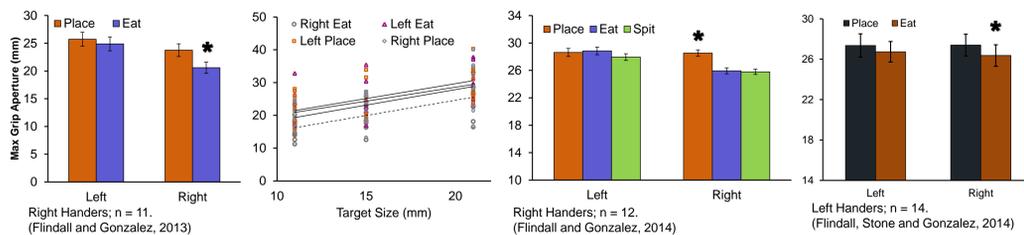


### Background

- Despite a near-universal preference for right-handed grasping actions, right- and left-handed grasp-to-place movements have identical kinematics<sup>1</sup>.
- However, there is evidence that the end-goal of the movement will influence the pre-contact kinematics of the reach-to-grasp action<sup>2</sup>.
- We have shown that grasp-to-eat<sup>3</sup> and other hand-to-mouth movements<sup>4</sup> show kinematic asymmetries in the form of smaller maximum grip apertures (MGAs). Irrespective of hand preference, these asymmetries favour the right hand<sup>5</sup>. We have interpreted these results as a right-hand advantage for grasp-to-eat actions.



- However, similar changes in MGA have also been demonstrated in cases of increased target uncertainty<sup>6</sup>, reduced visual feedback, and immature development<sup>7</sup>.
- What if this asymmetry is not *task-dependent*, but rather arises because the right-hand is simply more sensitive to the precision requirements of hand-to-mouth actions?
- Does end-goal aperture influence pre-contact grasp kinematics?**

### Methods

#### Two reach-to-grasp motion-capture experiments:

##### E1: Precise vs. Eat:

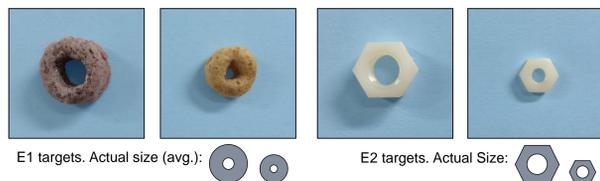
- Reach-to-grasp cereal items to either eat them (Eat condition) or place them into a receptacle (Precise condition).
- Precise condition required placement in a small-aperture shot glass (28 mm aperture).
- Targets: edible cereal items, Cheerios™ (~11mm) and Froot Loops™ (~15 mm).



Materials. TOP: Optotrak Certus. LEFT: PLATO liquid crystal goggles, IRED placement. RIGHT: Participant (Eat task).

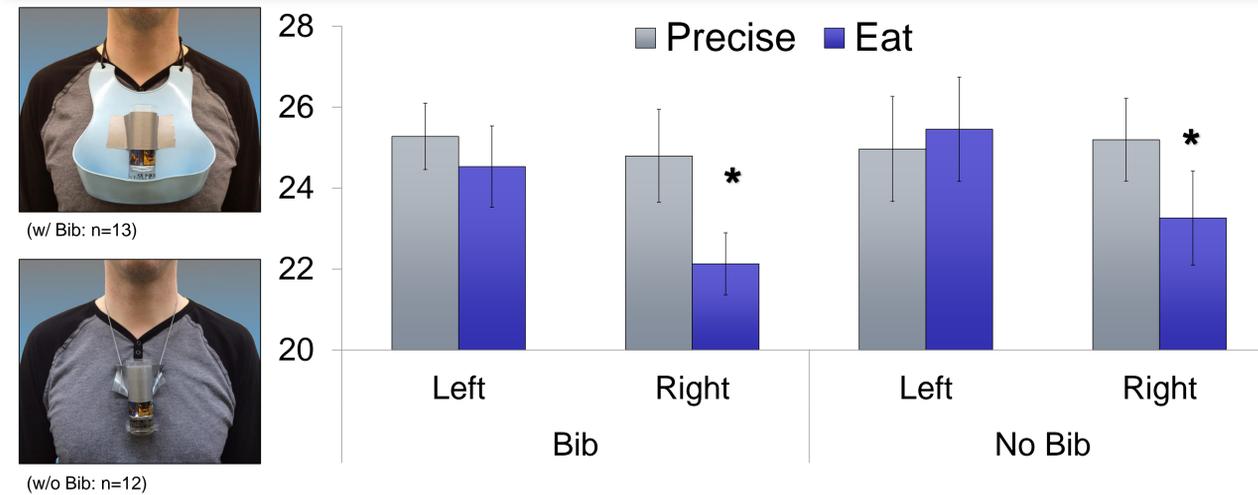
##### E2: Precise vs. Gross:

