

# Brain, Body, & Space:

Does tool-use *extend*  
visuotactile peripersonal space?

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# 'Tool-Use' is HOT!

Between 1840 - 1995 (found so far...):

- 6 Anecdotes (1846, 1856, 1890, 1911, 1966, 1993...)
- 20+ Psychophysical ('active touch', 1988-)
- Many on Apraxia (1900-)

1996 – 2003 studies (at least):

- 12 Imaging (4 PET, 8 fMRI, + viewing, naming, & imagery)
- 12 Psychophysical
- 8 Neuropsychological (+ apraxia)
- 4 Neurophysiological
- 4 IMRF presentations!

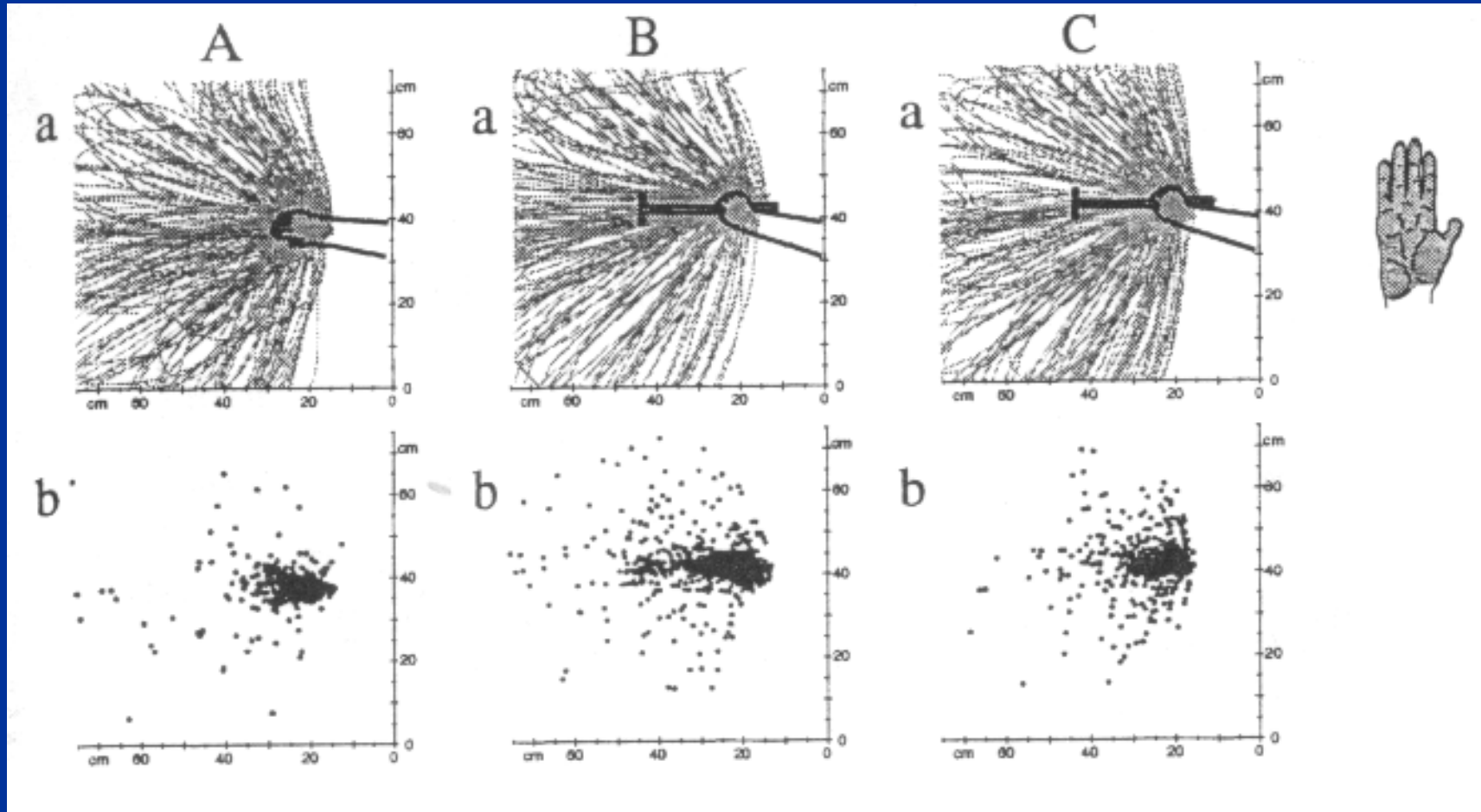
# Extension of Peripersonal Space?

