

Distinct Characteristics between “Anshin” and Feeling of Safety Evaluations

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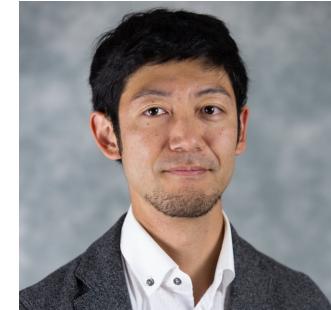


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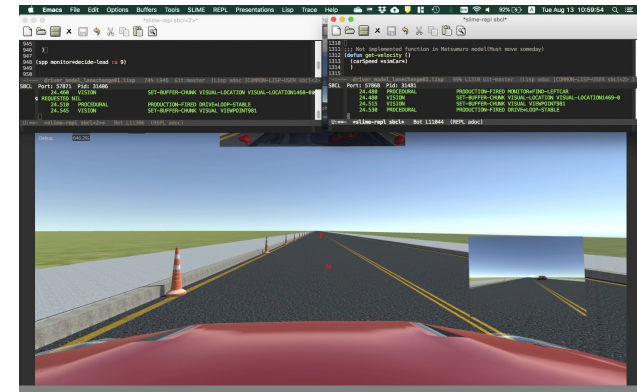
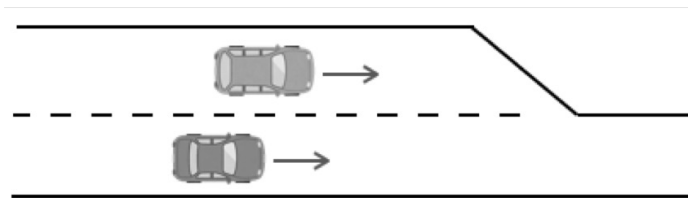
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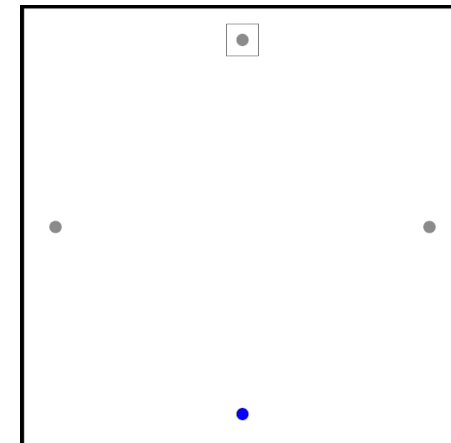
- Recent Work

- **Self-Benefit and Others' Benefit in Cooperative Behavior in Shared Space** (in press), *Human Factors: The Journal of the Human Factors and Ergonomics Society*.
 - **Development of a Driving Model That Understands Other Drivers' Characteristics** (2020). *HCII 2020*, 2(1918), 29–39.
 - **Model-based Approach with ACT-R about Benefits of Memory-based Strategy on Anomalous Behaviors** (2019), *Proceedings of the 41th Annual Meeting of the Cognitive Science Society*, 776–781.

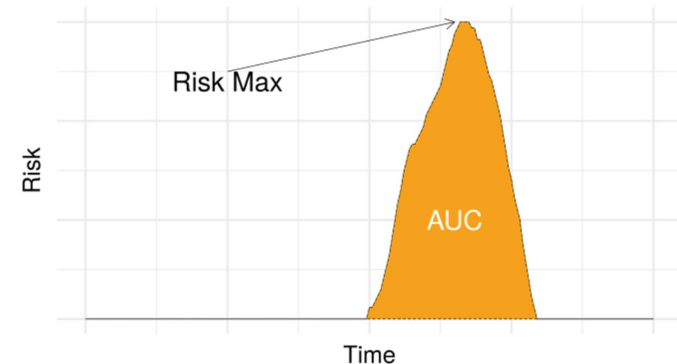
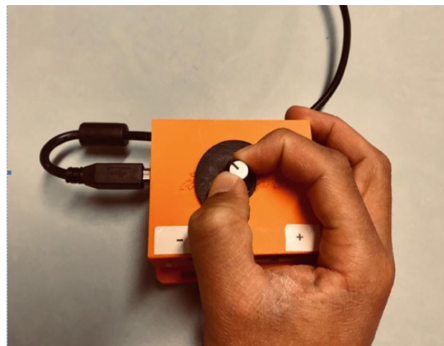
- In traffic studies, **subjective evaluations** have become important
 - Useful for developing **cooperative** autonomous vehicles [Hase]
 - in merging



