Visual-Spatial Perspective Switching

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Introduction

- According to the Mental Transformation Hypothesis, visual-spatial perspective taking is the ability to **imagine** how a stimulus array will appear from another perspective (Kozhevnikov & Hegarty, 2001).
- The Sensorimotor Hypothesis (May, 2004) suggests that the difficulty in perspective taking is due to **perspective switching**. Subjects are required to inhibit the sensorimotor information and make judgements about the cognitive information.
- In pointing tasks, participants are required to switch from the perspective taken in the objects array to an incongruent perspective in the response-board (Avraamides & Kelly, 2008).
- No study so far has examined the sequential effects in perspective switching.

Experiment 1

Perspective Switching in Pointing tasks

Method and design: The Dots Perspective Task (DPT)

- 2 within-subject variables (2X2): **Perspective** (0° / 180°), **Congruency** (smiley's position and clock lines' position congruent / incongruent), 1 between-subject variable: **Group** (different configuration arrangements) (N=39, 30)
- 69 undergraduate students (*Mean age*= 23.66, *SD*= 1.99).

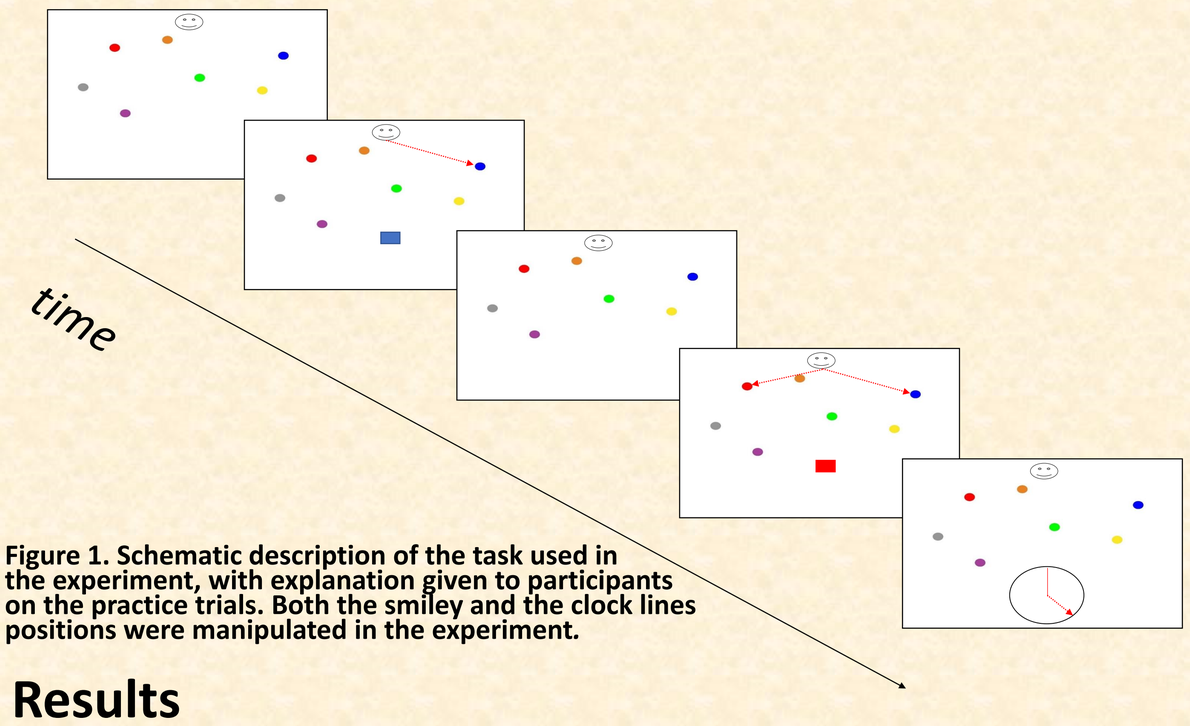

Figure 1. Schematic description of the task used in the experiment, with explanation given to participants on the practice trials. Both the smiley and the clock lines positions were manipulated in the experiment.

Results

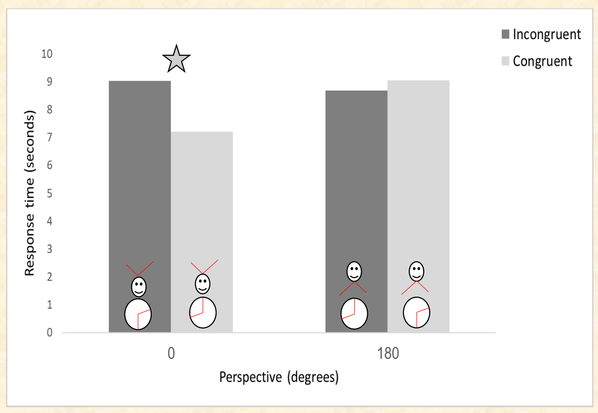

Figure 2. Response time as a function of perspective and congruency (*Pers.: p < .001, η2= .21, Cong.: p = .001, η2= .16, Int.: p = .001, η2= .39*)