No tool

'Tool-use'

'Hold tool'

stimuli  
responses



Iriki, Tanaka, Iwamura, 1996

# State of Play

## Most visuotactile studies of tool-use:

A. Examine visuotactile interaction only at the tip of 'tools' – is it really an *extension*?

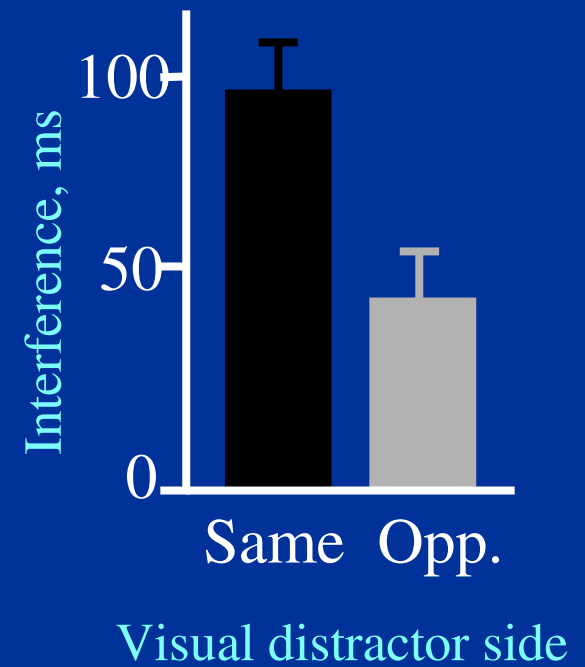
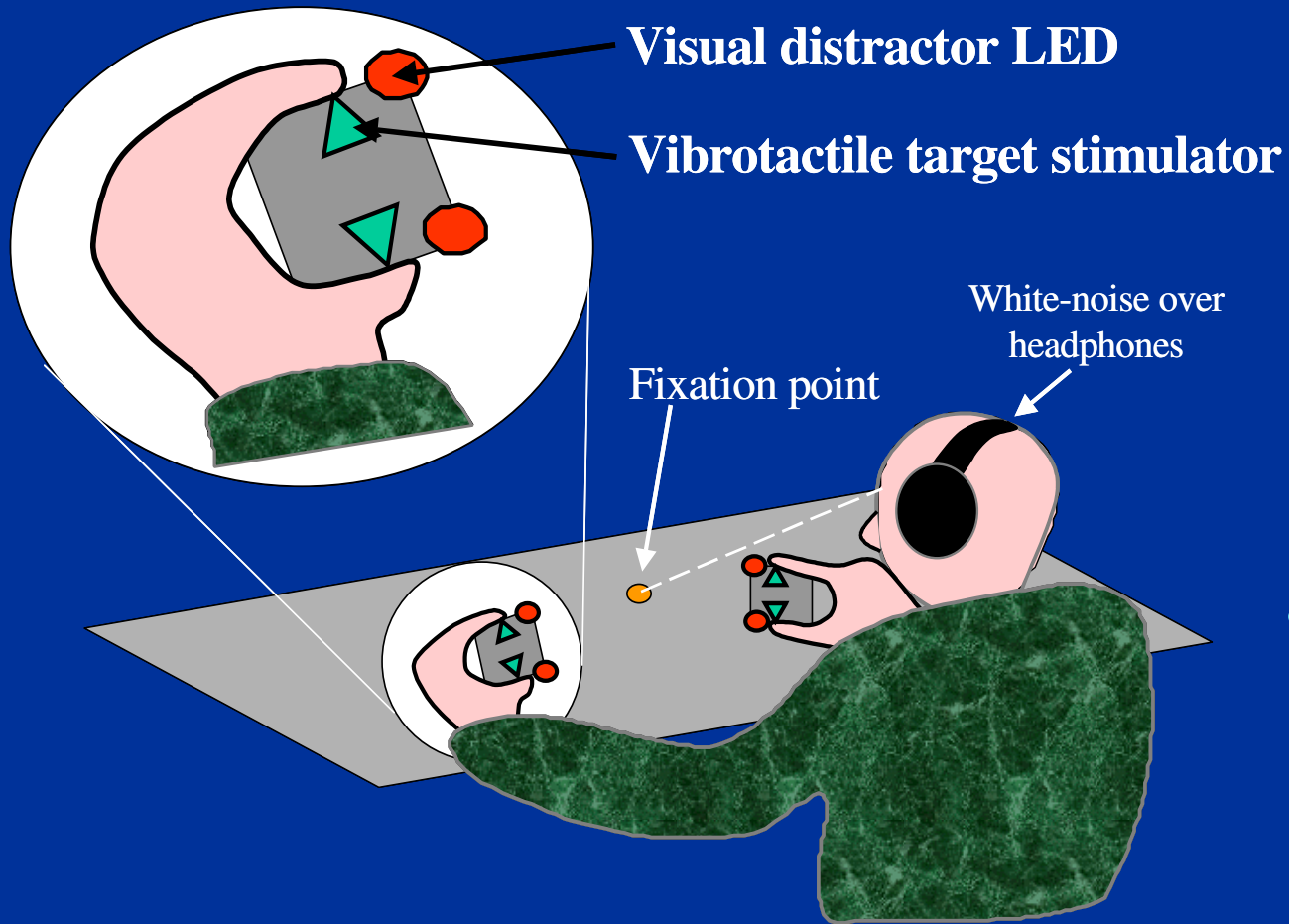
B. Compare active 'tool-use' task to a passive task  
- is it just an effect of targeted motor activity?

