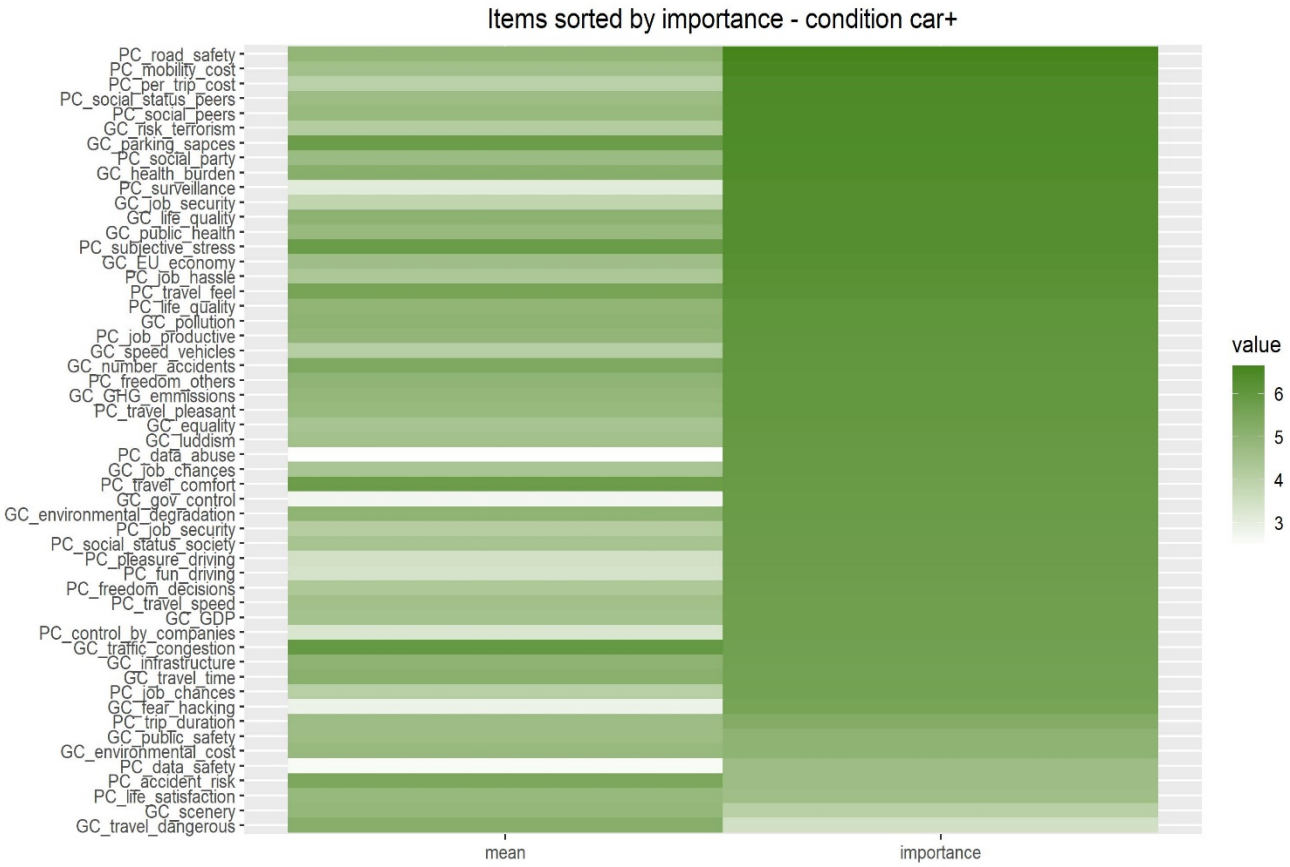


Figure 19. Consequences of autonomous car adoption condition 2.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

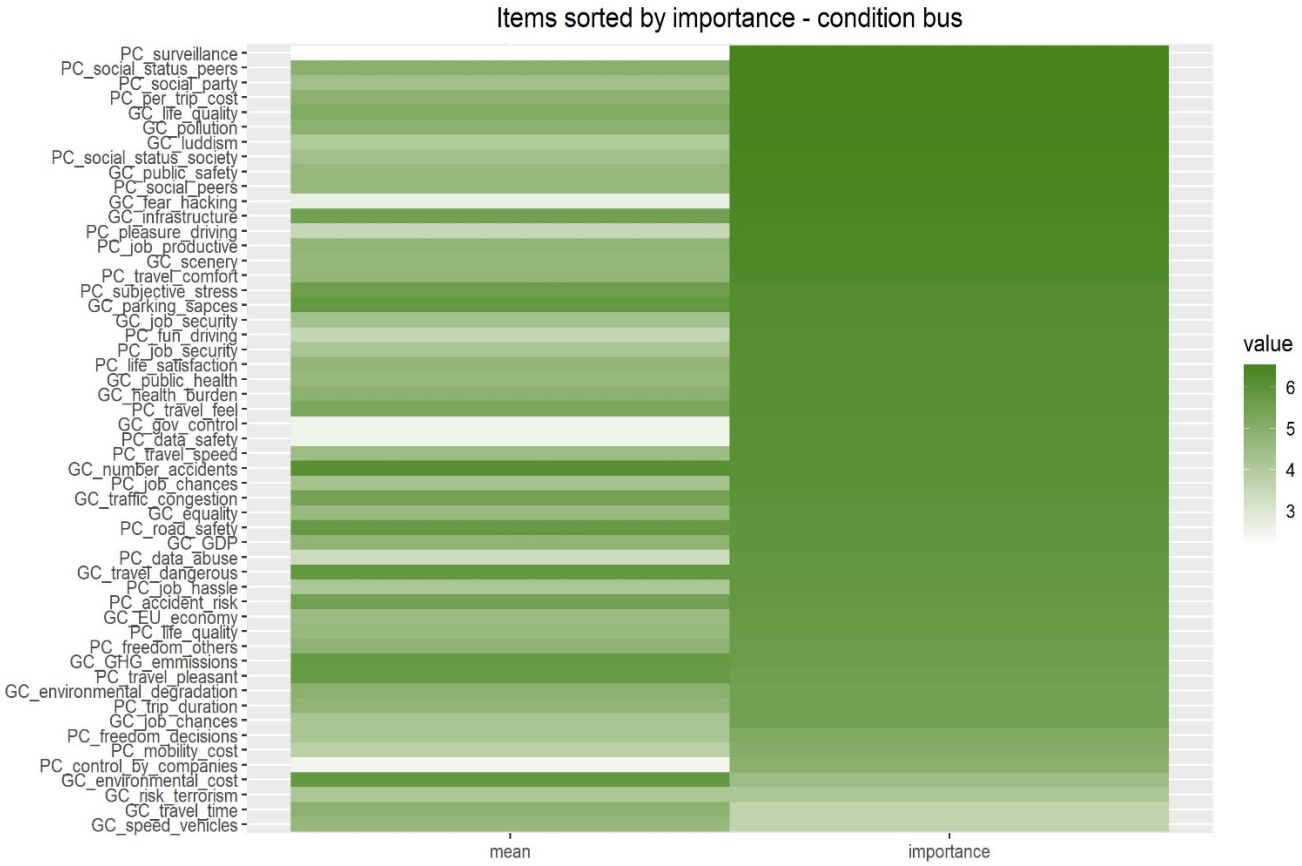


Figure 20. Consequences of autonomous bus adoption condition 3.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

For the respondents who use car-sharing services, the most important consequence from mass CAVs adoption was the availability of opportunities on the job market. While the majority of the participants (67%) were not sure what the consequences will be, 27% believed adopting CAVs would increase the availability of job chances on the market. (Figure GC job chances)

Next in importance were concerns about the degree of government control, if large sections of the population adopted CAVs. A large part of the respondents (68%) believed that in this case, government control would tighten (Figure GC_gov_control).

If the participants received additional information about the consequences of CAV adoption, personal safety on the road became most important. The majority of the respondents (83%) believed that using a CAV on a regular basis would make them safer (Figure GC_job_safety).

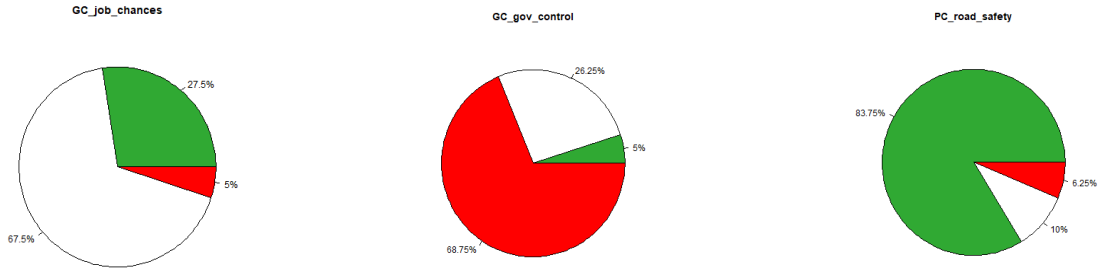


Figure 21. Car sharing users: top 3 most important consequences for cars.

If the respondents imagined that they would use autonomous buses on a regular basis, concerns for third party surveillance became most important. Most participants (80%) believed that in this case, monitoring by third parties (e.g. companies, government agencies) would become more frequent (Figure PC_surveillance).

Next in importance were the consequences from using autonomous buses for the opinion of others. There, views were divided: 47% of the respondents believed their acquaintances would approve of them using autonomous buses, and 43% expect no changes (Figure_PC_social_status_peers).

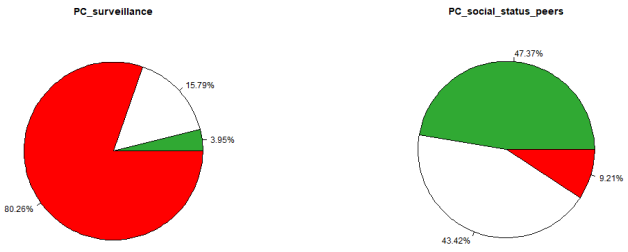


Figure 22. Car sharing users: top 2 most important consequences for busses.

4.2.2 Major improvement or worsening expected from CAV introduction

For car sharing users, privacy is also a major issue, with a similar response pattern to the panel population: as can be seen in Figure 23, the majority of car sharing users agreed that CAVs would worsen surveillance, government control, with only a tiny percentage believing it will improve.

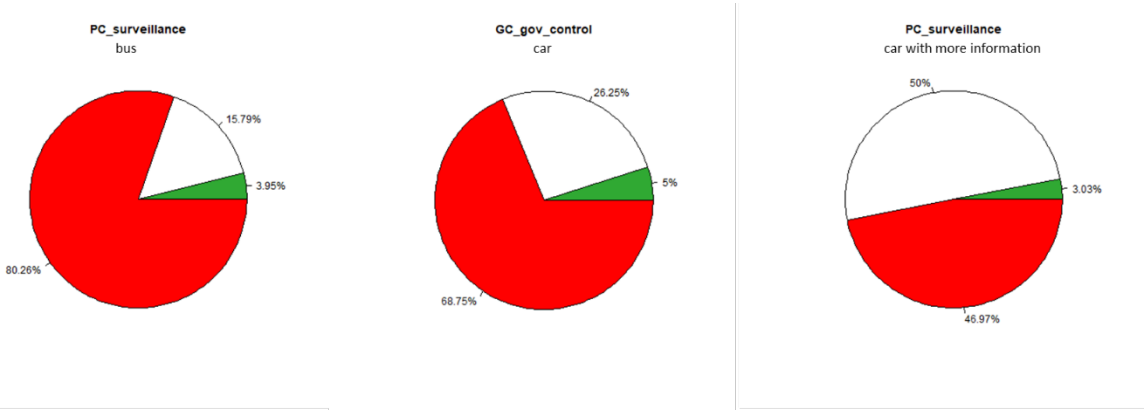


Figure 23. Car sharing users: Negative effects on privacy.

An important issues for car sharing users were improvements in life quality and social participation: more strongly than the general populace, they believed that CAVs would improve these, with only a small minority believing that CAVs would worsen life quality and social participation, as can be seen in Figure 24.

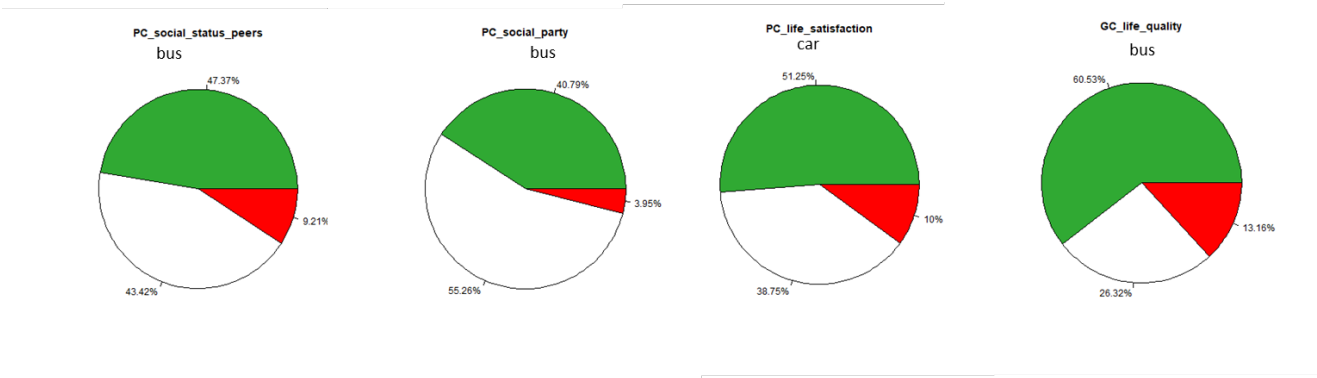


Figure 24. Car sharing users: Social and life satisfaction improvements.

Road safety was also a concern for car sharing users. Much more so than the general populace, two thirds or more of car sharing users thought that CAVs would improve road safety, in particular with regards to number of accidents (88%), as can be seen in Figure 25.

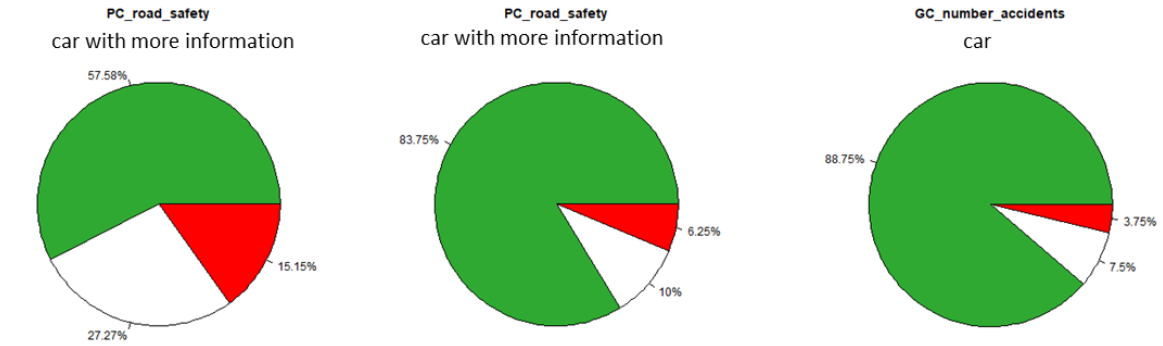


Figure 25. Car sharing users: Road safety improvements.

Finally, other areas of importance for car sharing users were the availability of parking spaces, driving pleasure, and trip cost, as can be seen in Figure 26. While they thought that parking spaces would be more widely available thanks to the introduction of CAVs, and the cost per trip would improve as well, the driving pleasure was estimated to worsen if CAVs were widely adopted.

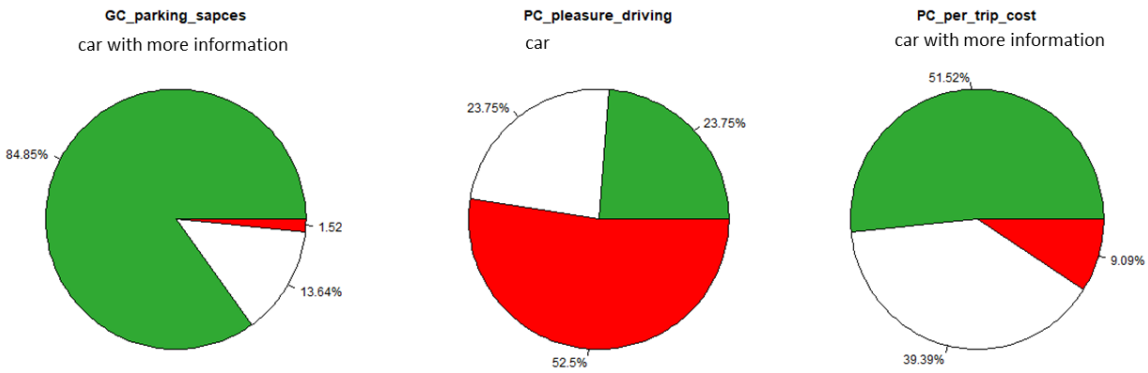


Figure 26. Car sharing users: Parking spaces, trip cost and pleasure driving anticipated consequences.

4.3 Current professional drivers

4.3.1 Most important consequences of CAV introduction, presented by solution

Figure 27, Figure 28 and Figure 29 show the distribution of the same consequences as discussed before, again presented for the three conditions, sorted by importance.

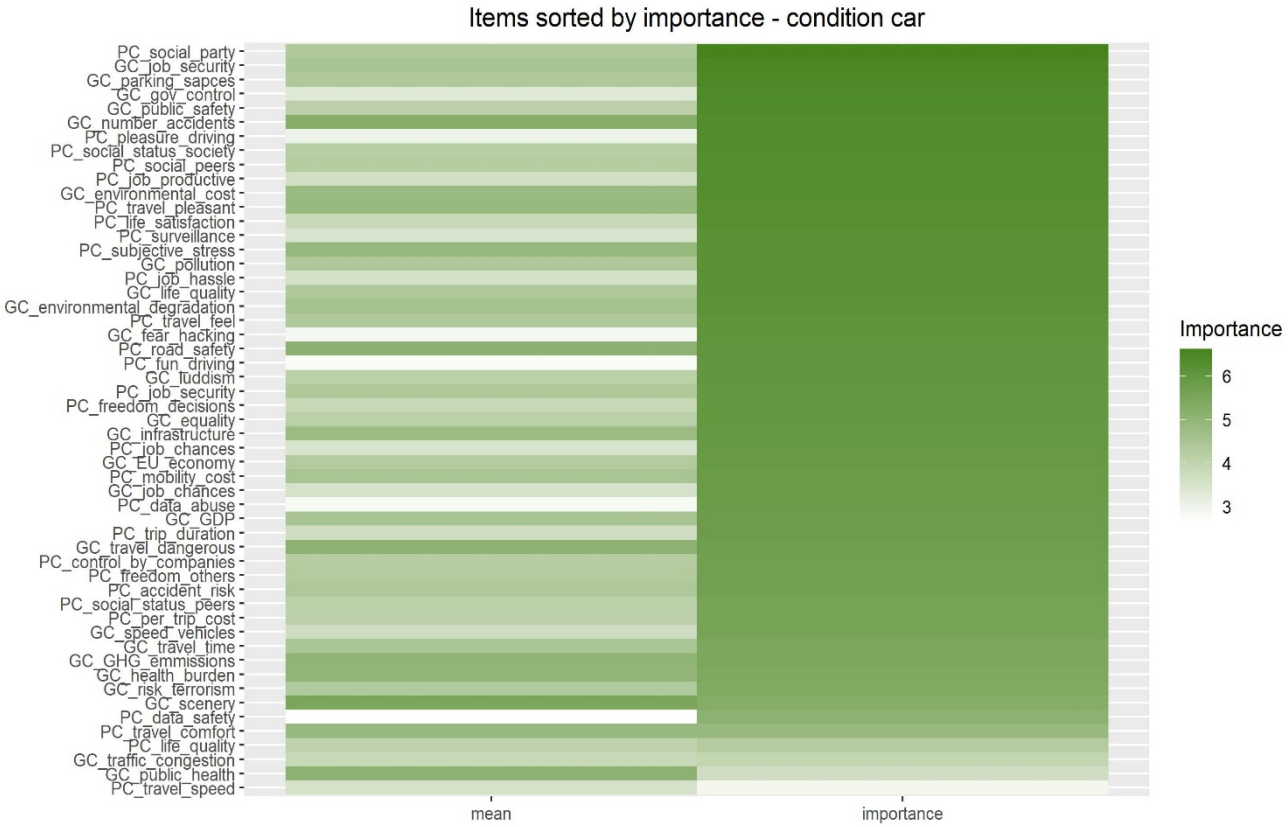


Figure 27. Consequences of autonomous car adoption condition 1.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

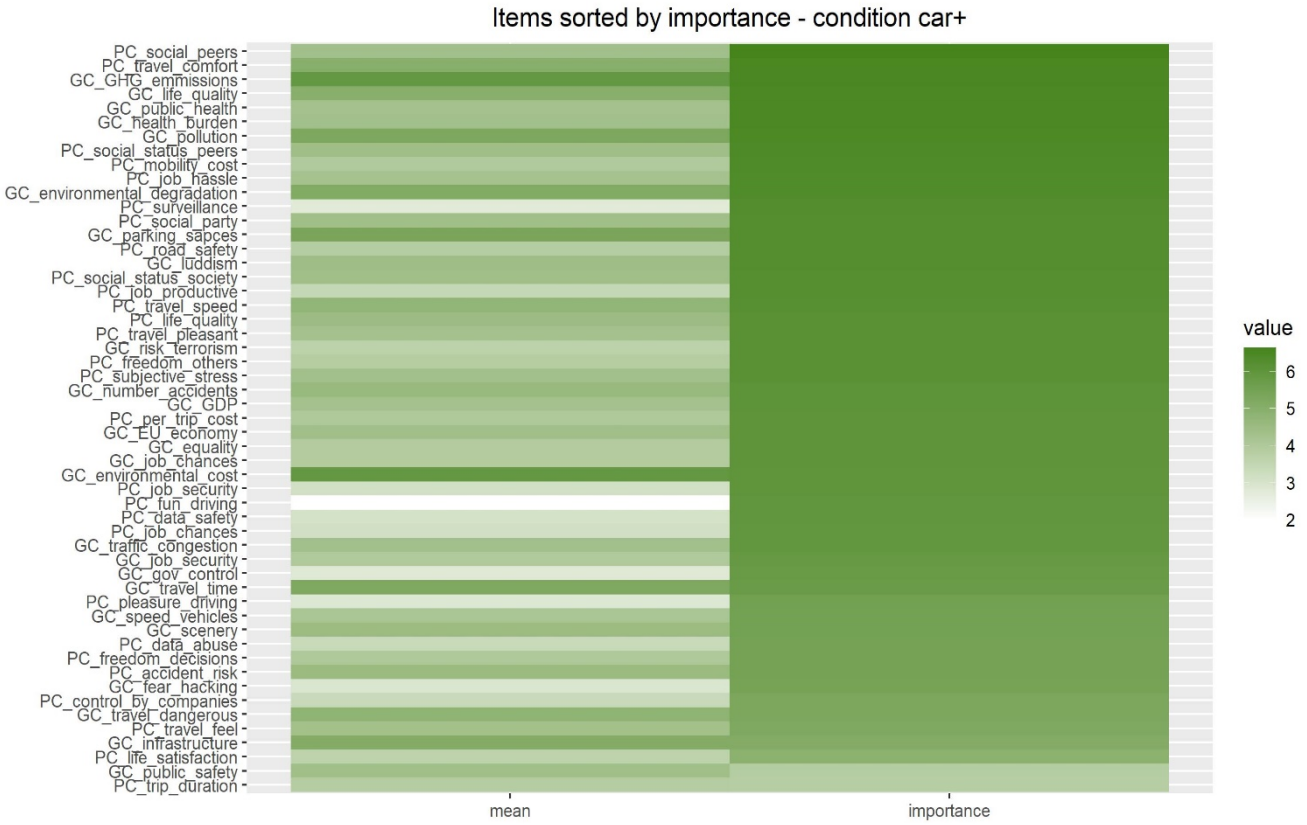


Figure 28. Consequences of autonomous car adoption condition 2.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

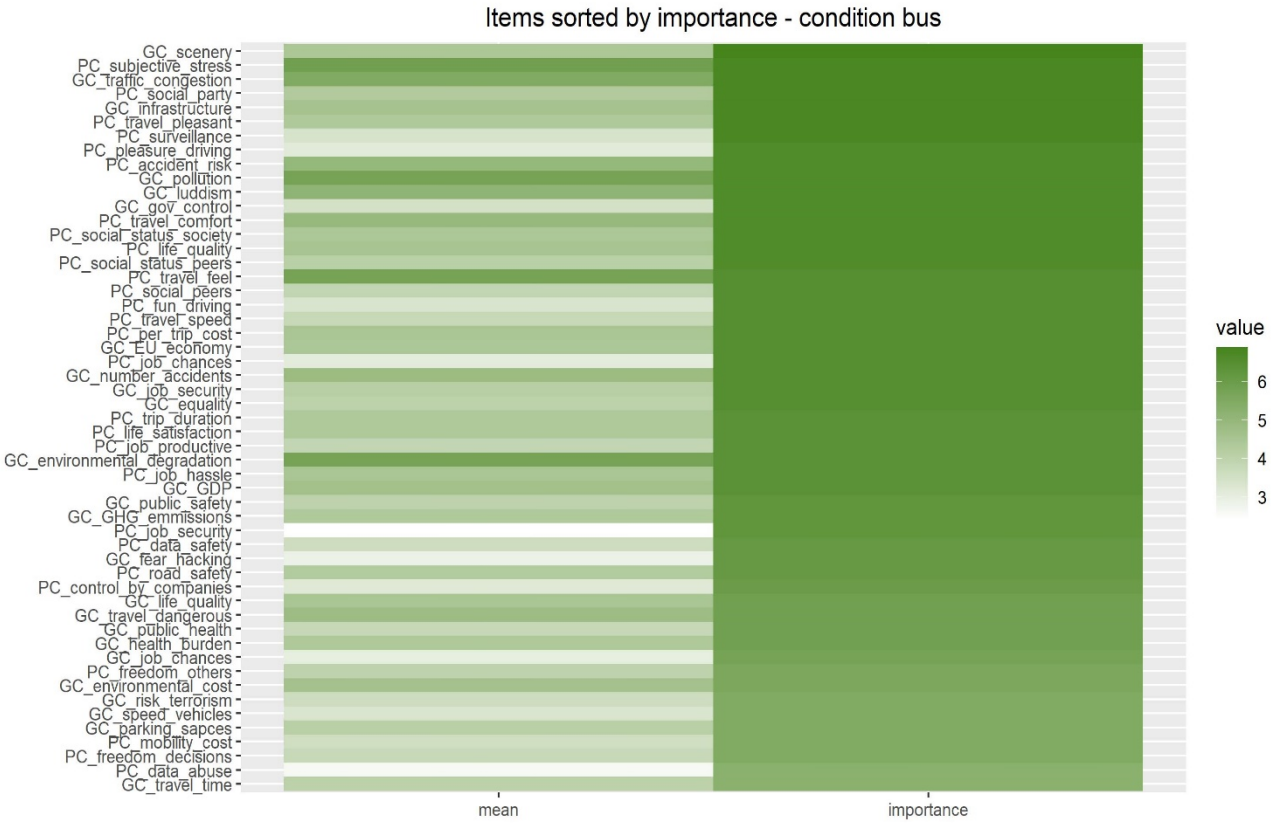


Figure 29. Consequences of autonomous bus adoption condition 3.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

For the professional drivers, the most important consequence from using CAVs regularly was the number of times they would be able to attend social events. Most of the respondents believed that they would attend as many as they do with conventional vehicles (61%), and 26% thought that using a CAV would allow them to socialize more (Figure_PC_social_party).

