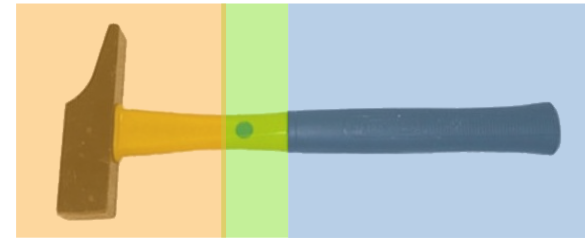# Saccadic landing positions on daily-life objects as a function of saliency and semantics

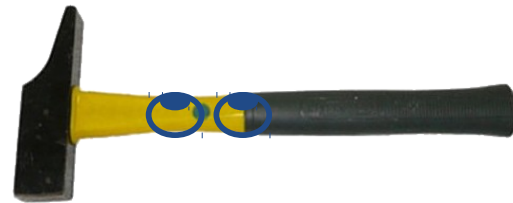Lotje van der Linden, Sebastiaan Mathôt and Françoise Vitu

Introduction

- **Purpose:** investigate eye movements towards isolated **objects**

  - Graspable tools

  - Distinguish between 3 possible effects:
    1. **'Global effect'** towards center of gravity (cf. Deubel, 2013)
    2. **Semantic effect** towards informative part (Roberts & Humphreys, 2011)
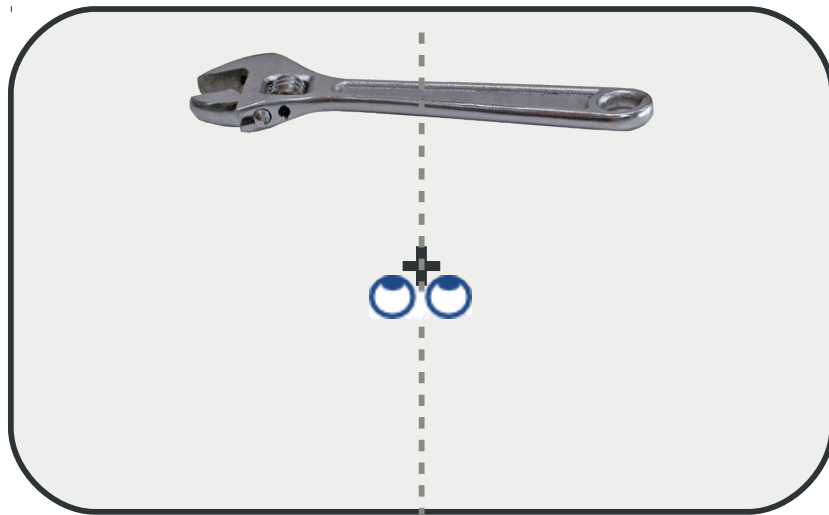   3. **Affordance effect** towards graspable part (cf. Myachykov et al., 2013)

- **Purpose:** investigate **eye movements** towards isolated objects

  - Initial towards-objects saccades

  - Subsequent within-object refixations

- ## Paradigm

Dependent variable:

x axis ——————————————————————

0

Task:

1. Make eye movement

2. Response:

garage   kitchen

Independent variable:
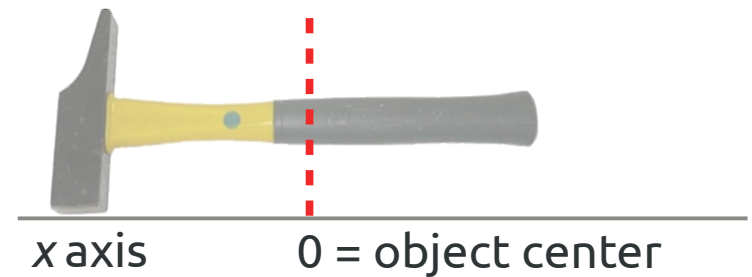
Orientation:

handle right   handle left

- To distinguish between:
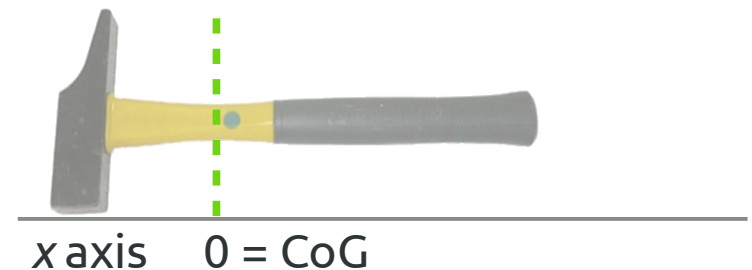
1. 'Global effect' — low-level
2. Semantic effect } — high-level
3. Affordance effect }

Two measures:

1. Relative to object center:

x axis   0 = object center

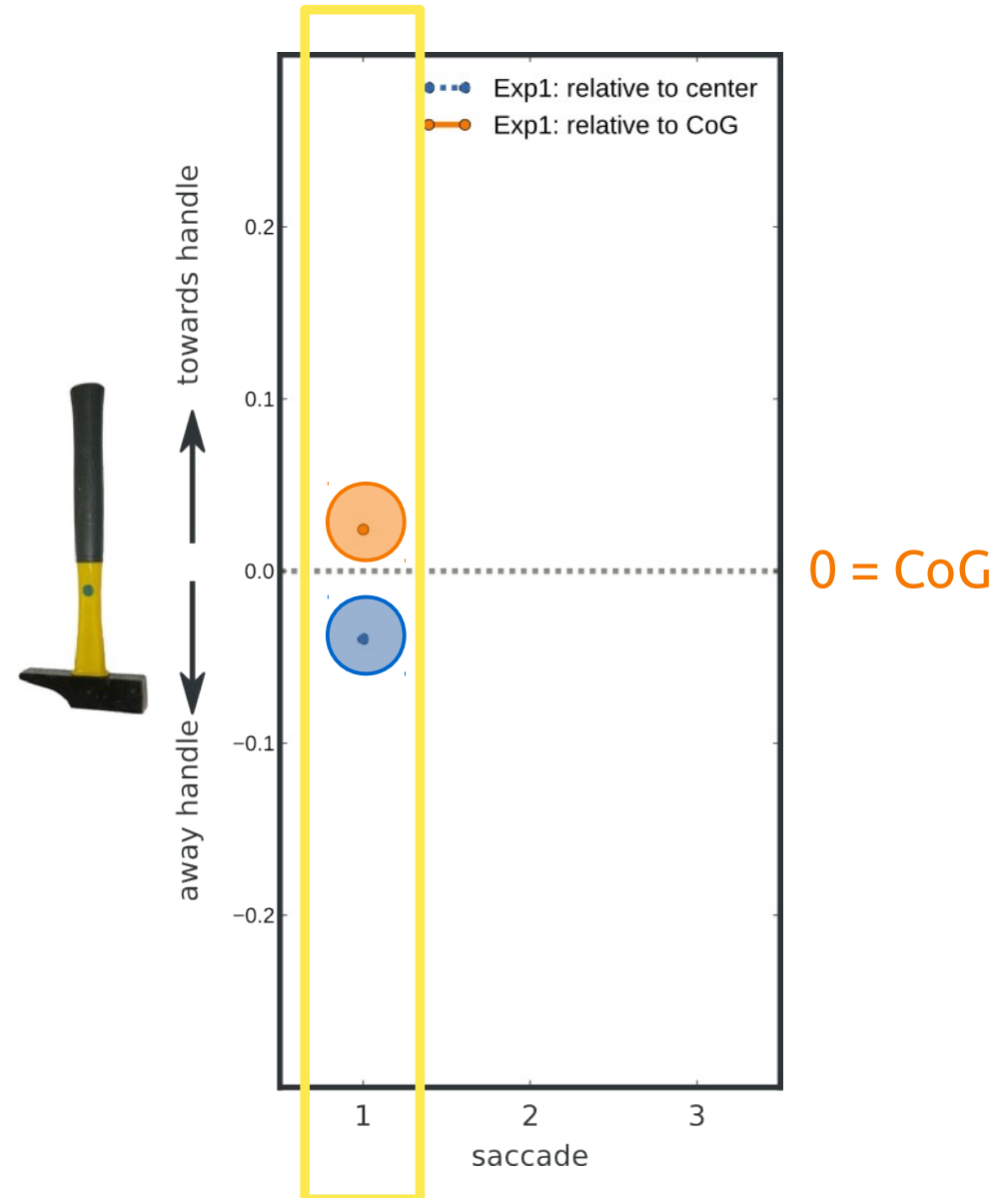**2.** Relative to CoG:

x axis   0 = CoG

Results experiment 1

- Landing positions

  - First saccade

- Landing positions

  - First saccade
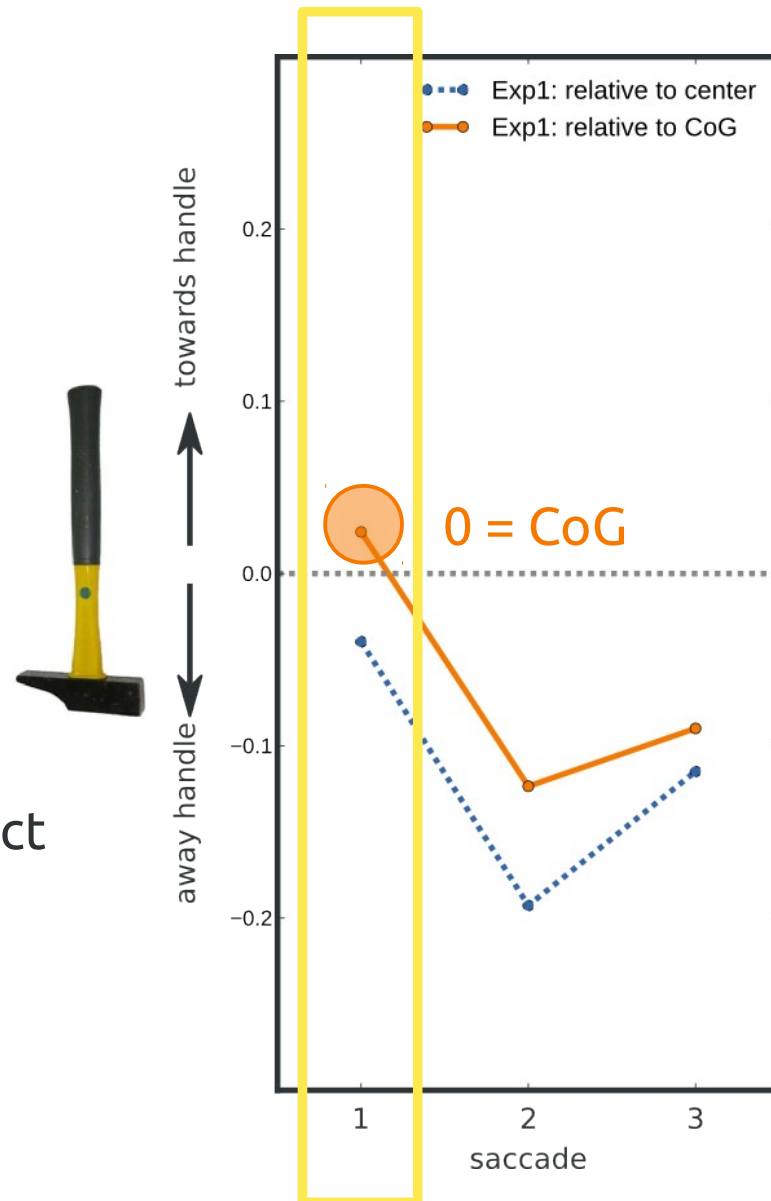
  - Refixations

0 = CoG
0 = center

- ## Landing positions

  - ### First saccade

    - CoG effect

    - Towards handle

  - ### Refixations

    - Away from handle

    - Semantic effect

Legend:
- Exp1: relative to center
- Exp1: relative to CoG

towards handle / away handle

0 = CoG
0 = center

saccade: 1, 2, 3
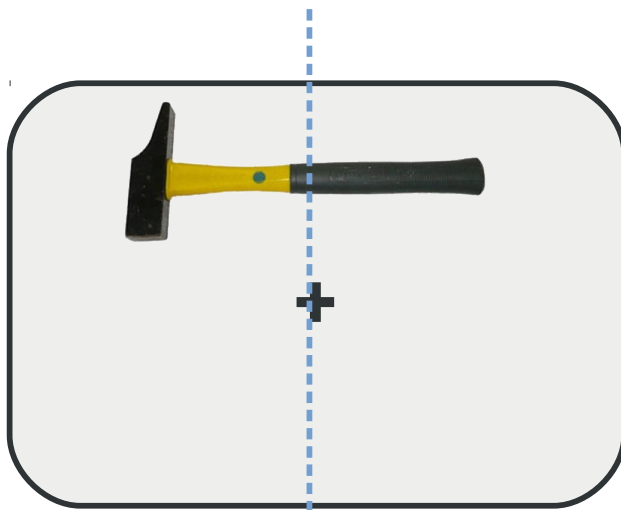
- First saccade

  - Bias towards handle,

    because …

    1. Affordance effect

       (cf. Myachykov et al., 2013)

