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EFFECT OF IMPOSED POSTURAL CHANGE ON COGNITIVE LOAD

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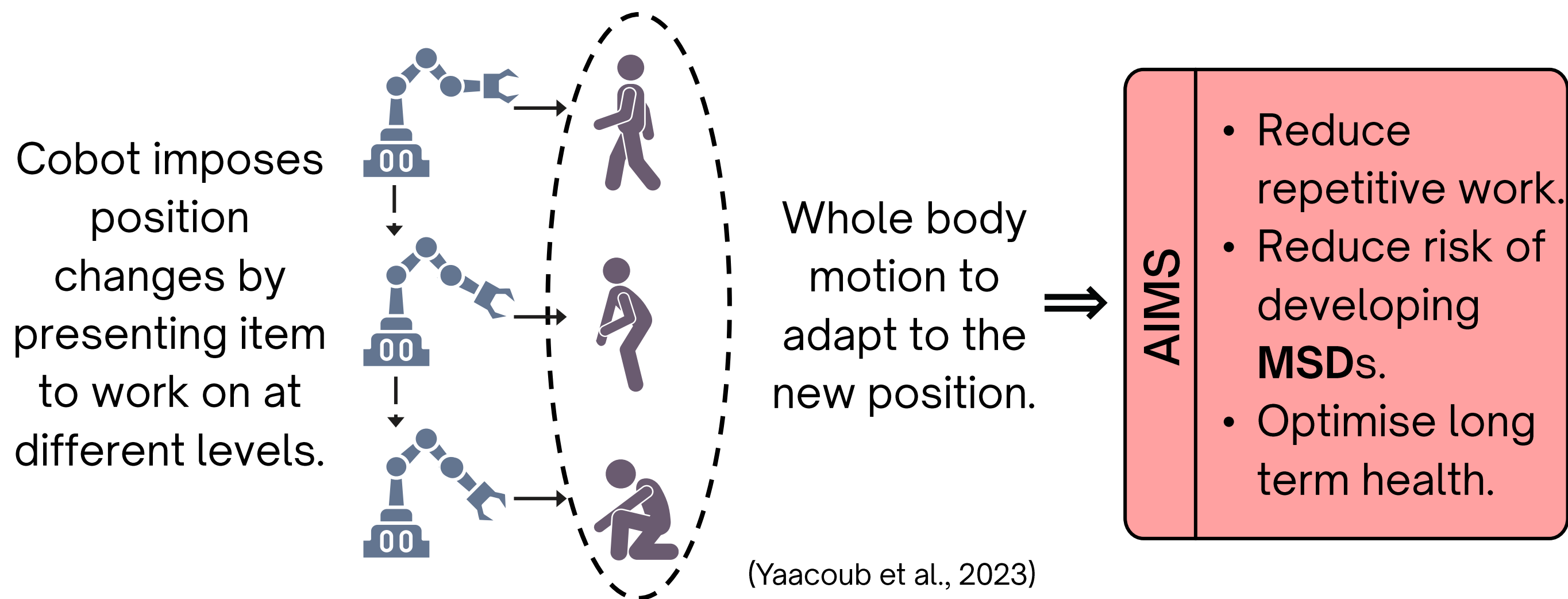
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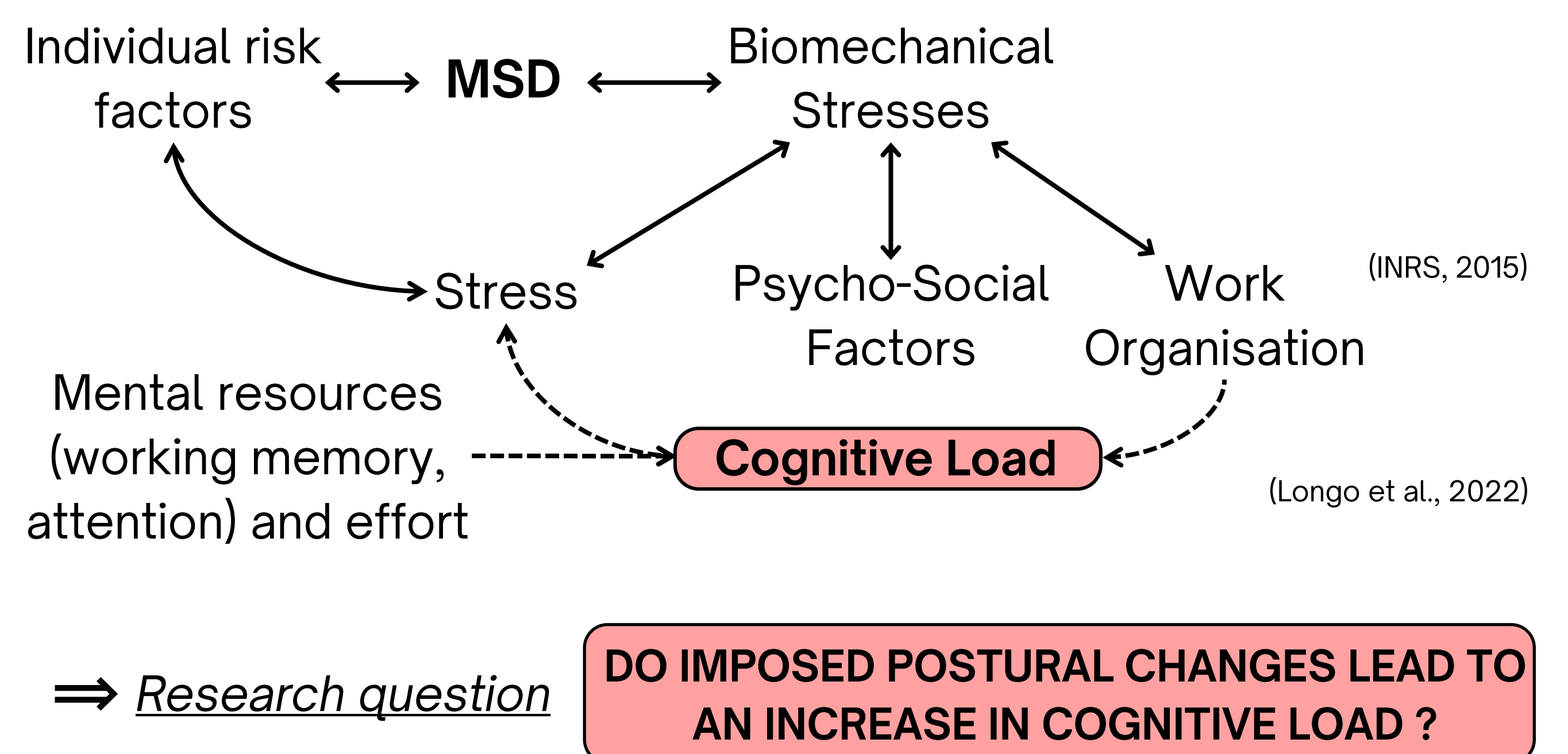
BACKGROUND

