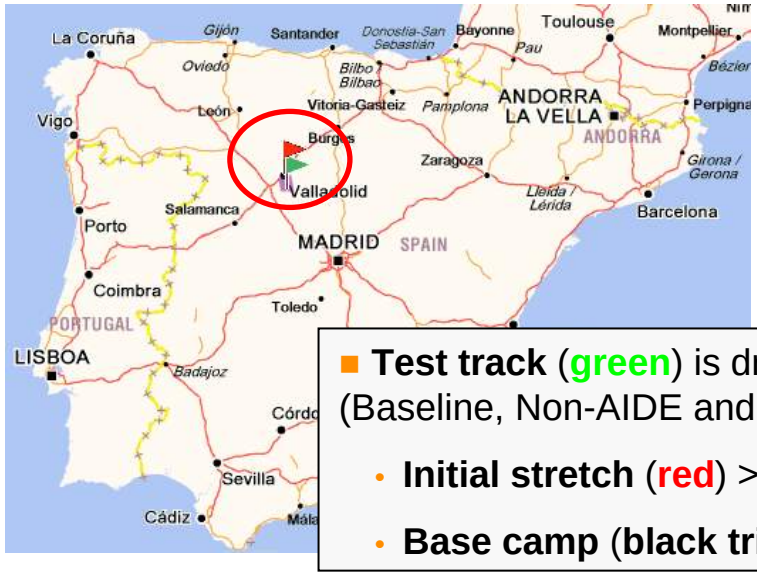
Evaluation of AIDE SEAT demonstrator

CIDAUT/SEAT

Experimental design

- **Test scenario** (main features)
  - Urban / Extra-urban / National roads
  - Rush hours were avoided
  - Each drive took 40 min. approx.
  - Drivers were informed about the route



- **Test track** (**green**) is driven 3 times > 3 conditions (Baseline, Non-AIDE and AIDE)
  - **Initial stretch** (**red**) > familiarisation stage
  - **Base camp** (**black triangle**) > breaks between trials

Experimental design

- **Use cases** > **7** use cases repeated 2/3 times (**16 total**)

Use case Id.	Description of the use case	AIDE condition
1.1	The driver is asked to make **speech-initiated phone call**	-
1.1	Start an **MP3-song** through **speech commands** and stop it with the **barrel key** / **touch screen**	-
1.3	While **parking**, an **incoming call** occurs	The incoming call is postponed
1.6	A **navigation instruction** occurs simultaneously with an **incoming call**	The incoming call is postponed
2.1	In a **demanding driving situation**, an **incoming call** takes place	The incoming call is postponed
2.3	In a situation with **cognitive distraction**, a **traffic sign recognition warning** appears	Warning enhanced
2.3	In a situation with **visual distraction**, a **traffic sign recognition warning** appears	Warning enhanced

- Drivers face a set of Use Cases representing different AIDE functionalities

Experimental design

- **Experimental Vehicle - AIDE City Car**

- **ADAS:**
  - **DW** Distraction Warning
  - **PDC** Parking Distance Control
  - **TSR** Traffic Sign Recognition

- **IVIS:**
  - **Audio**: radio / CD / nomad device mp3
  - **Communication**: phone
  - **Navigation**

- **I/O Devices:**
  - **Input**: HBK / PTT / Microphone
  - **Output**: Loudspeaker / Cluster display
  - **I / O**: Touch screen / Speech commands

