Neural Correlates of Visual Imagery

Crawford Winlove

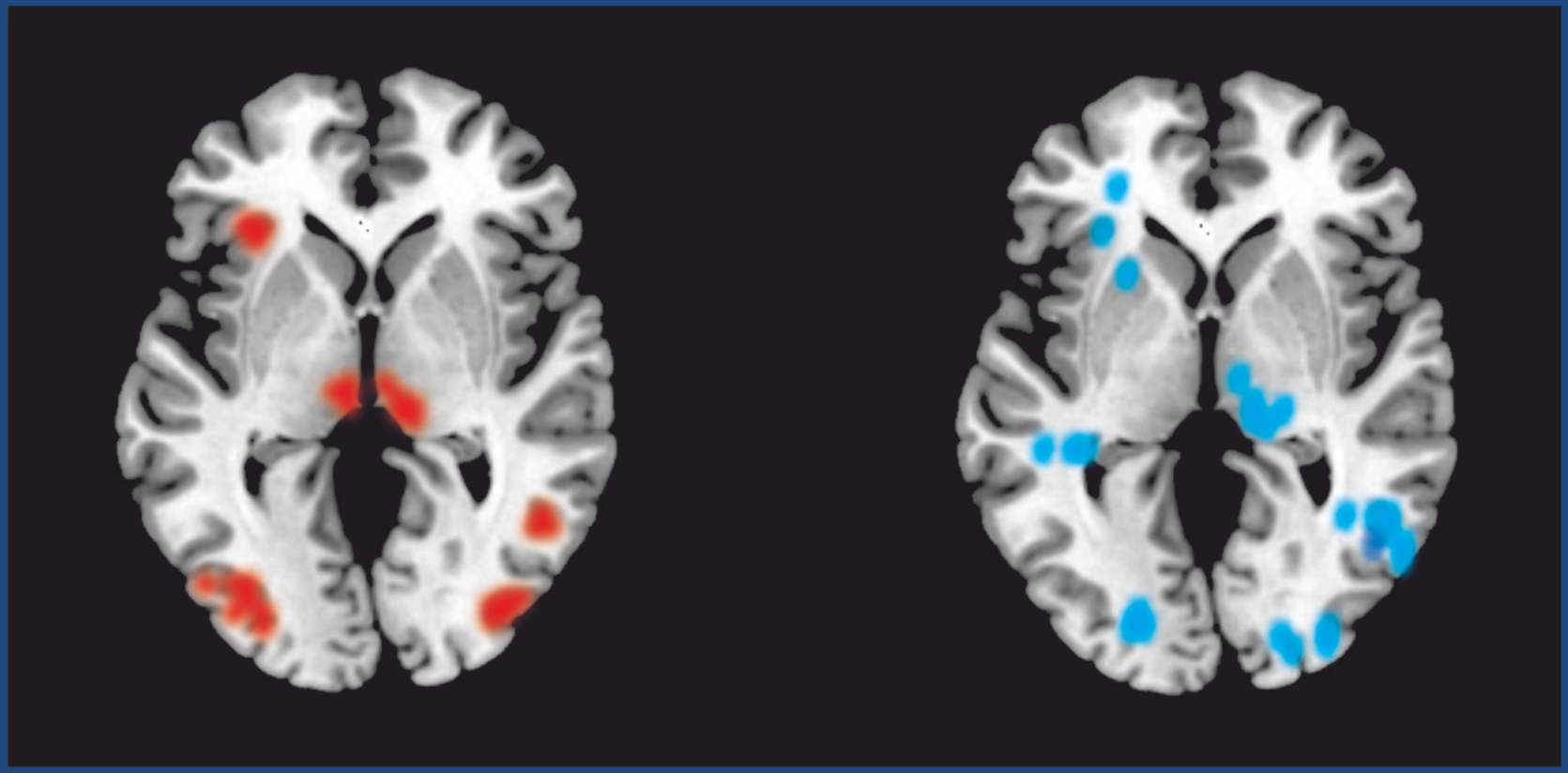
UNIVERSITY OF EXETER | MEDICAL SCHOOL

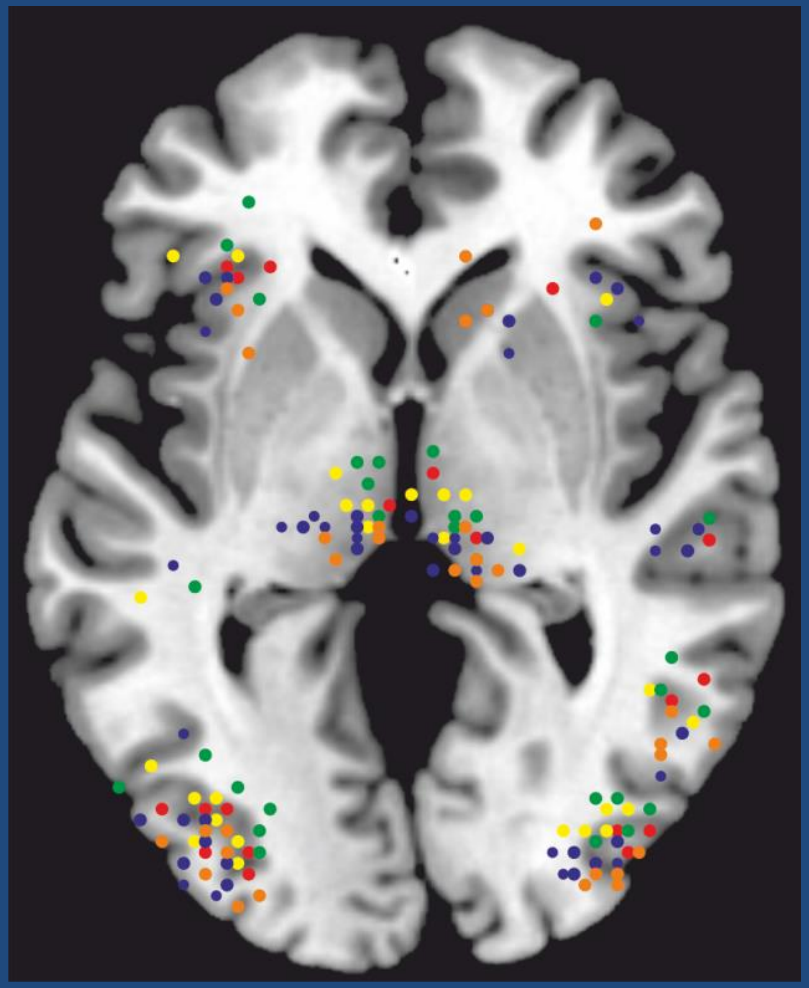

SIEMENS

Signals are small

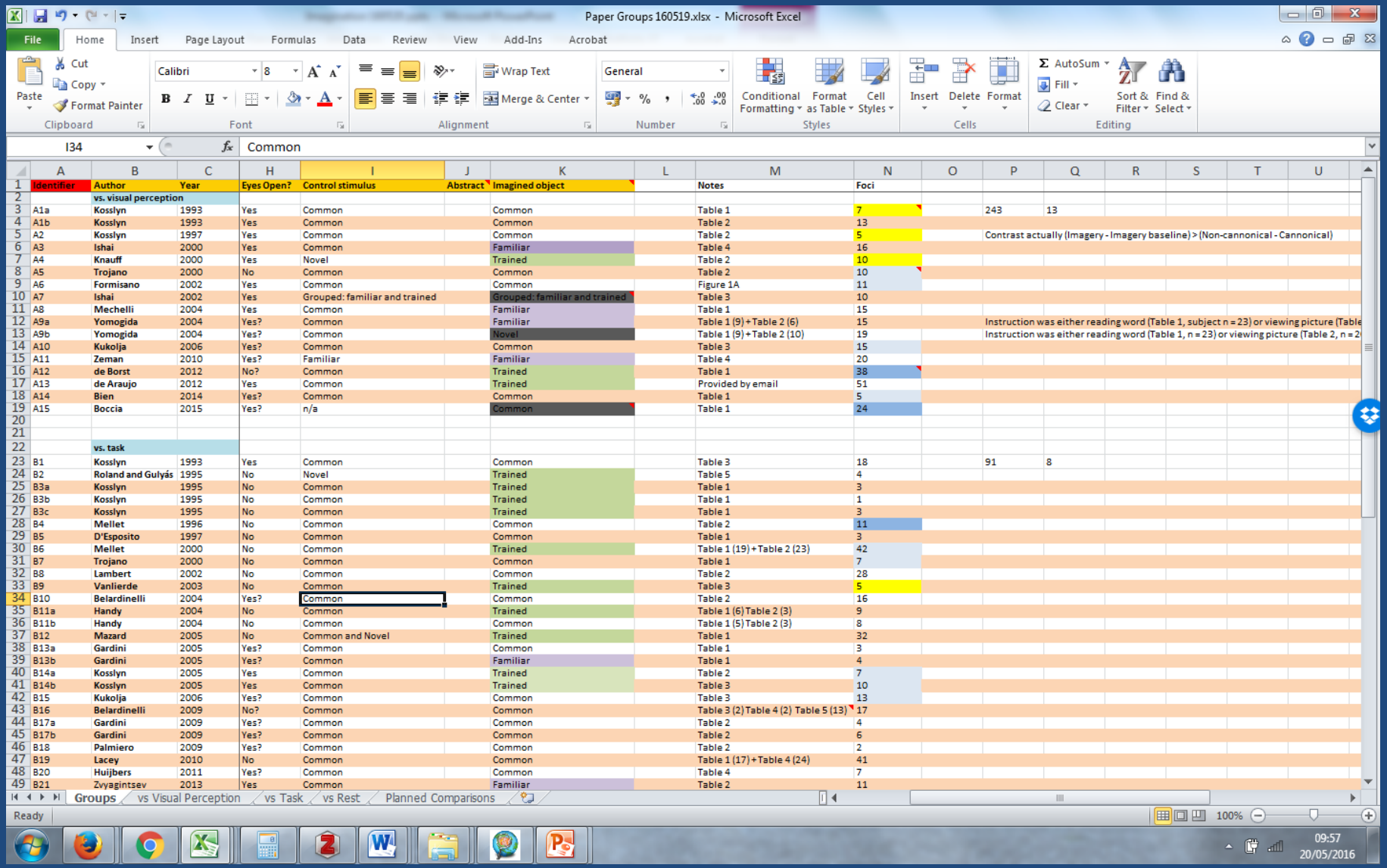
Statistics are complicated

Physiology is uncertain





$$p = \frac{e^{\frac{-d^2}{2\sigma^2}}}{(2\pi)^{1.5}\,\sigma^3}$$



Paper Groups 160519.xlsx - Microsoft Excel

Identifier	Author	Year	Eyes Open?	Control stimulus	Abstract	Imagined object	Notes	Foci			
	vs. visual perception										
A1a	Kosslyn	1993	Yes	Common		Common	Table 1	7	243	13	
A1b	Kosslyn	1993	Yes	Common		Common	Table 2	13			
A2	Kosslyn	1997	Yes	Common		Common	Table 2	5	Contrast actually (Imagery - Imagery baseline) > (Non-cannonical - Cannonical)		
A3	Ishai	2000	Yes	Common		Familiar	Table 4	16			
A4	Knauff	2000	Yes	Novel		Trained	Table 2	10			
A5	Trojano	2000	No	Common		Common	Table 2	10			
A6	Formisano	2002	Yes	Common		Common	Figure 1A	11			
A7	Ishai	2002	Yes	Grouped: familiar and trained		Grouped: familiar and trained	Table 3	10			