    2. 'Side' effect …

       - CoG calculation incorrect

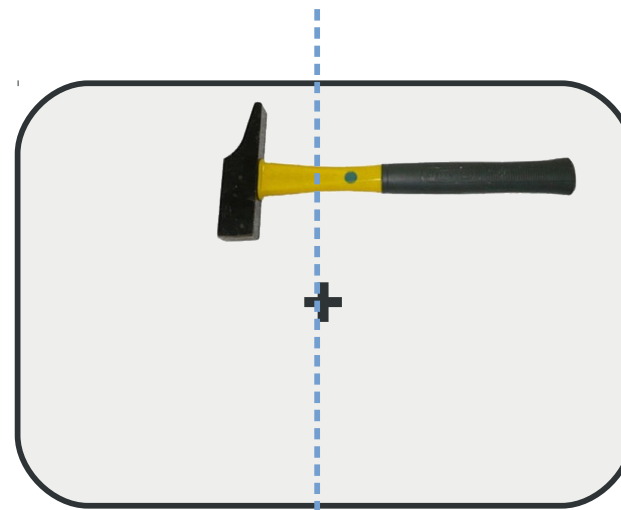   - Landing-position error

0 = CoG

Methods experiment 2

- Experiment 1
- Experiment 2

0 = object center
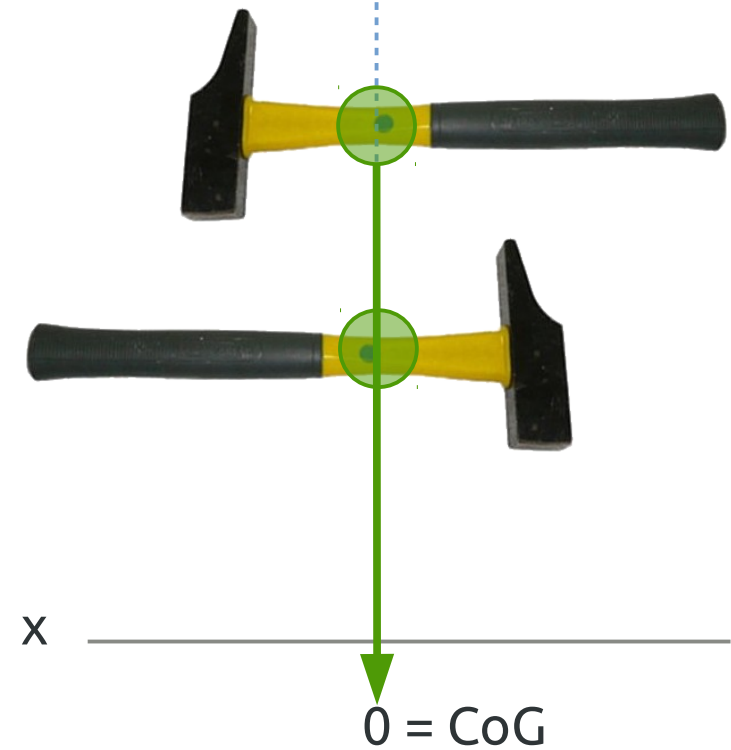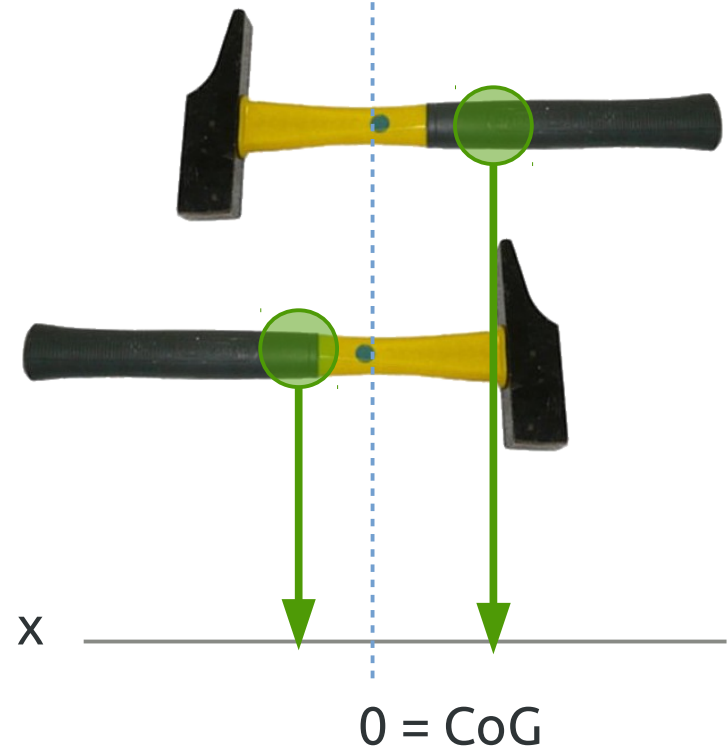
0 = CoG

Hypothesis experiment 2

- If CoG calculation is correct *and* only CoG plays a role:

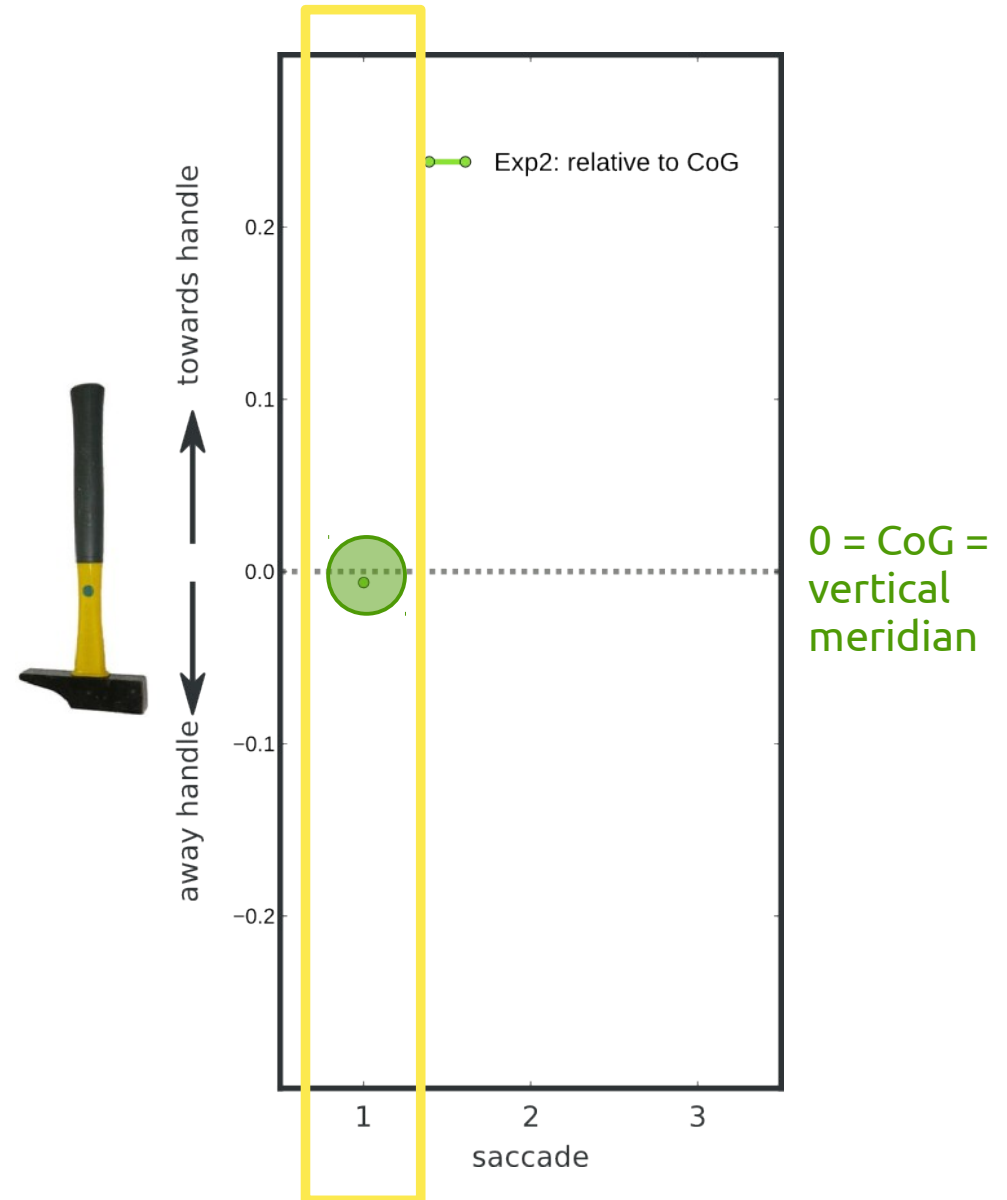 - Landing ≈ 0

  - Independent of orientation

x

0 = CoG

Hypothesis experiment 2

- If CoG calculation is correct *and* only CoG plays a role:

  - Landing ≈ 0

  - Independent of orientation

- If bias towards handle is real:

  - Landing ≠ 0

  - Landing depends on handle side
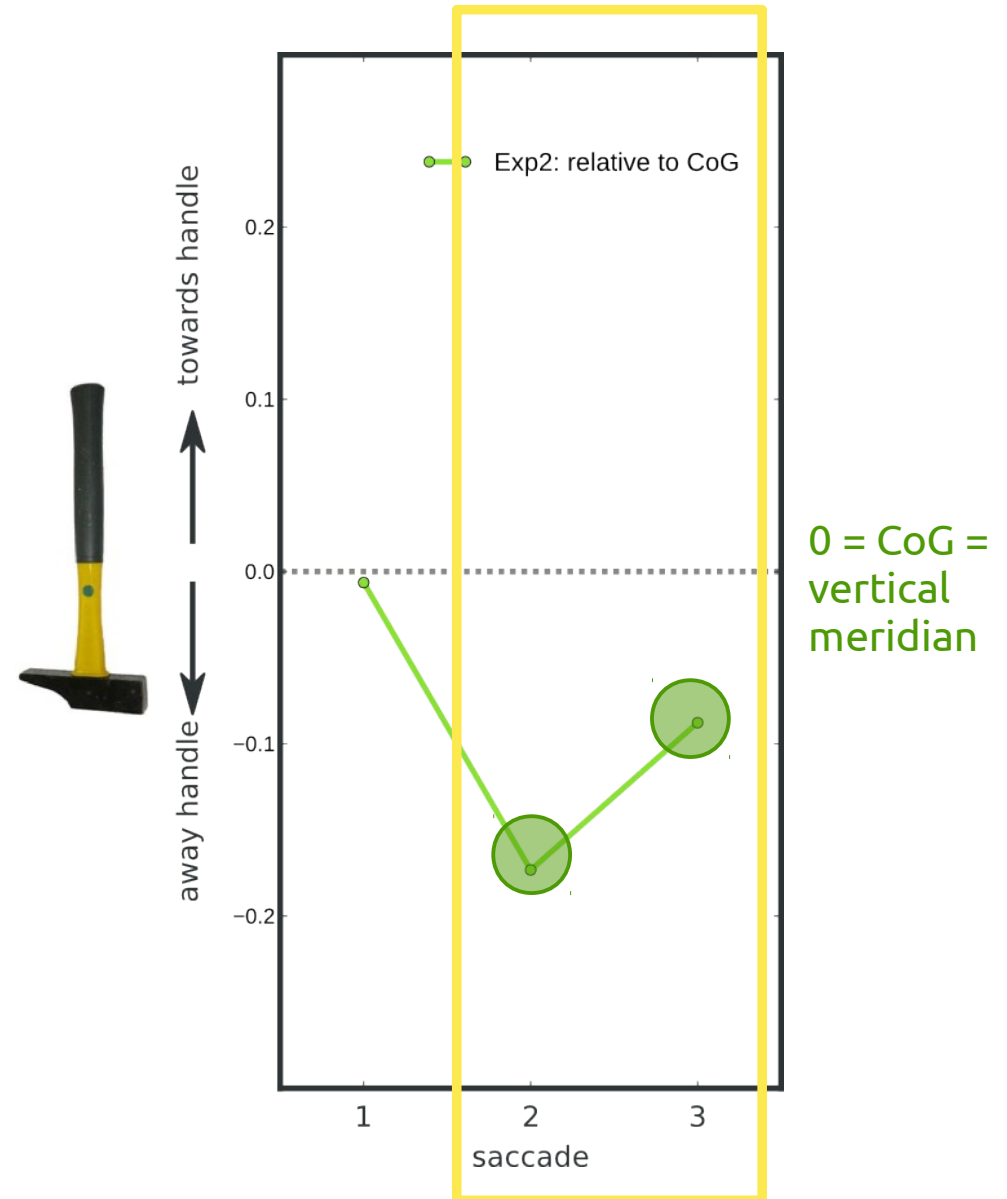
x

0 = CoG

Results experiment 2

- ## Landing positions
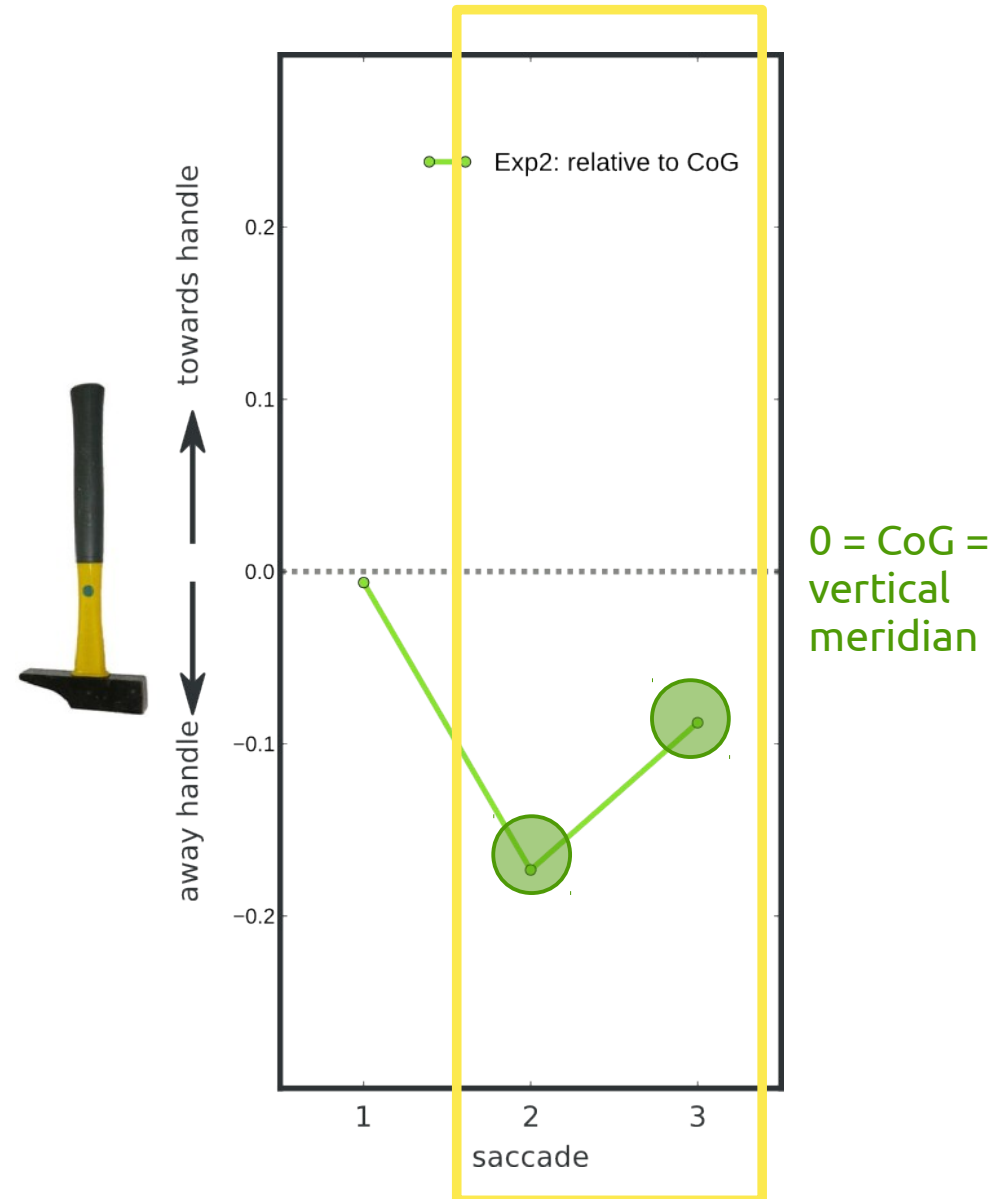
  - ### First saccade