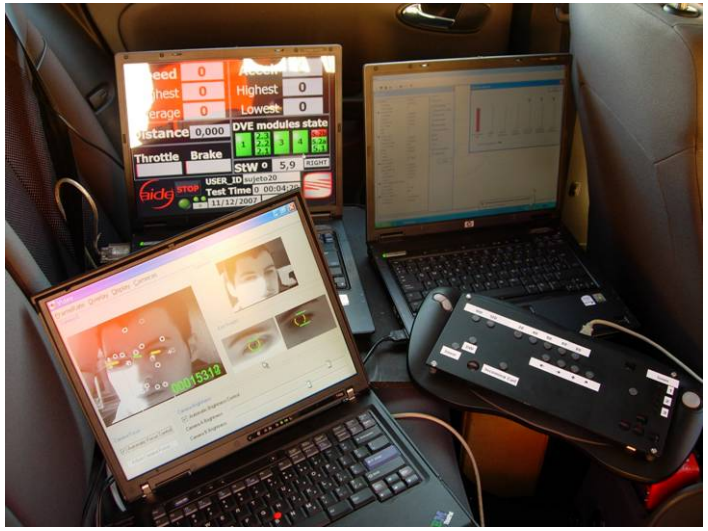
Experimental design

- **Objective / Subjective Tools for Data Logging**

- **Video recording:** Road ahead, cockpit, FaceLAB and vehicle data

- **Objective:**
  - **Vehicle measurements:** speed, acceleration, steering wheel angle, use of pedals (gas / brake)
  - **Gaze metrics:** (FaceLAB)

- **Subjective:**
  - **Entry questionnaire**
  - **RSME**
  - **DALI questionnaire**
  - **CRF questionnaire**
  - **Comparative session**



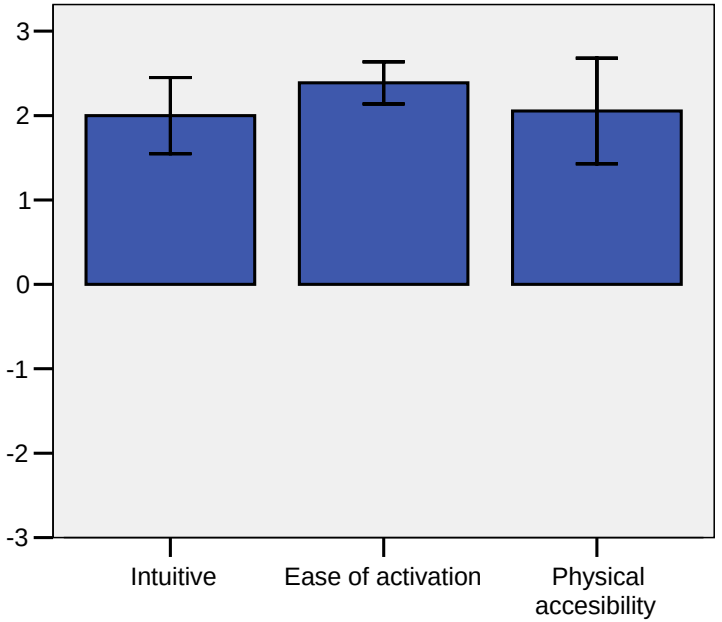
Results

Results (subjective)

- Globally, **AIDE interfaces** (visual, tactile, vocal, acoustic) have been rated as **fairly necessary, understandable, adequate and pleasant**

- **System activation modes** have been rated as **fairly intuitive, easy to be activated and accessible**

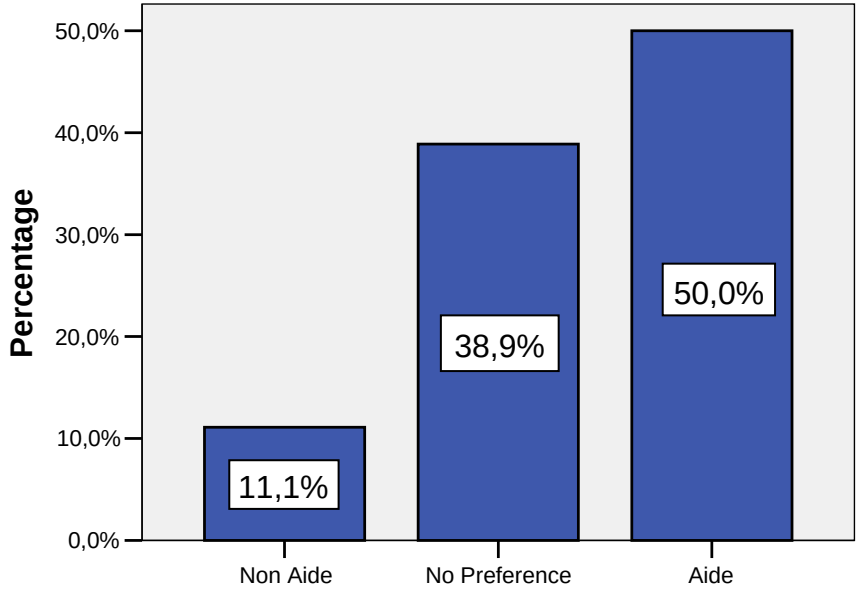
Adequacy of interfaces: system activation modes