A8	Mechelli	2004	Yes	Common		Familiar	Table 1	15			
A9a	Yomogida	2004	Yes?	Common		Familiar	Table 1 (9) + Table 2 (6)	15	Instruction was either reading word (Table 1, subject n = 23) or viewing picture (Table		
A9b	Yomogida	2004	Yes?	Common		Novel	Table 1 (9) + Table 2 (10)	19	Instruction was either reading word (Table 1, n = 23) or viewing picture (Table 2, n = 2		
A10	Kukolja	2006	Yes?	Common		Common	Table 3	15			
A11	Zeman	2010	Yes?	Familiar		Familiar	Table 4	20			
A12	de Borst	2012	No?	Common		Trained	Table 1	38			
A13	de Araujo	2012	Yes	Common		Trained	Provided by email	51			
A14	Bien	2014	Yes?	Common		Common	Table 1	5			
A15	Boccia	2015	Yes?	n/a		Common	Table 1	24			
	vs. task										
B1	Kosslyn	1993	Yes	Common		Common	Table 3	18	91	8	
B2	Roland and Gulyás	1995	No	Novel		Trained	Table 5	4			
B3a	Kosslyn	1995	No	Common		Trained	Table 1	3			
B3b	Kosslyn	1995	No	Common		Trained	Table 1	1			
B3c	Kosslyn	1995	No	Common		Trained	Table 1	3			
B4	Mellet	1996	No	Common		Common	Table 2	11			
B5	D'Esposito	1997	No	Common		Common	Table 1	3			
B6	Mellet	2000	No	Common		Trained	Table 1 (19) + Table 2 (23)	42			