Next in importance were concerns about job security, when drivers imagined CAVs were adopted by large portions of the population. There, 38% of the respondents believed the mass adoption of CAVs would make people's jobs more secure, while 42% thought it will bring no significant changes (Figure GC_job_security).

If the divers receive additional information about the consequences of CAV adoption before responding, most important become the consequences from driving a CAV for the frequency of meeting their

friends and family. Most of the respondents (68%) believed CAVs would not affect the number of times they meet with friend and acquaintances, and 17% believe driving a CAV would help them do that more often (Figure PC_social_peers).

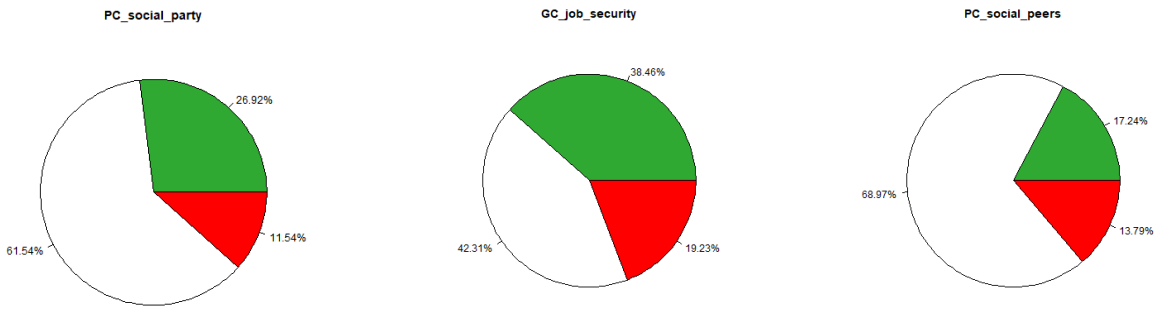


Figure 30. Professional drivers: top 3 most important consequences for cars.

When the driving professionals imagined that autonomous buses were adopted by large portions of the population, most important for them were scenery improvements: 75% of respondents thought that cities and landscapes would become more beautiful. (Figure GC_scenery). The subjective stress from driving an autonomous bus followed in importance, with 75% of the respondents believing that if they used CAVs regularly they would feel more relaxed (Figure PC_subjective_stress).

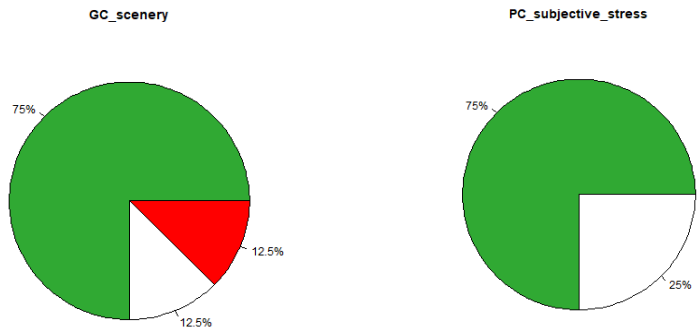


Figure 31. Professional drivers: top 2 most important consequences for busses.

4.3.2 Major improvement or worsening expected from CAV introduction

In this section, we will present an overview over major improvement or worsening expected from CAV introduction; for this purpose, only those Figure charts will be presented which showcase that over 40% of the population agree that an issue is positively or negatively impacted by CAVs.

As with the previous groups, safety was a major concern for professional drivers; a large percentage of professional drivers felt that CAVs would improve on the number of accidents in terms of cars, and lessen the risk of accidents for busses, as well as lessen the risk of wilful destruction of vehicles when it comes to busses (luddism). However, a small percentage of professional drivers also felt that potentially, CAVs could worsen the situation in terms of safety, as can be seen in Figure 32.

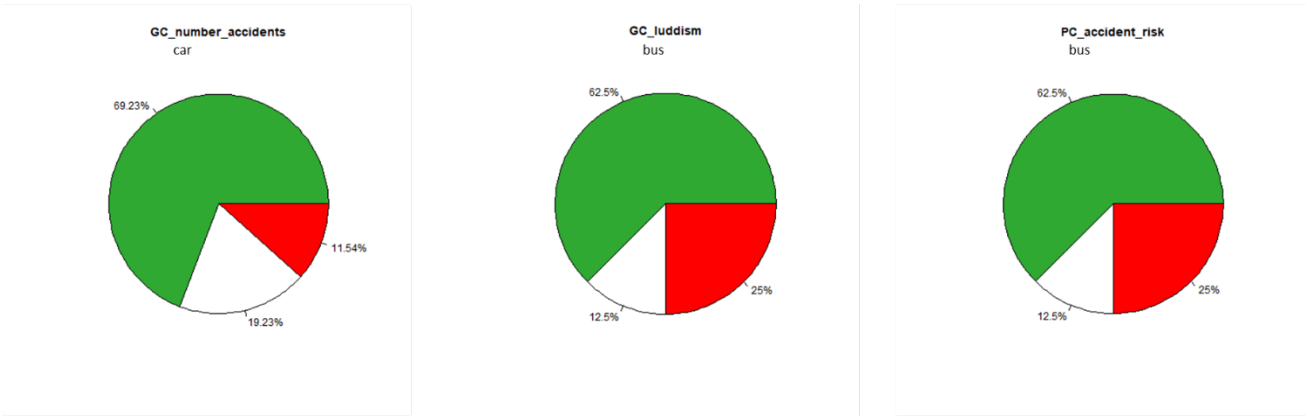


Figure 32. Professional drivers: Accident rate improvement.

In terms of pleasantness of driving, the majority of professional drivers agreed that in a bus context, CAVs (as busses) would improve travel, comfort, and even congestion, as can be seen in Figure 33. For cars, this was also the case for comfort. Less than 15% of people thought that CAVs would worsen the situation in terms of comfort.

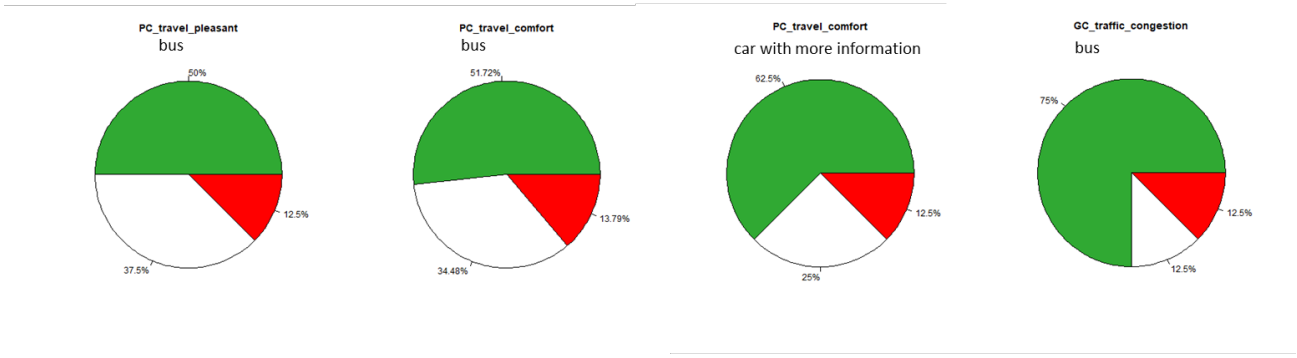


Figure 33. Professional drivers: Improvement of ease of travel and comfort

An important aspect for professional drivers was the impact of CAVs on the environment and infrastructure in general. Generally, the majority of these respondents answered that CAVs would be beneficial on an array of environmental issues, such as degradation, pollution and in general lower the cost to the environment. In terms of infrastructure, professional drivers thought CAVs would benefit the scenery, parking availability as well as driving infrastructure in general. However, there was also a quarter of respondents who were not so optimistic and rather predicted that CAVs would worsen the environmental degradation and pollution already in existence; this was particularly the case of the condition in which participants received some information regarding the consequences of CAV introduction in the first place.

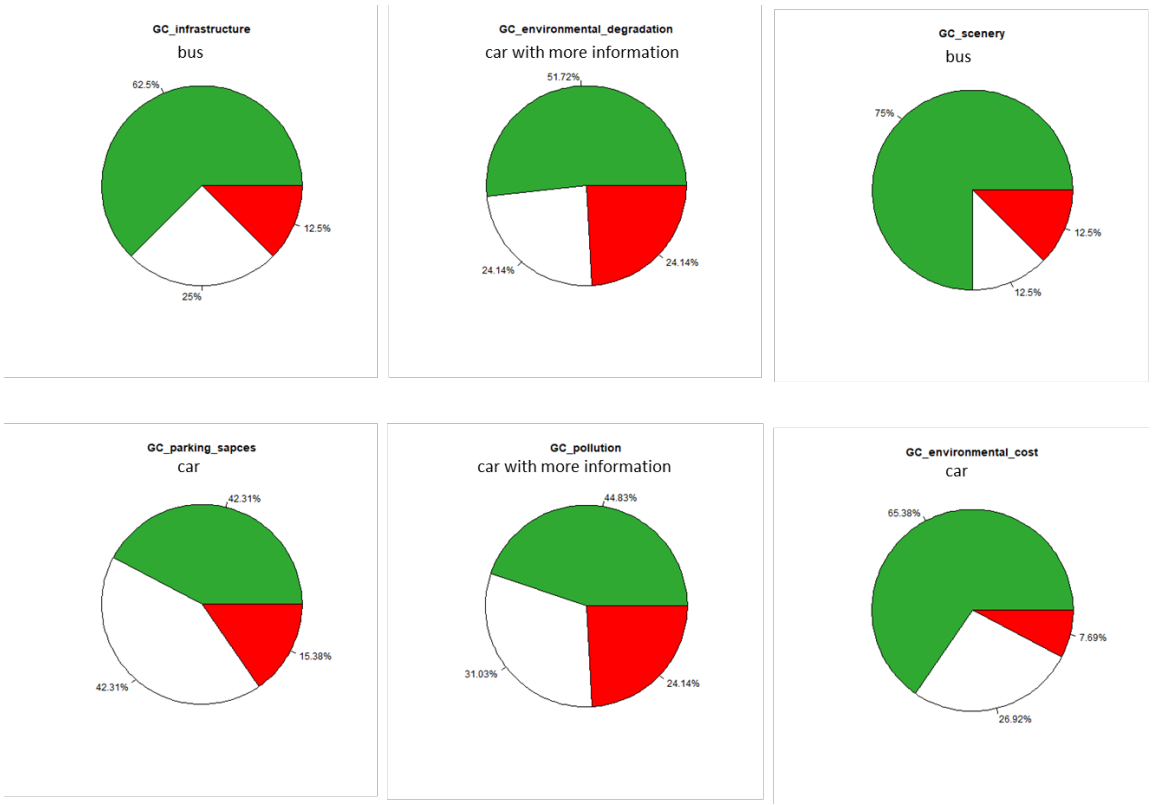


Figure 34. Professional drivers: Expected positive effects on infrastructure, environmental pollution and scenery.

4.4 Pedestrians/bicycle users and public transport users

4.4.1 Most important consequences of CAV introduction, presented by solution

Figure 35, Figure 36 and Figure 37 show consequences as discussed before, presented for the three conditions, sorted by importance, for road co-users as a subset of the panel representative sample. This includes all persons that do not own a car of any kind and are instead pedestrians, cyclists or public transportation users for the majority of their travels.

Figure 35. Consequences of autonomous car adoption condition 1.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

Figure 36. Consequences of autonomous car adoption condition 2.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

Figure 37. Consequences of autonomous bus adoption condition 3.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

For the participants who do not use private motor vehicles for transport, the most important consequence from driving CAVs regularly was related to satisfaction with life. More than half of the respondents (55%) believed that driving a CAV on regular basis would make them feel more satisfied with life, while only 11% thought the opposite (Figure PC life satisfaction). Next in importance came the impact from mass autonomous car adoption on the environment, in particular pollution. 50% of the respondents thought that if large sections of the population used CAVs, the environment would be less polluted, while only 16.67% believed the opposite (Figure GC_pollution).

For participants that received additional information about the consequences from CAV adoption, their experiences of stress and relaxation during CAV became most important. Almost half of the respondents (46%) believed that using a CAV regularly would make their driving experience more relaxed, while 25% thought the opposite (Figure PC subjective_stress).

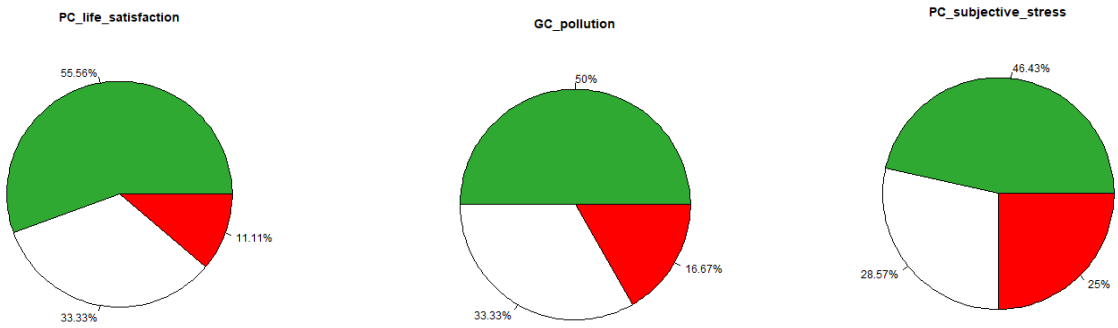


Figure 38. Pedestrians: top 3 most important consequences for cars.

When the respondents imagined that they used autonomous buses regularly, most important became concerned about their social life: 54% thought they would attend as many social events as previously, while 30% believed riding on an autonomous bus could be detrimental to their social life (Figure PC_social_party).
The opinion of others followed in importance. While roughly half the respondents (54%) believed that riding on an autonomous bus would not change how others thought of them, more than 30% thought that their acquaintances would not approve such a choice of transportation (Figure PC_social_status_peers).

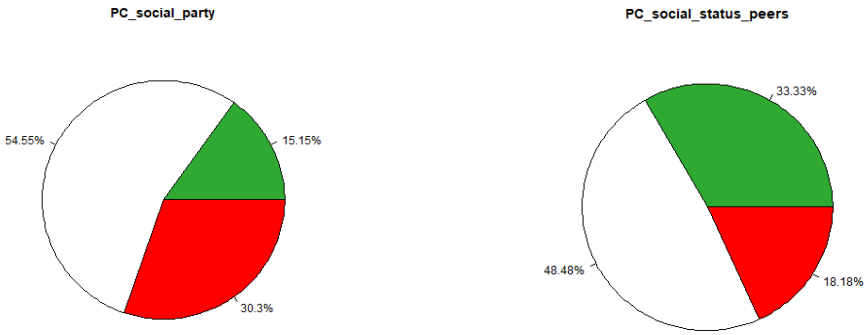


Figure 39. Pedestrians: top 2 most important consequences for busses.

4.4.2 Major improvement or worsening expected from CAV introduction

In this section, we will present an overview over major improvement or worsening expected from CAV introduction; for this purpose, only those

Figure charts will be presented which showcase that over 30% of the population agree that an issue is positively or negatively impacted by CAVs.
A particularly important consequence of CAV introduction for pedestrians is the improvement of life quality and reduction of subjective stress that CAVs can impart; as can be seen in Figure 40, the majority of respondents here agreed that CAVs would indeed improve the situation, though especially for subjective stress, there was also a quarter of the pedestrian respondents that disagreed, and felt that CAVs might make it worse.

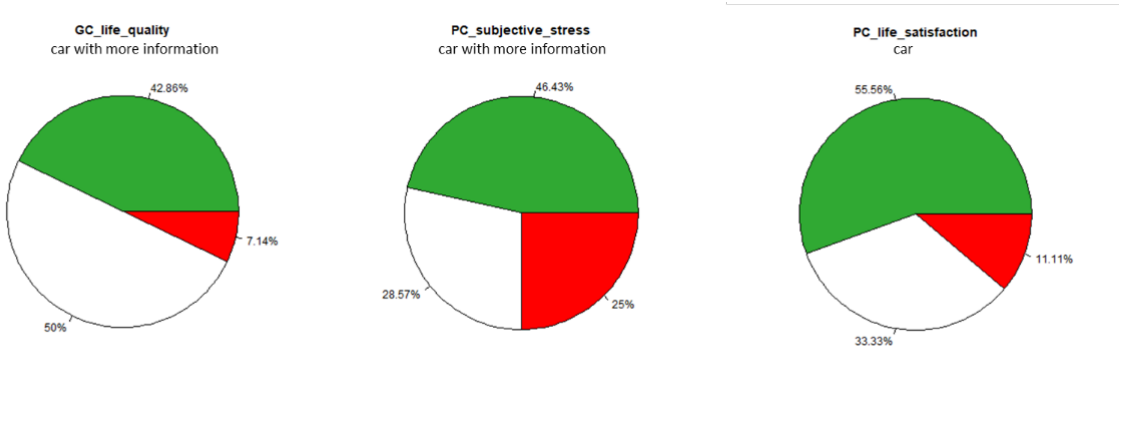


Figure 40. Pedestrians: Life quality and stress improvements.

Safety on the road was also an important issue here, as Figure 41 showcases that road co-users felt that CAVs could bring an improvement to number of accidents and road safety; however, it seems that for this population, this is a much more polarizing issue, as almost a third also believed that CAVs might make the situation even worse. A similar picture is perceived from environmental pollution, for both cars and busses, while a majority of this subpopulation agreed that CAVs might improve the effect of vehicles on the environment, a large section also thought that matters will be made worse, see Figure 42.

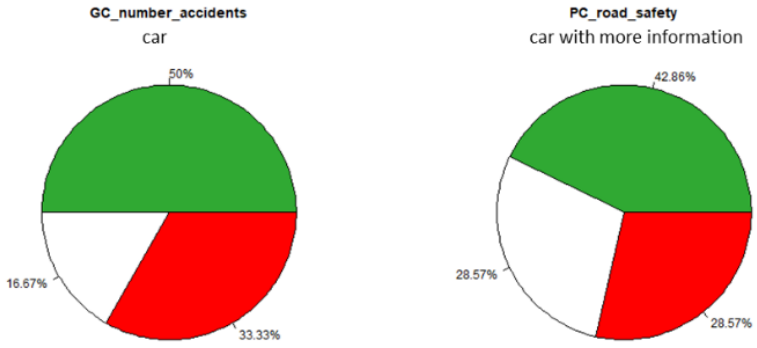


Figure 41. Pedestrians: polarized opinion on accident number and road safety.

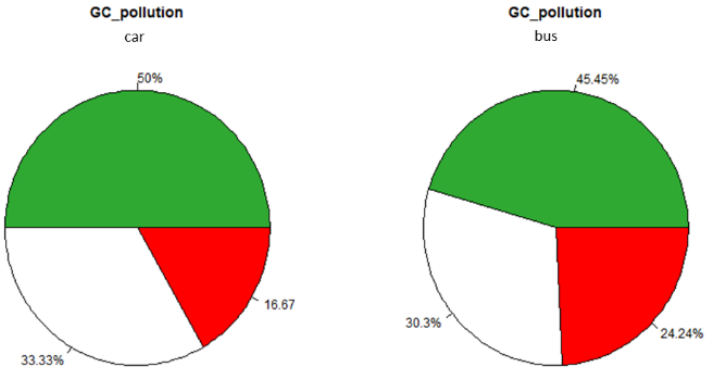


Figure 42. Pedestrians: Improvements on pollution.

Figure 43 refers to participation in everyday out of home life, both in terms of job security, as well as in terms of social party attendance, meeting with peers, and the status that one obtains from these. Here, the respondents felt more inclined to believe that CAVs would improve the situation, however, especially for meeting peers, many also believed that the status quo would be kept constant, or even worsen for some.

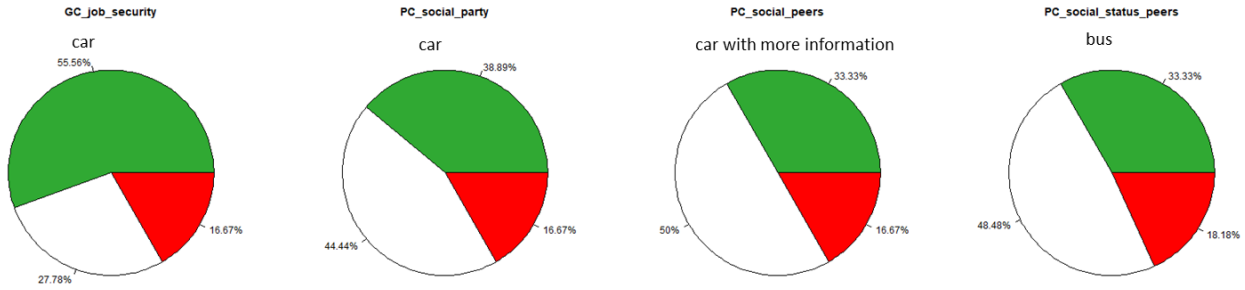


Figure 43. Pedestrians: Positive impact on job and social related consequences.

4.5 Visually impaired population

4.5.1 Most important consequences of CAV introduction, presented by solution

Figure 44, Figure 45, and Figure 46 show the distribution of consequences as discussed before, again presented for the three conditions, sorted by importance.