Results

Results (subjective)

- **50% of drivers expressed a preference for the AIDE system** (opposite to a 11,1% who indicated a preference for NA).

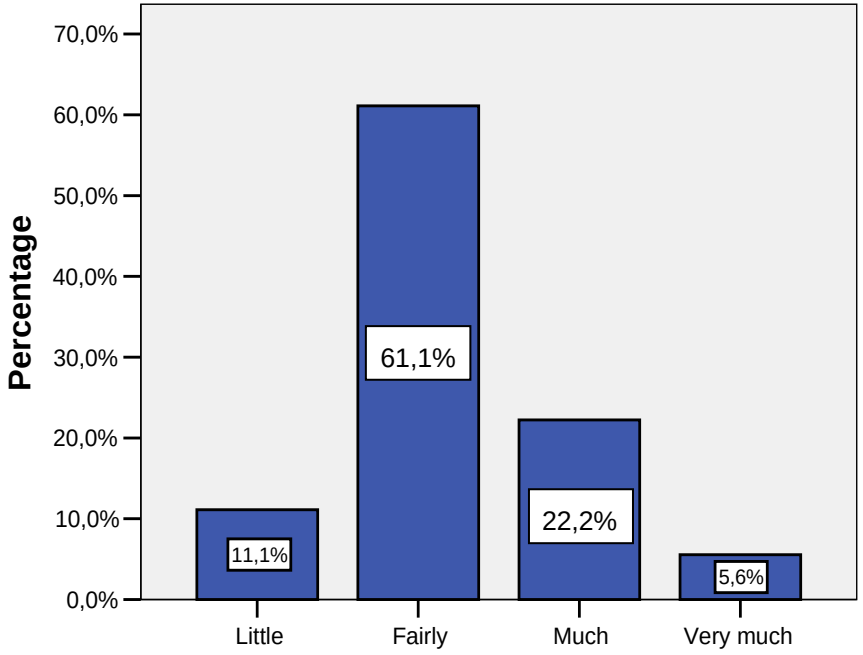


Preference for A, NA or No preference

Results

- **Results (subjective)**

- **Most of the drivers** (83,3%) **have indicated a strong willingness to have the AIDE system in their cars** (61,1% fairly and 22,2% much)