B7	Trojano	2000	No	Common		Common	Table 1	7			
B8	Lambert	2002	No	Common		Common	Table 2	28			
B9	Vanlierde	2003	No	Common		Trained	Table 3	5			
B10	Belardinelli	2004	Yes?	Common		Common	Table 2	16			
B11a	Handy	2004	No	Common		Trained	Table 1 (6) Table 2 (3)	9			
B11b	Handy	2004	No	Common		Common	Table 1 (5) Table 2 (3)	8			
B12	Mazard	2005	No	Common and Novel		Trained	Table 1	32			
B13a	Gardini	2005	Yes?	Common		Common	Table 1	3			
B13b	Gardini	2005	Yes?	Common		Familiar	Table 1	4			
B14a	Kosslyn	2005	Yes	Common		Trained	Table 2	7			
B14b	Kosslyn	2005	Yes	Common		Trained	Table 3	10			
B15	Kukolja	2006	Yes?	Common		Common	Table 3	13			
B16	Belardinelli	2009	No?	Common		Common	Table 3 (2) Table 4 (2) Table 5 (13)	17			
B17a	Gardini	2009	Yes?	Common		Common	Table 2	4			
B17b	Gardini	2009	Yes?	Common		Common	Table 2	6			
B18	Palmiero	2009	Yes?	Common		Common	Table 2	2			
B19	Lacey	2010	No	Common		Common	Table 1 (17) + Table 4 (24)	41			
B20	Huijbers	2011	Yes?	Common		Common	Table 4	7			
B21	Zvyagintsev	2013	Yes	Common		Familiar	Table 2	11			

