

## Abstract

Baseball batters require a “batting eye” to judge whether to swing or not, and must make split-second decisions. However, how this **rapid decision-making is influenced by the ability to control the bat remains unclear**. This study investigated the relationship between motor control and decision-making by **comparing baseball players with gymnasts**. By assessing hand movements during a baseball-like hitting task involving Go/No-go decisions, we found that **differences in sports expertise yielded differences in motor control ability**. Notably, **baseball players demonstrated a great capacity to inhibit their ongoing movement once the decision to stop was made, which may underlie their enhanced No-go performance**. These findings contribute to developing training methods to enhance rapid decision-making through improved motor control. Furthermore, the resulting techniques improve athletic performance and aid in talent identification. Beyond sports, these approaches may also have broader applications in domains such as driver assistance and rehabilitation.

## Rapid decision-making required in sports

- In sports like baseball, **quick and accurate decision-making and motor control are essential**
- However, it is not yet fully understood how decision-making and motor control information processing can be balanced under strict time constraints



## Our research

- Using a rapid hitting task that mimicked baseball batting, we investigated how **decision-making and motor control interact under time pressure**, especially when deciding whether to swing or not.
- In particular, we examined how **differences in sports expertise affect rapid decision-making ability**.

## Our experiments investigated the interaction between decision-making and motor control

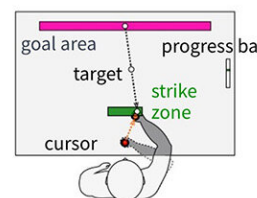
## ■ Task that mimicked baseball hitting

- Decision-making  
Hit only Strike targets, and not to hit Ball targets

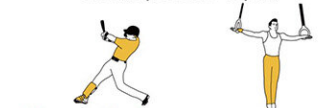
- Motor control  
Hit and return the target to the goal area

## Target arrival time

- 0.4 seconds  $\approx$  153 km/h
- 0.5 seconds  $\approx$  122 km/h
- 0.6 seconds  $\approx$  102 km/h



- Participants  
■ Students who belong to university clubs (top level in Japan)

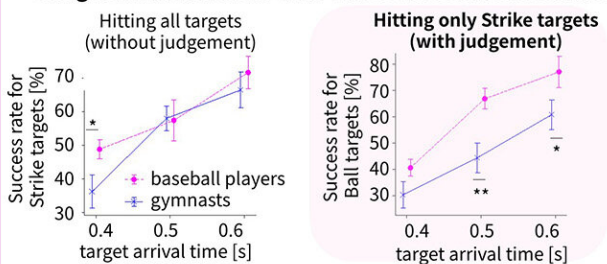


8 baseball players 6 gymnasts

## Accurate No-go response is key to a refined batting eye

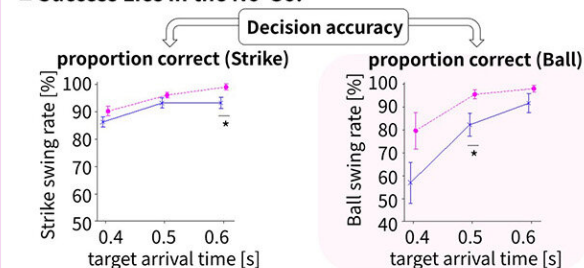
\* significant difference ( $p < 0.05$ )  
\*\* significant difference ( $p < 0.01$ )

## ■ Judgment tasks reveal clear differences in motor control.



**When required to judge Strike or Ball, baseball players were better at hitting accurately.**

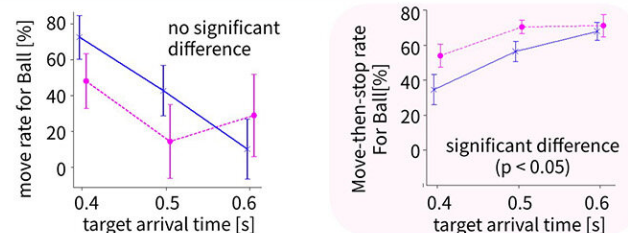
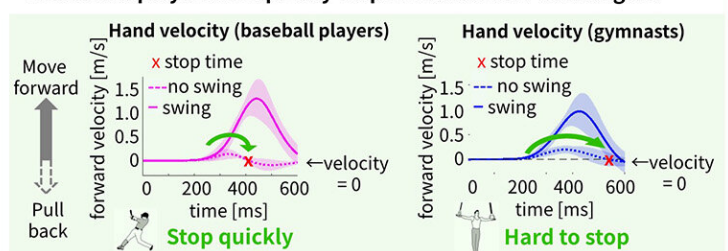
## ■ Success Lies in the No-Go.



**The major difference was correctly withholding Ball targets not hitting Strike targets.**

## The ability to instantly stop movement is a key strength of baseball players

## ■ Baseball players can quickly stop mid-action for Ball targets.



**Both groups start moving similarly. However, baseball players can stop their action mid-motion, while gymnasts struggle to stop once they've started.**

**Superior stopping ability could contribute to better decision making under time pressure.**

## References

- [1] A. Kobayashi, T. Kimura, “Compensative movement ameliorates reduced efficacy of rapidly-embodied decisions in humans,” *Communications Biology*, Vol. 5, No. 294, 2022.
- [2] A. Kobayashi, T. Kimura, “Sport expertise-dependent movement adjustments impact Go/No-go decision in rapid hitting task,” in *Proc. The 51st Annual Meeting of the Society for Neuroscience (Neuroscience 2021)*, 2021.

## Contact

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