- in shared space



- In traffic studies, **subjective evaluations** have become important
 - Examples:
 - **Risk perception**
“How much risk do you perceive in this situation?”
 - **Comfort/discomfort**
“How comfortable/discomfortable is this vehicle?”
 - **Fear**
“How much fear do you experience about the vehicle as a pedestrian?”



- Subjective evaluation **does not always match** objective safety
 - Model fitting is not high enough to predict perceived risk precisely [Hasegawa]
 - Perceived risk exhibits a large variation among participants
 - Predicting perceived risk requires considering more complex independent variables [Petit]
 - Passengers perceive risk even when the vehicle maintains an objectively safe speed and gap

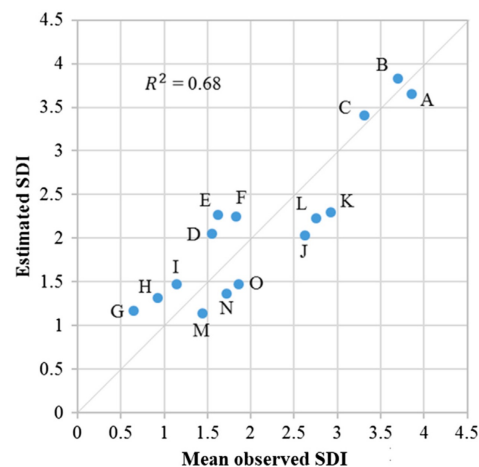
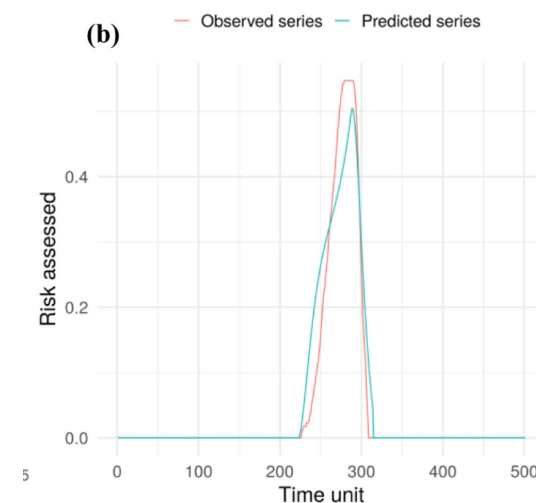


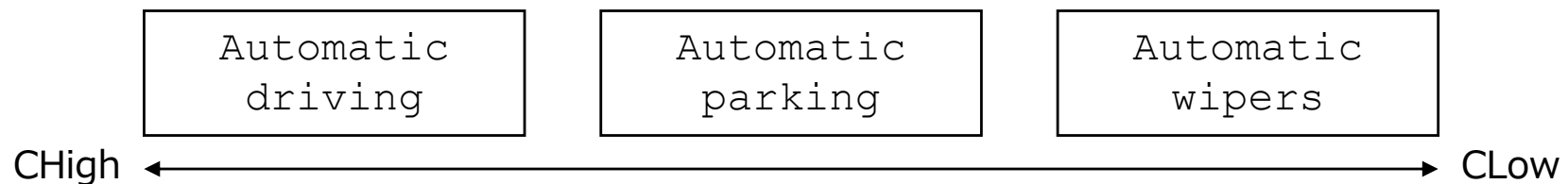
Fig. 4. Model fitness.