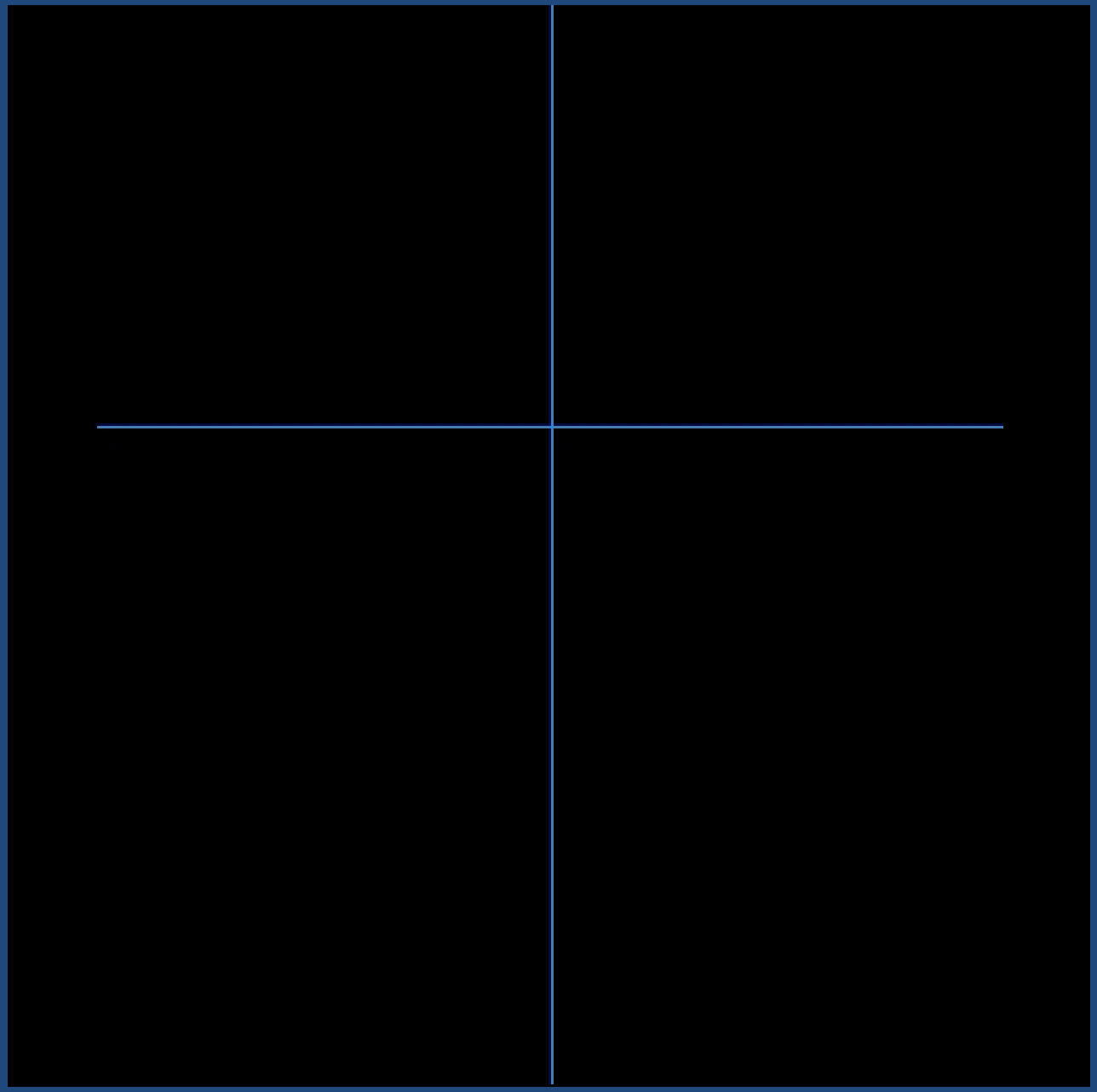
Groups | vs Visual Perception | vs Task | vs Rest | Planned Comparisons