Context

ANR Project on user-specific adaptation of collaborative robot behaviour to reduce fatigue and prevent work-related MusculoSkeletal Disorders (MSD).

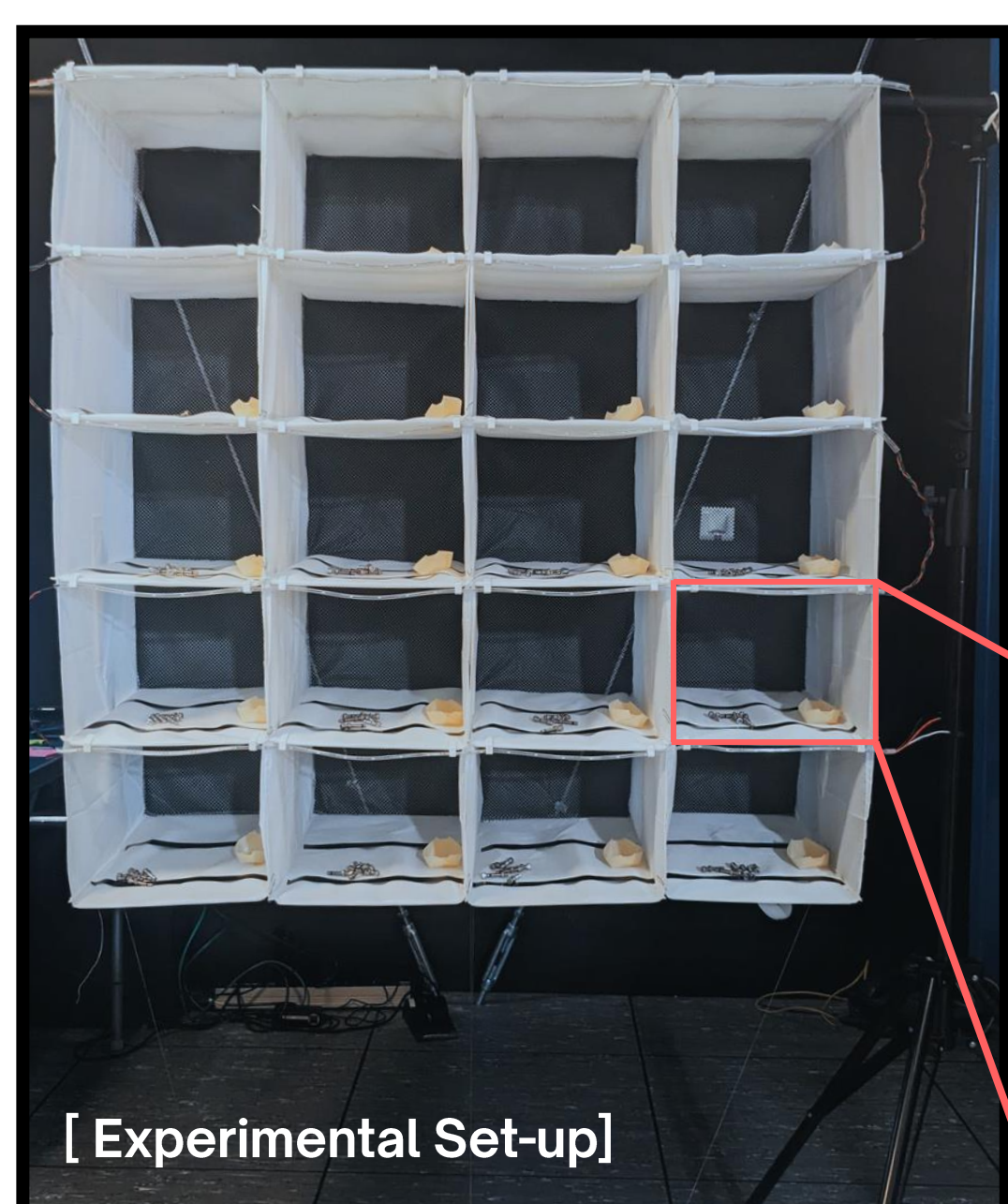


Literature review



METHODS

Experiment : Change of posture while doing a repetitive manual task



- 23 Participants [9 ♀ ; 14 ♂], \bar{x} age = 29.9 years.
- 5 Experimental conditions
 - No postural change ⇒ Baseline : **Fixed** position.
 - Change of posture ⇒ 2 main variables :
 - Level : **Small** vs. **Large**,
 - Type : **Predictable** vs. **Random**.
- ↳ 5 mins/condition.
- ↳ 15 s/box.
- ↳ Change is guided by a light and a sound signal.

| | Measures | Performance | Physical Effort | Cognitive Load |
|----------|----------------|-------------|-----------------|----------------|
| Direct | Motion Capture | | ✓ | |
| | Eye-Tracker | | | ✓ |
| | ECG | | ✓ | ✓ |
| Indirect | Task Score | ✓ | | |
| | NASA-TLX | ✓ | ✓ | ✓ |
| | Borg's CR-10 | | ✓ | |

RESULTS & DISCUSSION

Performance : Scores do not show significant difference between any conditions.