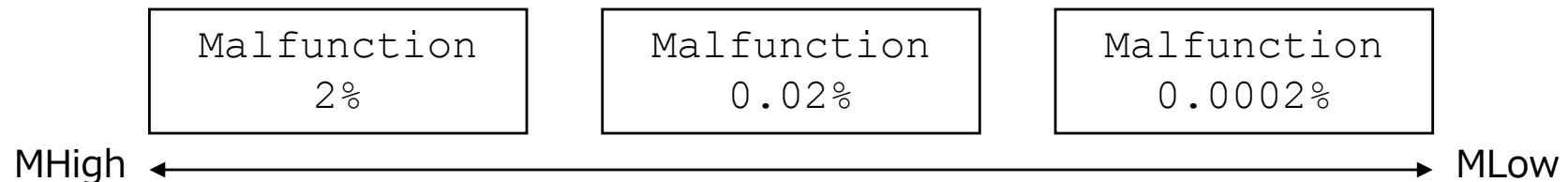
- In Japanese, “**安心 (anshin)**” is a well-known concept to express a subjective feeling
 - **Dictionary definition:**
 - peace of mind
 - freedom from care/fear
 - **Usage Example:**
 - 安心な社会 (peaceful society)
 - 安心な暮らし (comfortable living)
 - **Nature:**
 - **Difficult to be translated into English precisely** [Mukaidono]
 - **Used differently from “安全 (safety)” or “安全感 (feeling of safety)”** [Kikkawa]
 - “**Anshin**” is totally based on psychological factors
 - **Safety** can be ensured with technology

- What is the difference between “Anshin” and feeling of safety evaluations?

- As for the criticality of feature,
 - Feeling of safety evaluation will be lower than “anshin” evaluation for a high-criticality feature



- As for the information about malfunction,
 - “Anshin” evaluations will change significantly after the information about the unstable performance