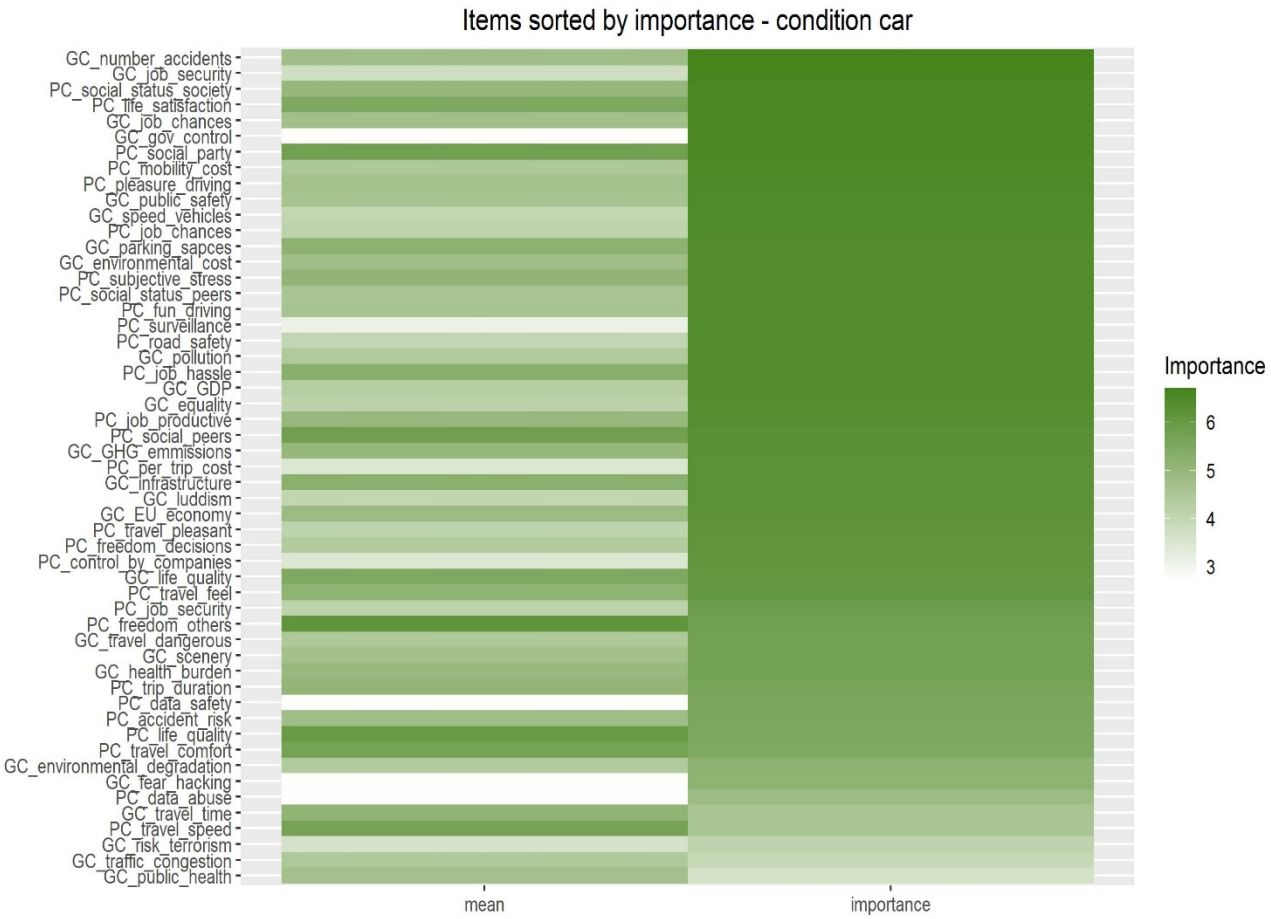


Figure 44. Consequences of autonomous car adoption condition 1.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

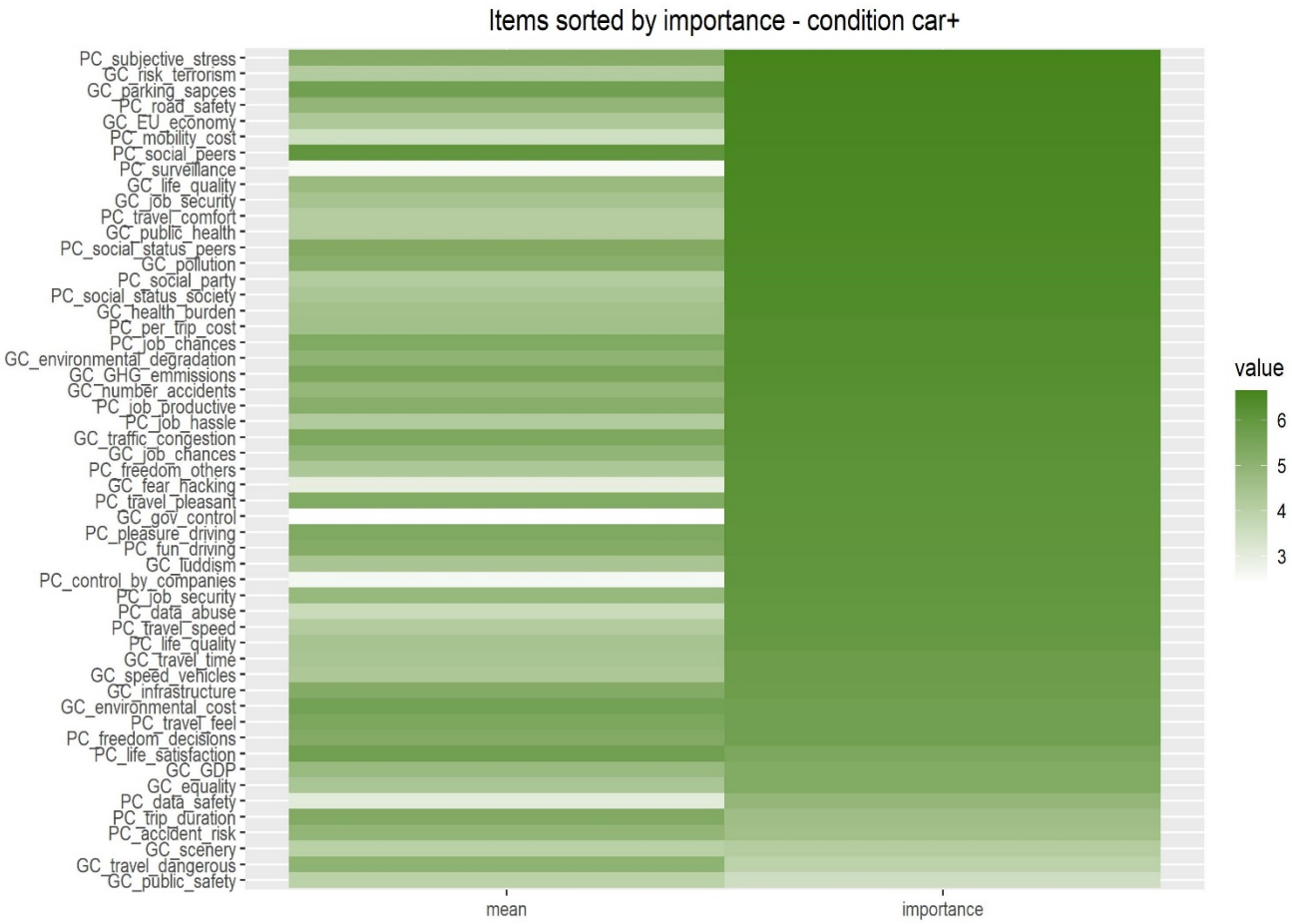


Figure 45. Consequences of autonomous car adoption condition 2.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

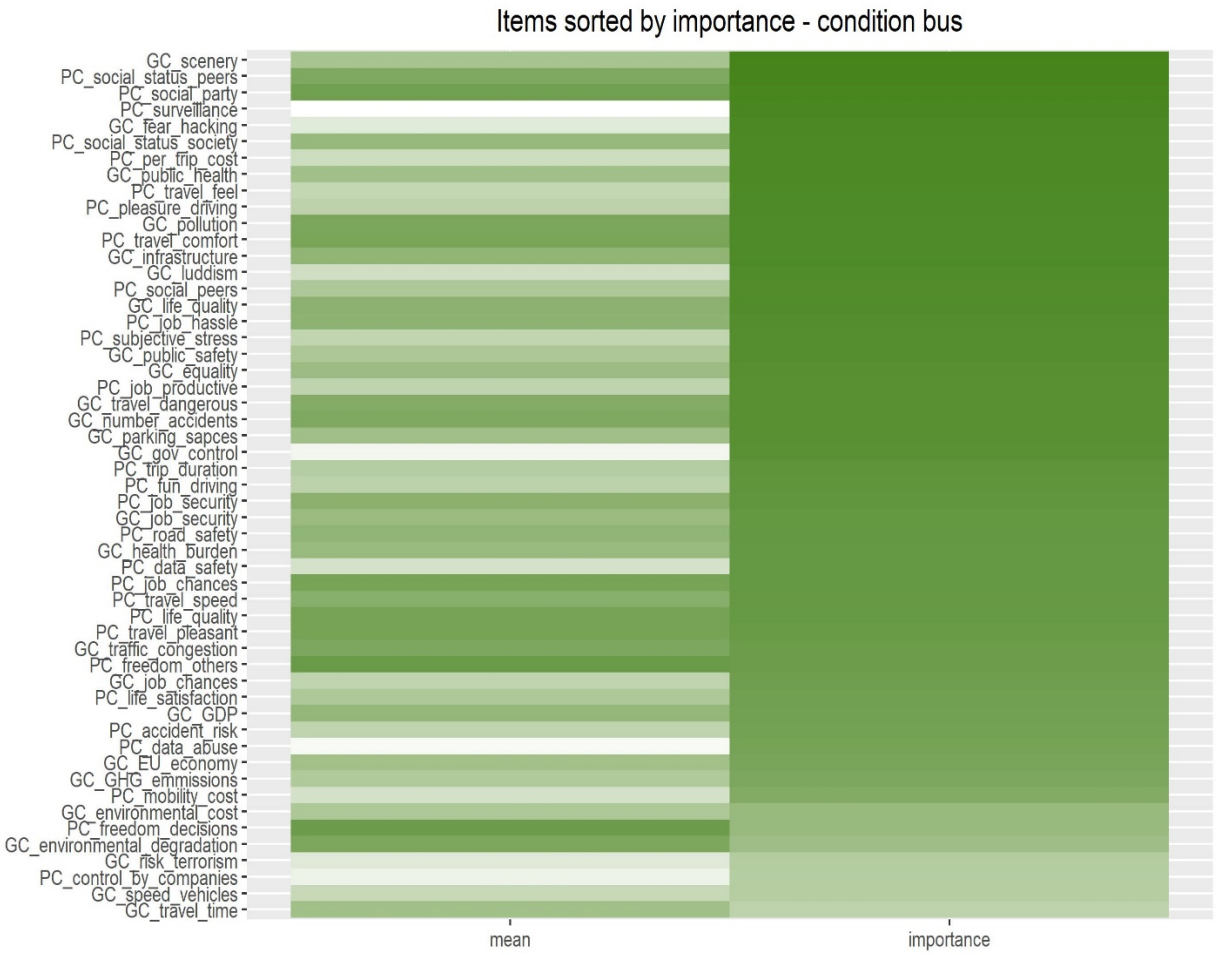


Figure 46. Consequences of autonomous bus adoption condition 3.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

For the visually impaired respondents, the most important issue was the number of accidents on the road as a consequence from mass CAV adoption. Overall, 70% of the respondents believed accidents would be less common once large portions of the population started using CAVs. Next in importance were concerns about the security of jobs in general, where the majority of the visually impaired respondents (70%) believed that the mass adoption of CAVs would make jobs more secure. (Figure PC_ job_security)

If the participants received additional information about the consequences from CAV adoption, their experiences of stress and relaxation during

driving became most important. 66% of the respondents believed that using a CAV regularly would make their driving experience more relaxed, while only 19% thought the opposite. (Figure PC_subj_stress).

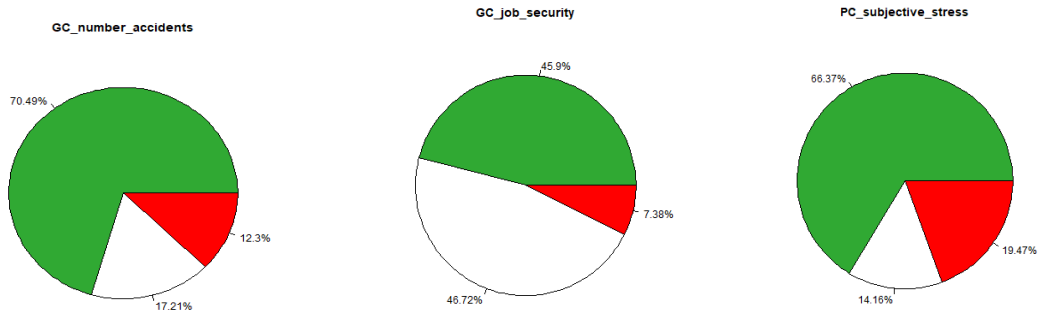


Figure 47. Visually impaired population: top 3 most important items for cars.

When the participants imagined that autonomous buses would be adopted by large portions of the population, most important for them were the infrastructure of the city and landscape. For this issue, opinions are divided: 50% of the respondents thought that cities and landscapes will become more beautiful, while 40% believed mass CAV adoption would have no impact on the aesthetic qualities of their surroundings (Figure GC_scenery).

The opinion of others as a consequence from using an autonomous bus regularly follows in importance, where more than half of the respondents (55%) thought their friends and acquaintances would find using a CAV good, and 33% believed others would think better of them (Figure PC_social status_peers).

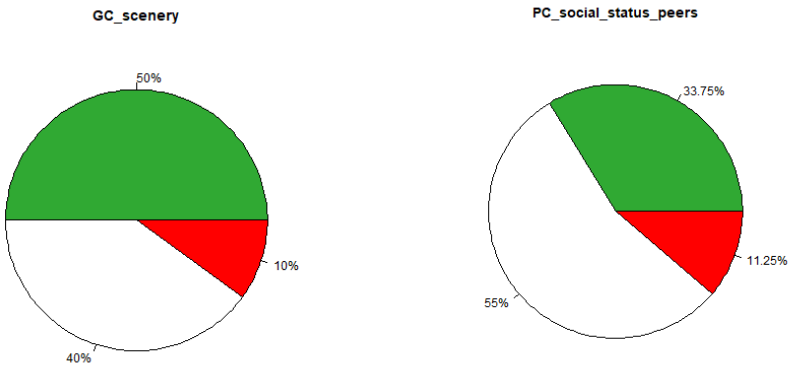


Figure 48. Visually impaired population: top 2 most important items for busses.

4.5.2 Major improvement or worsening expected from CAV introduction

In this section, we will present an overview over major improvement or worsening expected from CAV introduction; for this purpose, only those Figure charts will be presented which showcase that over 40% of the population agree that an issue is positively or negatively impacted by CAVs.

Similar to the other subgroups, safety was also a major concern for visually impaired people – in particular, as can be seen in Figure 49, number of accidents and road safety were mentioned to benefit from CAV introduction by a majority of the respondents. However, 10-20% of the responds also felt that CAVs might worsen safety.

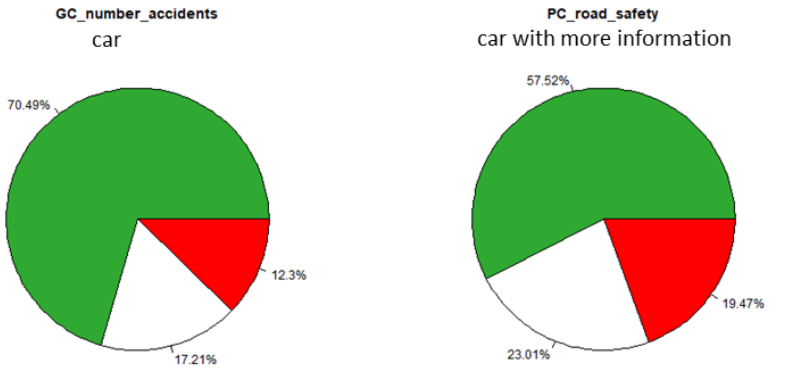
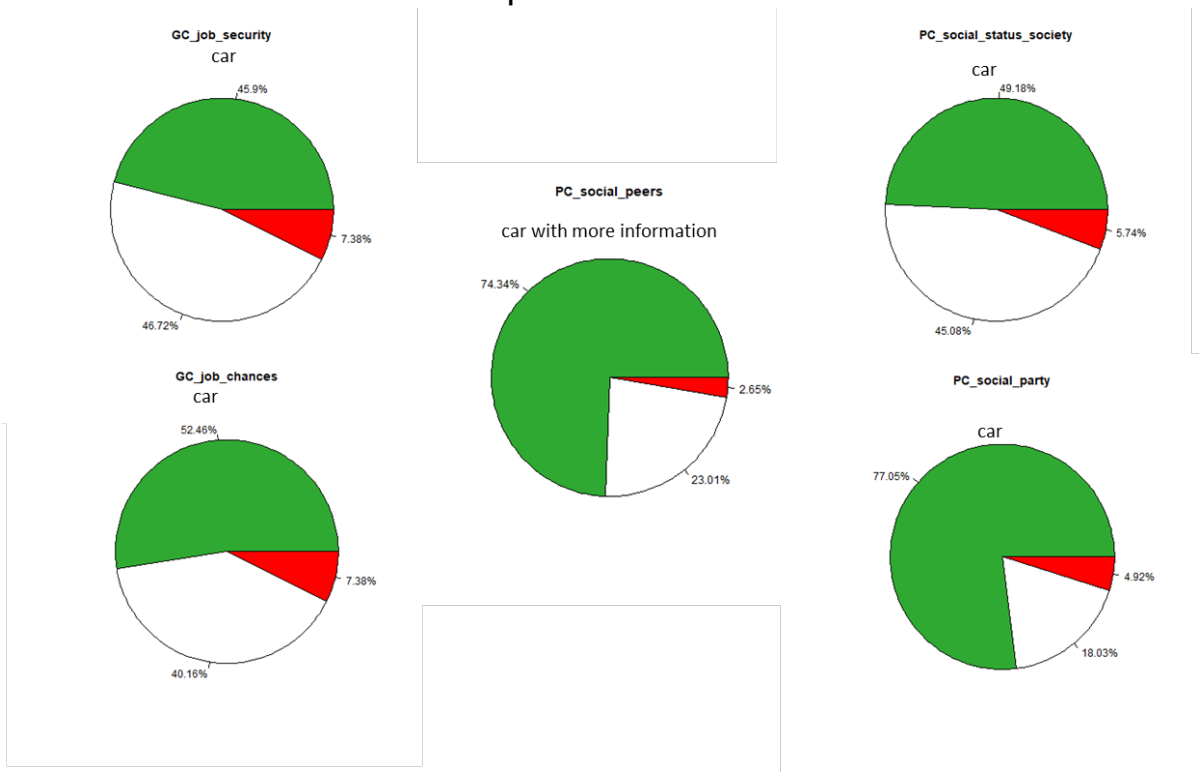


Figure 49. Visually impaired population: improvements for accidents and road safety.

Just as for road co-users, visually impaired people placed a high importance on participation in social life and the job environment. In particular for this subgroup, it seems that high hopes were placed in CAVs to improve this area of life, with cars as the vehicle that are expected to bring about the most change; maybe expected, busses were not considered to have such an impact.



showcases the vast improvement that were expected from CAVs in job security, job changes, as well as social party and peer attendance, and even social status. Only a very small minority believed that CAVs might worsen the situation.

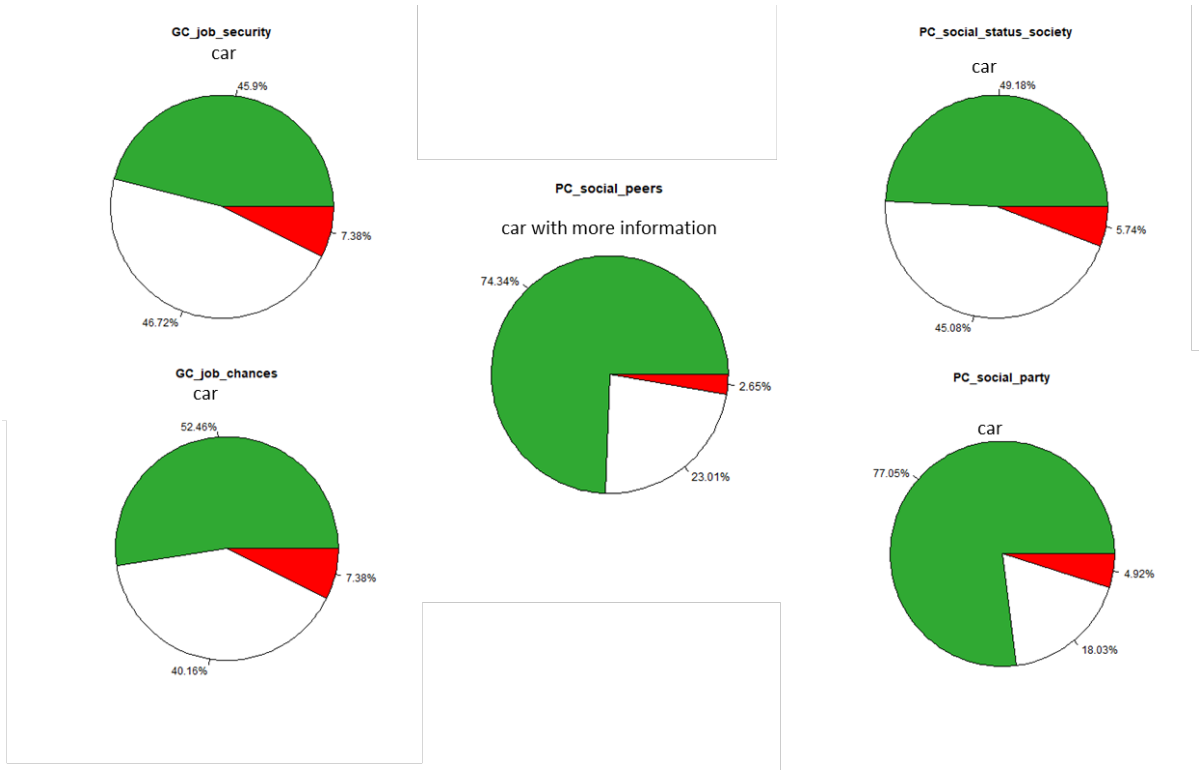


Figure 50. Visually impaired population: positive expected consequences of job-related areas of life and social life and social status.

More pronouncedly than other subgroups, visually impaired people felt that the introduction of CAVs might have a negative impact on people's privacy (over 75% on average, as compared to 50-55% from the panel population. As can be seen in Figure 51, government control, surveillance as well as hacking were all expected to get worse, for both cars and busses.

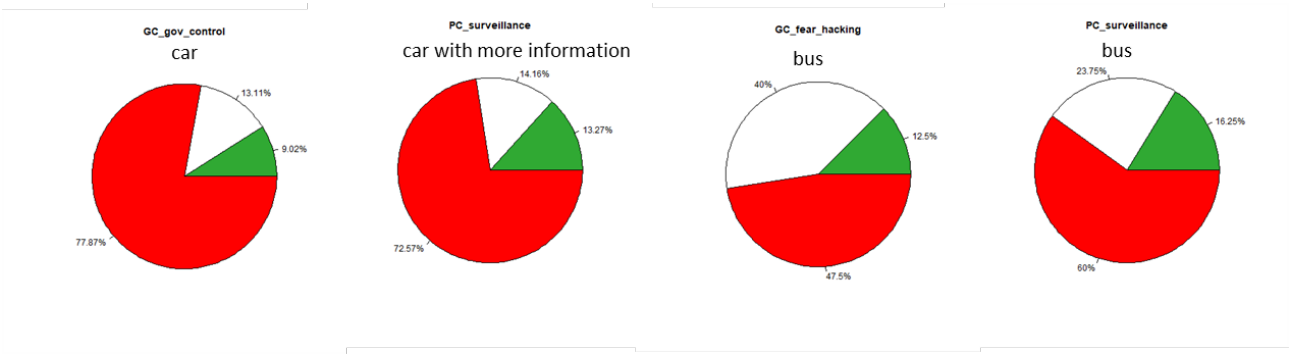


Figure 51. Visually impaired population: negative expected consequences on privacy.

As the only subgroup, visually impaired people felt that CAV introduction would affect the cost of mobility, as can be seen in Figure 52 –

interestingly, for cars, the cost of mobility was expected to worsen, whereas for the bus, the per trip cost was expected to improve.

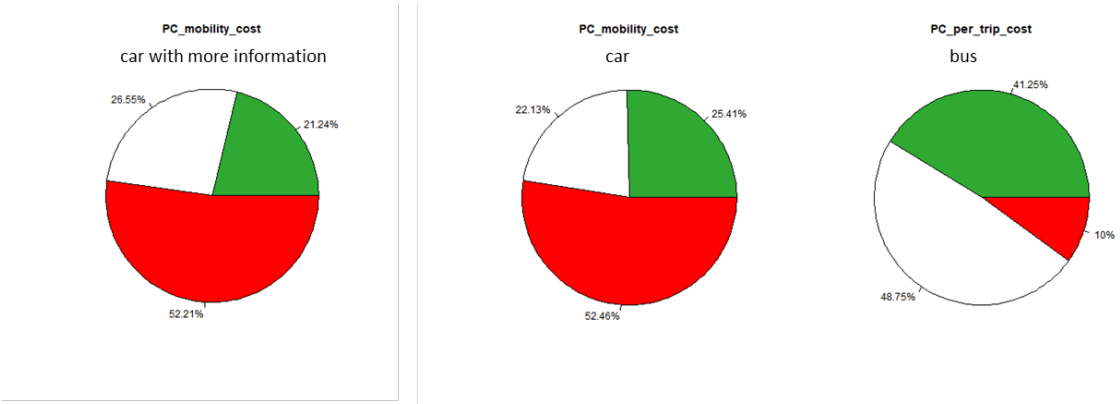


Figure 52. Visually impaired population: negative expected consequences on mobility cost for cars, and positive on mobility cost for busses.

