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Motor Outputs, But not Mere Preparation of Actions, Affect Subsequent Visual Perception

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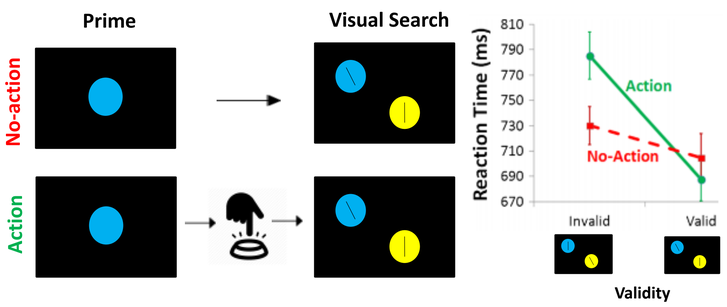
Background

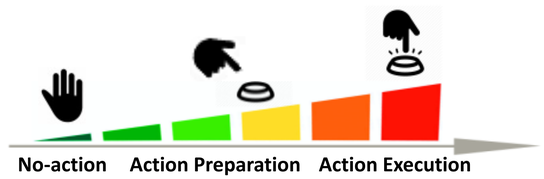
- **Action effect**: Simple actions toward an object cause people to allocate attention preferentially toward properties of that object in subsequent tasks, even when properties of the acted-on object are task irrelevant [1][2].



- Research has shown that the effect is not contingent on action consequences, property processing of the acted-on object, or task goal updating, suggesting that action processing itself is sufficient to affect later attention [2].

Question

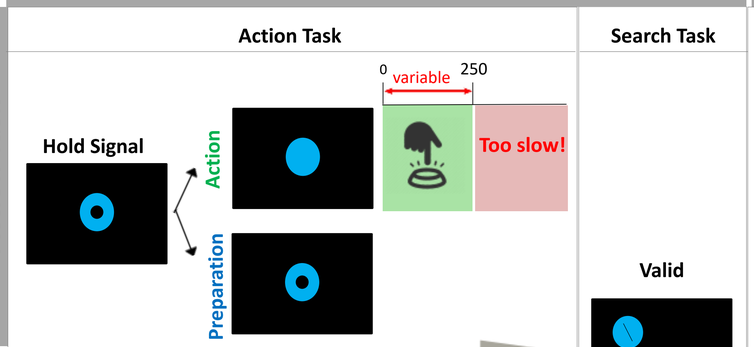
- The traditional information processing view of motor behavior distinguishes between covert **preparatory** and overt **executive processes** in the sequence of operations leading to a motor response [3].
- It has been known that mentally planning for an action leads to similar activation of the primary motor area (M1) as executing an action, though in reduced proportion, suggesting both similarities and differences between motor actions at different stages of completion [4].



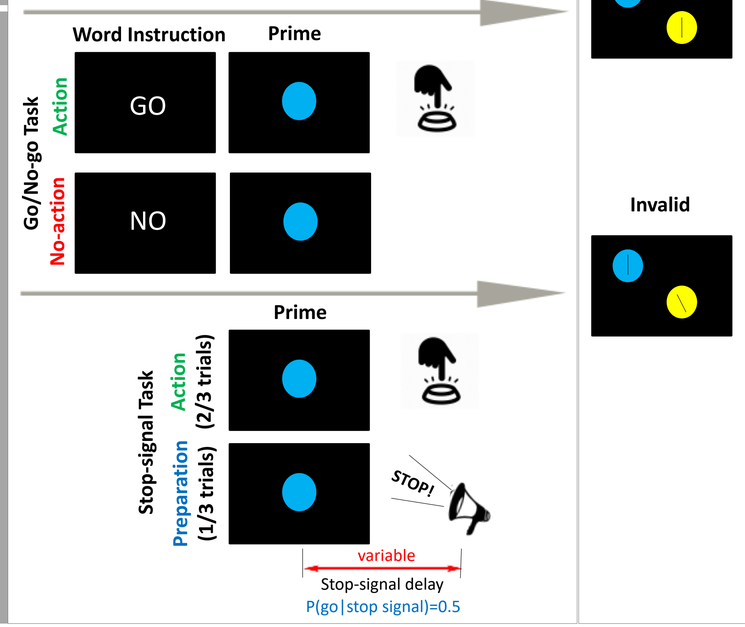
- **Would mere preparation of an action have similar effects as an executed action in enhancing later visual attention?**