- 4-factor design

1. Evaluation ("Anshin"/Feeling of safety; between factor)

2. Malfunction (MHigh/MMid/Mlow; between factor)

Malfunction 2%

Malfunction 0.02%

Malfunction 0.0002%

3. Criticality (CHigh/CMid/CLow; within factor)

Automatic driving

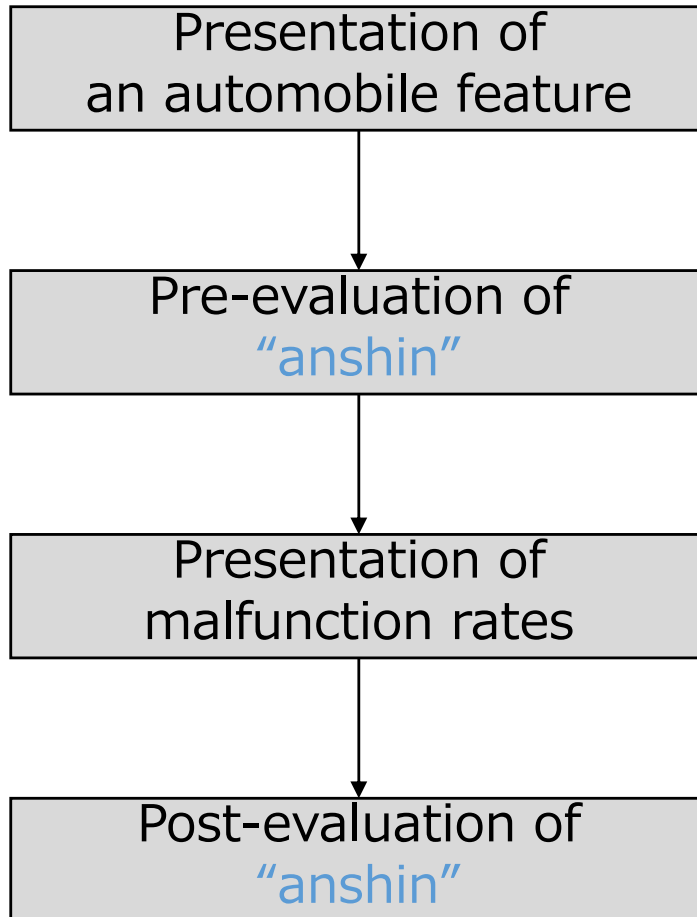
Automatic parking

Automatic wipers

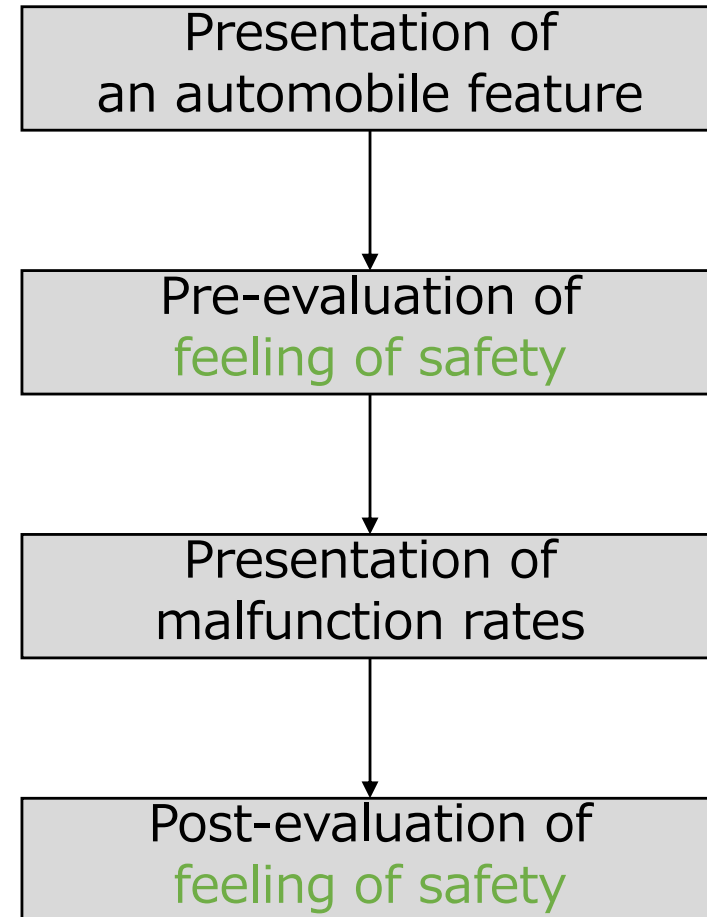
4. Phase (Pre-evaluation/Post-evaluation; within factor)

- Evaluation before/after the malfunction information is provided

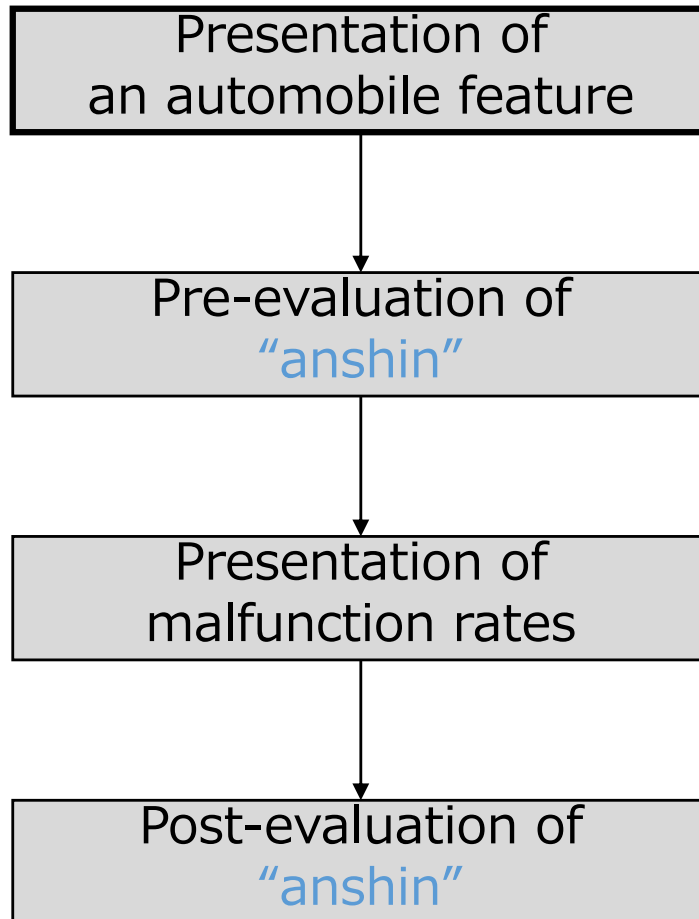
"Anshin" condition



Feeling of safety condition



"Anshin" condition



CHigh condition

In recent years, **the automatic driving** feature has become popular. This feature allows a vehicle to sense its surroundings and **automatically drive to the destination**. Although this feature is effective in reducing drivers' efforts, malfunctions can still occur.