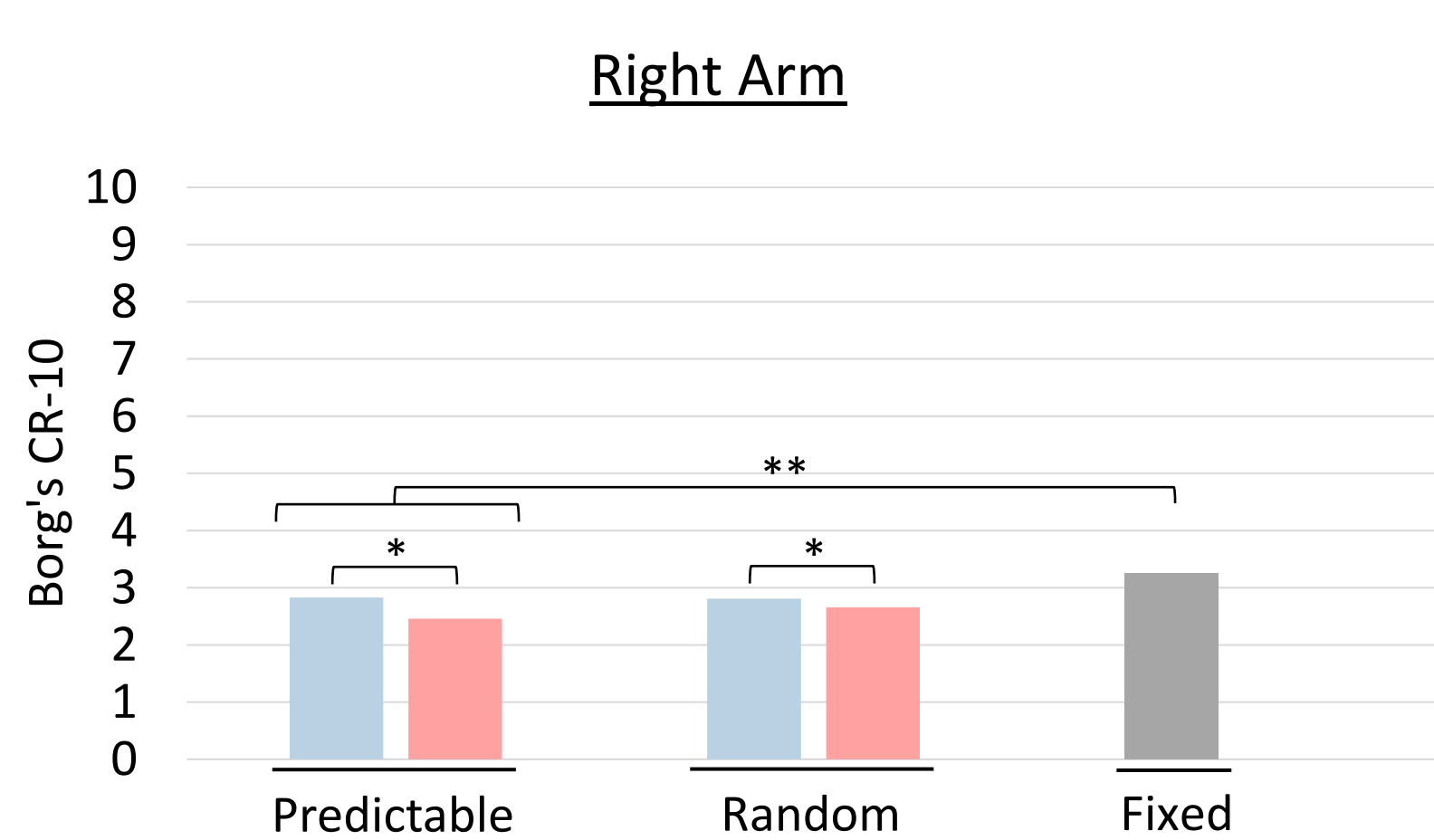
Nasa-TLX score shows that better performance is perceived for the fixed condition than for the rest.

