**Notes after the conference:**

* **Dror Dotan –** does similar work with numerical cognition, finger tracking. Might be relevant to contact him.
* **Jason Friedman –** Use different Onsets to pin point to perfect point in time in which unconscious priming takes

effect.

* **Leon Deull –** Look in the Y axis: if you change your mind mid-height, then the path you travel on the Y axis when

you change your mind will be bigger than the path you travel if you don't change your mind.

**Chart

Description automatically generated with medium confidence**

A single camera from a top view can be used if we only analyze information in the x,z axes.

It's video should be analyzed with image processing.

**Motion tracking VS keyboard response?**

* Online as opposed to post-decision – We are interested in the processes that lead to the final decision.

keyboard records the response after the decision was made and the response given. We can use its duration to indirectly draw conclusions on the processes that occurred prior to the final decision.

In contrast, motion tracking records the formulation of the decision, hence is directly sensitive to fluctuations in the decision and the confidence which stem from conflicts between competing cognitive processes.

* Sensitive to COM – Keyboard captures the final decision alone and doesn't allow subjects to change their mind while making it. Contrary to that, motion tracking can capture changes of mind that are represented as changes in the trajectory's implied end point.
* Rich – Keyboard produces accuracy and RT while motion tracking yields many parameters: movement time, onset time, velocity, acceleration, position in time, deviation from optimal path, number of changes in direction, timing of changes in direction, area difference from optimal path.

The effect of unconscious processing on behavior might not be present in accuracy/RT but appear in other response parameters.

**Previous papers used Motion tracking** to probe unconscious effects.

* semantic priming – Exp 1 in: The flexibility of nonconsciously deployed cognitive processes: evidence from masked congruence priming

Temporal dynamics of masked congruence priming: evidence from reaching trajectories,

**Exp1,2** in: Engaging the motor system with masked orthographic primes: A kinematic analysis,

Conceptual priming – Exp 2 in: The flexibility of nonconsciously deployed cognitive processes: evidence from masked congruence priming

* Response priming – Subliminal semantic priming in near absence of attention: A cursor motion study,

The role of attention in subliminal semantic processing: A mouse tracking study

**Used both motion tracking and keyboard response**.

* Response priming – On-line control of pointing is modified by unseen visual shapes
* Shape priming – Exp 4 in: Grasping with the eyes: The role of elongation in visual recognition of manipulable objects

**Compared directly between them**.

* Semantic? Priming – Assessing Masked Semantic Priming: Cursor Trajectory versus Response Time Measures

**Motion tracking VS mouse tracking?**

* While reaching is intuitive, mouse requires remapping,

That could be costly (in terms of processing),

Higher motor costs reduce the frequency of COM,

COM might represent incongruent prime influence.

* + Intuitive
  + Direct goal to action mapping – mouse requires remapping the 3D representation of to target to 2D. This

could affect the trajectory and timing and place constraints on the subject's movement.

* Reaching responds faster to COM –
* More extreme parameters – Reaching has faster RT, higher speeds and larger curvatures.

Higher speeds and larger curvatures increase the chance for a difference in the trajectory between two conditions.

**Major pitfalls in previous studies?**

* Only objective measure – susceptible to criterion issues.
* Separate from main session – Can't evaluate awareness on single trial level.
* Less trials (96) than minimal requirement for discovering awareness of the prime (200, as shown in recent unpublished work in our lab).
* Correlation between d' and performance as a measure of awareness – inflates unconscious effects because:

1. Lack of evidence for correlation isn't evidence for lack of correlation.
2. Low reliability (=big measurement error) shadows individual differences,

thus correlations aren't discovered.

You won't expect random measurement errors to correlate.

Formula: (rexp\_obs,rlatent are correlations, rxx/yy are reliabilties) low reliability diminishes the observed correlation.

* Small stimuli set sizes = response priming, not semantic.
* Examination of d' reveals many subjects were aware of the prime
* Unintuitive semantic connection between positive stimuli and "same" response.

**How many subjects?**

* Exp 2 –
  + 10 valid
  + 5 disqualified
    - 3 – exp problem
    - 1 – chance level at categorization
    - 1 – pas>1 on most trials
* Exp 3 –
  + 11 valid
  + 2 disqualified
    - 2 – low number of valid trials

**How many trials?**

* Exp 2 –
  + Avg valid trials: congruent=83, incongruent=74.
* Exp 3 –
  + Avg valid trials: congruent=79, incongruent=70.

Chart, histogram

Description automatically generated

Effect size comparison:

Timeline

Description automatically generated