So...

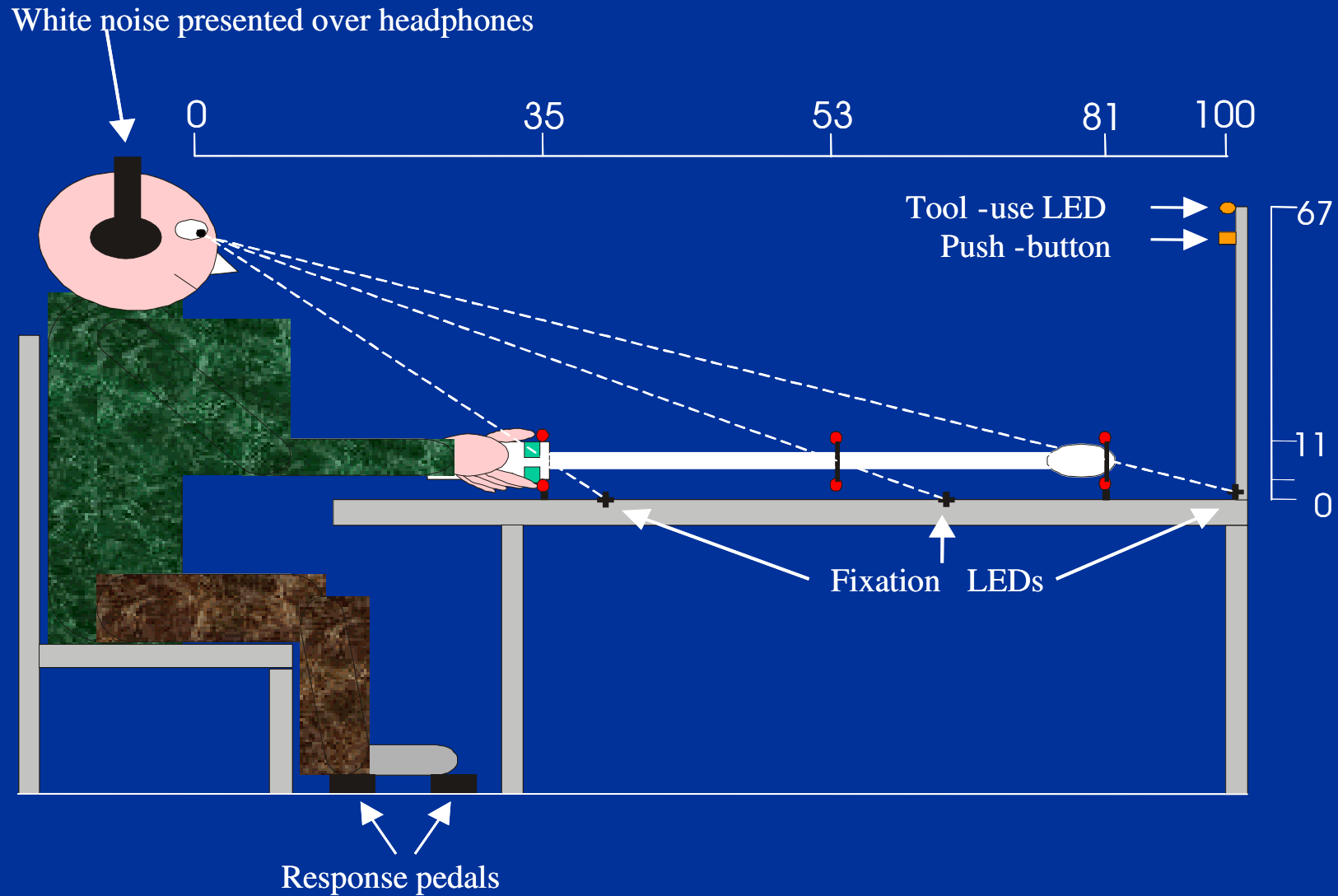
1 – Examine visuotactile interactions at different distances from participants