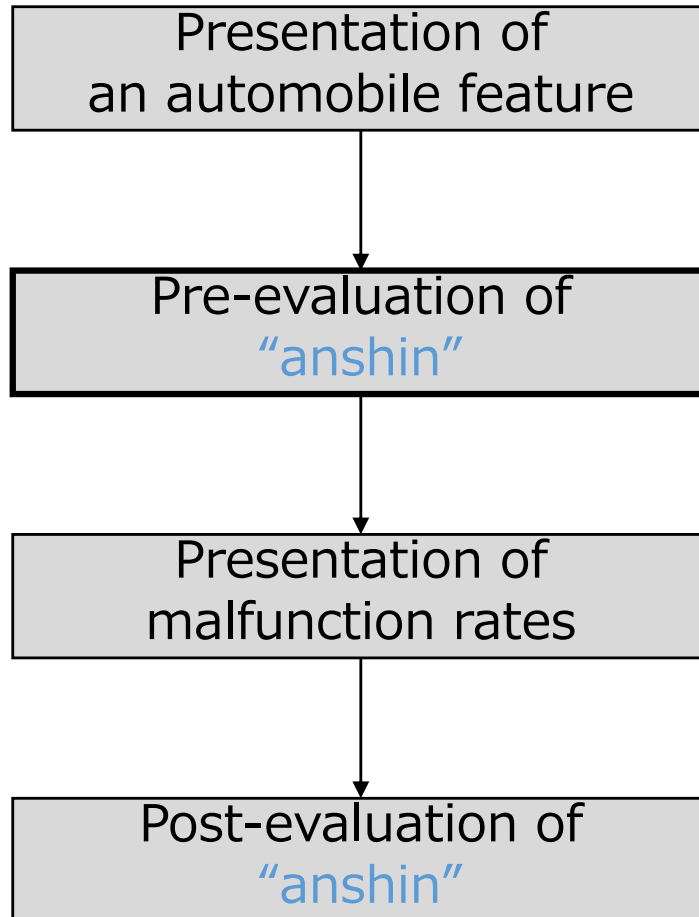
CMid condition

~, **the automatic parking** ~

CLow condition

~, **the automatic wiper** ~

"Anshin" condition



"Anshin" condition

How do you feel about its "anshin"?

1: Does not feel "anshin" at all

|

4: Neither

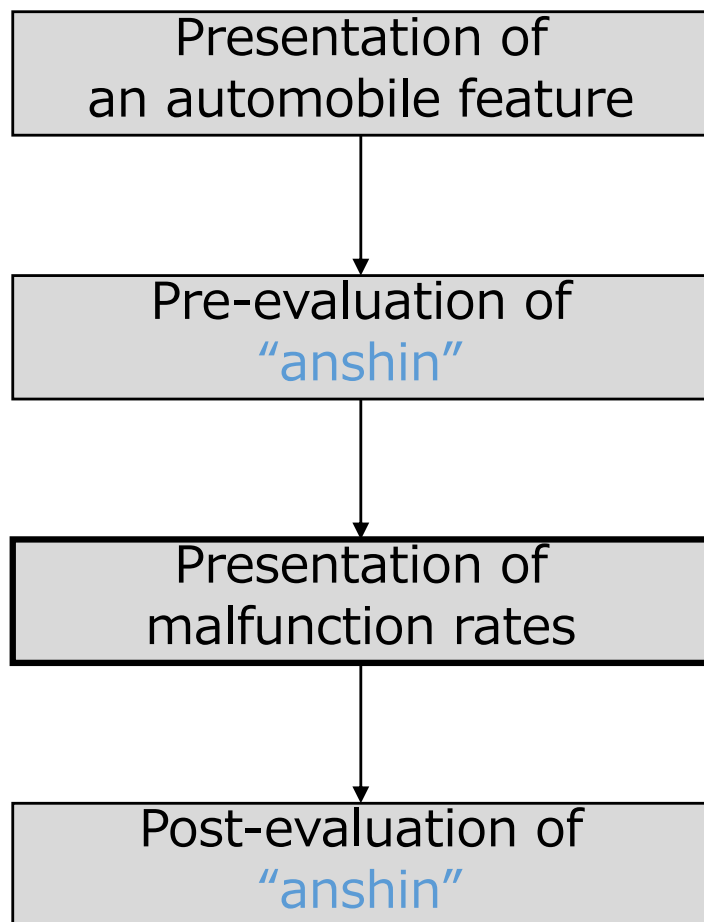
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7: Highly feel "anshin"

