**INTERNAL MODELS IN INTERCEPTION**

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**Introduction**

The presence of delays in our central nervous system causes a systematic delay between action initiation and the corresponding motor act. During interceptive or catching tasks, in particular, these delays prevent the instantaneous adjustment of our movements and force us to use a strategy alternative to feedback control. We have designed an interception experiment with the aim of understanding whether this strategy involves building internal models of the flying object dynamics and whether the motor system plays a role in this modeling phase.

**Main questions**

- Do humans build internal model of flying objects dynamics to better intercept them?
- Is motor system involved in the modeling phase?

**Methods**

Subjects scored a better performance when there was coherence between the force field they saw acting on the ball and the force field they perceived moving the paddle (Fig. 5). In the first sets of trials of the fixed force field condition and in the whole variable force field condition subjects ended up with their paddle nearer to a false arrival point. This position was obtained extrapolating the ball trajectory with a straight line, tangent to the real parabolic one in the point where the ball vanished behind the occlusion (the green line in figure). This result indicates the progressive building of a model in the fixed force field case in opposition to the continuous extrapolation strategy adopted in the variable force field case.

**Results**

The fixed force field case allows for better performances than the variable force field case. When the fixed force field is suddenly replaced with a vertical force that changes randomly its orientation at each trial (14th set) an error peak appears. As soon as a fixed force field temporarily varied is restored, errors return in trend with the previous values, as subjects could simply return to a model already learned.

**Conclusions**

The possibility to model object dynamics has a relevant influence on prediction and interception. Prediction is not only influenced by what is seen (the behavior of the object and its dynamical feature) but also by the environment in which subjects move their hand (a gravitational world).

**Further developments**

Expand research to different object behaviors (e.g. drifting or rolling) and to different force fields (e.g. not gravitational force fields). Analyze if there is a difference in the modeling phase when subjects have to predict just giving a visual judgement or when they have to move their hand while predicting.

The final aim of my research would be to understand how the ability of predicting future course of actions is developed and used by humans and how it could be applied to the construction of better robotic systems.

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**References**