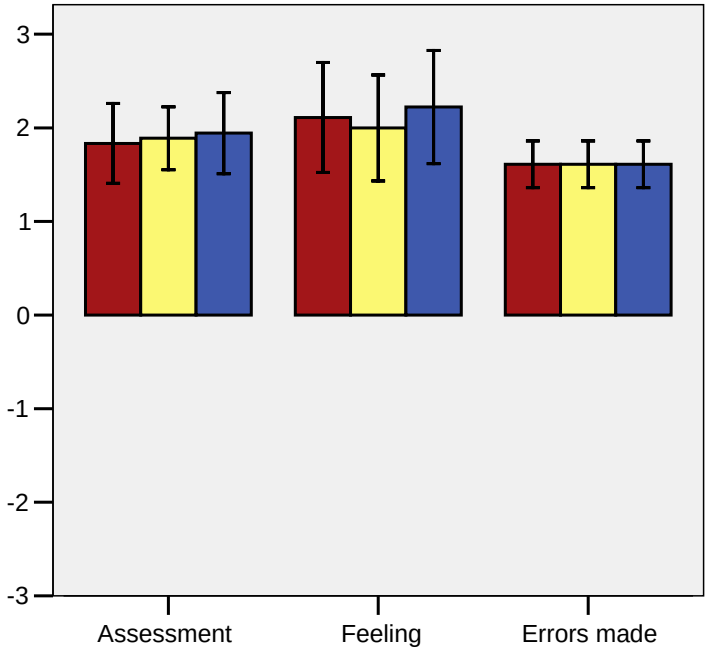


Willingness to have

Results

- **Results (subjective)**

- **No differences** have been found **in perceived driving performance**



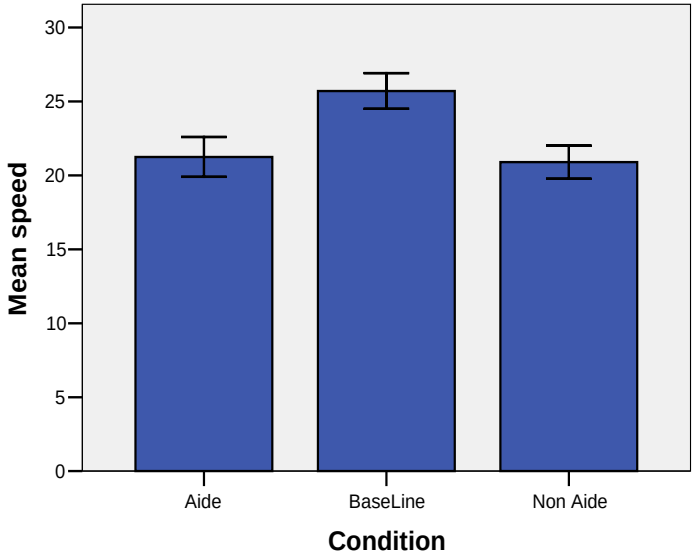
Driving performance

Condition
- ***A***
- **NA**
- ***BL***

Results

Results (objective – all data)

- There are **no significant differences between A and NA related to "Mean speed" and "Time used to perform the test"** but **there are differences between A/NA and BL, being A closer to BL than NA**



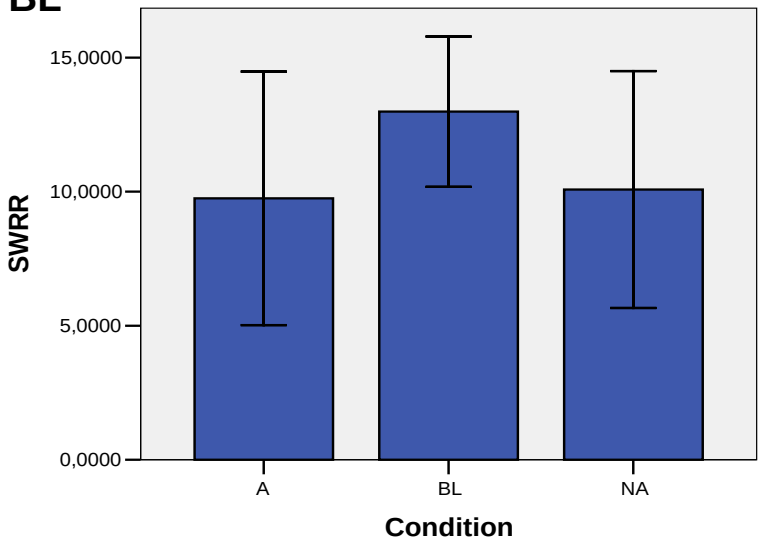
Mean speed

- According to the variables **"Maximum speed", "Gas", "Break" and "Steering wheel angle"** there are **no significant differences between A, NA and BL conditions**