- Grasp-to-place into a receptacle; no Eat condition.
- Receptacle aperture was either wide (bib; Gross condition) or narrow (shot glass; Precise condition).
- Targets: inedible nylon hex nuts, both small (9 mm) and large (15 mm), reused between participants.



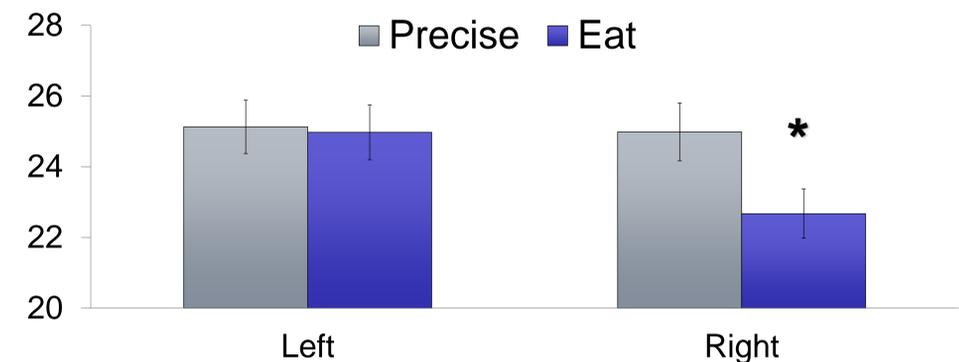
### Results and Discussion

#### PRECISE VS. EAT: (n=25)

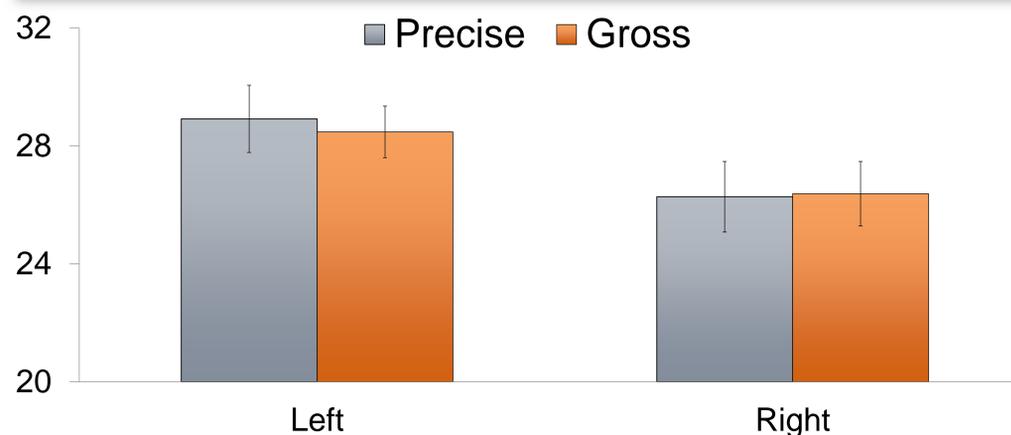


- Right hand produces smaller MGAs when grasping to Eat than grasping to Place.
- Results are consistent with those from earlier studies.

- Collapsed across groups: Eat condition generates significantly smaller MGAs than place condition, solely in the right hand; ∴ **aperture of the end-goal is not responsible for the effect on MGA observed here and in previous experiments.**



#### PRECISE VS. GROSS: (n=19)



Precise Condition Gross Condition



NOTE: Significant effect of Hand in E2 (i.e., RH MGA < LH MGA in both conditions) caused by MGA correction factor. Uncorrected MGA shows no effect of hand.

- No MGA difference between Precise and Gross conditions in either hand; ∴ **precision required for placing action does not affect MGA.**

### CONCLUSION:

- Maximum grip aperture is not influenced by aperture of end-goal;** asymmetries observed in previous studies are indeed task-dependent, and not triggered by precision requirements of the placing action.