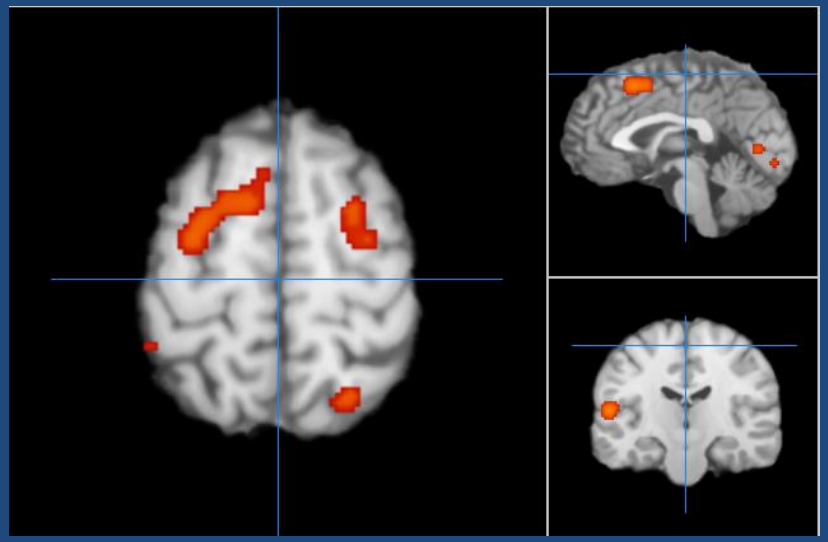
Ready

45 Papers

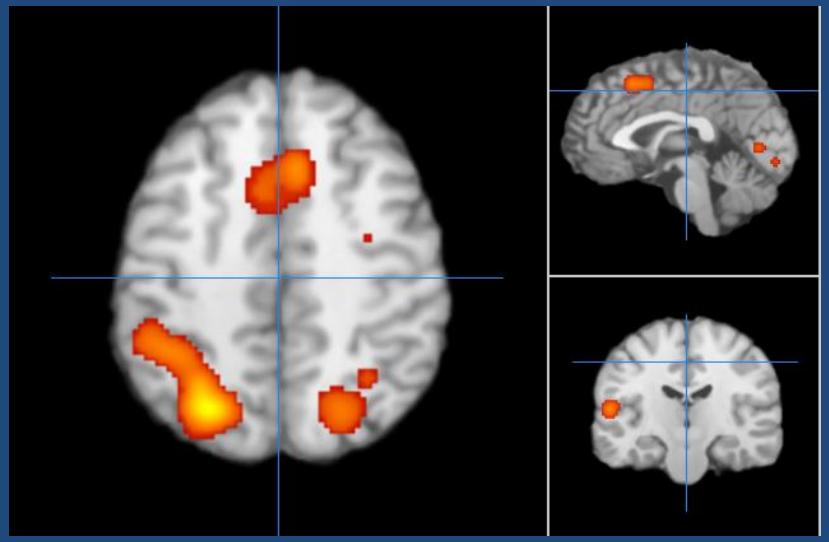
762 Foci

650 Participants





1



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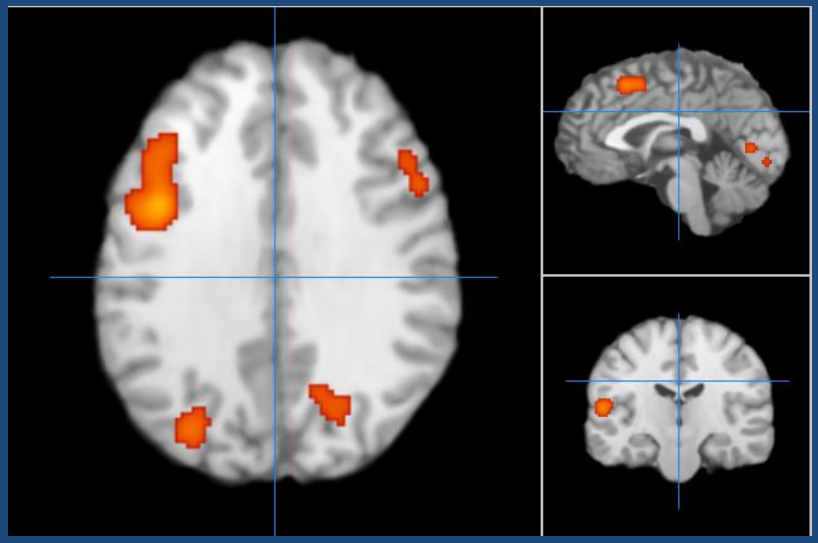