Feeling of safety condition

How do you feel about its safety?

"Anshin" condition



MHigh condition

Report of large investigation shows the following malfunction rates of this feature.

	Region X	Region Y	Region Z
Company A	1.4%	1.7%	1.9%
Company B	2.1%	2.3%	2.5%

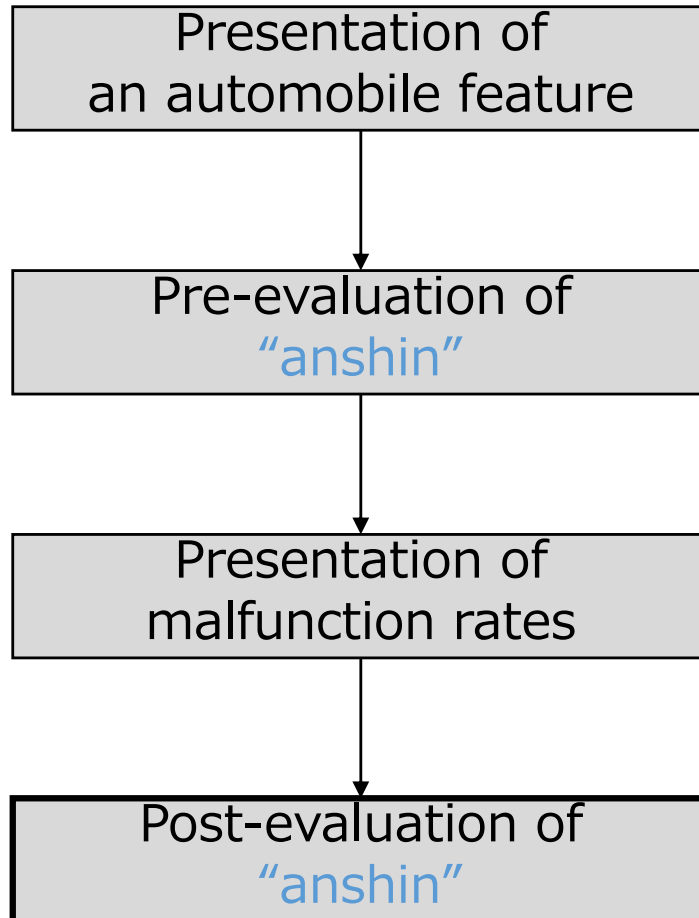
MMid condition

	Region X	Region Y	Region Z
Company A	0.014%	0.017%	0.019%
Company B	0.021%	0.023%	0.025%

MLow condition

	Region X	Region Y	Region Z
Company A	0.00014%	0.00017%	0.00019%
Company B	0.00021%	0.00023%	0.00025%