Finally, from Figure 53, it can be observed that visually impaired people felt that CAVs would improve a few other areas of life, such as public health and public safety, as well as overall life satisfaction and life quality. Only a small percentage of people felt that these aspects would be worsened through CAV introduction.

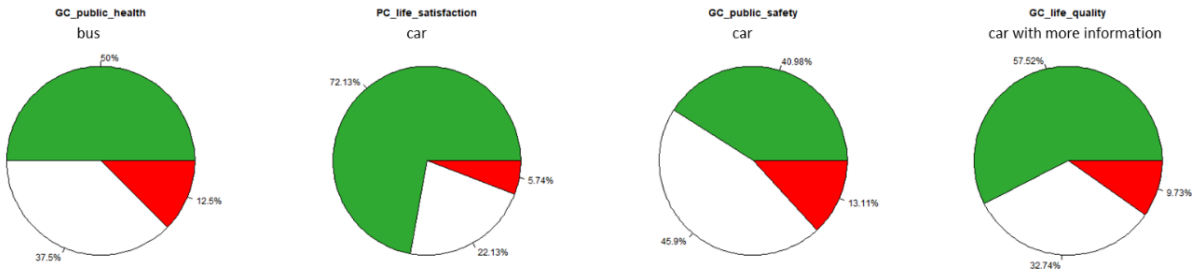


Figure 53. Visually impaired population: expected improvements in public health, life satisfaction/quality and public safety.

4.6 German population

4.6.1 Most important consequences of CAV introduction, presented by solution

Figure 54, Figure 55 and Figure 56 show the distribution of the same items as discussed before, again presented for the three conditions, sorted by importance.

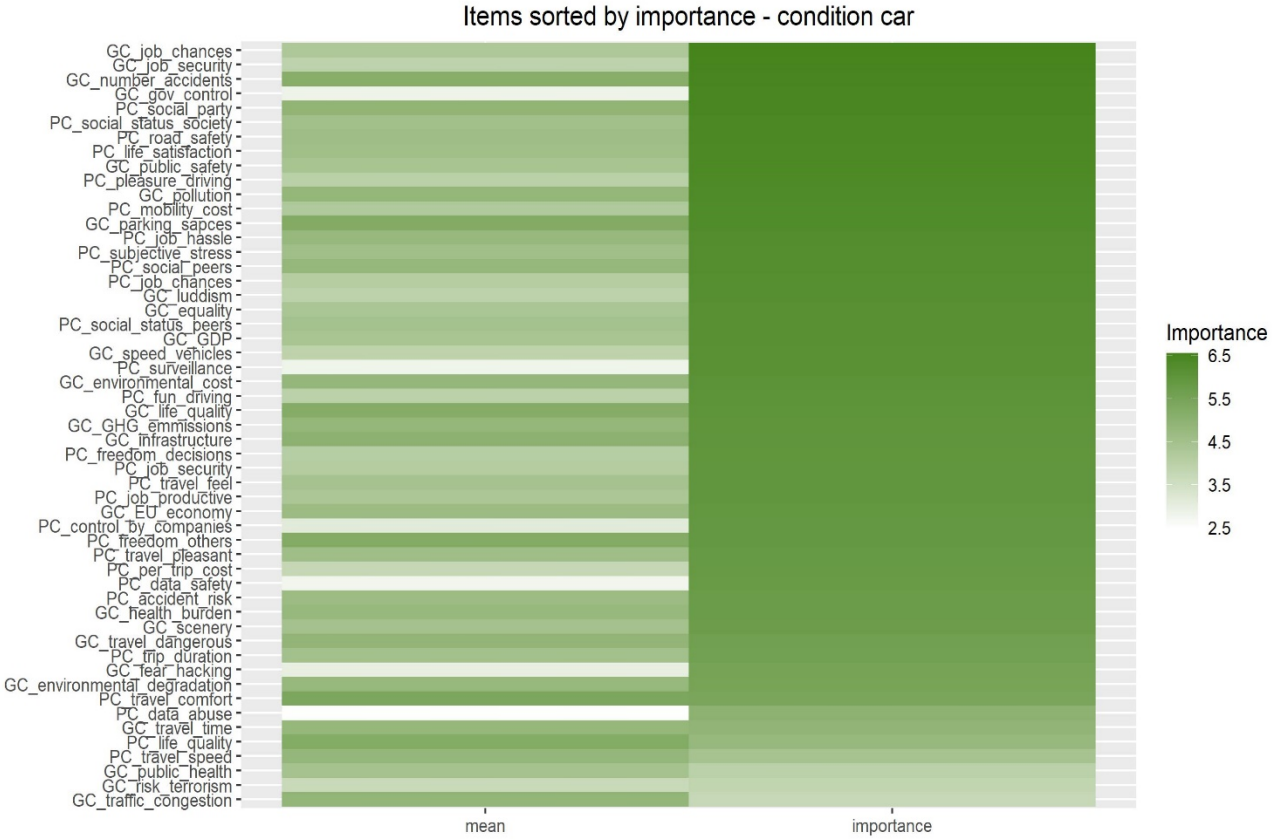


Figure 54. Consequences of autonomous car adoption condition 1.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

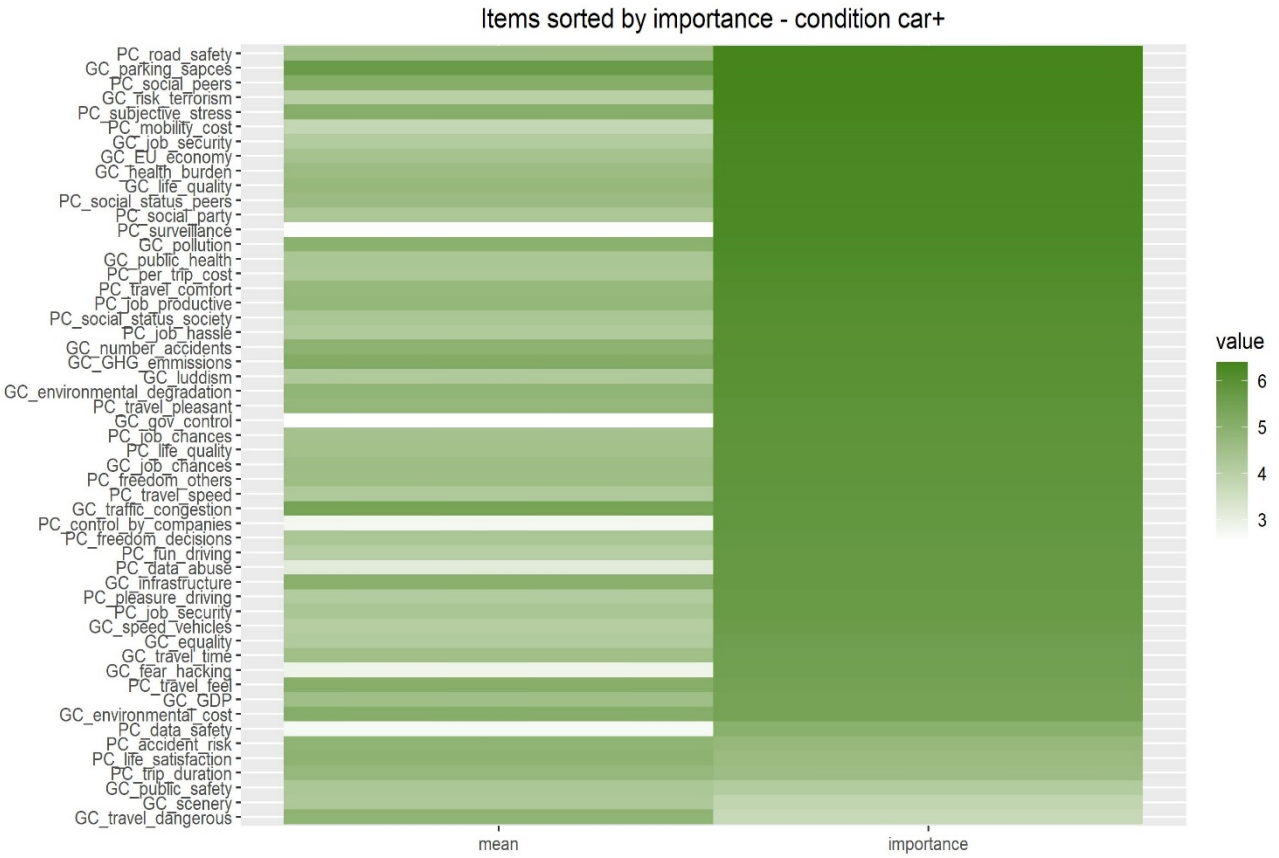


Figure 55. Consequences of autonomous car adoption condition 2.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

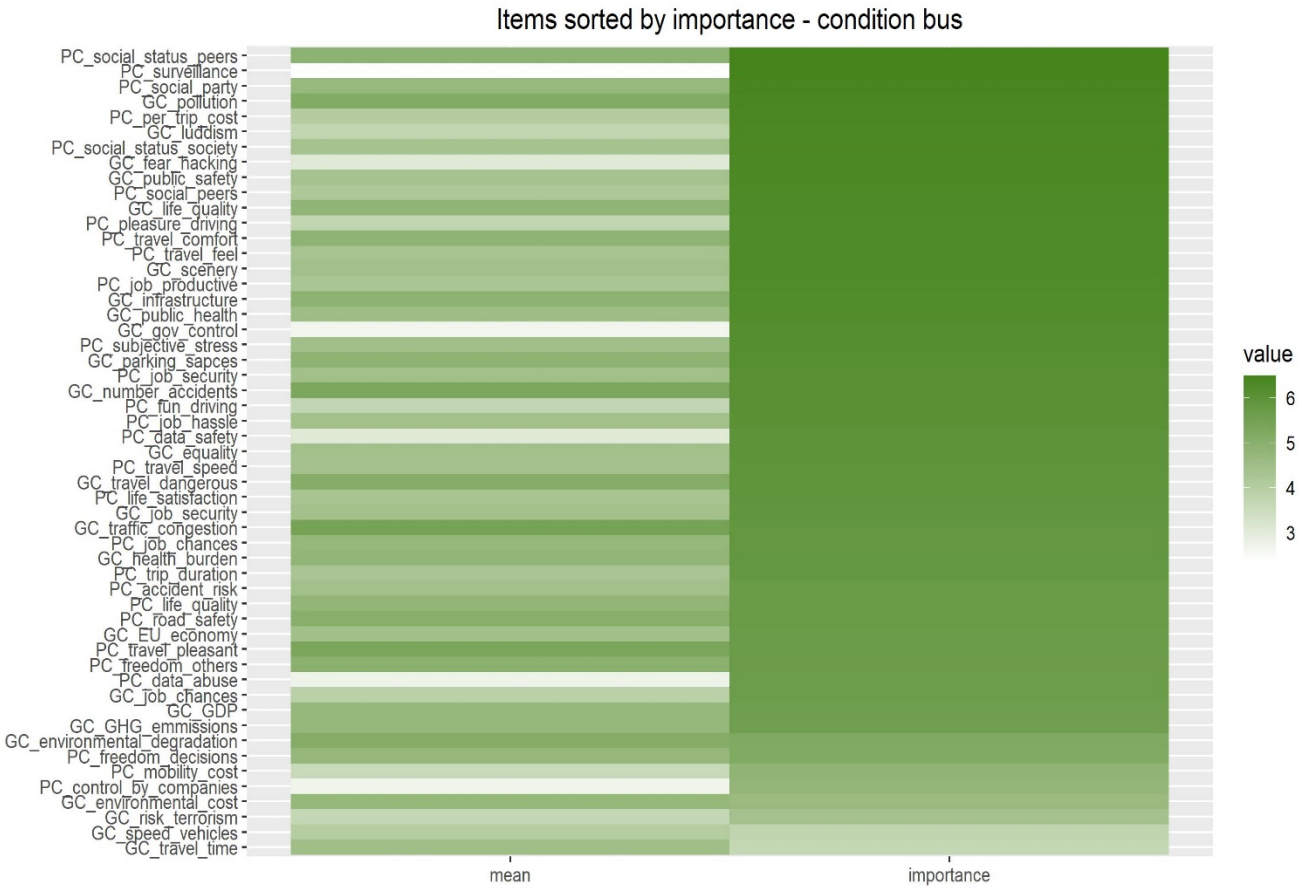


Figure 56. Consequences of autonomous bus adoption condition 3.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

For the German respondents, the most important issue was the number of opportunities on the job market as a consequence from the mass adoption of CAVs. Opinions were divided: while 37% of the German respondents thought that CAVs would bring more job opportunities on the market, 53% believed the situation wouldn't change. (Figure CG_job_chances)

Next in importance were concerns about people's job security if CAVs were adopted by large portions of the population. The percentages were almost identical: 34% of the respondent thought that jobs would be more secure if CAVs are adopted *en masse*, while only 11% believed the situation would get worse. (Figure GC_job_security)

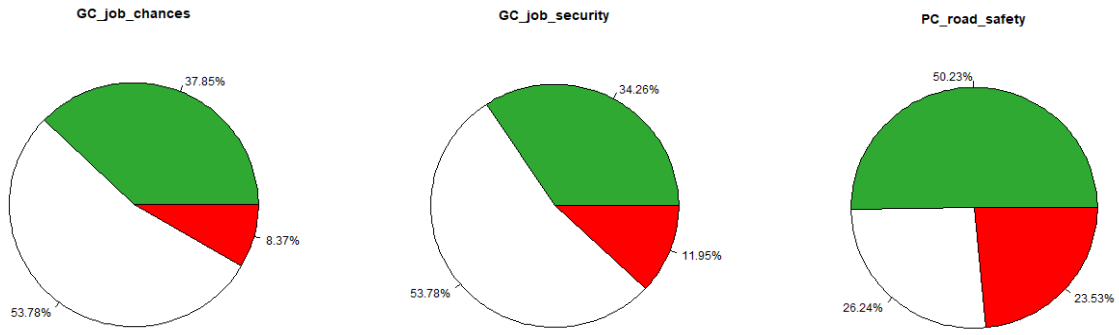


Figure 57. German population: top 3 most important items for cars.

If the participants received additional information about the consequences of CAV adoption before responding, most important became the personal concerns for road safety. The majority of the participants (50%) thought that using a CAV regularly would make travelling safer for them, while 23% believed the opposite. (Figure PC_road_safety).
The opinion of others became most important, if the respondents imagined that they used autonomous buses regularly. Half of the participants believed CAVs would not make others think better or worse of them (50%), and 37% thought their friends and acquaintances would approve if they used a CAV (Figure PC_social_status_peers)
The security of the participants' personal data followed in importance, where 66% of the respondents believed that monitoring by third parties (e.g. companies, government agencies) would become more frequent if they used autonomous buses on a regular basis (Figure PC_surveillance).

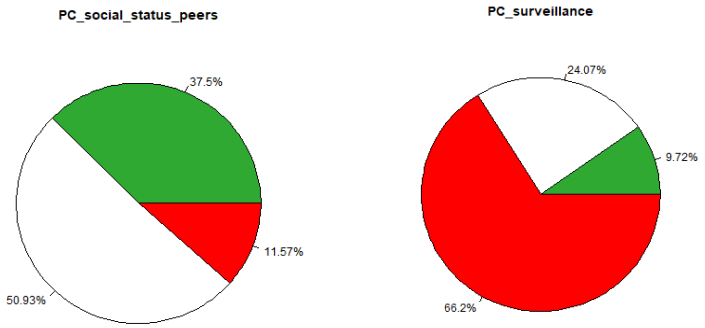


Figure 58. German population: top 2 most important items for busses.

4.6.2 Major improvement or worsening expected from CAV introduction

In this section, we will present an overview over major improvement or worsening expected from CAV introduction; for this purpose, only those Figure charts will be presented which showcase that over 40% of the population agree that an issue is positively or negatively impacted by CAVs.
Three major areas are identified where German respondents felt CAVs would introduce improvement and worsening: as can be seen in Figure 59, privacy was a major concern, and most respondents felt that CAVs would worsen the current situation; an increase in government control for usage of autonomous cars, and hacking and surveillance in autonomous busses were expected.

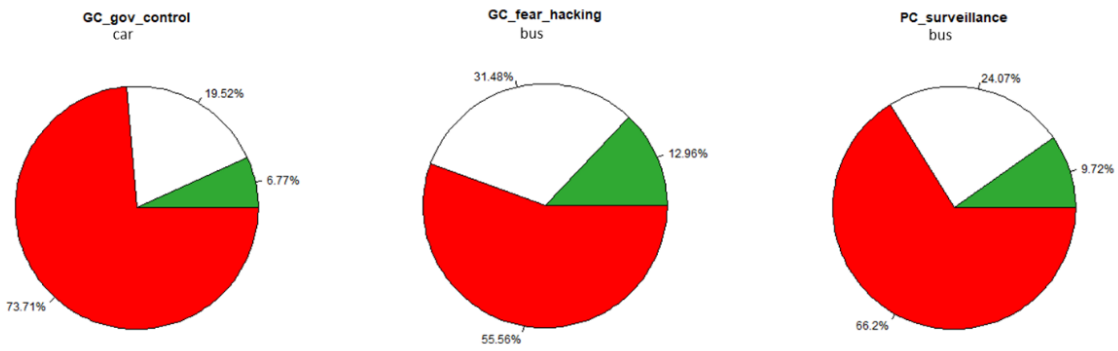


Figure 59. German population: negative expected consequences for privacy.

Figure 60 presents expectations towards a variety of areas of life that have to do with social integration, life quality and well-being – here, the majority of German respondents agreed that CAVs would bring improvement, in particular in the form of cars; only for subjective stress, a quarter of respondents disagreed and felt that CAVs might instead worsen the situation.

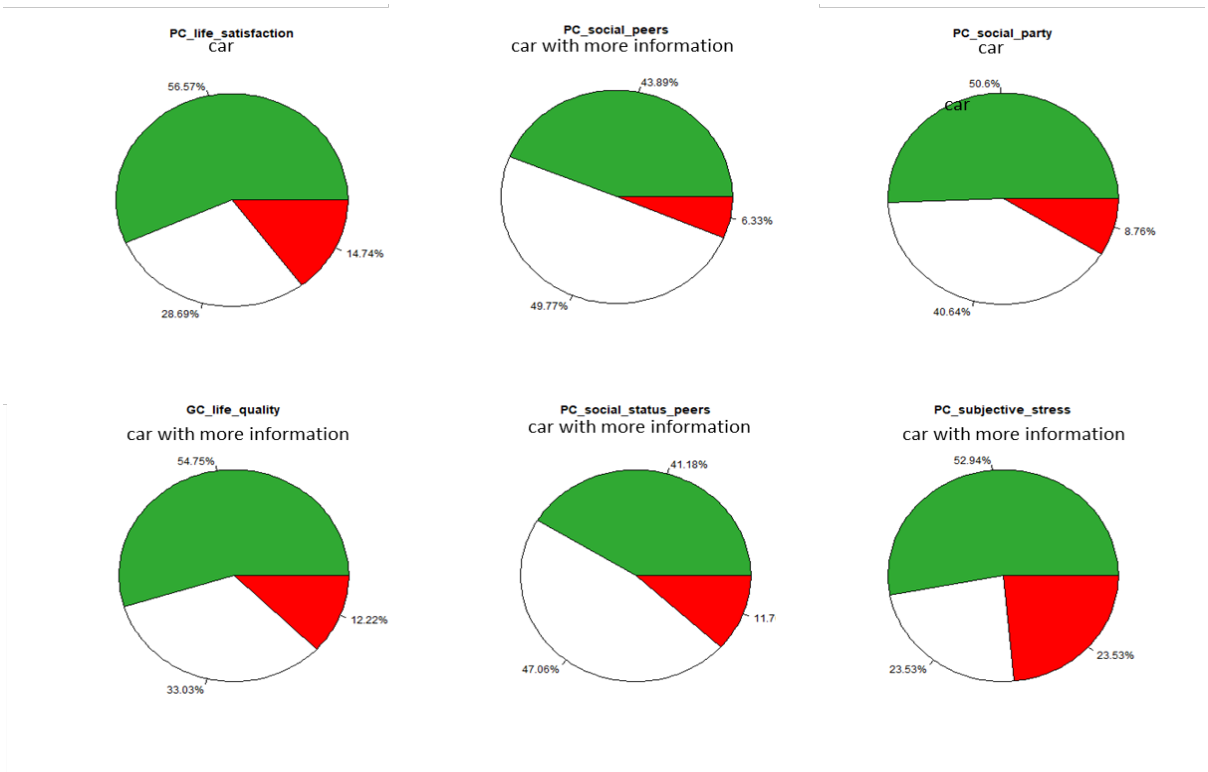


Figure 60. German population: positive expected consequences for life satisfaction/quality, stress, and social life.

Finally, for the area of safety on the road, German respondents felt that here also, CAVs would enact an improvement, as can be seen in **Error! Reference source not found.**.
Error! Reference source not found. However, the image is somewhat ambivalent, as some section of the population also felt that they might instead worsen the situation, in particular when it came to road safety in general.

4.7 French population

4.7.1 Most important consequences of CAV introduction, presented by solution

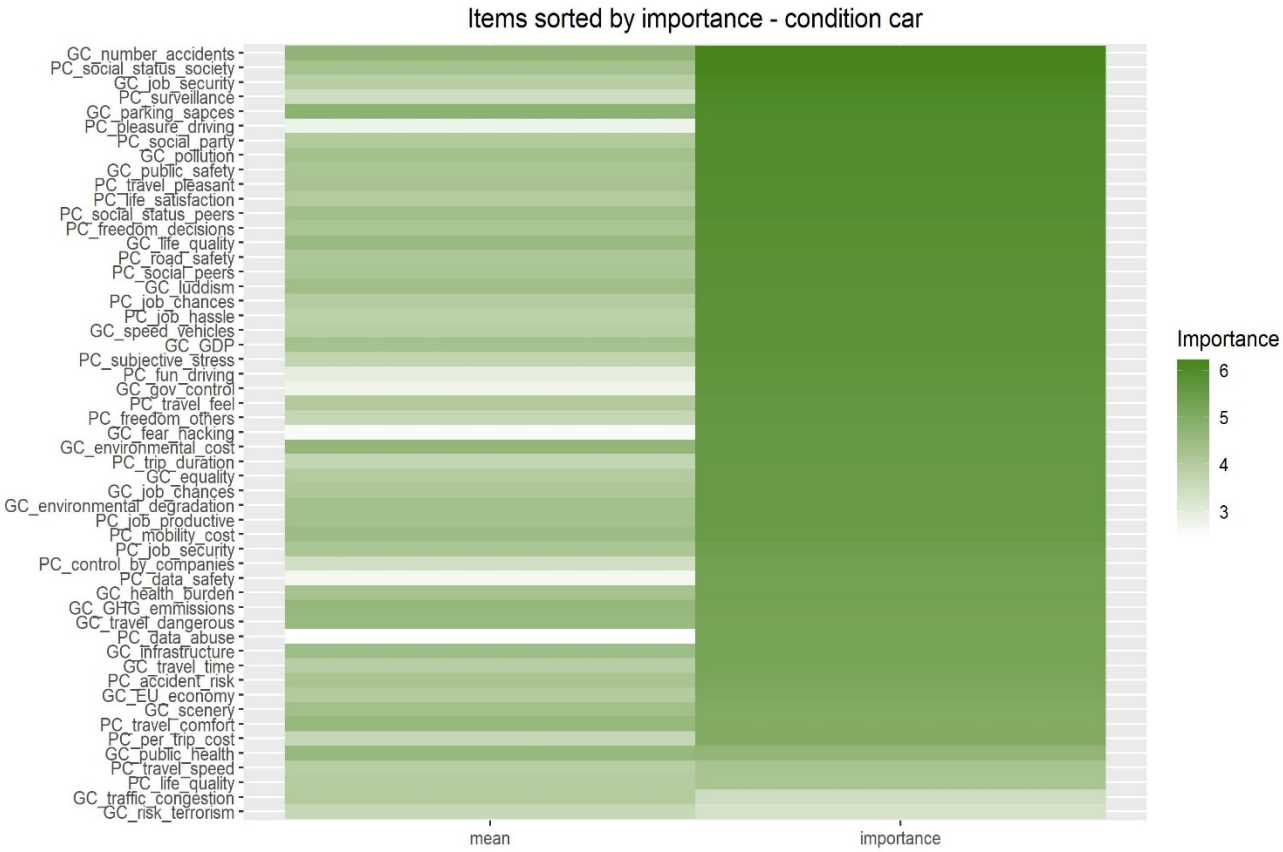


Figure 61. Consequences of autonomous car adoption condition 1.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

Error! Reference source not found., Figure 62 and Figure 63 show the distribution of the same items as discussed before, again presented for the three conditions, sorted by importance.