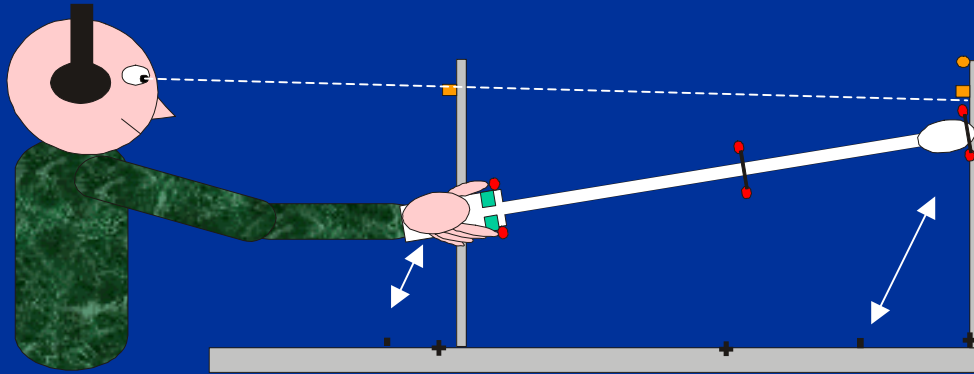
2 – Compare tool-use to equivalent active tasks

