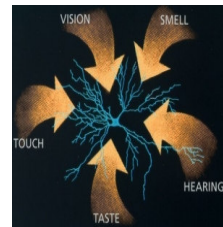




# Visual-tactile interactions in tool-use: Peripersonal space or multisensory spatial attention?



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<http://www.psy.ox.ac.uk/xmodal/default.htm>

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## The Task

Participants held a single 'tool' (75 cm stick) in their right hand, contacting a MR-compatible piezoelectric vibrator on the right or left side.

Participants discriminated single (200 ms) & double (65-70-65 ms) target vibrations & respond with left hand. Visual distractors (either single or double, random & irrelevant) presented from the right or the left side.

e.g.:

	Congruent	Incongruent
Vision	200	65 70 65
Touch	200	200

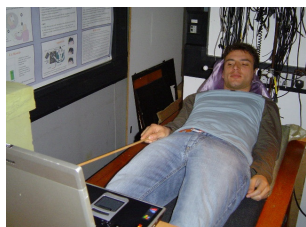
2 x 2 blocked factorial design:

Tool side (right/left) x Visual distractor side (right/left)

12 trials per block x 16 task blocks (24 s) + 16 rest blocks (18 s) x 2 sessions.

Brain BOLD response recorded with fMRI: Siemens Sonata, 1.5 T, TR = 3 s, TE = 60 ms, 36 slices, 3 x 3 x 3 mm, 2 x 224 volumes.

FSL 3.2., FEAT 5.4, Motion correction, 6 mm FWHM spatial smoothing, highpass temporal filtering, cluster analysis (GRF, Z > 2.3, p < .05).



Pilot behavioural data (see left and below) shows stronger visual-tactile interactions when visual & tactile stimuli are presented in the same position.

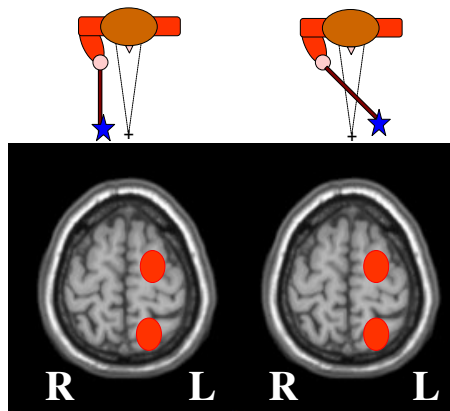
## Peripersonal Space

When we use a tool, the representation of multisensory peripersonal space (the space immediately around our body) is extended. Visual receptive fields stretch along the tool, & visual-tactile interactions are strengthened.

### Prediction

Visual & tactile stimuli presented at the end of a tool held in the right hand are processed more by the left hemisphere than by the right hemisphere.

(Neurons representing peripersonal space more frequently represent contralateral than ipsilateral body parts).



[TR\_VR] - [TL\_VL] -  
[TL\_VR] [TR\_VL]  
Visual stimulus + tool = activation of right hand peripersonal space areas

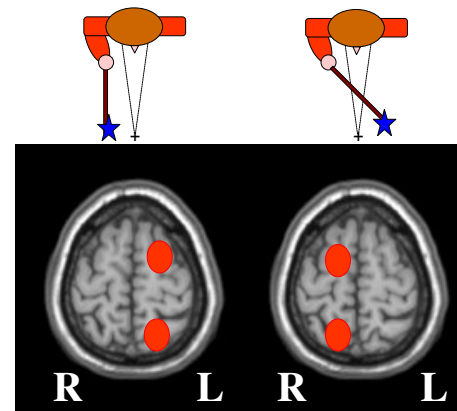
## Multisensory Attention

When we use a tool, the tip of the tool (or perhaps the functional part) captures multisensory spatial attention. Attention is attracted towards stimuli presented at the tip of the tool, strengthening visual-tactile interactions.

### Prediction

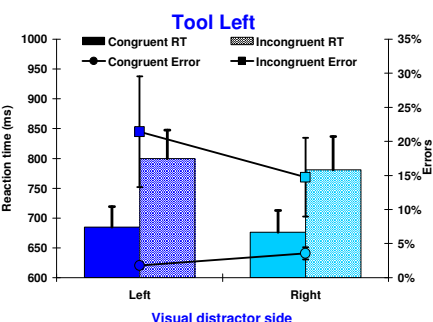
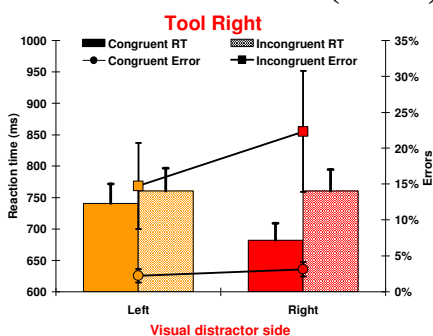
Visual & tactile stimuli presented at the end of a tool held in the right hand are processed more by the hemisphere contralateral to the tool tip than by the ipsilateral hemisphere.

(Multisensory attention involves the hemisphere contralateral to the stimulus location more than the ipsilateral hemisphere).



[TR\_VR] - [TL\_VL] -  
[TL\_VR] [TR\_VL]  
Visual stimulus + tool = activation of contralateral spatial attention areas

## Behavioural Data (n = 7)



## fMRI Data (n = 2) (and counting...!)