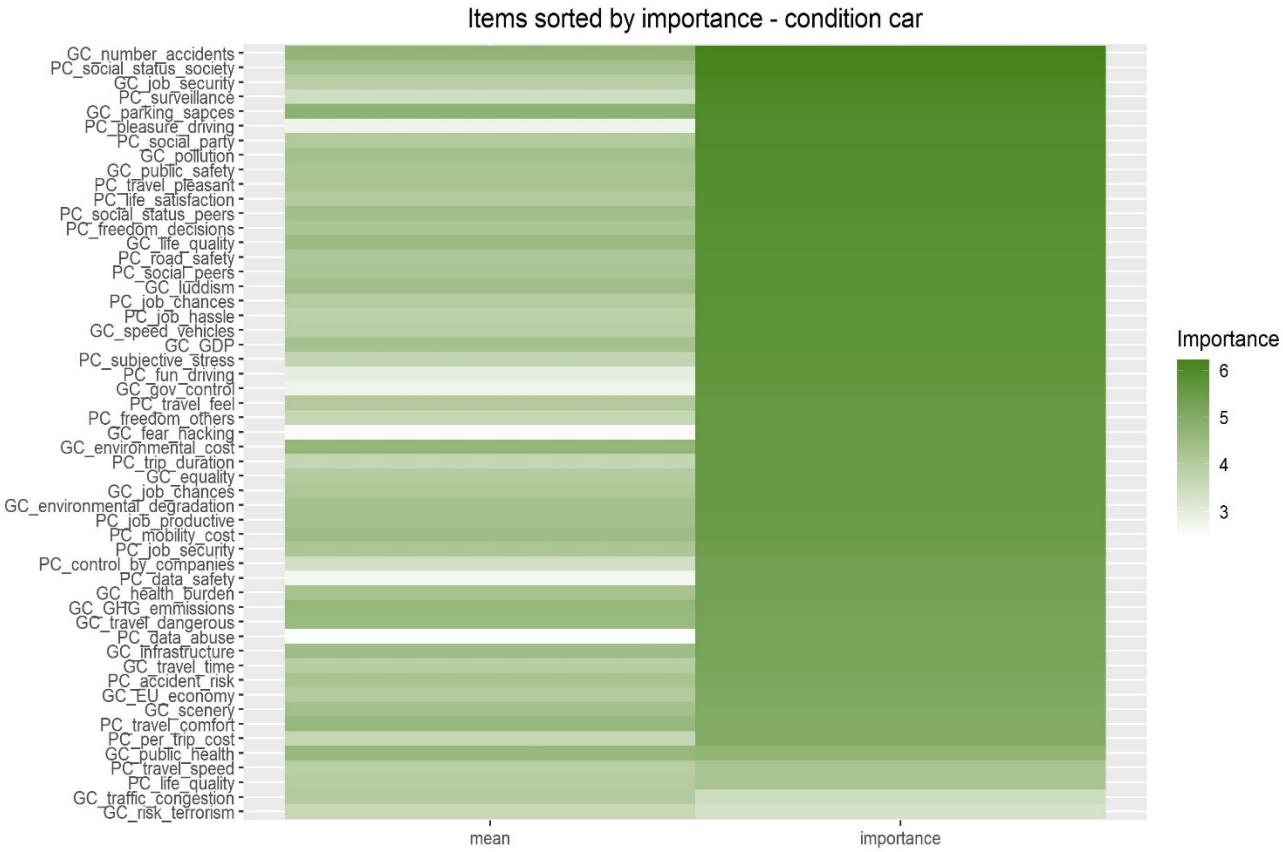


Figure 61. Consequences of autonomous car adoption condition 1.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

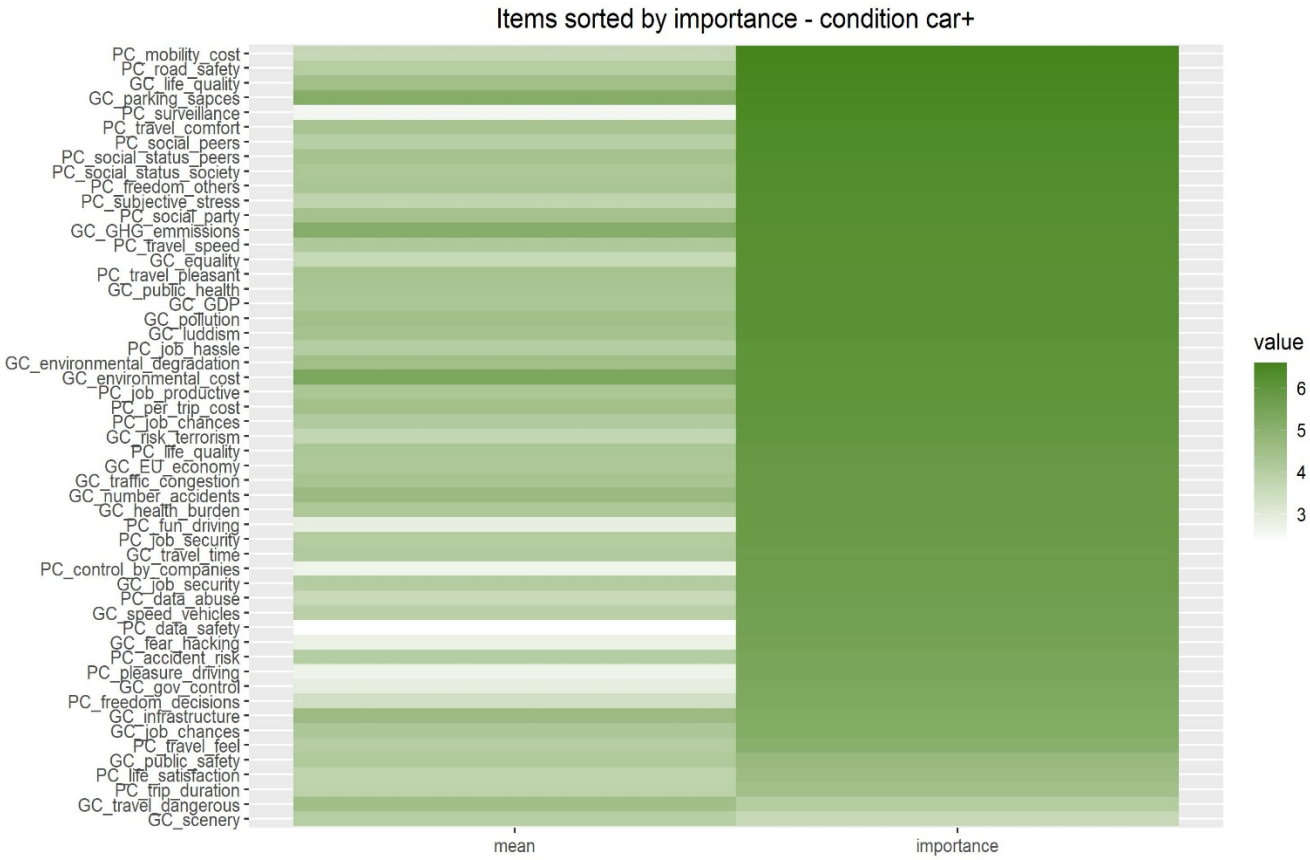


Figure 62. Consequences of autonomous car adoption condition 2.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

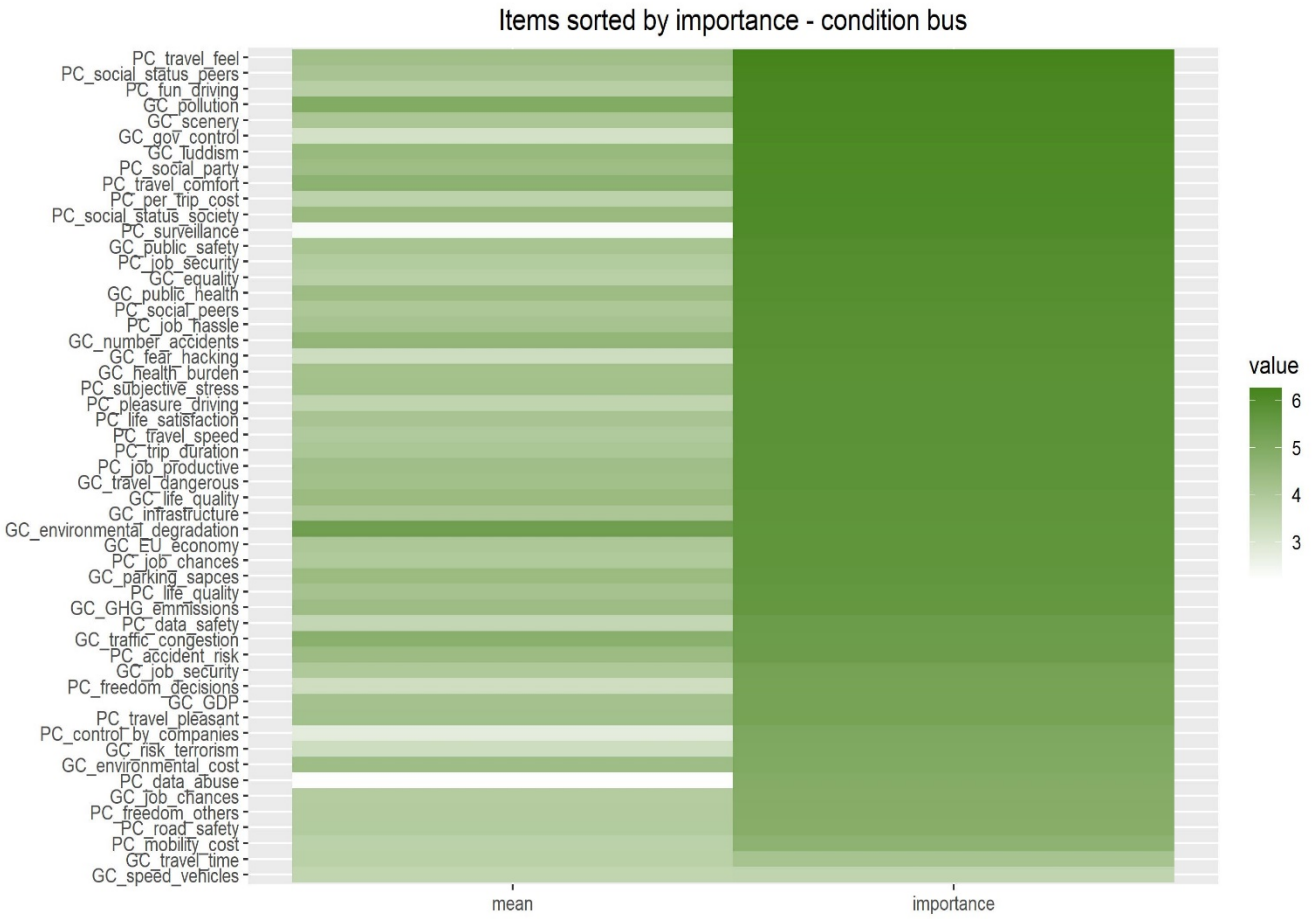


Figure 63. Consequences of autonomous bus adoption condition 3.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

When the French respondents imagined that CAVs were adopted by large portions of the population, they were most concerned with the number of road accidents. Overall, 53% of the respondents believed accidents would be less common once large portions of the population start using CAVs. (Figure GC_number_accidents)

When the participants imagined they used a CAV on a regular basis, their reputation in society became the primary issue. Roughly half of the respondents believed it would remain unaffected 51%, and 34% thought using a CAV would improve their social reputation (Figure_social status_society).

If the French participants received additional information about the consequences of CAV adoption before responding, the costs of travel was considered most important. However, the results indicated that the respondents were not sure how using a CAV regularly would affect them: 32% believed their mobility costs would not change, 30% thought they would spend less on travelling, and 37% thought driving a CAV would make travel more expensive (Figure mobility_cost).

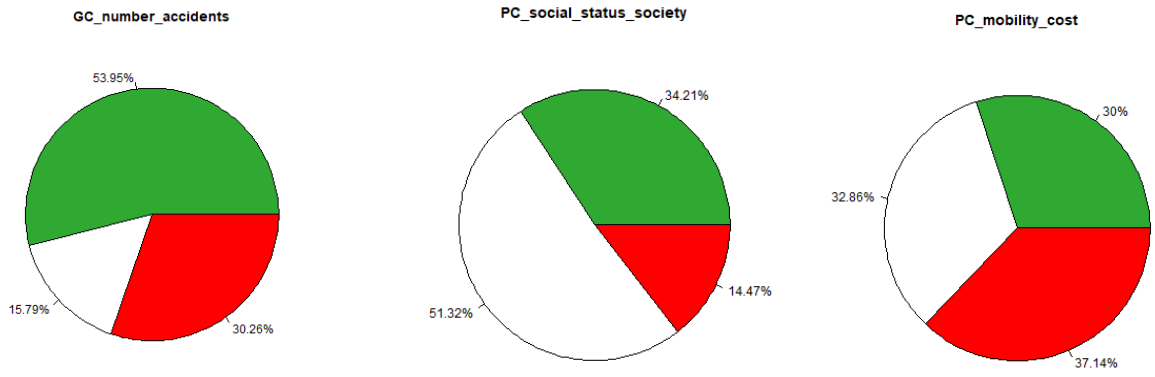


Figure 64. French population: top 3 most important items for cars.

When the respondents imagined that they used autonomous buses regularly, their travelling experience became most important. 44% of the participants believed that using a CAV would make their travel more pleasant, while 24% thought it will make it worse (Figure PC_travel_ feel).

Next in importance were concerns about the opinion of others. While more than 40% of the respondents thought their acquaintances would approve of them using an autonomous bus regularly, only 16% believed the opposite (Figure PC_social_status_peers).

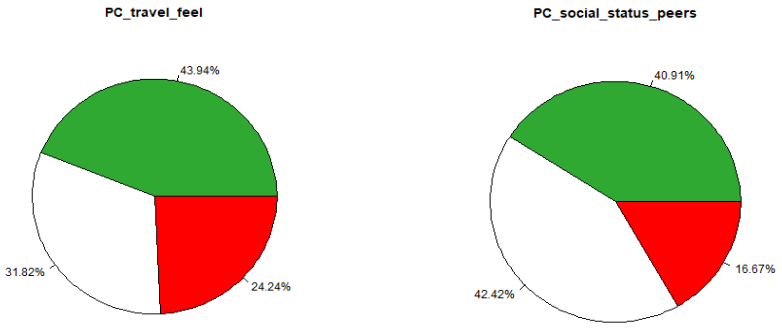


Figure 65. French population: top 2 most important items for busses.

4.7.2 Major improvement or worsening expected from CAV introduction

In this section, we will present an overview over major improvement or worsening expected from CAV introduction; for this purpose, only those Figure charts will be presented which showcase that over 40% of the population agree that an issue is positively or negatively impacted by CAVs.

Similarly to the previous German subpopulation, French respondents also judged that CAVs would worsen the situation around privacy: over three quarters suggested autonomous cars would worsen surveillance, and over half thought that governmental control would worsen in busses (Figure 66).

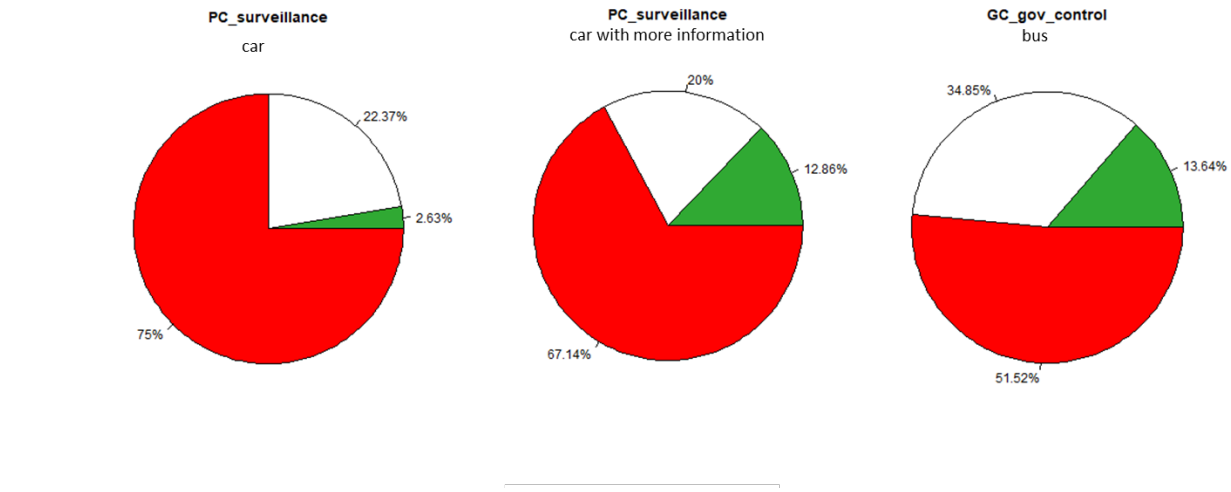


Figure 66. French population: negative consequences on surveillance and governmental control

Also in line with their German counterparts, French respondents felt that CAVs might improve social attendance of parties and meeting with peers, as well as life quality; however this was reflected in less items, and ambivalence was in general somewhat larger, as more respondents here also felt it might worsen the situation (Figure 67).

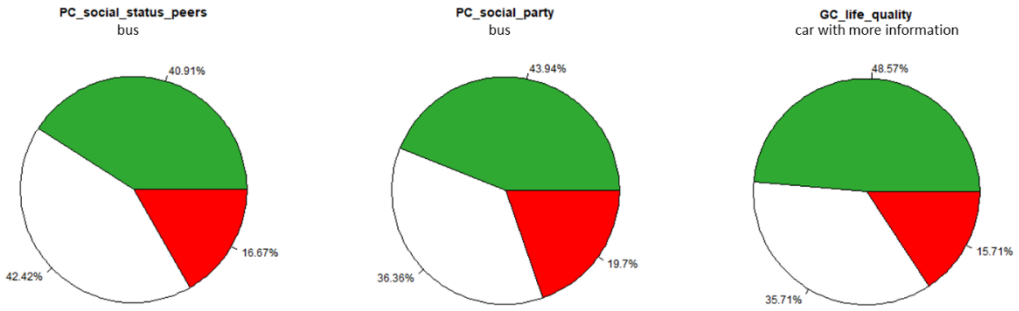


Figure 67. French population: positive consequences for social life and life quality

Finally, while German respondents felt that safety was one of the major areas of impact for CAVs, more French respondents instead thought that CAVs would have a positive impact on travel comfort and feel, the availability of parking spaces, and would reduce driving pleasure (Figure 68).

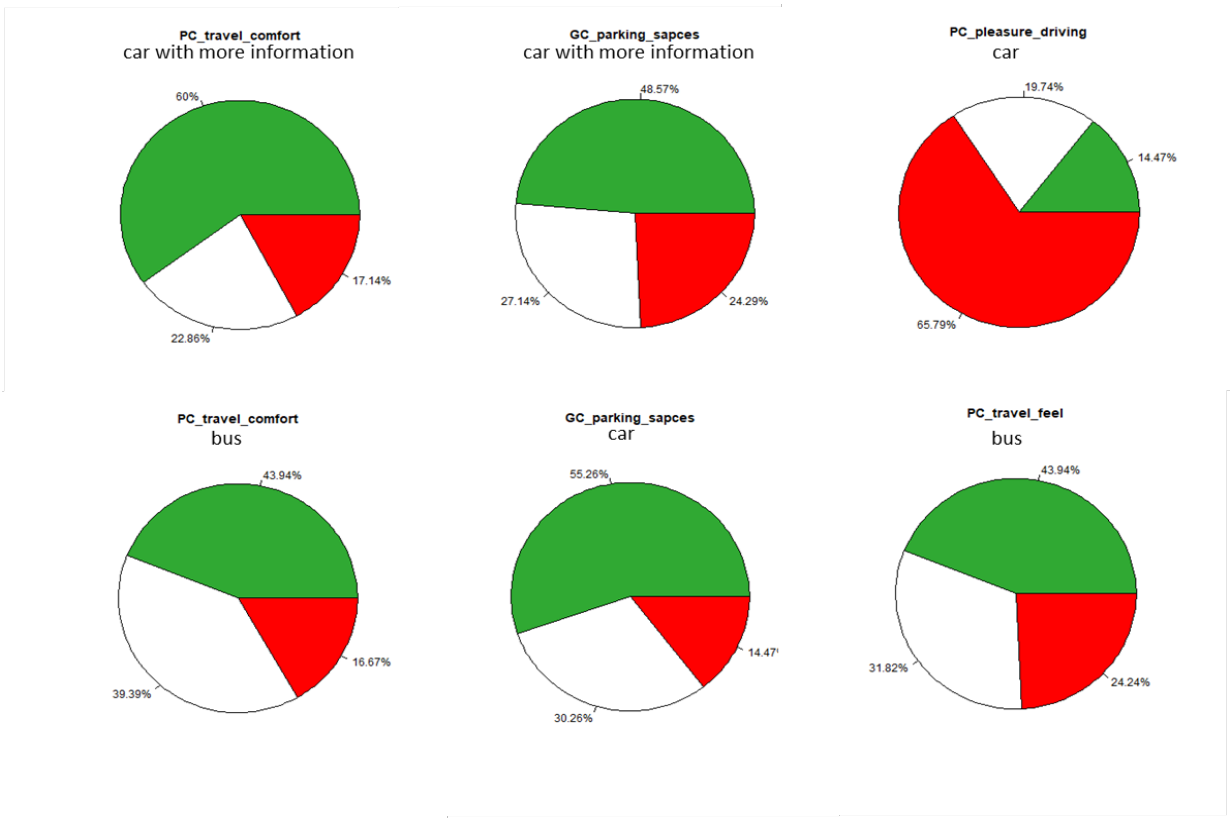


Figure 68. French population: positive impact on travel comfort and parking, negative impact on driving pleasure

The environmental effects of CAVs were also felt by a majority of French respondents to be positive: autonomous cars and busses were judged to improve the situation around traffic pollution, and respondents felt that the introduction of CAV busses would improve the scenery and reduce willful damaging of vehicles as opposed to manned vehicles.

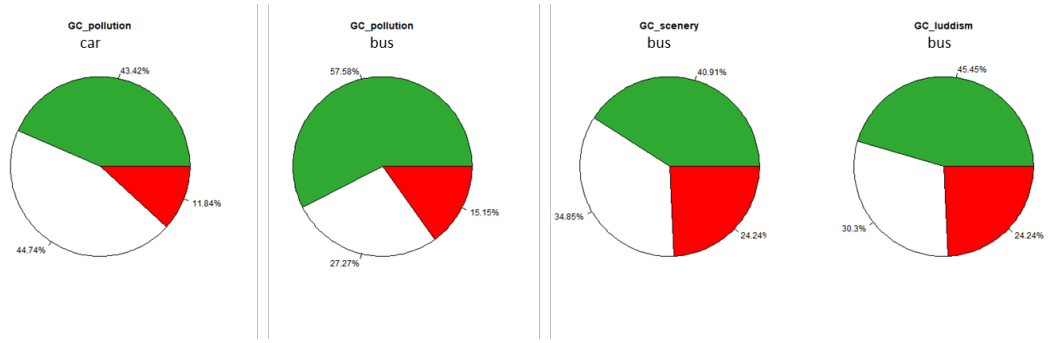


Figure 69. French population: positive impacts on pollution, scenery and luddism

4.8 UK population

4.8.1 Most important consequences of CAV introduction, presented by solution

Figure 70, Figure 71 and Figure 72 show the distribution of consequences as discussed before, again presented for the three conditions, sorted by importance.