"Anshin" condition



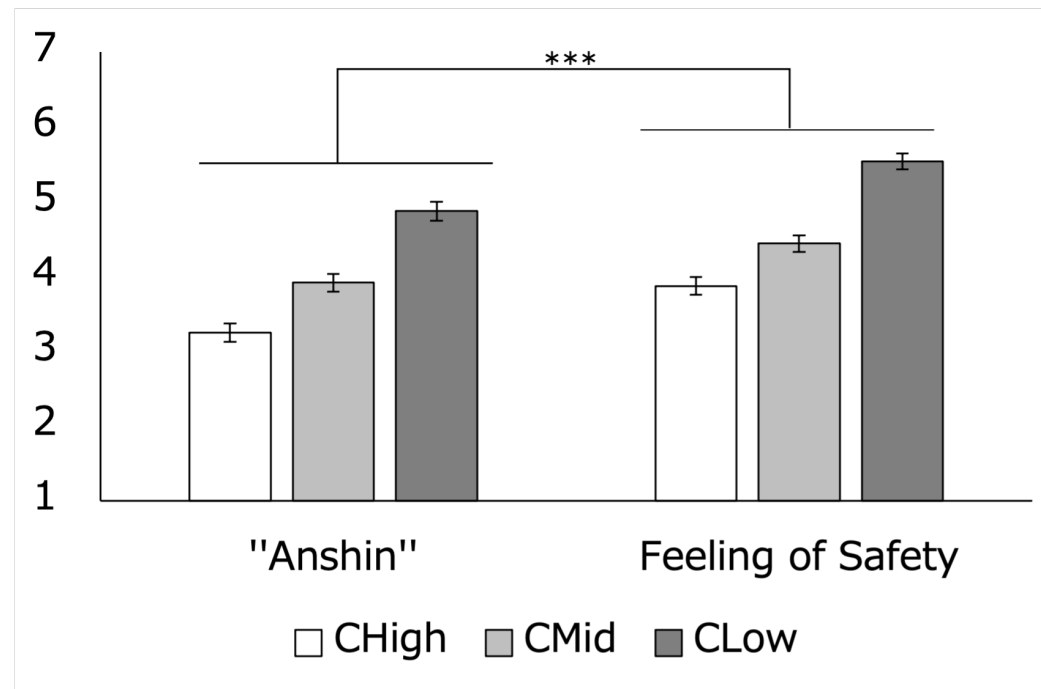
"Anshin" condition

Consider the malfunction rates.
How do you feel about its "anshin"?

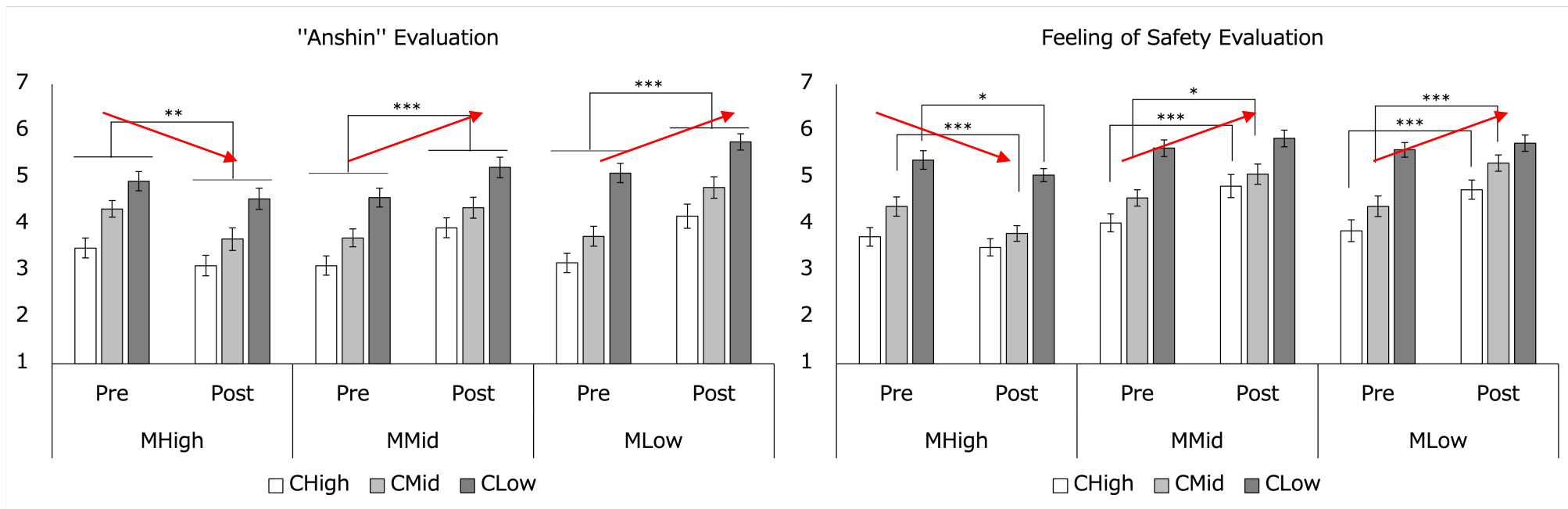
Feeling of safety condition

Consider the malfunction rates.
How do you feel about its safety?