Results

- **Results (objective/subjective – all data)**

- **Objective analyses: Steering Wheel Reversal Rate (SWRR) was not found to be significantly different between A and NA, but was found to be significantly different between A/NA and BL**

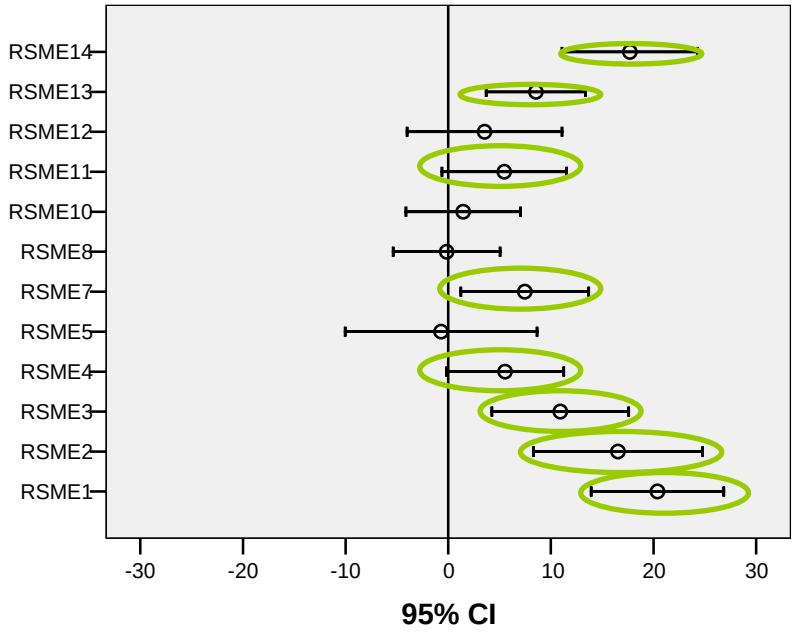


- **Subjective analyses: DALI did not provide any significant difference between A and NA**

Results

Results (subjective – UC data)

- In the **analyses per UCs,** it was found that **workload assessment (through RSME) did not give any significant difference between A and NA, although it gave significant results in the comparison between BL and A/NA**



RSME comparison between A and BL

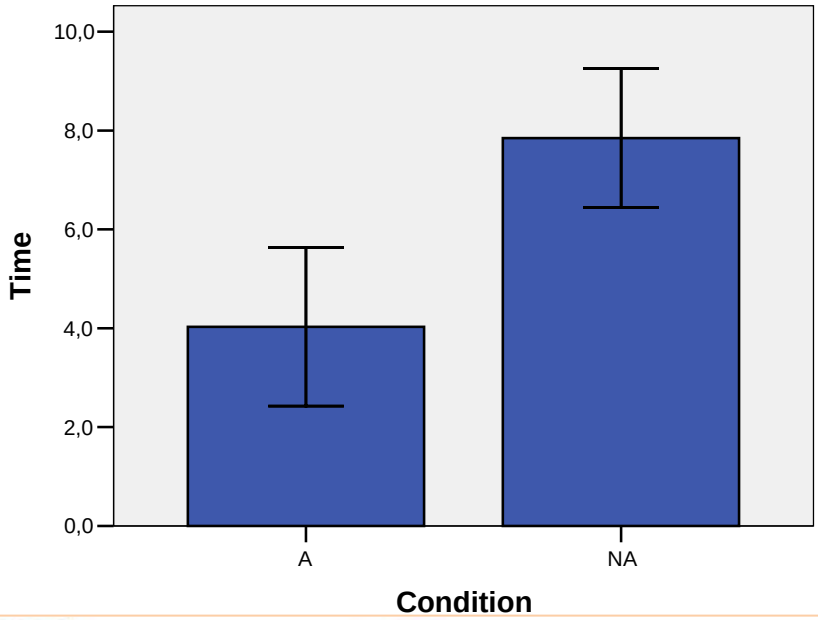
The A system imposes a certain level of workload in the driving activity compared to driving without any system

Results

Results (objective – UC data)

- In the **analyses per UCs,** it was found that **reaction time to an incoming call was significantly shorter in the A condition than in the NA condition.** Specifically, this result was found in three UCs identified as 1.6 (*navigation* + *incoming call*), representing a navigation instruction followed by a phone call.

