

Which Voice Do You Want To Hear From Your Automated Vehicle? User Preference on In-Vehicle Intelligent Agent Voice In Automated Vehicles

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OBJECTIVE

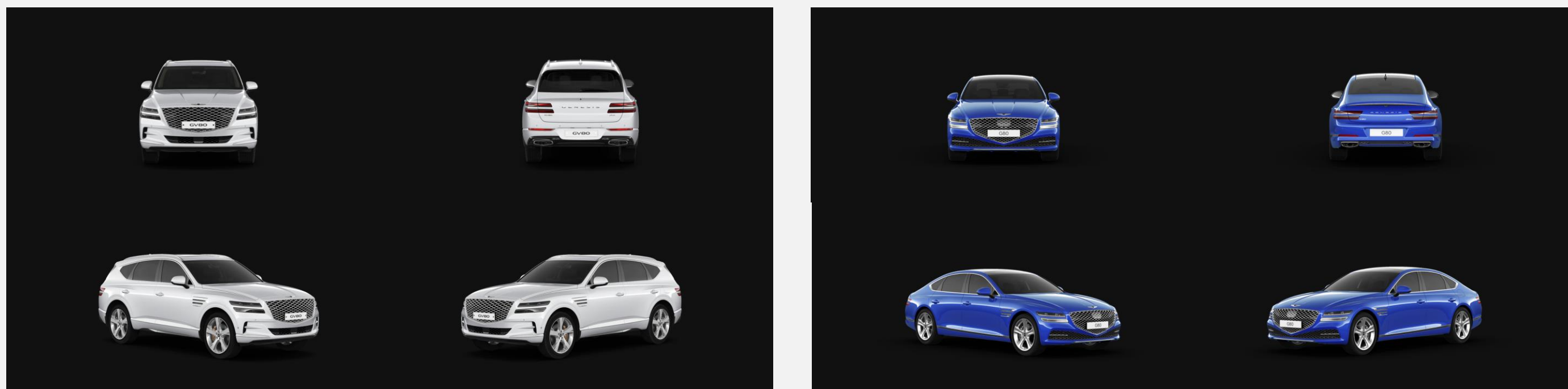
The purpose of this research is to evaluate the user preference between the Automated Vehicles (AVs) appearance and In-Vehicle Intelligent Agents (IVIA) voices.