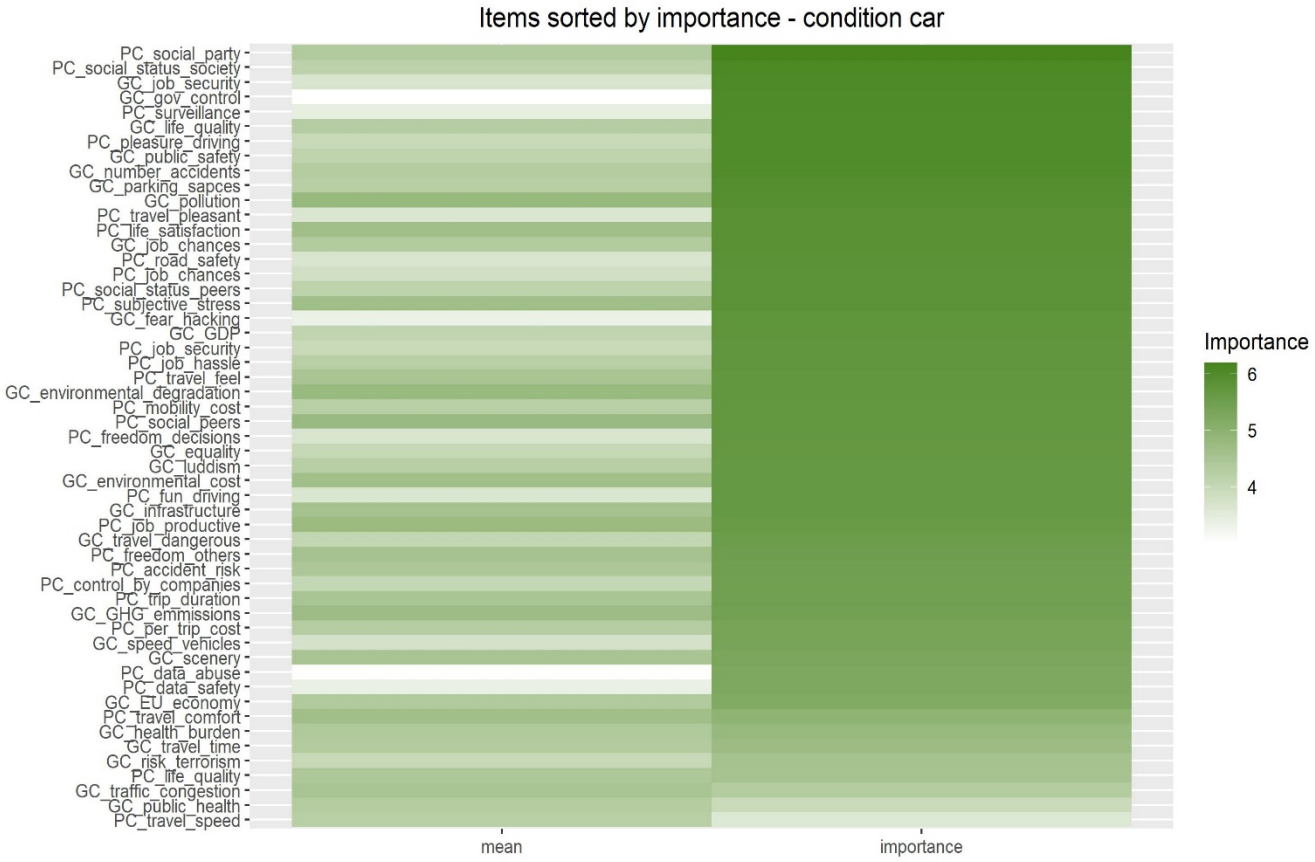


Figure 70. Consequences of autonomous car adoption condition 1.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

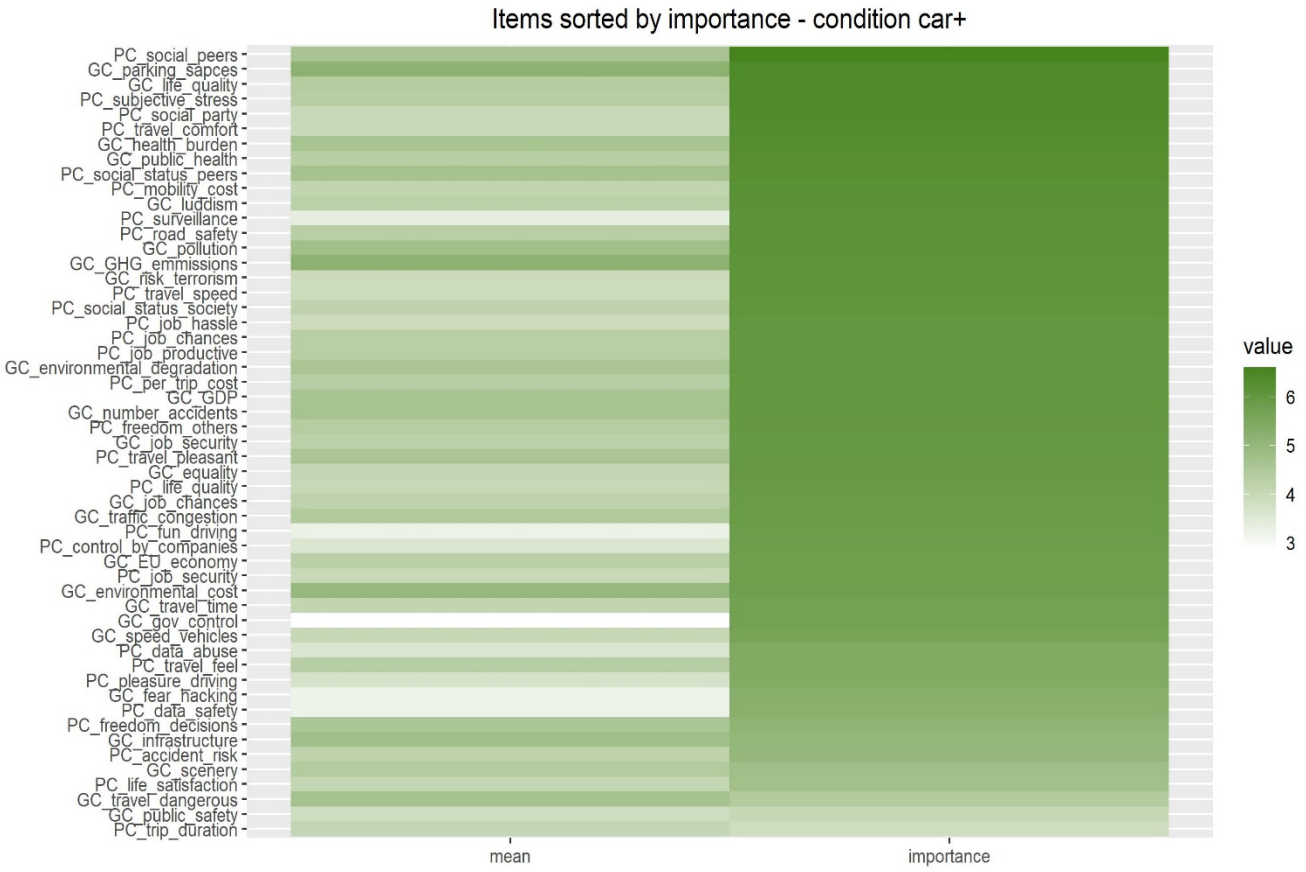


Figure 71. Consequences of autonomous car adoption condition 2.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

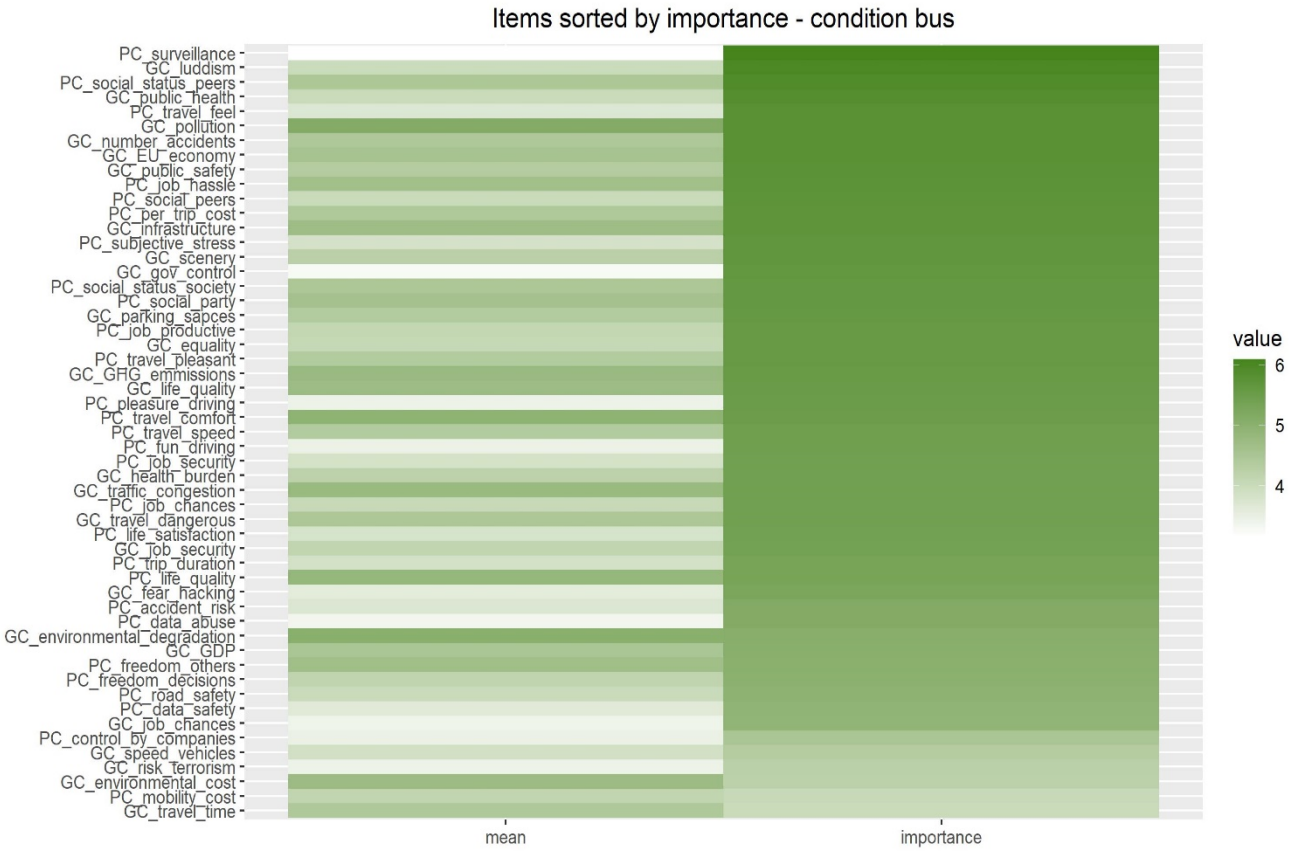


Figure 72. Consequences of autonomous bus adoption condition 3.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

When the UK respondents imagined they used CAVs on a regular basis, they were most concerned with the frequency of attending social events Half of the respondents believed that they would attend as many as they normally do with conventional vehicles (50%), and 33% thought that using a CAV would allow them to socialize more. (Figure PC_social_party)
Next in importance were concerns about their social status. Roughly half of the respondents believed it would remain unaffected (49%), and 32% thought using a CAV would improve their social reputation. (Figure social_status_society).

If the UK participants received additional information about the consequences of CAV adoption before responding, they become most concerned with the consequences from driving a CAV on their social life.

Less than half of the respondents (47%) believed CAVs would not affect the number of times they meet with friend and acquaintances, while 42% thought that driving a CAV would help them do that more often. (Figure PC_social_peers).

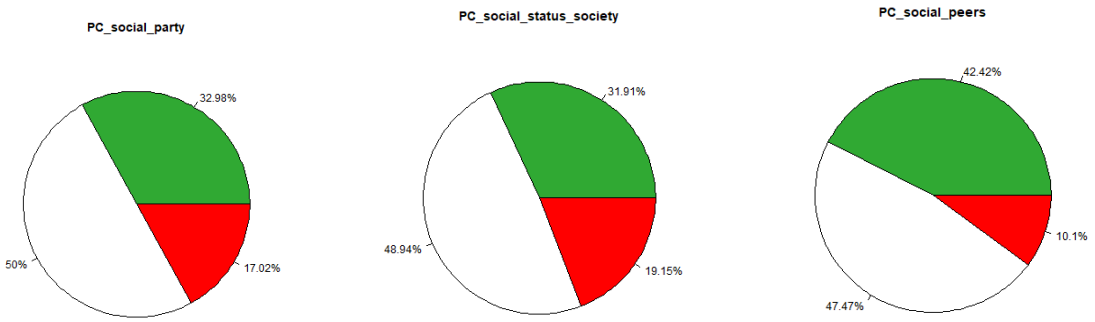


Figure 73. UK population: top 3 most important items for cars.

When the respondents imagined that they used autonomous buses regularly, they became most concerned with monitoring by third parties. More than half of the participants (50%) believed that in this case, monitoring by third parties (e.g. companies, government agencies) would become more frequent (Figure PC_surveillance).

Next in importance was risk of willful damage on vehicles, if CAVs were adopted by large sections of the population. In such case, the respondents were not sure of the impact CAVs might have: 37% believed that the risk of vehicles being willfully damaged would not change, 33% thought it would go down, and 30% thought that when CAVS were adopted *en masse*, more vehicles would be damaged on purpose (Figure GC_luddism).

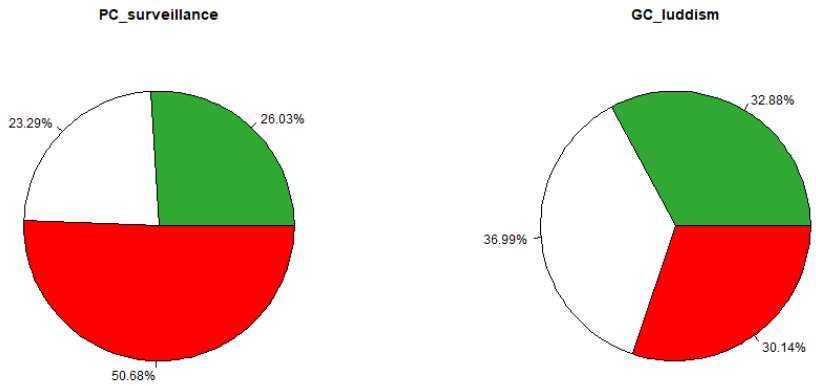


Figure 74. UK population: top 2 most important items for busses.

4.8.2 Major improvement or worsening expected from CAV introduction

In this section, we will present an overview over major improvement or worsening expected from CAV introduction; for this purpose, only those Figure charts will be presented which showcase that over 40% of the population agree that an issue is positively or negatively impacted by CAVs.

As before for German and French respondents, respondents from the UK also felt that safety would be negatively impacted by the introduction of CAVs – here also government control as well as surveillance were the most impactful items, for both bus and car usage, as seen in Figure 75.

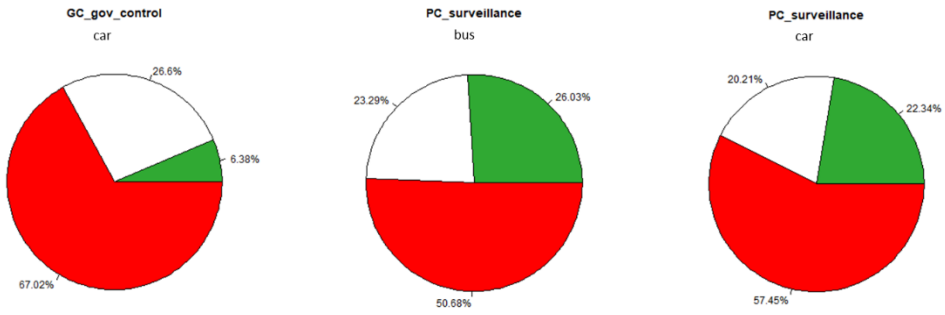


Figure 75. UK population: negative impact on surveillance and government control.

As can be seen in Figure 76, similar also to German and French respondents, the changes of CAV introduction upon life quality, stress,

and social participation was agreed upon by the majority of UK respondents; here, as well, CAVs were predicted to lower the health burden on the general population. Importantly, percentages for the opposite perception were also quite high, i.e. there were also a good number of respondents that felt that CAVs would worsen life quality and subjective stress.

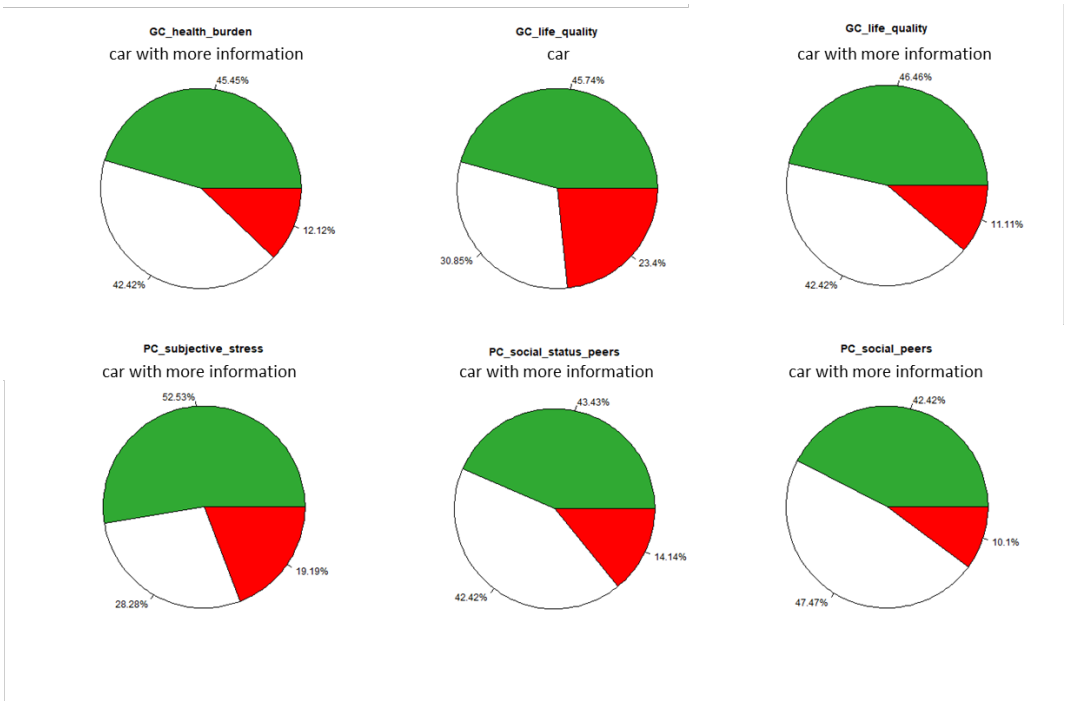


Figure 76. UK population: positive impact on life quality, social life and health/stress.

UK respondents also felt that CAVs would have a major impact on road conditions - safety, such as the number of accidents, and the availability of parking spaces, as well as a general feeling of pleasurable driving and travel comfort. While UK respondents were much more ambivalent about the impact of CAVs on the pleasure of driving, on the remaining items, the response pattern was fairly similar to that of French respondents. While the majority agreed that autonomous cars would improve the situation, a good quarter of respondents also felt that CAVs might worsen the situation.

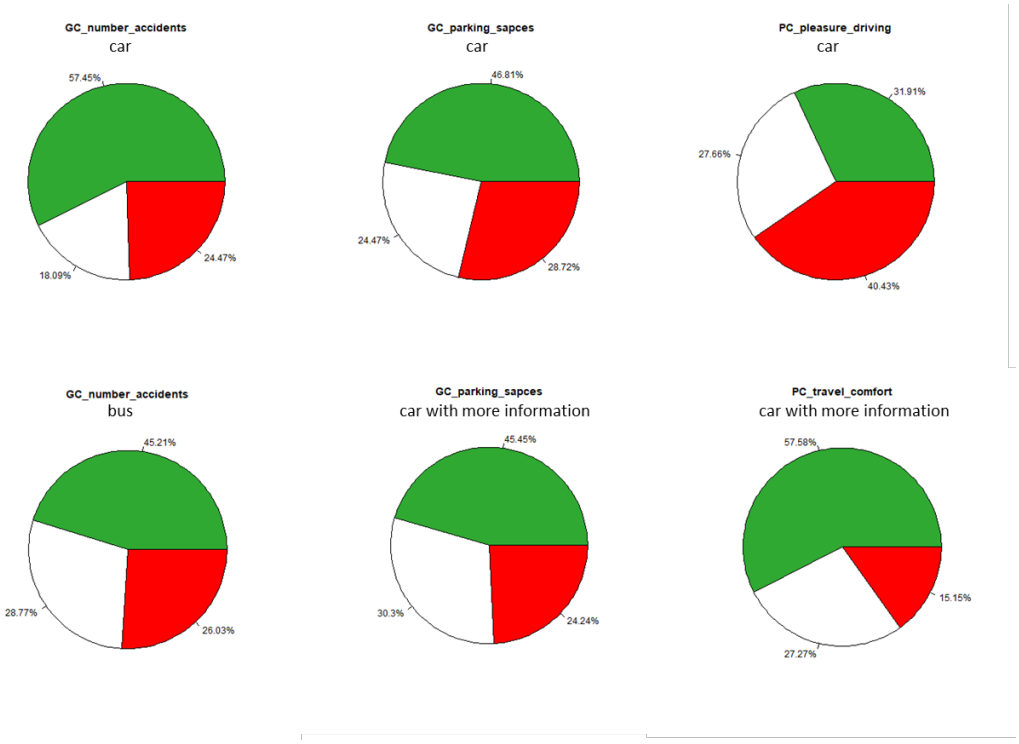


Figure 77. UK population: positive impact on road safety, parking spaces and travel comfort.

4.9 Italian population

4.9.1 Most important consequences of CAV introduction, presented by solution

Figure 78, Figure 79 and Figure 80 show the distribution of consequences as discussed before, again presented for the three conditions, sorted by importance.

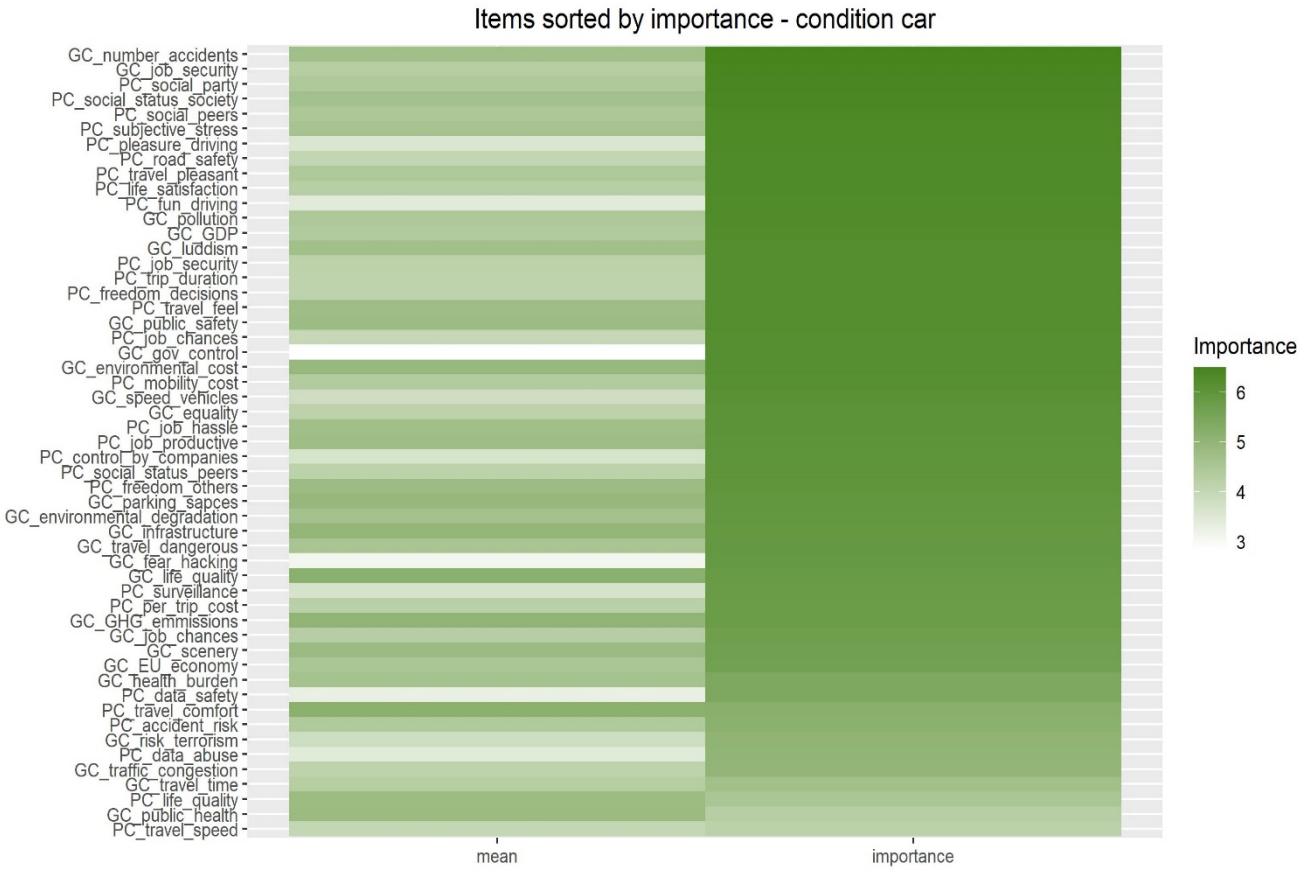


Figure 78. Consequences of autonomous car adoption condition 1.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