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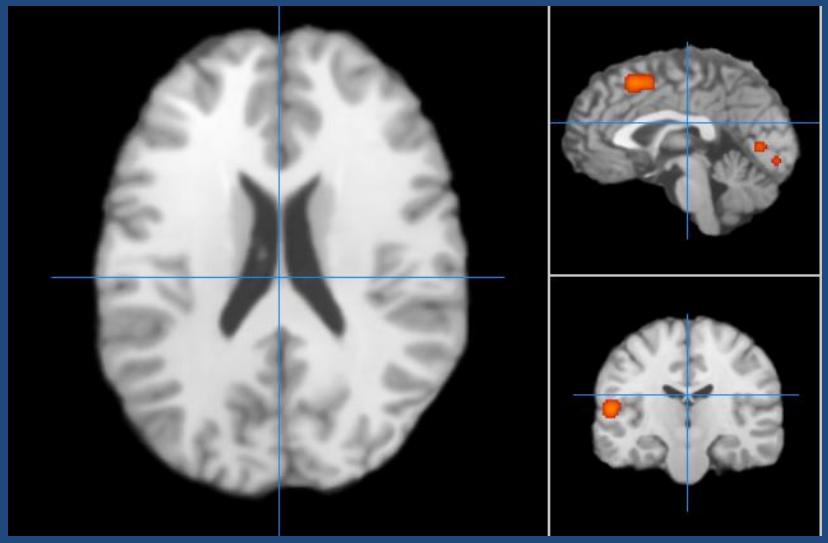

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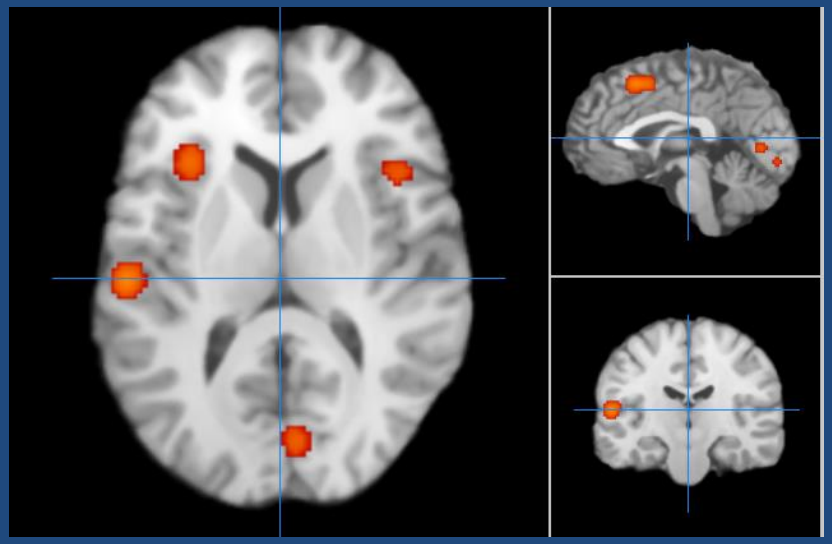