# 'Crossmodal Congruency' Task



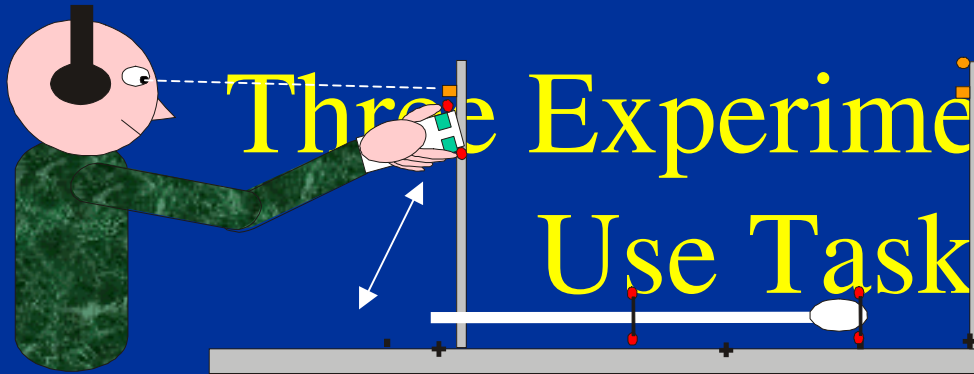
# 'Extended' Crossmodal Congruency Task





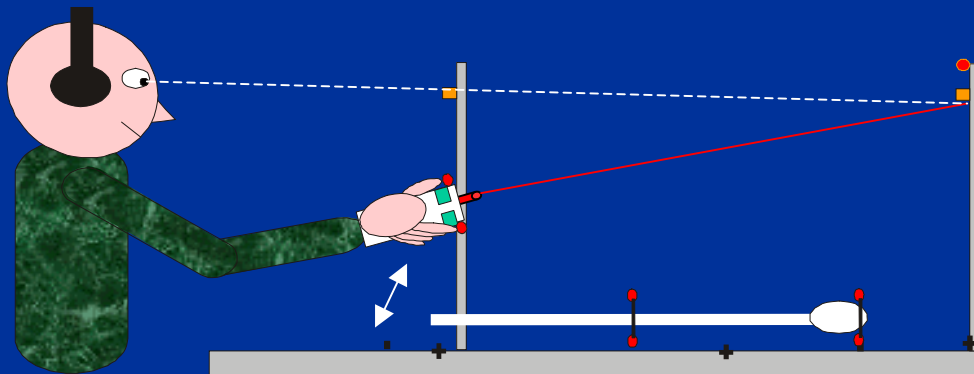
### E1: 'Tool-use'

Gaze = Far  
 Action = Far  
 'extended' reach



## Three Experimental: Tool-use Use Tasks...

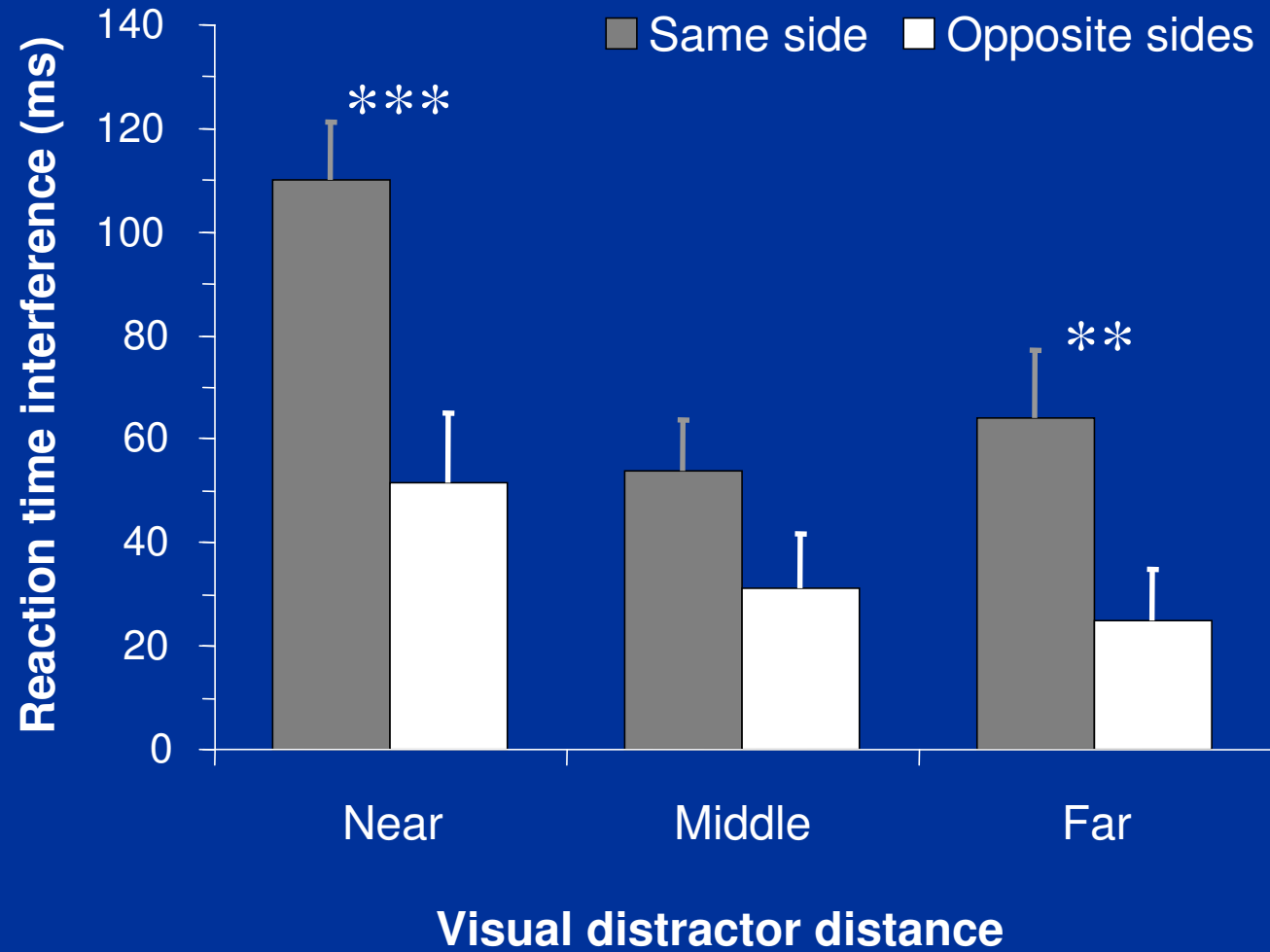
Gaze = Near  
 Action = Near  
 'unextended' reach