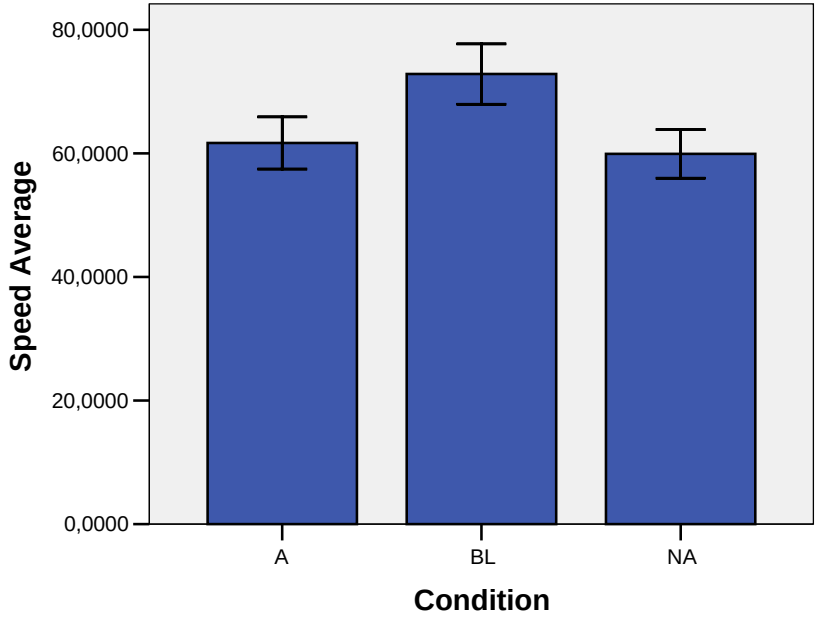
Reaction time



Results

Results (objective – UC data)

- In the **analyses per UCs** (UCs related to cognitive distraction)**,** it was found that **speed average was significantly different in BL compared to A and NA conditions, being higher in BL and being A closer to BL than NA.**



Speed average

A tendency has been found reflecting that A improves the perception of warning messages (TSR) in a cognitive distracted situation

Results

Conclusions

- Globally, **AIDE interfaces** (visual, tactile, vocal, acoustic) have been rated as **fairly necessary, understandable, adequate and pleasant**

- **System activation modes** have been rated as **fairly intuitive, easy to be activated and accessible**

- **50% of drivers expressed a preference for the AIDE system** (opposite to a 11,1% who indicated a preference for NA).

- **Most of the drivers** (83,3%) **have indicated a strong willingness to have the AIDE system in their cars** (61,1% fairly and 22,2% much)

- **No differences** have been found **in perceived driving performance**

Results

Conclusions

- In the **analyses per UCs,** it was found that **workload assessment (RSME) did not give any significant difference between A and NA, although it gave significant results in the comparison between BL and A/NA >** The A system imposes a certain level of workload in the driving activity compared to driving without any system

- In the **analyses per UCs** (1.6)**,** it was found that **reaction time to an incoming call was significantly shorter in the A condition than in the NA condition.**

- In the **analyses per UCs** (UCs related to cognitive distraction)**,** it was found that **speed average was significantly different in BL compared to A and NA conditions, being higher in BL and being A closer to BL than NA.** Also, a tendency has been found reflecting that A improves the perception of warning messages (TSR) in a cognitive distracted situation

Evaluation of AIDE city-car demonstrator

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