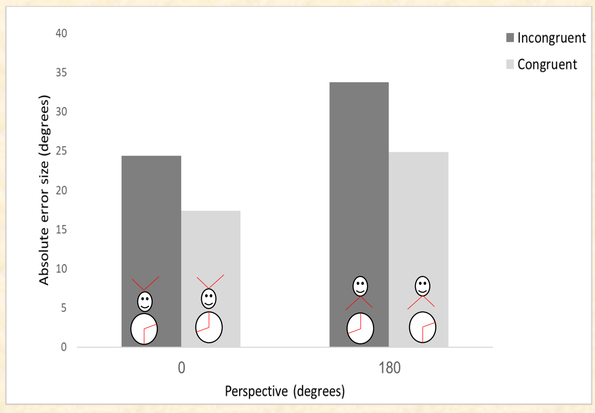

Figure 3. Accuracy as a function of perspective and congruency (*Pers.: p < .002, η2= .15, Cong.: p = .003, η2= .13*)

Discussion

- Mental transformation (180° condition) causes bigger errors and takes more time, compared to the conditions that do not require mental transformation (0° condition).
- Switching between perspectives in the dots array and in the clock (incongruent trials) causes bigger errors and takes more time, compared to the conditions that do not require perspective switching (congruent trials).

Perspective switching "costs" time and causes bigger errors.

Experiment 2*

Perspective Switching in Sequential Effects

Method and design:

- 2 within-subject variables (2X2): **Perspective** (0° / 180°), **Sequence** (repeat / switch). (See conditions in Figure 4).
- 25 undergraduate students (*Mean age*= 24.24, *SD*= 1.82).
- Design is similar to Experiment 1, but the clock lines position is always congruent to the smiley's position.

Condition	Trial N-1	Trial N	Perspective Switching
1) Repeat			X
2) Repeat			X ?
3) Switch			✓
4) Switch			✓

Figure 4. Schematic description of the four conditions in Experiment 2.

Results

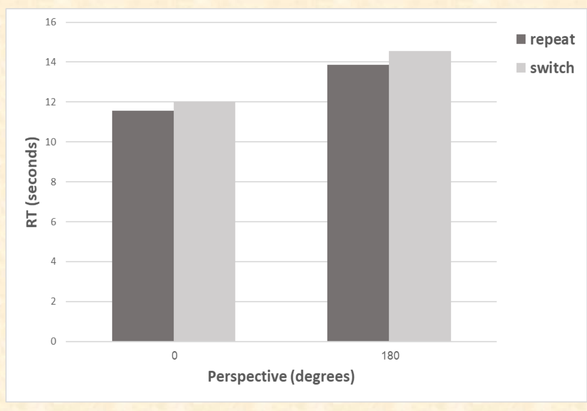

Figure 5. Response time as a function of perspective and sequence (*Pers.: p = .001, η2 = .4, Sequence: p = .014, η2 = .22*)

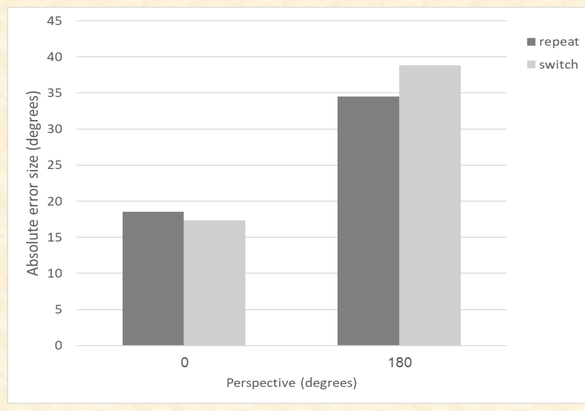

Figure 6. Accuracy as a function of perspective and sequence (*Pers.: p = .035, η2 = .17, Interaction: p = .029, η2 = .18*)

Discussion

- Perspective switching requires more time, both in 0° and 180° perspectives.
- Perspective switching causes bigger errors in the pointing direction when switching from the sensorimotor perspective (0°) to a cognitive perspective (180°), but not vice versa.

Perspective switching is an effortful process. It is harder to inhibit the egocentric perspective after it arises.
(*preliminary results)

References

Avraamides, M. N., & Kelly, J. W. (2008). Multiple systems of spatial memory and action. *Cognitive Processing*, *9*(2), 93-106.

Kozhevnikov, M., & Hegarty, M. (2001). A dissociation between object manipulation spatial ability and spatial orientation ability. *Memory & Cognition*, *29*(5), 745-756.

May, M. (2004). Imaginal perspective switches in remembered environments: Transformation versus interference accounts. *Cognitive Psychology*, *48*(2), 163-206.