### E3: 'Laser-use'

Gaze = Far  
 Action = Far  
 extended reach?

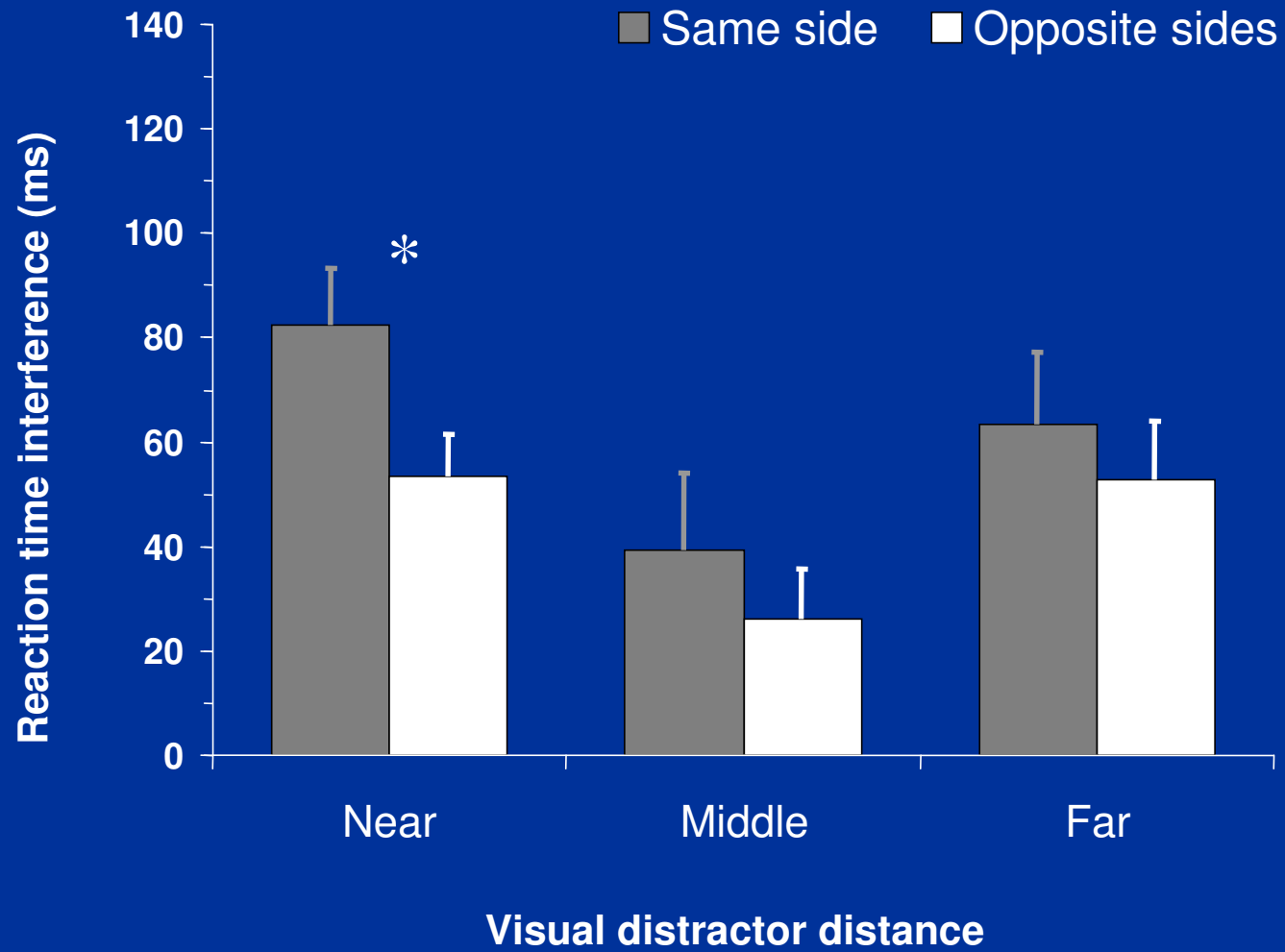
# E1: 'Tool-Use'