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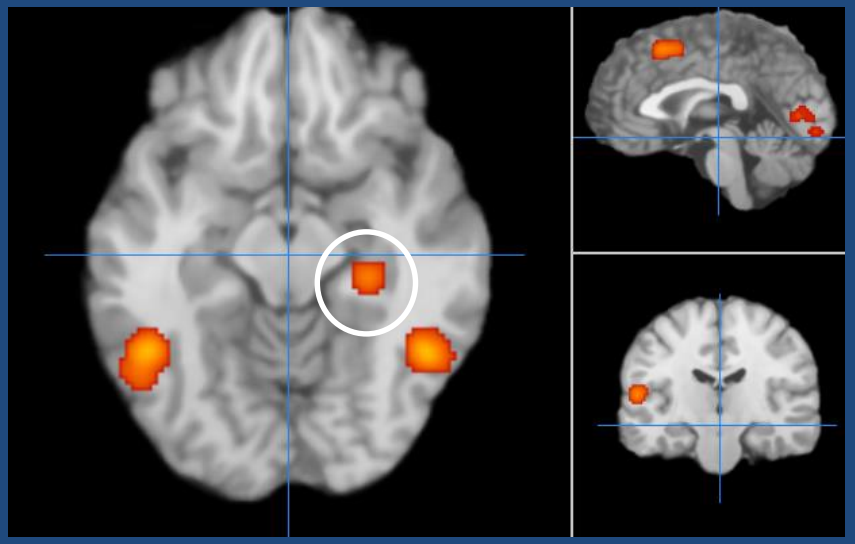


6

Which of these activations is most important?