Methods

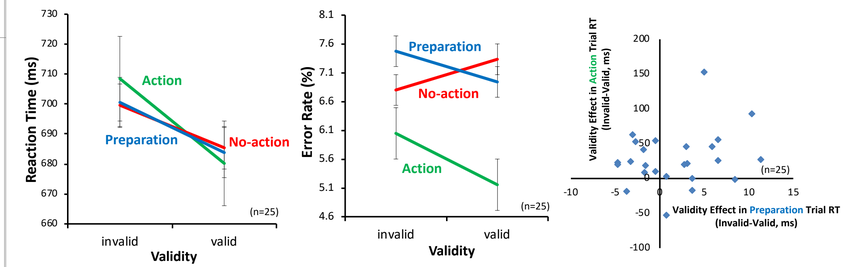
Experiment 1: Time Pressured Action Task



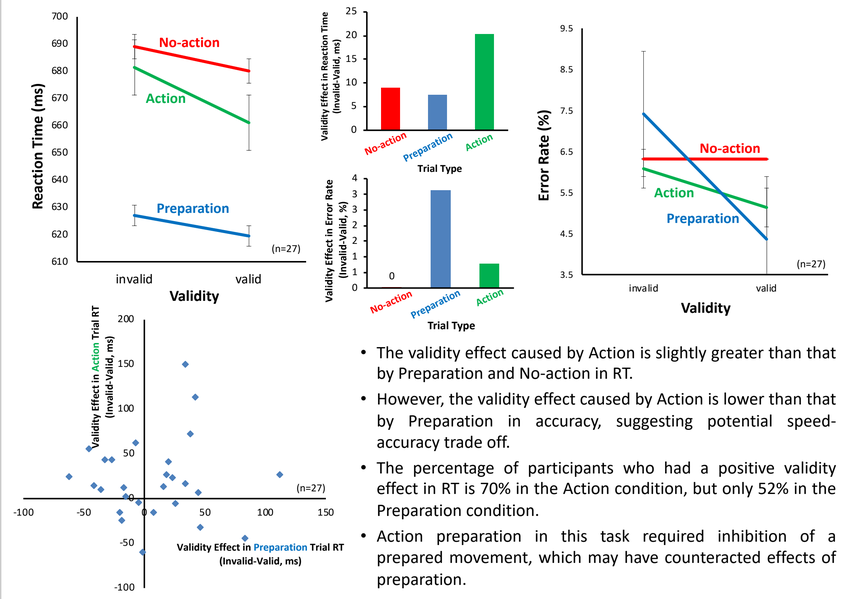
Experiment 2: Countermanding Task



Results



- The validity effect caused by Action is slightly greater than that by Preparation and No-action in both RT and accuracy.
- The percentage of participants who had a positive validity effect in RT is 84% in the Action condition, but only 56% in the Preparation condition.



- The validity effect caused by Action is slightly greater than that by Preparation and No-action in RT.
- However, the validity effect caused by Action is lower than that by Preparation in accuracy, suggesting potential speed-accuracy trade off.
- The percentage of participants who had a positive validity effect in RT is 70% in the Action condition, but only 52% in the Preparation condition.
- Action preparation in this task required inhibition of a prepared movement, which may have counteracted effects of preparation.

References

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4. Lotze, M., Montoya, P., Erb, M., Hülsmann, E., Flor, H., Klose, U., ... & Grodd, W. (1999). Activation of cortical and cerebellar motor areas during executed and imagined hand movements: an fMRI study. *Journal of cognitive neuroscience*, 11(5), 491-501.

Conclusions

- An initiated but soon-cancelled action does not produce priming effects over and above what is observed from passive viewing of an object.
- This suggests that actual motor outputs, but not the preceding preparatory stages, is necessary for actions to affect subsequent visual perception.

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