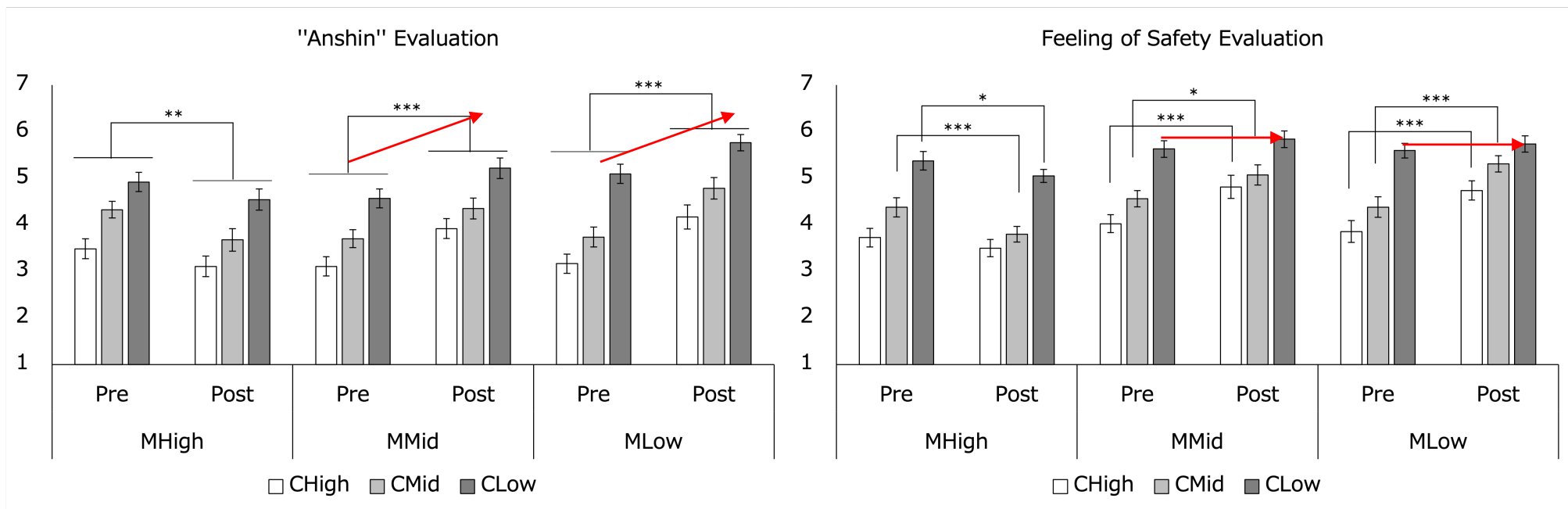
- ANOVA results show that:
 - “Anshin” < Feeling of safety
 - There was no difference with respect to the criticality



- Common Characteristics
 - Both evaluations decreased with high malfunction rates
 - Both evaluations increased with moderate or low malfunction rates



- Dinstinct Characteristics
 - With moderate or low malfunction rates,
 - the “anshin” evaluations increased uniformly
 - the feeling of safety evaluations did not increase for the low criticality features (i.e., automatic wipers)



- The difference between “Anshin” and feeling of safety evaluations
 - Overall characteristics
 - Feeling of safety evaluations was higher than the “anshin” evaluations
 - “Anshin” may have more stringent criteria than feeling of safety
- As for the criticality of feature and the information about malfunction,
 - Feeling of safety evaluations did not improve when non-critical features were described as stable
 - Stable performance of low-critical features can be objectively interpreted as non-relevant to safety

- **Feeling of safety** is sensitive to feature criticality and unstable performance
 - Because **feeling of safety** is based on objective physical measurements
- Conversely, **“anshin”** may be relatively insensitive and more subjective
 - Because **“anshin”** includes complex processes of prediction and trust [Mukaidono2009]
- Further verification is needed to clarify the differences between **“anshin”** and **feeling of safety**