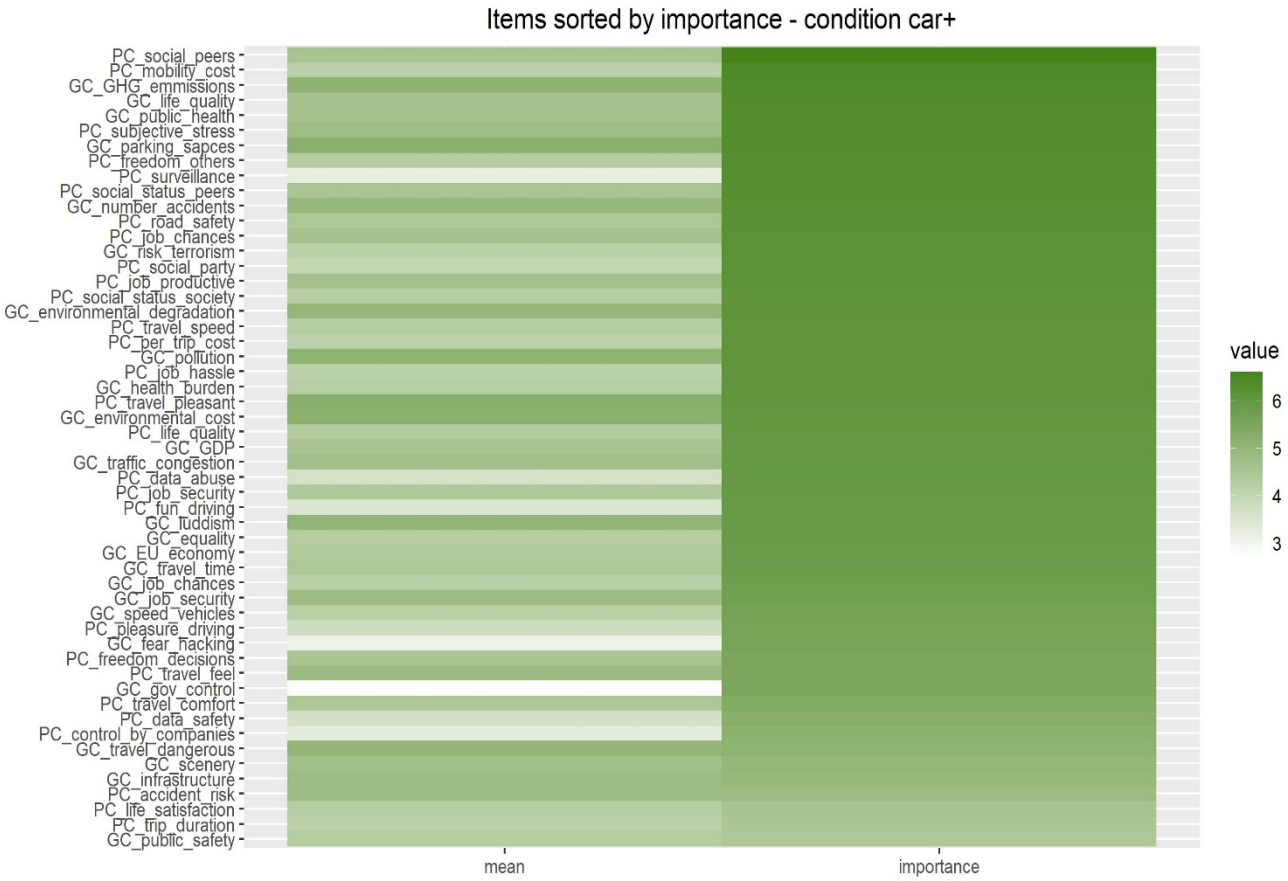


Figure 79. Consequences of autonomous car adoption condition 2.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

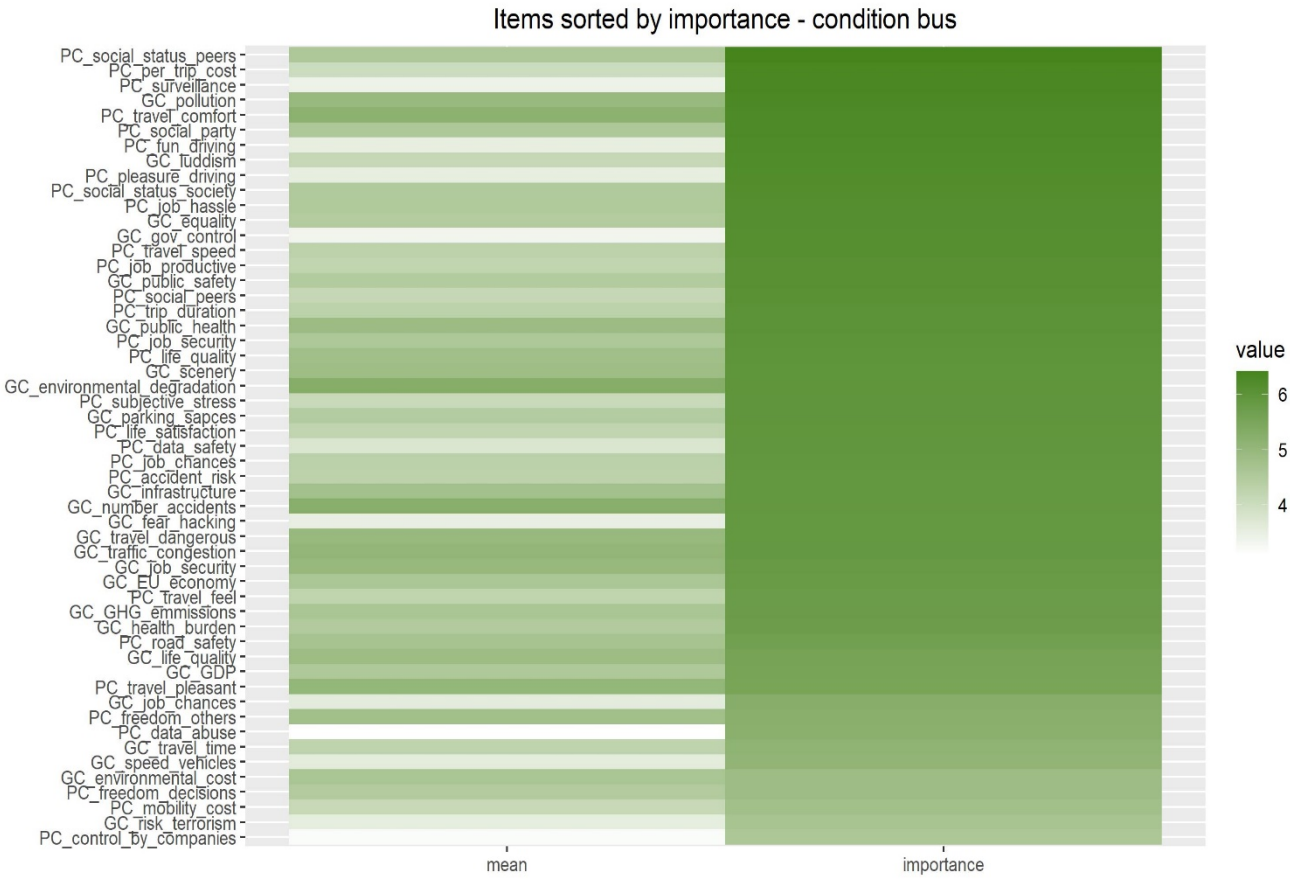


Figure 80. Consequences of autonomous bus adoption condition 3.

Note. Left (text): list of consequences, sorted by importance. Right (green figure): ratings averaged across participants. Mean indicates the average valence (the whiter, the more negative the consequence); Importance indicates the average importance (the whiter, the less important).

If the Italian respondents received only general information about CAVs before responding, they considered the number of traffic accidents the most important consequence from mass CAV adoption. The majority of the respondents, 70%, believed accidents would be less common once large portions of the population started using CAVs. (Figure GC number accidents)

Next in importance were concerns about job security, when the respondents imagined CAVs were adopted by large portions of the population. In this case, 54% of the respondents believed the mass adoption of CAVs would make people's jobs more secure, while 39% thought it would bring no significant changes (GC job security)

If the Italian participants received additional information about the consequences of CAV adoption before responding, most important become the consequences from using a CAV for the frequency of meeting friends and family. Roughly half of the respondents (46%) believed CAVs would not affect it, while 36% believed using a CAV would help them meet significant others more often. (Figure PC social peers)

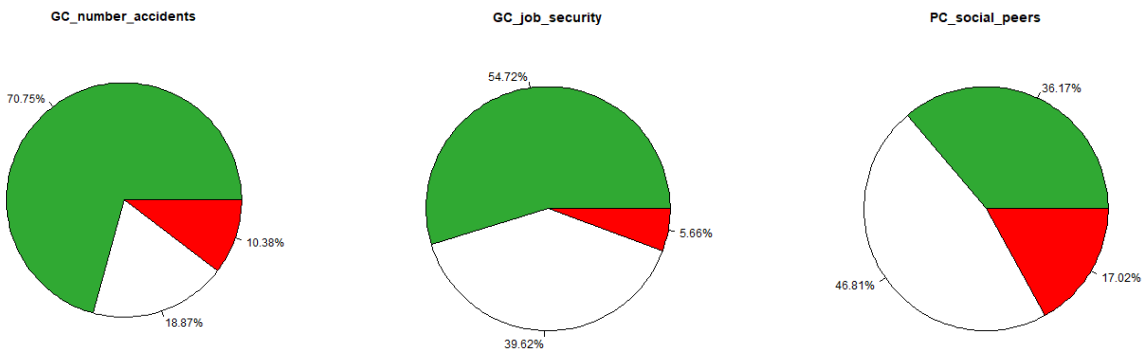


Figure 81. Italian population: top 3 most important items for cars.

When the respondents imagined that they used autonomous buses regularly, they became most concerned with the opinion of others. Here, views were divided: 53% of the respondents believed it would not change, while 28% thought their acquaintances would approve (Figure PC social status peers).

Next in importance were the costs of travel per trip. The results indicate that the respondents were not sure how using a CAV regularly would affect them in this regard: 29% believed their costs per trip would not change, 41% thought they would spend less on travelling, and 29% thought driving a CAV would make travel per trip more expensive (Figure PC per trip cost).

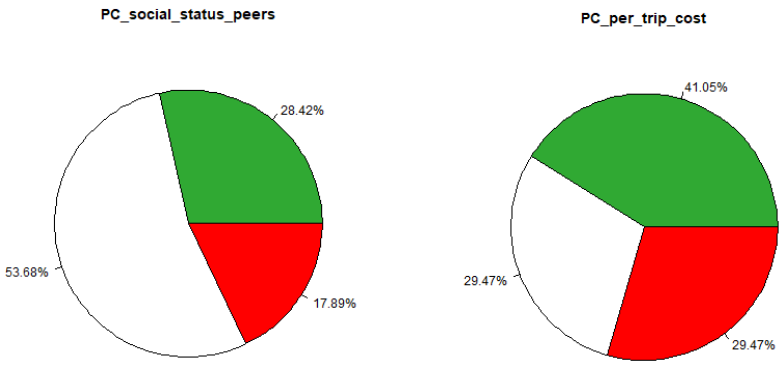


Figure 82. Italian population: top 2 most important items for busses.

4.9.2 Major improvement or worsening expected from CAV introduction

In this section, we will present an overview over major improvement or worsening expected from CAV introduction; for this purpose, only those Figure charts will be presented which showcase that over 40% of the population agree that an issue is positively or negatively impacted by CAVs.

While German, French and UK respondents all felt that privacy was an important area where CAVs would have a large negative effect, Italian respondents did not feel as strongly about it; instead, a lessening of driving fun and pleasure of driving were expected, as can be seen in Figure 83 Interestingly, while fun and pleasure of steering the wheel was seen as a negative impact, CAVs were still judged by Italian respondents to improve travel comfort and travel pleasantness, both in the bus and the car.

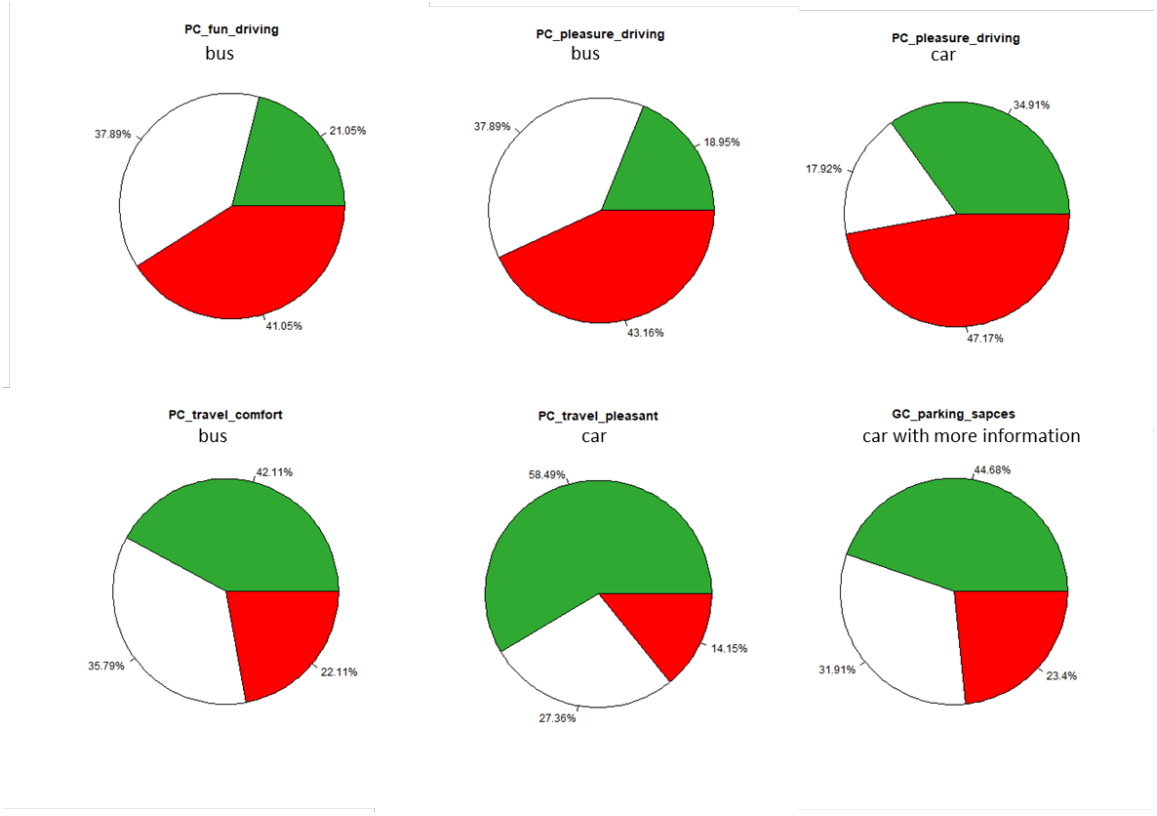


Figure 83. Italian population: negative consequences for driving fun, positive consequences for travel comfort and parking spaces

Similar to the other three subpopulations, as can be seen in Figure 84 Italian respondents agreed in majority that CAVs might improve life quality, subjective stress, and participation in social and work life – here, in addition, Italian respondents found that CAVs might increase freedom from others, and job security. Just as respondents from Germany, France and UK, however, there was a large section of the population that felt that CAVs might also worsen stress.

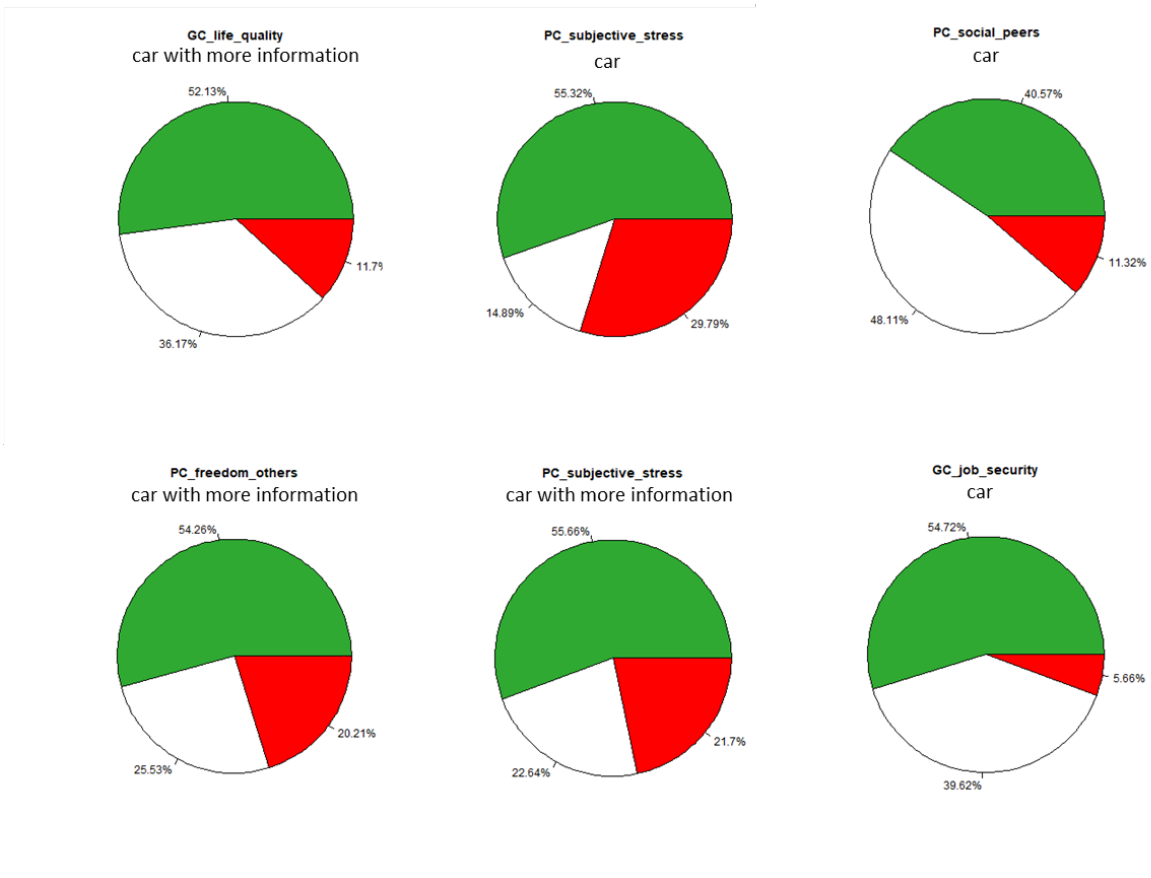


Figure 84. Italian population: positive consequences for life quality, stress, social interactions and job security.

The sustainability impact of CAVs was considered by Italian respondents, as it had been by French respondents, whereas German and UK respondents had not largely agreed whether CAVs would impact the environment one way or another. Here, as seen in Figure 85, participants expected CAVS would improve emissions, pollution and public health.

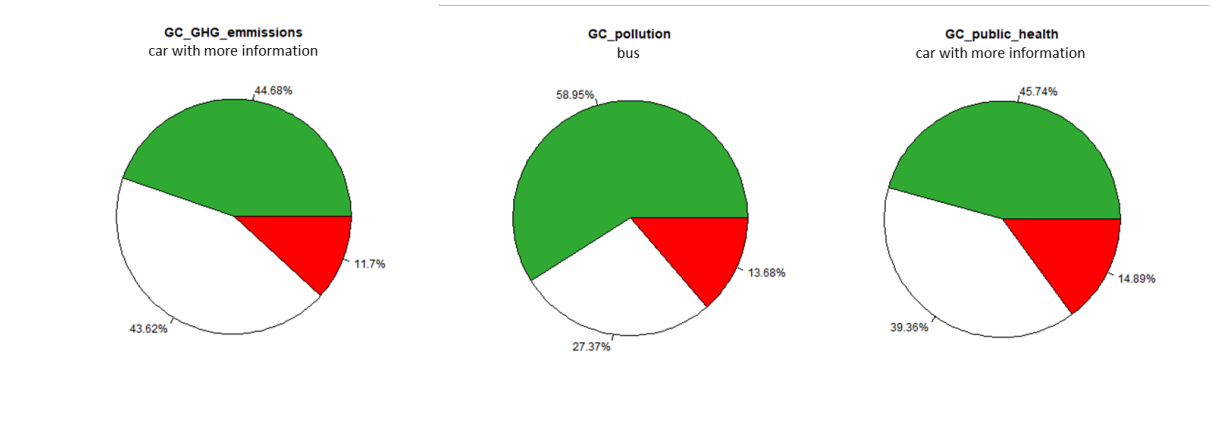


Figure 85. Italian population: improvement for emissions, pollution and public health.

Finally, a large section of the Italian respondents agreed that CAVs would improve safety on the road, an area that German and UK respondents had judged similarly, whereas French respondents had not felt a major impact by CAVs on this area. In particular, Italian respondents felt that autonomous cars would decrease the number of accidents and increase road safety in general.

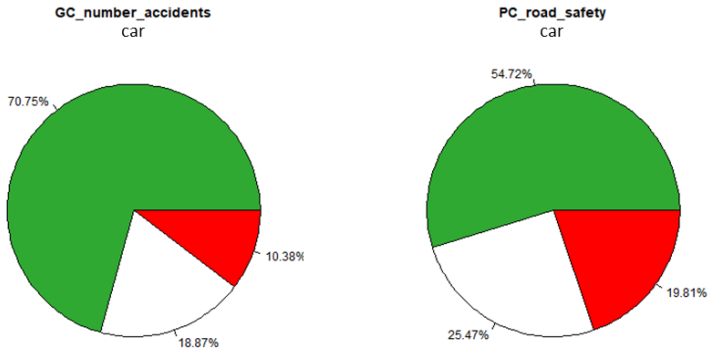


Figure 86. Italian population: improvement for road safety.

5 User-centered recommendations

In this section, we summarize the results and highlight the design implications for improving CAV acceptance regarding the existing motivators and barriers.

5.1 Summary of results

Our results replicate and extend previous findings in the literature (see Section 1). We substantiate these findings employing the first demographically stratified sample on CAV acceptance and applying the same measurement (i.e. questionnaire) across multiple countries. We further extend previous findings in that we do not rely on overall evaluations or willingness to pay. Instead we extensively investigate which anticipated consequences tend to be seen favorably or unfavorably. This provides more instructive information on how to design CAV systems.

Finally, we extend previous findings with reporting results on three particularly relevant subpopulations: car-sharing users as a population used to connected mobility, professional drivers as a population highly proficient in mobility and visually impaired persons as a population with possibly substantial improvements in their mobility situation on the table.
For this section, we take the perspective of policy makers designing the CAV ecosystem. Therefore, we do report evidence, for the general population and the subpopulations of special interest (with the caveat that such subpopulations were not recruited in a stratified sample format). We do not engage in segmentation of the population along demographic or other characteristics more common in individual marketing approaches.

5.1.1 Most important expected consequences

Several consequences of CAV usage and large-scale introduction were rated as most important across the subpopulations. They are reported ordered by the average importance they received. As judged by the most important issues, expectations were overall quite positive, except for privacy.
Privacy was identified as the domain most importantly affected by the use and introduction of CAVs. In our survey, this meant surveillance and control by governments. For individual cars as well as for busses, the high importance of privacy was usually paired with **negative expectations**.

Further, **road safety** featured prominently in participants' thinking about CAVs. This involved general road safety for cars and busses, accident numbers for cars and acts of interfering with public transport vehicles. With regard to these safety issues, respondents held **mainly positive expectations**. Some safety aspects, such as the treat of terroristic attacks, did not seem of high importance.

Another highly important, yet ambivalent, aspect was the travel experience. While **stress and enjoyment** went along with **positive expectations**, **driving** itself was expected to be **less fun**. Interestingly, this was not only true for cars but also for busses, highlighting the fact that CAVs could improve the stress levels in public transport.

Relatedly, the overall **life quality**, including subjective overall stress levels and life satisfaction, was considered of high importance, especially when thinking about CAV as cars. In this case, **expectations where mostly positive**.

The possibility that **environmental issues** were affected by the large-scale introduction of CAVs also ranked relatively high in importance, especially for cars where environmental concerns seem more pressing than for busses. Expectations were again **mostly positive** with regards to implications for pollution.

Broader implications for the **physical infrastructure** in the public space also received some high importance ratings. These included the availability of parking spaces for cars, which were **expected to increase**.

Finally, the **participation in social life**, meeting peers and going to parties, was considered as important, especially for cars. Here **expectations were mostly positive**.

5.1.2 Special observations with subpopulations.

For some aspects, these general trends were qualified within the subpopulations of special interest to CAV introduction.

In the subpopulation of **visually impaired** respondents, the **participation in social life** was of particular importance. In this population, this included **economic participation,** was present for **cars and busses**, and went

along **pronounced positive expectations**. As the only subpopulation, **worries about increasing cost** for both types of mobility emerged.

In the subpopulation of **currently car-sharing** respondents, **more agreement** on the negative impact of CAVs on **privacy** was found than in the more general populations. This might reflect past considerations of privacy aspects in relation to car-sharing services. Further, in this subpopulation, there was **more agreement** on the positive expectations about the positive impact of CAVs on **safety**. This might reflect more exposure to connected and semi-autonomous functions in car-sharing vehicles.

In the subpopulation of respondents in driving related professions, such as freight drivers and driving instructors, there was **more agreement** on the possibility of **comfort improvements**. This might reflect higher proficiency with technologies of lower levels of automation. This was also the only subpopulation where elements of the infrastructure featured prominently. Especially with regards to busses, respondents expected **improvements for scenery and traffic congestion**.

Finally, in the subpopulation of road co-users, i.e. respondents who self-identified mainly as **pedestrians and bicycle users**, **heightened ambivalence** for all the important aspects was found.

Finally, there were some **less pronounced country differences**. Respondents from France and Italy had more positive expectations overall than those from Germany and the UK. Italian respondents, for example, were the only ones where privacy issues seemed not prominent. Yet, even for French and Italian respondents there were less favourable aspects. For example, French respondents were less sure than those from other countries that road safety would improve. Italian respondents saw the issues of lowered driving fun and improved travel comfort as particularly important.