\*\*\*  $p < .002$   
\*\*  $p < .01$

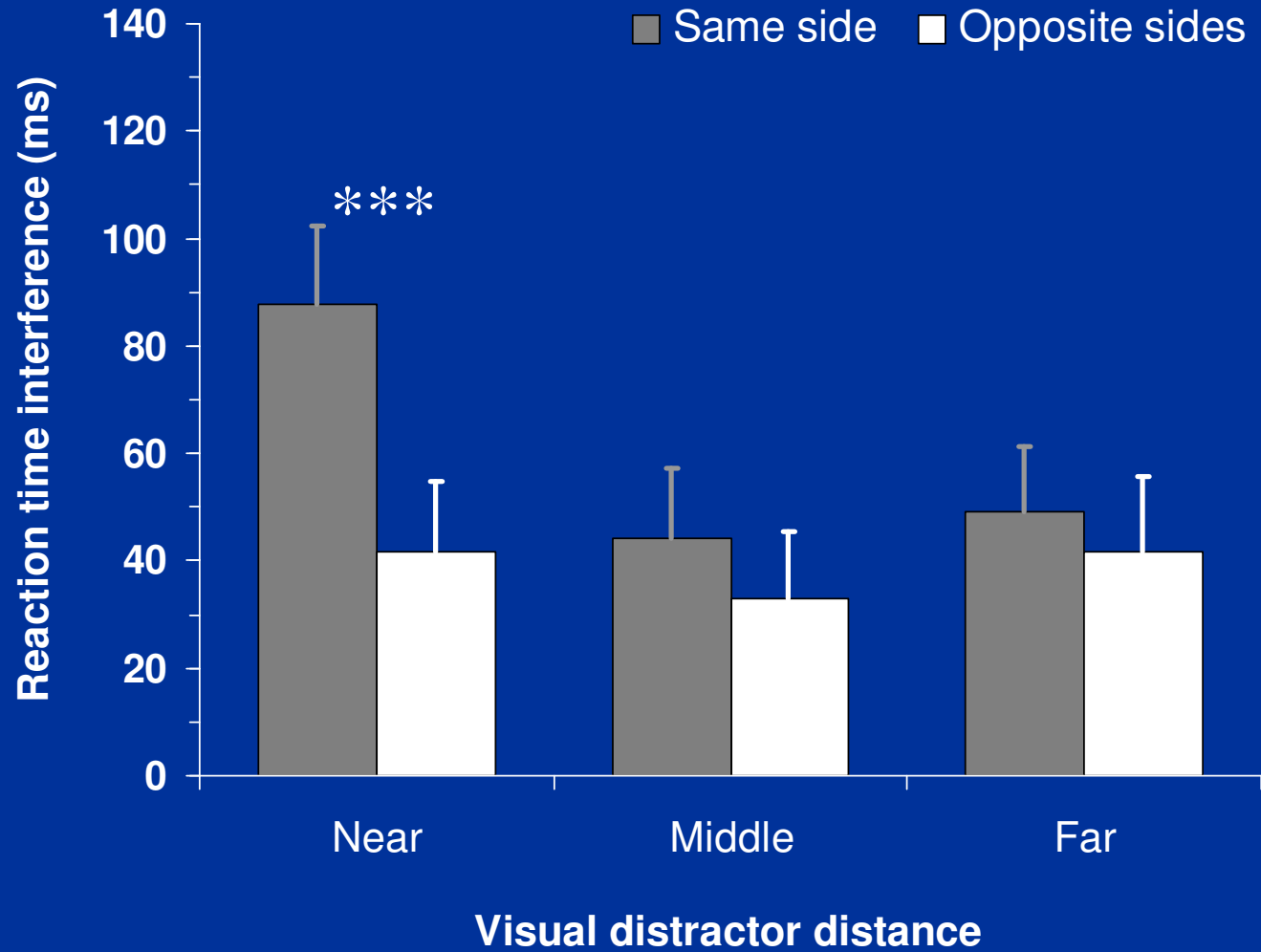


# E2: 'Handle-Use'



\* p < .05

# E3: 'Laser-Use'

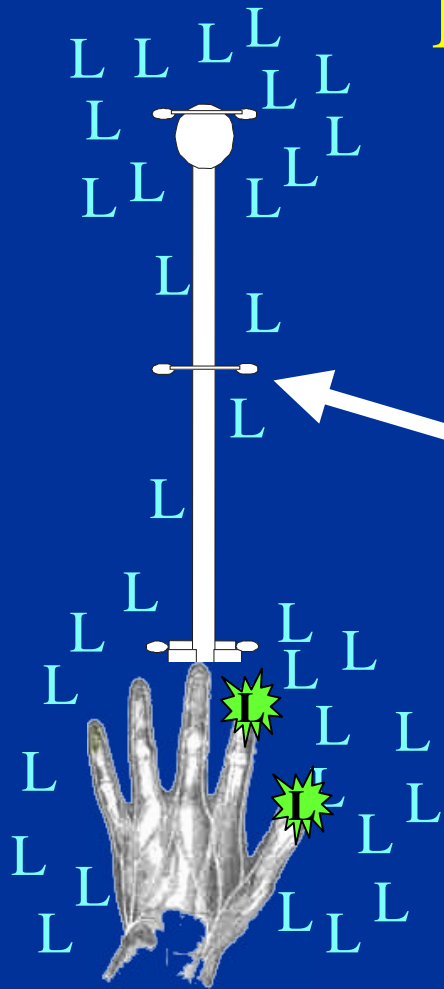


\*\*\* p < .002

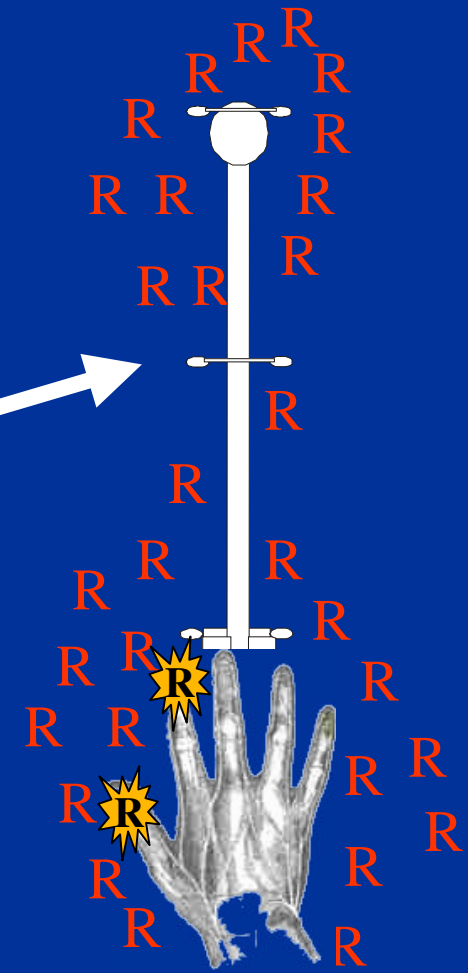
# Visuotactile peripersonal space is body-part centred



# Does tool-use *extend* visuotactile peripersonal space?



Visual distractors at the tip of actively-wielded tools interfere with ipsilateral (smaller ( $p = .06$ ) effects in the example with ipsilateral than contralateral tactile judgements) space does not segregate (in uncrossed posture) space to same degree



# Implications

- The body or peripersonal space is not simply *extended* with tool-use
- Visual / spatial attention is ‘drawn’ to the functional part of tool during active usage
- Do we need to distinguish between different ‘tools’?
  - Sticks, laser pointers, torch-lights, computer mice, shadows...

**The  
End**



**The End**