BACKGROUND

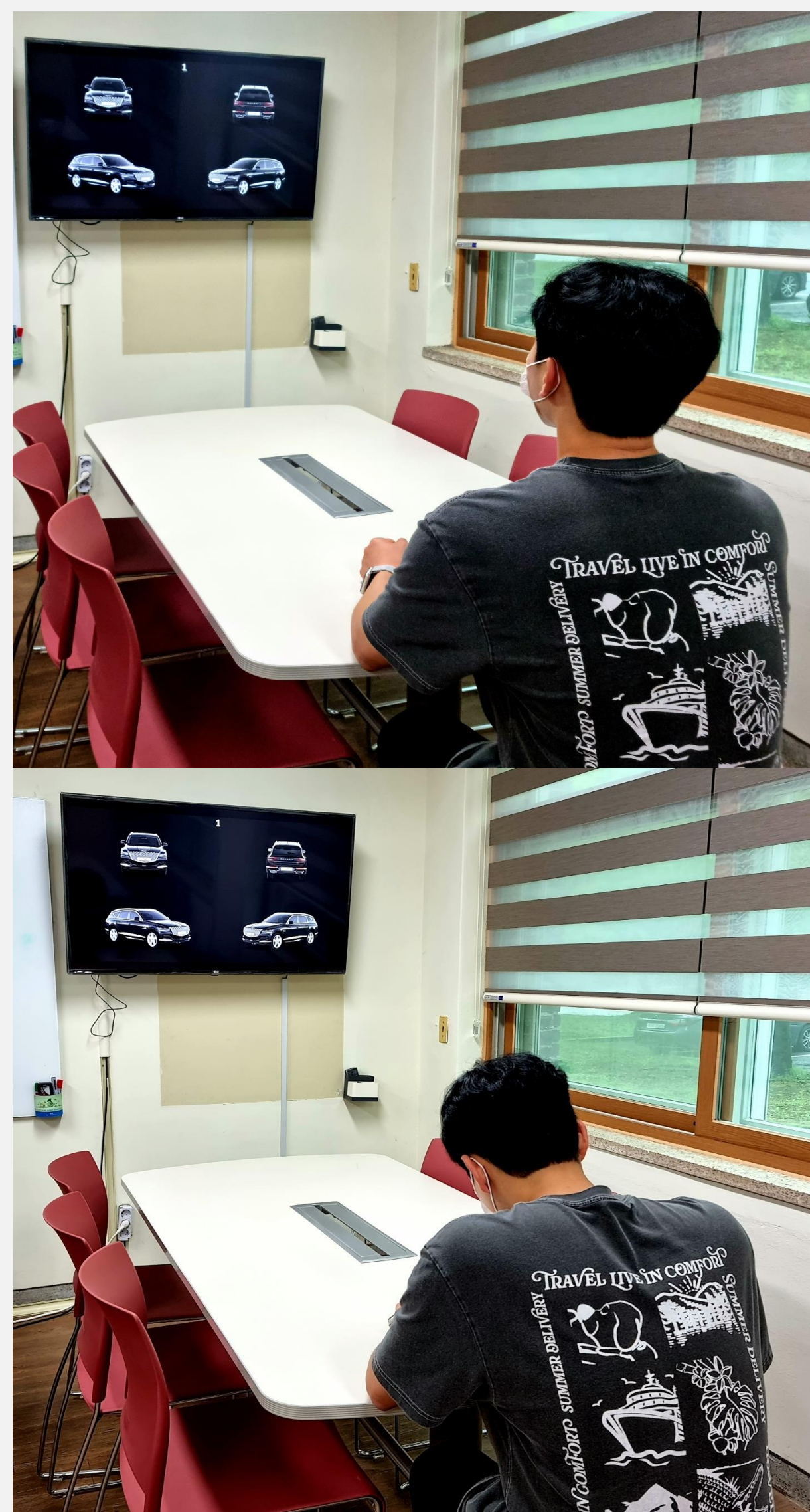
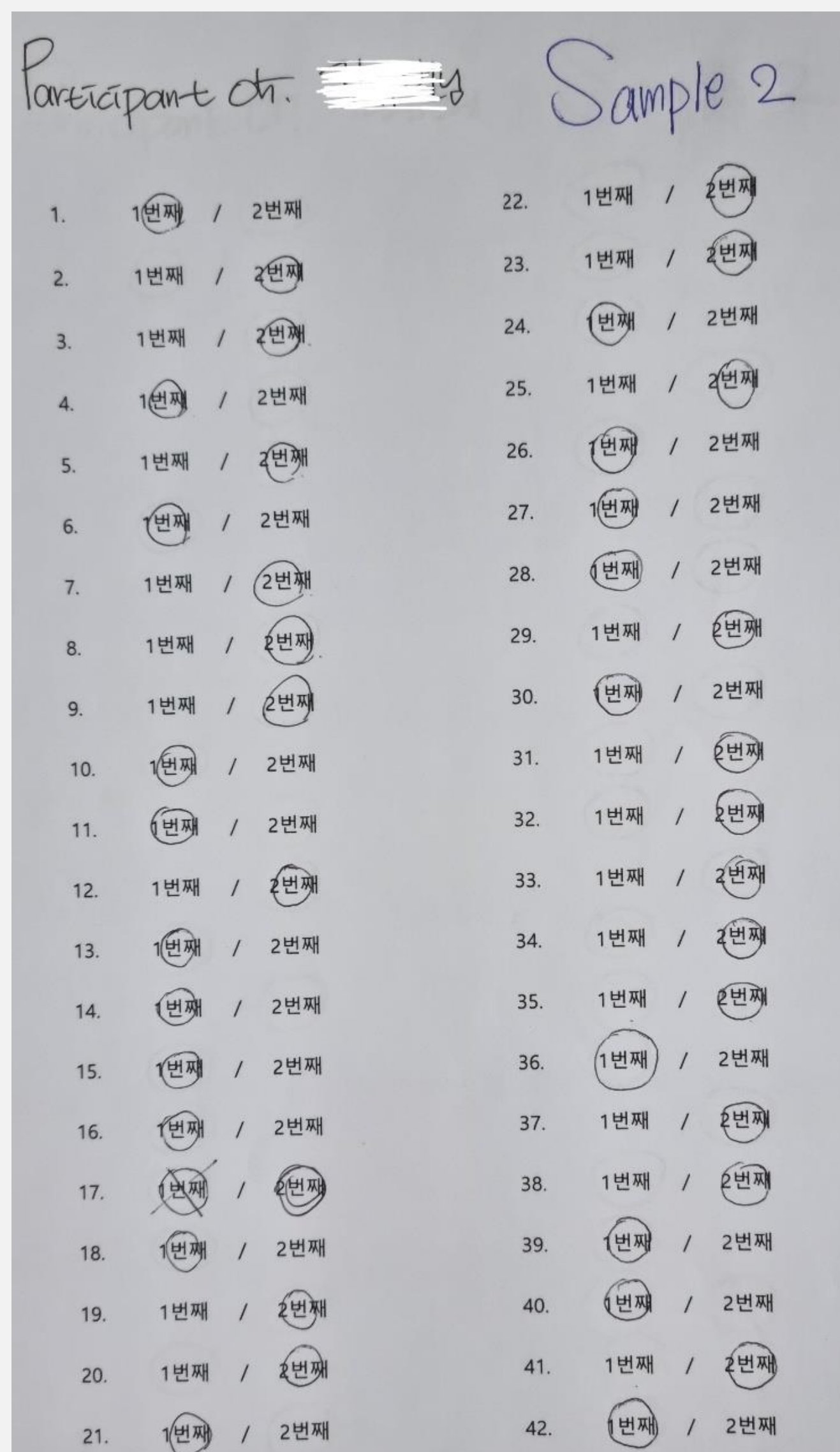
- People say that there is no collection as revealing human characteristics as cars. Because cars are easily noticeable and products that symbolize the status, income, and personality of users.
- Voice User Interfaces (VUIs) have been studied extensively due to their advantages in driving contexts. If AVs are close to perfection, people in AVs will not be involved in any driving tasks and VUIs will be an important factor in trust and satisfaction.
- Until recently, much literature investigated voice characteristics from the perspective of whether people prefer or not in a certain context. However, considering that people have a close emotional attachment to their cars, it is necessary to design IVIA's voice associated with car appearance.