Level of postural change :
■ Small ■ Large

Physical Effort :

Borg's CR-10 : [Arms and Legs]

- Fixed position > Postural change,
- Large change < Small change.

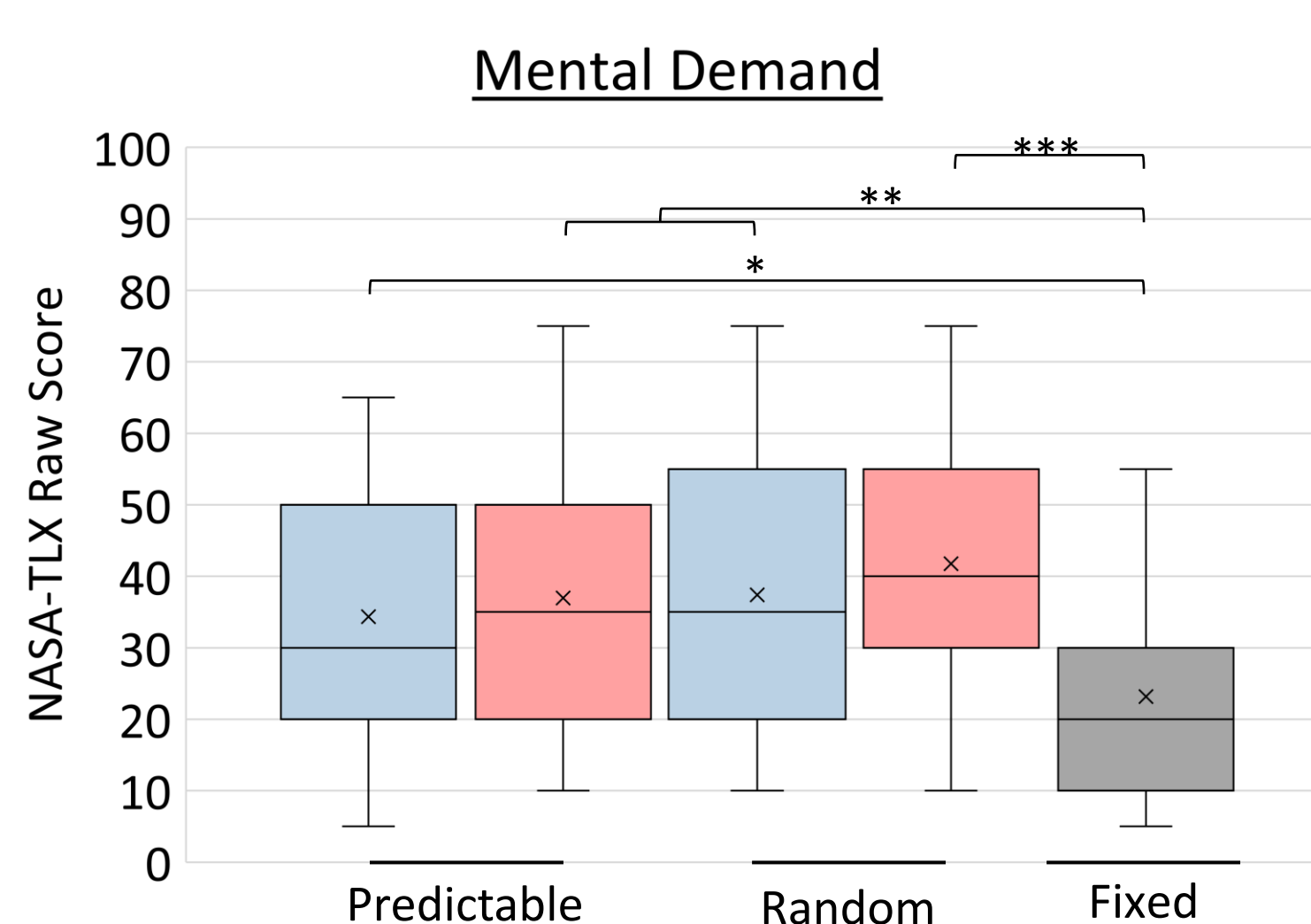