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- Landing positions

  - First saccade

  - Refixations

0 = CoG = vertical meridian

Results experiment 2

- Landing positions

  - First saccade

  - Refixations

1. 'Global effect'

2. Semantic effect ✓

3. Affordance effect

4. Saliency effect

Exp2: relative to CoG

0 = CoG = vertical meridian

- Landing positions

  - First saccade

  - Refixations

    - Compared to saliency
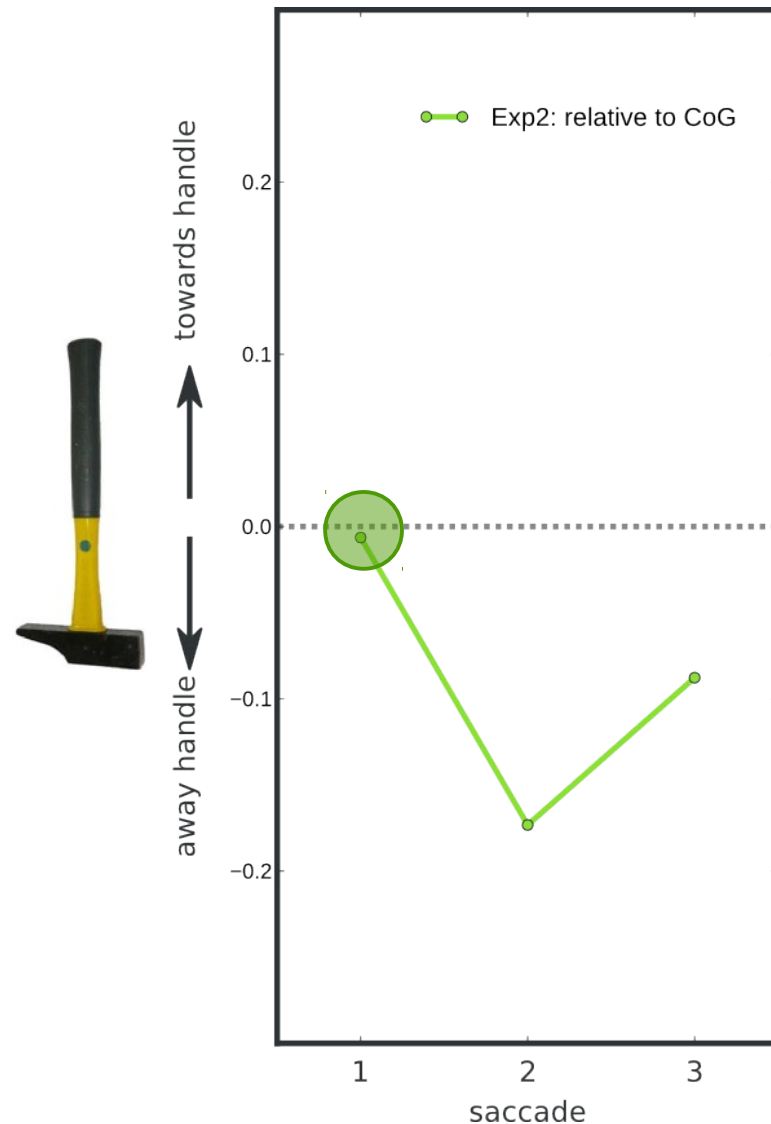   model (Itti et al., 1998)

Results experiment 2

- Landing positions

  - First saccade

    - Is different from CoG
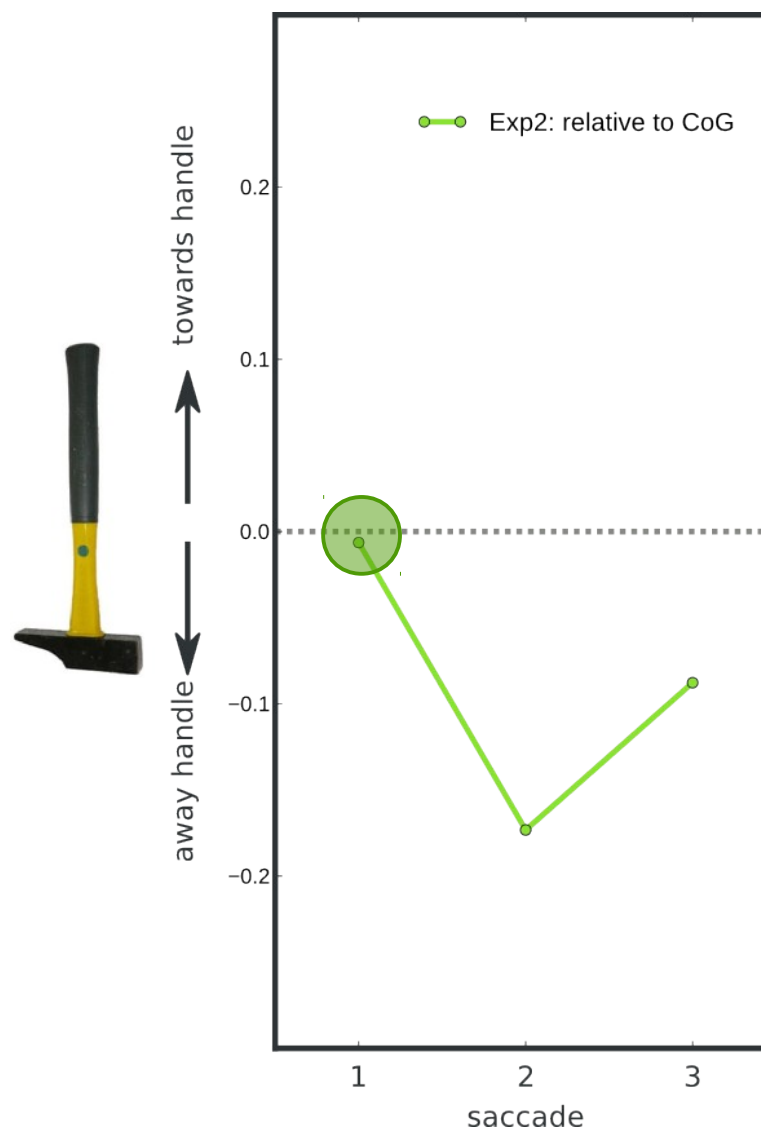
      (F(1,16) = , p = .05)

