Background

Macaque inferior parietal neurons selectively respond to voluntary grasping movements that differ only in terms of end-goal1,2.

- Long-term electrical stimulation of the macaque prefrontal cortex can produce functional movements, including grasp-to-eat and grasp-to-inspect type actions3.

Study 1: Right-hand signature for grasp-to-eat actions.

**Procedure:**
- N = 13 right-handed adults (11 females; average age 20.3 y.o.)
- Participants grasped Cheerios™, FrootLoops™, and Oatmeal Squares™, presented pseudo-randomly, in 4 blocks of 25 trials each.
- 2 (Hand; LH/RH) x 2 (Task; Eat/Place) factorial design, counterbalanced.

**Results:**

<table>
<thead>
<tr>
<th>N/A</th>
<th>SMALL (21mm)</th>
<th>MEDIUM (12mm)</th>
<th>LARGE (21mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLACE</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>EAT</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Conclusion:**

- Maximum grip apertures (MGAs) are significantly smaller during grasp-to-eat actions than during grasp-to-place actions, but only when using the right hand.

Study 2 and 3: Signature lateralization is not due to practice.

**Study 2 - Procedure:**
- N = 21 left-handed adults (11 females; average age 21.8 y.o.)

**Results:**

<table>
<thead>
<tr>
<th>MGA (mm)</th>
<th>11 mm</th>
<th>15 mm</th>
<th>21 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLACE</td>
<td>100%</td>
<td>90%</td>
<td>70%</td>
</tr>
<tr>
<td>EAT</td>
<td>0%</td>
<td>10%</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Conclusion:**

- Grasp-to-eat and grasp-to-place movements may be kinematically dissociated; further, there is an apparent right-hand advantage for grasp-to-eat actions.

General Materials and Methods:

**Research Question:** Are grasp-to-eat and grasp-to-place movements, two actions with identical mechanical requirements but different end-goals, kinematically distinct in adults?

**Studies 4 and 5:** “Grasp-to-eat” is actually “bring-to-the-mouth.”

**Study 4 - Procedure:**
- N = 12 adults (7 females; average age 20.8 y.o.)
- Only right-handed movements were tested

**Results:**

<table>
<thead>
<tr>
<th>MGA (mm)</th>
<th>11 mm</th>
<th>15 mm</th>
<th>30 mm</th>
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</tr>
<tr>
<td>EAT</td>
<td>0%</td>
<td>10%</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Conclusion:**

- Kinematic dissociation between place and eat actions does not require that the target be consumed, merely placed in the mouth.

**Study 5 - Procedure:**
- N = 17 adults (11 females; average age 20.1 y.o.)
- Only right-handed movements were tested

**Results:**

<table>
<thead>
<tr>
<th>MGA (mm)</th>
<th>11 mm</th>
<th>15 mm</th>
<th>30 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLACE</td>
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<td>70%</td>
</tr>
<tr>
<td>EAT</td>
<td>0%</td>
<td>10%</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Conclusion:**

- Kinematic dissociation between place and eat actions is independent of target affordances.

**Studies 6 and 7:** The kinematic signature is not due to mouth size or movement.

**Study 6 - Procedure:**
- N = 18 adults (13 females; average age 24.1 y.o.)
- Only right-handed movements were tested

**Study 7 - Procedure:**
- N = 25 adults (15 females; average age 22.3 y.o.)

**Conclusion:**

- Smaller MGAs are not a result of either the size of the mouth or its movement.

General Discussion & Conclusion:

- Kinematic differences between grasp-to-place and hand-to-mouth actions suggest a left-hemisphere specialization for grasp-to-eat and other functionally-related movements.
- This specialization may have initially supported other lateralized functions (e.g., praxis, speech), and created an impetus behind species-wide right-hand dominance in humans.