METHOD

- **Participants** 19 adults who use various transportations.
- **Design**
 - **IVIA's voice (2 gender x 3 communication style)**
Gender: male and female
Communication style: congruent, super reasonable, and placating
14 script scenarios (driving and non-driving situations)
 - **AVs appearance (4 color x 2 type)**
Color: black, white, red, and blue
Type: sedan and SUV



- **Task**
Each participant listens to 2 IVIA's voice stimuli for 1 AVs image, and chooses one voice stimuli that they are more suitable for the image.
- **Data collection**
Record IVIA's voice stimuli that match the car image with a pen on the paper.



RESULTS

- Among two vehicle appearance features, significant differences were only found depending on the vehicle type. There were no significant differences between different colors.

Vehicle type	Communication style			Total	χ^2	p-value
	Congruent	Super reasonable	Placating			
Sedan	109 (27.9)	199 (50.8)	82 (21.3)	390 (100.0)	34.638	p < 0.05
SUV	217 (53.2)	114 (27.9)	77 (18.9)	408 (100.0)		

Vehicle type	Voice gender		Total	χ^2	p-value
	Male	Female			
Sedan	166 (42.7)	224 (57.3)	390 (100.0)	58.243	p < 0.05
SUV	259 (63.5)	149 (36.5)	408 (100.0)		

- Female & super reasonable is the most frequently occurring IVIA's voice type involved in 118 counts, accounting for 30.1% of the frequency in sedan.
- Male & congruent is the most frequently occurring IVIA's voice type involved in 136 counts, accounting for 33.3% of the frequency in SUV.

	IVIA's Voice						Total	χ^2	p-value
	Male Congruent	Male Super reasonable	Male Placating	Female Congruent	Female Super reasonable	Female Placating			
Sedan	46 (12.6)	81 (20.8)	36 (9.3)	60 (15.4)	118 (30.1)	46 (11.8)	390 (100.0)	88.085	p < 0.05
SUV	136 (33.3)	74 (18.1)	49 (12.0)	81 (19.9)	40 (9.8)	28 (6.9)	408 (100.0)		

- The follow-up questionnaire results showed that female participants showed higher scores of preferences for male and congruent voices compared to male participants.

IVIA's voice	Participant gender	N	Mean (SD)	U	p-value
Male	Male	9	4.5 (2.1)	13.500	p < 0.05
	Female	10	6.5 (0.7)		
Female	Male	9	5.3 (1.9)	26.500	0.133
	Female	10	6.4 (0.7)		
Congruent	Male	9	4.8 (1.9)	19.000	p < 0.05
	Female	10	6.3 (1.1)		
Super reasonable	Male	9	5.4 (2.1)	33.000	0.356
	Female	10	5.0 (1.9)		
placating	Male	9	3.1 (2.3)	26.500	0.133
	Female	10	2.2 (1.2)		

- In a short interview after the experiment, it was mentioned that 14 (73.6%) of 19 participant on IVIA's voice rather than car appearance.

CONCLUSIONS

- Previous studies from industrial design perspectives showed that concepts of products are assigned to their usage purpose so that the user can easily understand and interact with them. Similarly, the type of vehicle was first considered when designing vehicle appearance compared to colors.
- The experiment was conducted without giving the real situations associated with IVIA's script. If scenario-based tasks or situations were considered in the experimental design, we could get more clear pictures.
- Only the selection ratio between conditions was analyzed. Collecting data for investigating direct relations between vehicle appearance and IVIA's characteristics is necessary.
- During the short interview, some participants mentioned that they did not seriously consider vehicle types or colors when selecting one of two voices and selected a voice with only considering IVIA's characteristics. It means there is a possibility of not detecting differences between some variables. Many scenarios or situations need to be considered.