⇒ Postural change seems to be beneficial in reducing physical effort especially with large change as the whole body is engaged in the postural adaptation.

Cognitive Load :

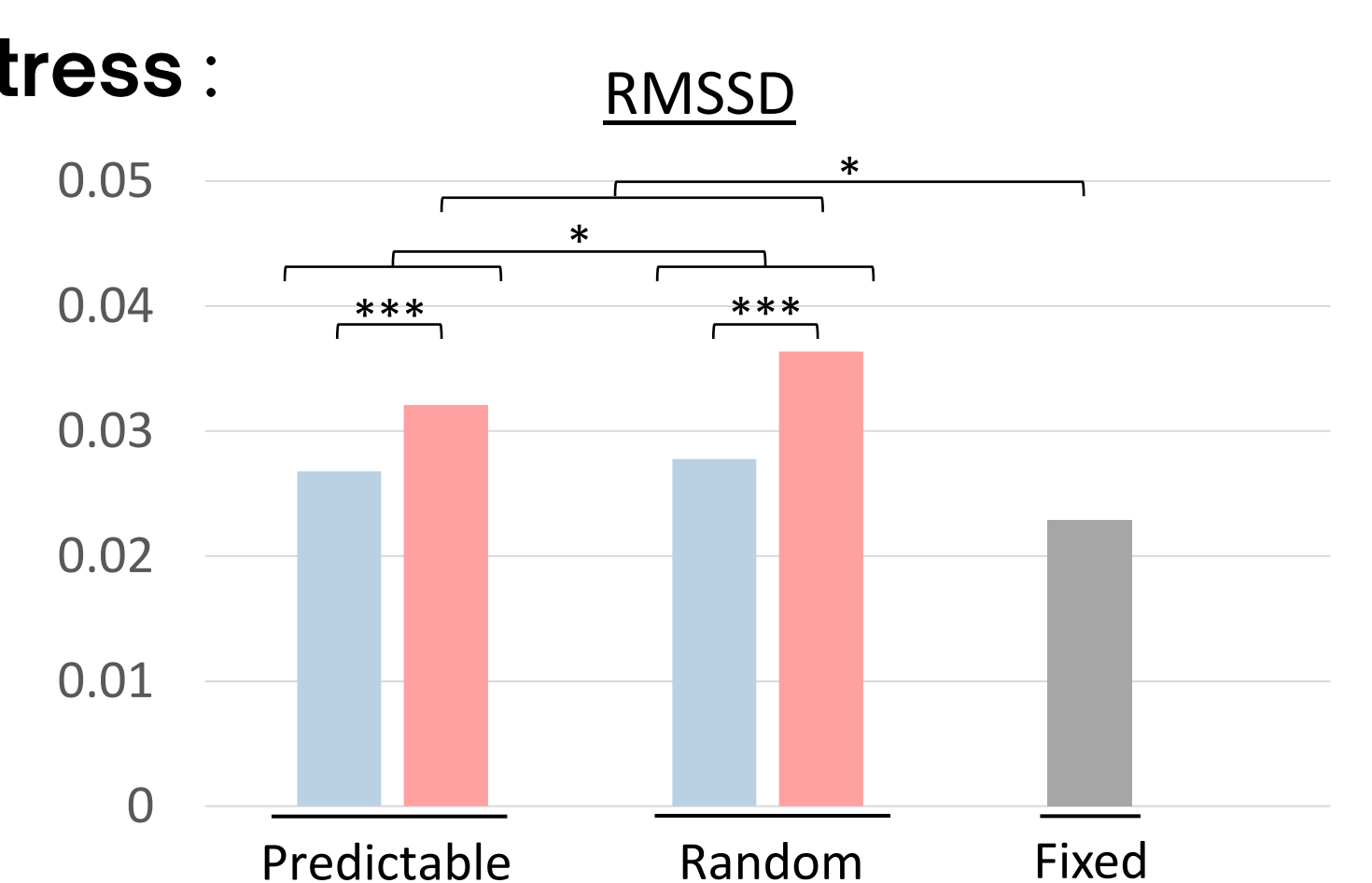
NASA-TLX : [Task Load, Mental Demand and Temporal Demand]