5.2 Capitalizing on existing motivators

In this section we provide some thoughts on the design implications to increase the acceptance for CAV solutions. We expect that capitalizing on motivators might increase acceptance.

First off, one of the issues that were not strongly targeted in the survey was that the experience of automated vehicles could a motivating factor in the uptake of CAVs. Nordoff *et al*. (2018) have found positive rating for usefulness and satisfaction of automated vehicles after respondents experienced a ride in an automated shuttle.

CAVs offer enhanced mobility for elderly, young and impaired people. The ability to share transport, decreased traffic congestion and ability to spend time on other activities have been found to positively affect user acceptance towards CAVs (Kaan, 2017).

From the literature, we also know that aspects such as innovation, technological progress, and transport mobility are also important factors that positively affects peoples' perception towards CAVs (Hilgartner and Granig, 2020).

The significance of perceived usefulness and perceived ease of use of CAVs as well as AVs has been highlighted in several studies (Jing *et al.*, 2020; Xu *et al*., 2018; Herrenkind *et al*., 2019). These factors are important for the users along with trust in AV technology (Xu *et al*., 2018).

Together with the levers from the literature, some levers to increase the acceptance of autonomous vehicles themselves are obvious from our study. Citizens associate autonomous cars and busses with increased comfort, social participation and quality of life. As such they are typical carriers of the established technological promises (Borup et al., 2006). Putting an emphasis on possible comfort increases will most likely appeal to parts of the population.

Aspects of the CAV ecosystems might also be designed to increase acceptance. In particular, designing the operations of CAVs to be environmentally friendly and to lower the burden on the traffic infrastructure is one lever. Environmental concern is a significant factor that has been found to positively affect the CAV uptake. This has been found to be important along with perceived usefulness and perceived ease of use of the automated vehicles (Jing *et al.*, 2020). This might imply measures to regulate how CAVs operate without occupants and how they make use of parking spaces.

With life quality and sustainability as core issues, CAVs and mobility as a service might mutually reinforce each other. While autonomous systems might help the mobility sharing business models, the transition away from ownership-based mobility might increase sustainability.
As a note of caution, these positive expectations can be the basis for aversive emotions like anger when frustrated by the experience with CAVs. Vehicles that cause stress and anxiety when driving, an increase in traffic jams and idle CAVs seeking parking spaces could be such experiences. These frustrations might be especially pronounced for partially sighted citizens, for whom expectations are particularly positive.

5.3 Addressing existing barriers

Some to-be-avoided features of CAVs also suggest themselves.

In various studies aimed to identify barriers towards uptake, respondents have shown, just as in our study, significant concern with traffic safety, security in CAVs such as violence and robbery, other security issues such as hacking and terrorism (Roche-Cerasi, 2019; Jing *et al*., 2020).

Similar to our survey, respondents have also stated job loss, lack of acceptance and awareness, technological reliability, and infrastructure problems as some of the perceived challenges related to AV and CAV uptake (Hilgartner and Granig, 2020; Kaan, 2017).

Considering the automated vehicles as not to be very safe or not as safe as manual driving is an important barrier towards the uptake of CAV technology (Jing *et al*., 2020). While low speed of the automated vehicle is crucial for safety of the vehicle, especially in its initial stages, this has been considered as a factor negatively affecting user acceptance of the automated shuttle, along with the space for luggage (Nordoff *et al*., 2018). Moreover, about half of the respondents in another study did not evaluate driverless shuttles to be useful (Roche-Cerasi, 2019).

Studies have also shown an ‘inertia effect’ in respondents where respondents have chosen not to select automated vehicles irrespective of the attributes shown by the automated vehicle. These studies have found that thought to a limited extent, some respondents do not tend to select AVs or CAVs because they do not like change (Cartenì, 2020).

In a study conducted to know the attitude of disabled people towards autonomous vehicles, about 66% of respondents considered the automated vehicles to be 'dangerous'. It was also found that with prior knowledge of the automated vehicles, more respondents with disabilities showed an increased dislike towards autonomous technology. Respondents also showed concern on the vulnerability of autonomous vehicles as it would share the same road and traffic conditions as a conventional vehicle (Bennett *et al*., 2019). Disabled respondents showed a higher level of anxiety towards the safety of the automated vehicle while respondents who were not disabled showed concern on road and traffic conditions as well as poor driving behaviour of conventional vehicle drivers (Bennett *et al*., 2019).

Both from the viewed literature and our survey, it seems obvious that CAVs need a convincing privacy solution in place, especially regarding control by governments and less by companies. Even though citizens routinely voice privacy concerns, for example regarding location tracking in smartphones (Sipior *et al*., 2014), more than they act by them (Ketelaar & van Balen, 2018), CAVs might be a special case. Autonomous vehicles depend on remote control in such obvious and attention-grabbing ways, that privacy concerns might endure longer than with other novel technologies. One aspects of a convincing privacy solution might be decentralized approaches to data storage.

Finally, cost might prove a divisive issue. In the survey, cost emerged as a concern mostly for partially sighted citizens. Yet, the introduction of CAVs might impart costs not only on those using them, but on society as a whole. Data and road infrastructures might need further investments that ultimately every user might contribute to. As such CAVs risk becoming a symbol for an ever more divided society. Regulations that ensure basic access for everybody to the benefits of CAV solutions might be considered.

5.4 Conclusion

The present deliverable aimed to provide some insights into subjectively experienced consequences of wide-spread CAV adoption by respondents, particularly of various subpopulations that we managed to recruit. The findings from a user-centered survey conducted in the context of WP3 gave some first indications as to which consequences are important for populations, and whether those consequences are experienced as mostly positive or negative ones. While we have presented the evidence we have

gathered based on our data, and drawn some recommendations from these findings in the context of already existing literature, there remains the questions why various subpopulations differ in their interpretation of the expected consequences, and why they differ in the importance they assign to such consequences. Future studies could well attempt to provide further insights into these questions in order to further refine policy recommendations for a CAV introduction that better includes a variety of viewpoints and takes into consideration the requirements of all stakeholders.

6 Appendix

Table 3. Percentages for top ten most important items of panel participants.

item	improve	no.impact	worsen	condition	population
PC_social_party	27%	54%	19%	car	panel
PC_social_status_society	32%	52%	16%	car	panel
GC_number_accidents	56%	20%	24%	car	panel
GC_job_security	34%	51%	15%	car	panel
GC_pollution	50%	37%	13%	car	panel
PC_pleasure_driving	26%	22%	52%	car	panel
GC_public_safety	40%	41%	19%	car	panel
PC_road_safety	44%	24%	32%	car	panel
PC_social_status_peers	35%	48%	17%	car	panel
PC_travel_pleasant	47%	30%	22%	car	panel
PC_social_peers	30%	55%	14%	car with info	panel
GC_parking_sapces	44%	33%	24%	car with info	panel
GC_life_quality	46%	39%	14%	car with info	panel
PC_subjective_stress	43%	22%	34%	car with info	panel
PC_mobility_cost	31%	39%	30%	car with info	panel
PC_road_safety	41%	28%	31%	car with info	panel
PC_social_party	31%	52%	17%	car with info	panel
PC_surveillance	19%	22%	59%	car with info	panel
PC_social_status_peers	33%	52%	15%	car with info	panel
GC_public_health	38%	44%	18%	car with info	panel
PC_social_status_peers	33%	50%	18%	bus	panel
PC_surveillance	21%	32%	47%	bus	panel
GC_pollution	57%	30%	13%	bus	panel
GC_luddism	34%	34%	33%	bus	panel
PC_per_trip_cost	41%	35%	24%	bus	panel
GC_gov_control	14%	30%	55%	bus	panel
PC_social_party	28%	50%	22%	bus	panel
GC_public_safety	29%	49%	22%	bus	panel
PC_travel_comfort	37%	42%	21%	bus	panel
GC_public_health	42%	41%	17%	bus	panel
PC_travel_feel	36%	30%	34%	bus	panel

Table 4. Percentages for top ten most important items of car sharing users.

item	improve	no.impact	worsen	condition	population
GC_job_chances	28%	68%	5%	car	car share
GC_gov_control	5%	26%	69%	car	car share
PC_road_safety	84%	10%	6%	car	car share
PC_life_satisfaction	51%	39%	10%	car	car share

GC_job_security	23%	66%	11%	car	car share
GC_number_accidents	89%	8%	4%	car	car share
PC_pleasure_driving	24%	24%	53%	car	car share
GC_public_safety	35%	55%	10%	car	car share
PC_social_party	38%	60%	3%	car	car share
PC_social_status_society	25%	75%	NA	car	car share
PC_road_safety	58%	27%	15%	car with info	car share
PC_mobility_cost	39%	52%	9%	car with info	car share
PC_social_status_peers	36%	61%	3%	car with info	car share
PC_per_trip_cost	52%	39%	9%	car with info	car share
GC_risk_terrorism	14%	61%	26%	car with info	car share
PC_social_peers	29%	68%	3%	car with info	car share
GC_parking_sapces	85%	14%	2%	car with info	car share
GC_health_burden	67%	26%	8%	car with info	car share
PC_social_party	30%	67%	3%	car with info	car share
GC_job_security	11%	76%	14%	car with info	car share
PC_surveillance	3%	50%	47%	car with info	car share
PC_social_status_peers	47%	43%	9%	bus	car share
PC_surveillance	4%	16%	80%	bus	car share
GC_life_quality	61%	26%	13%	bus	car share
PC_per_trip_cost	29%	38%	33%	bus	car share
PC_social_party	41%	55%	4%	bus	car share
GC_luddism	22%	53%	25%	bus	car share
GC_pollution	61%	21%	18%	bus	car share
GC_public_safety	42%	46%	12%	bus	car share
PC_social_status_society	29%	68%	3%	bus	car share
PC_social_peers	37%	59%	4%	bus	car share

Table 5. Percentages for top ten most important items of visually impaired participants.

item	improve	no.impact	worsen	condition	population
GC_number_accidents	70%	17%	12%	car	visually impaired
GC_job_security	46%	47%	7%	car	visually impaired
PC_social_status_society	49%	45%	6%	car	visually impaired
PC_social_party	77%	18%	5%	car	visually impaired
GC_gov_control	9%	13%	78%	car	visually impaired
GC_job_chances	52%	40%	7%	car	visually impaired
PC_life_satisfaction	72%	22%	6%	car	visually impaired
PC_mobility_cost	25%	22%	52%	car	visually impaired
PC_pleasure_driving	65%	25%	11%	car	visually impaired
GC_public_safety	41%	46%	13%	car	visually impaired
PC_subjective_stress	66%	14%	19%	car with info	visually impaired
GC_risk_terrorism	21%	41%	38%	car with info	visually impaired
PC_road_safety	58%	23%	19%	car with info	visually impaired

GC_parking_sapces	58%	14%	28%	car with info	visually impaired
GC_EU_economy	37%	51%	12%	car with info	visually impaired
PC_mobility_cost	21%	27%	52%	car with info	visually impaired
PC_social_peers	74%	23%	3%	car with info	visually impaired
PC_surveillance	13%	14%	73%	car with info	visually impaired
GC_job_security	34%	52%	14%	car with info	visually impaired
GC_life_quality	58%	33%	10%	car with info	visually impaired
GC_scenery	50%	40%	10%	bus	visually impaired
PC_social_status_peers	34%	55%	11%	bus	visually impaired
PC_social_party	28%	50%	23%	bus	visually impaired
PC_surveillance	16%	24%	60%	bus	visually impaired
GC_fear_hacking	13%	40%	48%	bus	visually impaired
PC_per_trip_cost	41%	49%	10%	bus	visually impaired
PC_social_status_society	30%	58%	13%	bus	visually impaired
GC_public_health	50%	38%	13%	bus	visually impaired
PC_travel_feel	24%	40%	36%	bus	visually impaired
PC_pleasure_driving	20%	56%	24%	bus	visually impaired
GC_number_accidents	70%	17%	12%	car	visually impaired

Table 6. Percentages for top ten most important items of professional drivers.

item	improve	no.impact	worsen	condition	population
PC_social_party	27%	62%	12%	car	prof. drivers
GC_job_security	38%	42%	19%	car	prof. drivers
GC_parking_sapces	42%	42%	15%	car	prof. drivers
GC_gov_control	4%	19%	77%	car	prof. drivers
GC_public_safety	31%	50%	19%	car	prof. drivers
PC_social_status_society	31%	46%	23%	car	prof. drivers
PC_pleasure_driving	15%	19%	65%	car	prof. drivers
GC_number_accidents	69%	19%	12%	car	prof. drivers
GC_environmental_cost	65%	27%	8%	car	prof. drivers
PC_job_productive	27%	31%	42%	car	prof. drivers
PC_social_peers	27%	58%	15%	car	prof. drivers
PC_social_peers	17%	69%	14%	car with info	prof. drivers
GC_GHG_emmissions	48%	21%	31%	car with info	prof. drivers
PC_travel_comfort	52%	34%	14%	car with info	prof. drivers
GC_health_burden	34%	41%	24%	car with info	prof. drivers
GC_public_health	34%	41%	24%	car with info	prof. drivers
GC_life_quality	41%	38%	21%	car with info	prof. drivers
GC_pollution	45%	31%	24%	car with info	prof. drivers
PC_social_status_peers	38%	45%	17%	car with info	prof. drivers
PC_mobility_cost	28%	41%	31%	car with info	prof. drivers
GC_environmental_degradation	52%	24%	24%	car with info	prof. drivers
PC_job_hassle	38%	52%	10%	car with info	prof. drivers

GC_scenery	75%	13%	13%	bus	prof. drivers
PC_surveillance	13%	50%	38%	bus	prof. drivers
PC_travel_pleasant	50%	38%	13%	bus	prof. drivers
GC_infrastructure	63%	25%	13%	bus	prof. drivers
PC_social_party	38%	50%	13%	bus	prof. drivers
GC_traffic_congestion	75%	13%	13%	bus	prof. drivers
PC_subjective_stress	75%	25%	NA	bus	prof. drivers
PC_social_status_peers	25%	63%	13%	bus	prof. drivers
PC_life_quality	38%	50%	13%	bus	prof. drivers

7 References

7.1 Bibliography/reference list

Anderson, J., Kalra, N., Stanley, K., Sorenson, P., Samaras, C., & Oluwatola, O., (2014). *Autonomous Vehicle Technology: A Guide for Policymakers* (No. RR443-RC). RAND Corporation: Santa Monica, CA. https://www.rand.org/pubs/research_reports/RR443-2.html

Arbib, J., & Seba, T. (2017). Rethinking transportation 2020-2030: The disruption of transportation and the 970 collapse of the internal-combustion vehicle and oil industries. https://static1.squarespace.com/static/585c3439be65942f022bbf9b/t/591a2e4be6f2e1c13df930c5/1494888038959/RethinkX+Report_051517.pdf

Bansal, P., & Kockelman, K. (2018). Are we ready to embrace connected and self-driving vehicles? A case study of Texans. *Transportation, 45*, 641-675. https://doi.org/10.1007/s11116-016-9745-z

Bansal, P., Kockelman, K.M., Singh, A., 2016. Assessing public opinions of and interest in new vehicle technologies: an Austin perspective. Transp. Res. Part C: Emerg. Technol. 67, 1–14. http://dx.doi.org/10.1016/j.trc.2016.01.019

Becker, F., & Axhausen, K. (2017). Literature review on surveys investigating the acceptance of automated vehicles. *Transportation, 44*, 1293-1306. https://doi.org/10.1007/s11116-017-9808-9

Bennett R., Vijaygopal R. and Kottasz R. (2019), 'Attitudes towards autonomous vehicles among people with physical disabilities', *Transportation Research Part A: Policy and Practice* **127**: 1-17

Cartenì A. (2020), 'The acceptability value of autonomous vehicles: A quantitative analysis of the willingness to pay for shared autonomous vehicles (SAVs) mobility services', *Transportation Research Interdisciplinary Perspectives* **8**: 100224

Collingwood, L. (2017). Privacy implications and liability issues of autonomous vehicles. *Information & Communications Technology Law, 26*(1), 32–45. https://doi.org/10.1080/13600834.2017.1269871

Dia, H., & Javanshour, F. (2017). Autonomous shared mobility-on-demand: Melbourne pilot simulation study. *Transportation Research Procedia, 22*, 285–296. https://doi.org/10.1016/j.trpro.2017.03.035

Fagnant, D. J., & Kockelman, K. (2015). Preparing a nation for autonomous vehicles: opportunities, barriers and policy recommendations. *Transportation Research Part A: Policy and Practice*, *77*, 167-181. https://doi.org/10.1016/j.tra.2015.04.003

Fournier, G., Pfeier, C., Baumann, M., & Worner, R. (2017). Individual mobility by shared autonomous electric veh elfeets: Cost and CO2 comparison with internal combustion engine vehicles in Berlin, Germany. In R. Jardim-Gon calves (Ed.), 2017 International Conference on Engineering, Technology and Innovation (ICE/ITMC), 368-376. https://doi.org/10.1109/ICE.2017.8279909.e

Fraedrich, E., & Lenz, B. (2016). Societal and individual acceptance of autonomous driving. In *Autonomous driving,* 621-640, Springer. https://doi.org/10.1007/978-3-662-48847-8_29

Glancy, D. (2012). Privacy in autonomous vehicles. *Santa Clara Law Review, 52*, 1171-1199.

Greenblatt, J., & Saxena, S. (2015). Autonomous taxis could greatly reduce greenhouse-gas emissions of US light-duty vehicles. *Nature Climate Change, 5*(9), 860-863. https://doi.org/10.1038/nclimate2685

Haboucha, C., Ishaq, R., & Shiftan, Y. (2017). User preferences regarding autonomous vehicles. *Transportation Research Part C: Emerging Technologies*, *78*, 37-49. https://doi.org/10.1016/j.trc.2017.01.010

Harper, C., Hendrickson, C. T., Mangones, S., & Samaras, C. (2016). Estimating potential increases in travel with autonomous vehicles for the non-driving, elderly and people with travel-restrictive medical conditions. *Transportation research part C: emerging technologies*, *72*, 1-9. https://doi.org/10.1016/j.trc.2016.09.003

Hegner, S., Beldad, A. D., & Brunswick, G. (2019). In automatic we trust: Investigating the impact of trust, control, personality characteristics, and extrinsic and intrinsic motivations on the acceptance of autonomous vehicles. *International Journal of Human–Computer Interaction*, *35*(19), 1769-1780. https://doi.org/10.1080/10447318.2019.1572353

Herrenkind B., Nastjuk I., Brendel A.B., Trang S. and Kolbe L.M. (2019), 'Young people's travel behaviour – Using the life-oriented approach to understand the acceptance of autonomous driving', *Transportation Research Part D: Transport and Environment* **74**: 214-233.

Hilgartner K. and Granig P. (2020), 'Public perception of autonomous vehicles: A qualitative study based on interviews after riding

an autonomous shuttle', *Transportation Research Part F: Traffic Psychology and Behaviour* **72**: 226-243

Howard, D., & Dai, D. (2015). Public perceptions of self-driving cars: the case of Berkeley, California. Presented at the 93rd Annual Meeting of Transportation Research Board, Washington, DC. https://www.ocf.berkeley.edu/~djhoward/reports/Report%20-%20Public%20Perceptions%20of%20Self%20Driving%20Cars.pdf

Hulse, L., Xie, H., & Galea, E. (2018). Perceptions of autonomous vehicles: Relationships with road users, risk, gender and age. *Safety Science*, *102*, 1-13. https://doi.org/10.1016/j.ssci.2017.10.001

Ipsos MORI, (2014). Ipsos MORI Loyalty Automotive Survey, Technical Report. http://www.sciencewise-erc.org.uk/cms/assets/Uploads/Automated-Vehicles-Update-Jan-2015.pdf

Jing P., Xu G., Chen Y., Shi Y. and Zhan F. (2020), 'The Determinants behind the Acceptance of Autonomous Vehicles: A Systematic Review', *Sustainability* **12**: 1719

Kaan J. (2017), 'User Acceptance of Autonomous Vehicles: Factors and Implications', MSc thesis, Delft University of Technology, The Netherlands

Kennedy, C. (2016). New threats to vehicle safety: how cybersecurity policy will shape the future of autonomous vehicles. *Mich. Telecomm. & Tech. L. Rev.*, *23*, 343.

Kim H. (2019), 'Trustworthiness of unmanned automated subway services and its effects on passengers' anxiety and fear', *Transportation Research Part F: Traffic Psychology and Behaviour* **65**: 158-175

Kyriakidis, M., Happee, R., & de Winter, J. (2015). Public opinion on automated driving: Results of an international questionnaire among 5000 respondents. *Transportation research part F: traffic psychology and Behaviour*, *32*, 127-140. https://doi.org/10.2139/ssrn.2506579

LaMondia, J., Fagnant, D., Qu, H., Barrett, J., & Kockelman, K. (2016). Shifts in long-distance travel mode due to automated vehicles: Statewide mode-shift simulation experiment and travel survey analysis. *Transportation Research Record*, *2566*(1), 1-11. https://doi.org/10.3141/2566-01

Liu, P., Guo, Q., Ren, F., Wang, L., & Xu, Z. (2019). Willingness to pay for self-driving vehicles: Influences of demographic and psychological factors. *Transportation Research Part C: Emerging Technologies, 100*, 306–317. https://doi.org/10.1016/j.trc.2019.01.022

Liu, P., Ma, Y., & Zuo, Y. (2019). Self-driving vehicles: Are people willing to trade risks for environmental benefits? Transportation Research Part A: Policy and Practice, 125, 139–149. https://doi.org/10.1016/j.tra.2019.05.014

Liu, P., Yang, R., & Xu, Z. (2018). How Safe Is Safe Enough for Self-Driving Vehicles? *Risk Analysis, 39*(2), 315–325. https://doi.org/10.1111/risa.13116

Millard-Ball, A. (2019). The autonomous vehicle parking problem. *Transport Policy, 75*, 99-108. https://doi.org/10.1016/j.tranpol.2019.01.003

NHTSA, (2008). National Motor Vehicle Crash Causation Survey. National Highway Traffic Safety Administration, U.S. Department of Transportation. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811059

NHTSA. (2016). Federal Automated Vehicles Policy: Accelerating the Next Revolution in Roadway Safety. *National Highway Traffic Safety Administration*, U.S. Department of Transportation, Washington, D.C. https://www.hsdl.org/?view&did=795644

Nordoff S., de Winter J., Madigan R., Merat N., van Arem B. and Happee R. (2018), 'User acceptance of automated shuttles in Berlin-Schöneberg: A questionnaire study', *Transportation Research Part F: Traffic Psychology and Behaviour* **58**: 843-854

Pakush C. and Bossauer P. (2017), 'User Acceptance of Fully Autonomous Public Transport', Proceedings of the 14th International Joint Conference on e-Business and Telecommunications (ICETE 2017) **2**: 52-60

Raj A., Kumar J.A. and Bansal P. (2020), 'A multicriteria decision making approach to study barriers to the adoption of autonomous vehicles', *Transportation Research Part A: Policy and Practice* **133**: 122-137

Roche-Cerasi I., (2019), 'Public acceptance of driverless shuttles in Norway', *Transportation Research Part F: Traffic Psychology and Behaviour* **66**: 162-183

Schoettle, B., Sivak, M. (2015). *Motorists' preferences for different levels of vehicle automation*. University of Michigan, Technical Report No. UMTRI-2015-22. http://www.umich.edu/~umtriswt/PDF/UMTRI-2015-22_Abstract_English.pdf

Seapine Software (2014). Study Finds 88 Percent of Adults Would Be Worried about Riding in a Driverless Car. http://www.seapine.com/about-us/press-release-full? press=217

Soteropoulos, A., Berger, M., & Ciari, F. (2018). Impacts of automated vehicles on travel behaviour and land use: an international review of modelling studies. *Transport Reviews, 39*(1), 29–49. https://doi.org/10.1080/01441647.2018.1523253

Taiebat, M., Brown, A., Safford, H., Qu, S., & Xu, M. (2018). A review on energy, environmental, and sustainability implications of connected and automated vehicles. *Environmental science & technology*, *52*(20), 11449-11465. https://doi.org/10.1021/acs.est.8b00127.s001

Tennant, C., Howard, S., Franks, B., & Bauer, M. W. and Stares, S. (2016). *Autonomous Vehicles - Negotiating a Place on the Road: A study on how drivers feel about Interacting with Autonomous Vehicles on the road* (executive summary). http://www.lse.ac.uk/websitearchive/newsAndMedia/PDF/AVs-negociating-aplace-on-the-road-1110.pdf

Xu, X., & Fan, C. (2019). Autonomous vehicles, risk perceptions and insurance demand: An individual survey in China. *Transportation research part A: policy and practice*, *124*, 549-556. https://doi.org/10.1016/j.tra.2018.04.009

Xu, Z., Zhang, K., Min, H., Wang, Z., Zhao, X., & Liu, P. (2018). What drives people to accept automated vehicles? Findings from a field experiment. *Transportation Research Part C: Emerging Technologies, 95*, 320–334. https://doi.org/ 10.1016/j.trc.2018.07.024

--- End of the document ---

PAsCAL
Enhance driver behaviour & Public Acceptance of Connected & Autonomous vehicles