Results experiment 2

- ## Landing positions

    - ### First saccade

        - #### Is different from CoG

          (F(1,16) = , p = .05)

    - ### Possibly …

        - #### CoG effect is fast, but fades away quickly

        - #### With time, semantic effect takes over

- Landing positions

  - First saccade

    - Is different from CoG

      ($F(1,16) = $, $p = .05$)

  - Possibly …

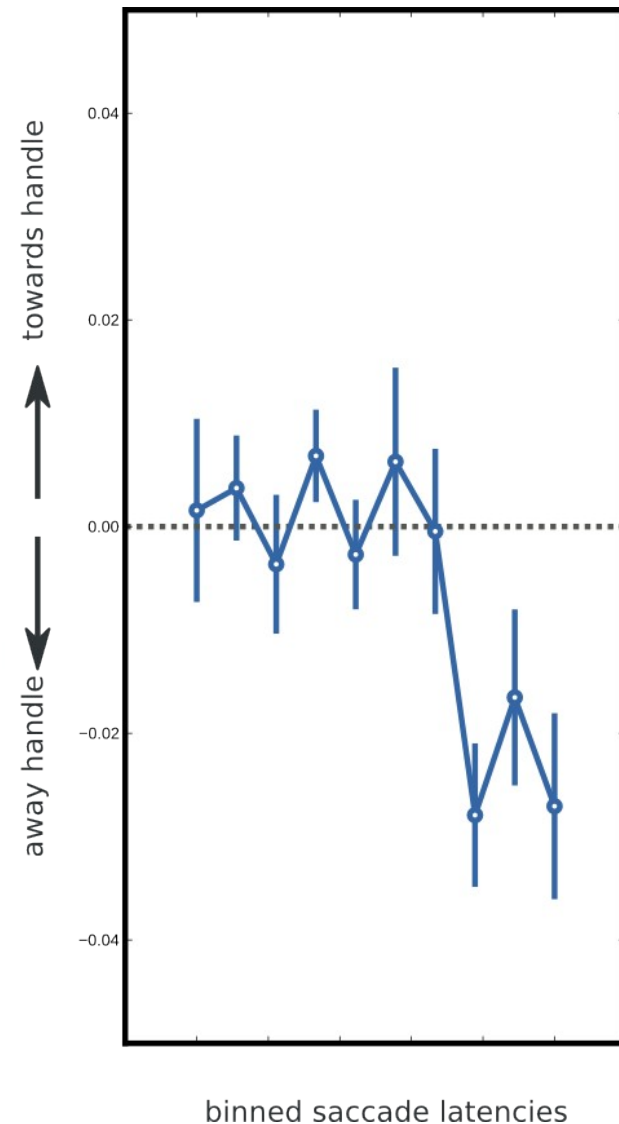   - Correlation saccade latency and semantic bias

Results experiment 2

- ## Landing positions

  - ### First saccade

    - Is different from CoG

      ($F(1,16) = $, $p = .05$)

  - ### Possibly ...

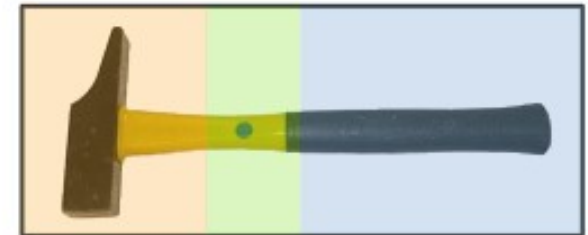   - Correlation saccade latency and semantic bias

    - Later saccades → semantic bias ($R = -.09$, $p < .0001$)

binned saccade latencies

Conclusion

- Early saccades

  - Drawn to CoG of object

  - So: no higher-level effects

- Late saccades:

  - No special role for handle

  - Drawn to semantically-informative part

  - So: higher-level processing

Thank you!!