- Postural change > Fixed position.



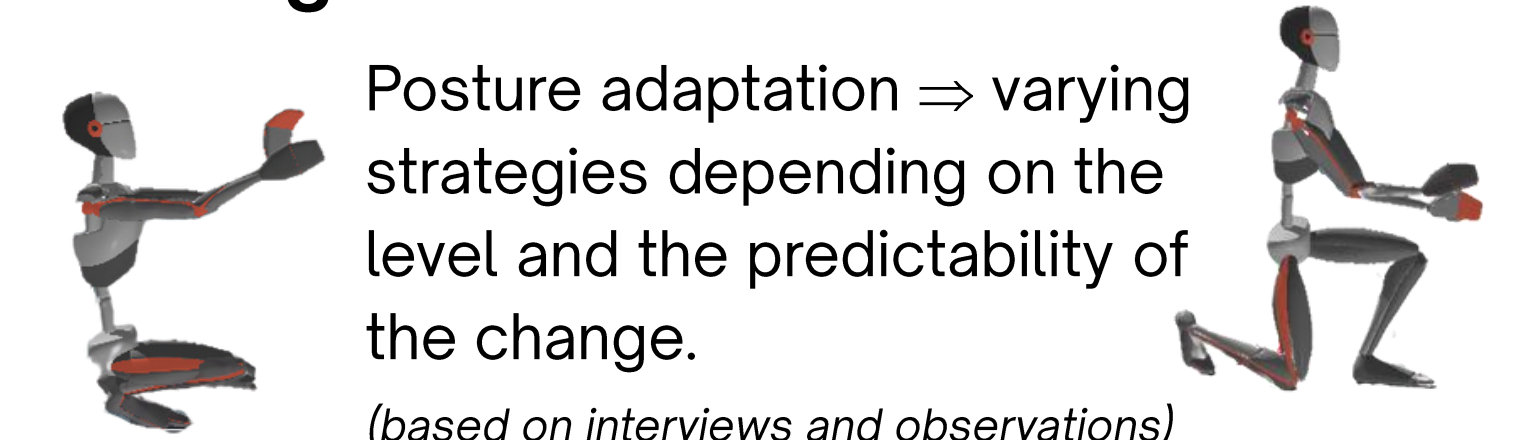
⇒ Postural change seems to have a cognitive cost that was felt irrespective of the type or level of change.

Stress :



⇒ Better adaptation to stress with postural changes and for large changes compared to small changes.

Strategies :



CONCLUSION & PERSPECTIVES

- Postural variation seems to mitigate physical fatigue but might impose additional cognitive load.
- This trade-off between physical and mental demands needs to be considered in task design as increased cognitive load could affect performance and overall well-being.
- It is important to replicate the experiment with robot, as the general context of the study is collaborative work with cobots, and human behaviour is highly influenced by its presence.

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