26 August 1999

International weekly journal of science

nature

$10.00

www.nature.com

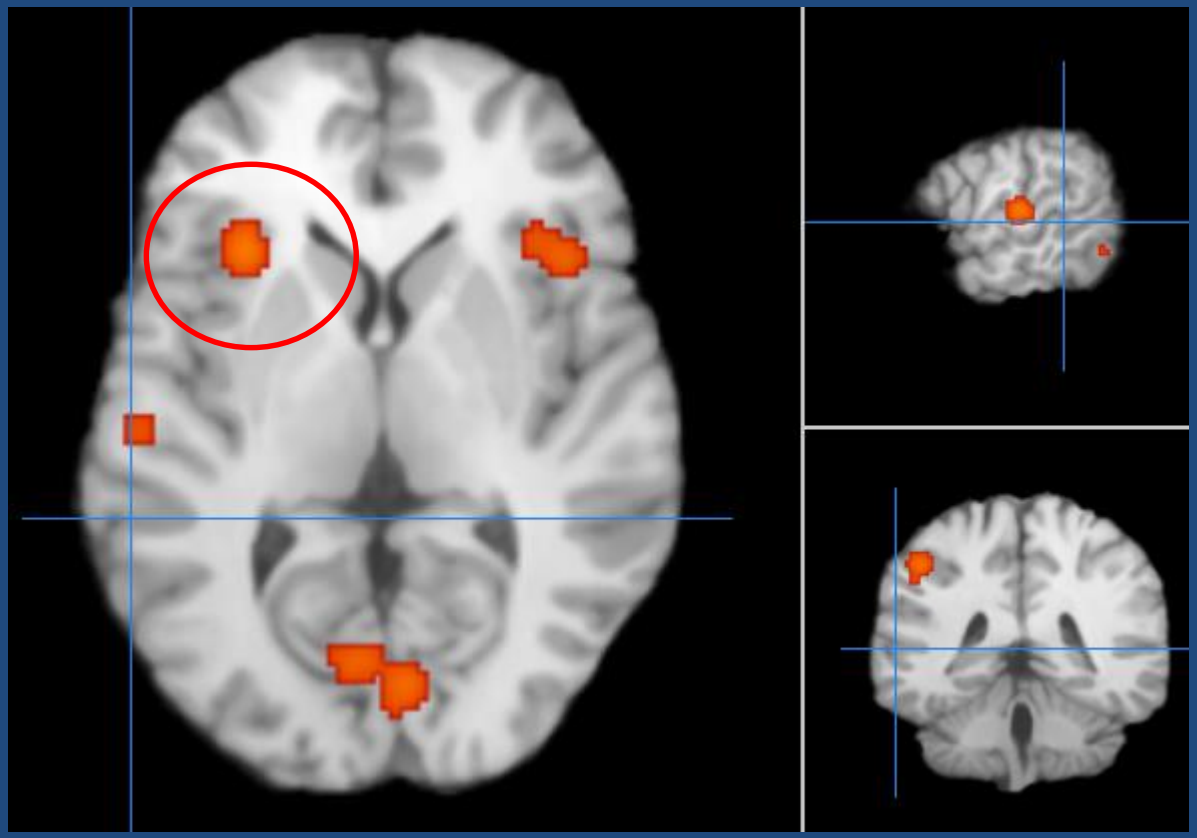
Bacterial ribosome structure

Mosquito control
Dynamics of insecticide resistance

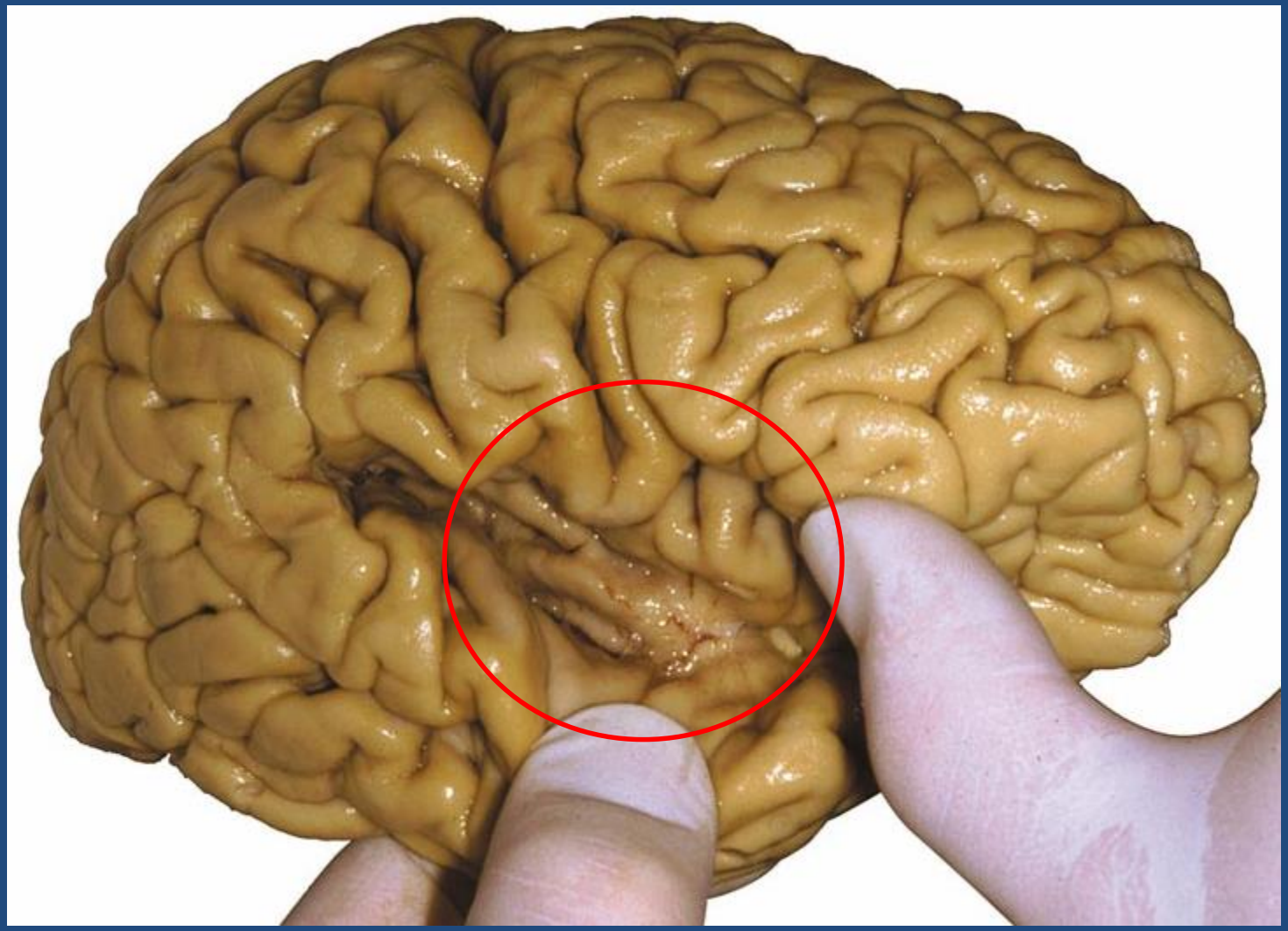
Measuring *g*
An atomic leap in accuracy

Oceanography
Iron piracy on the high seas

New on the market
Peptides and proteins



Insula

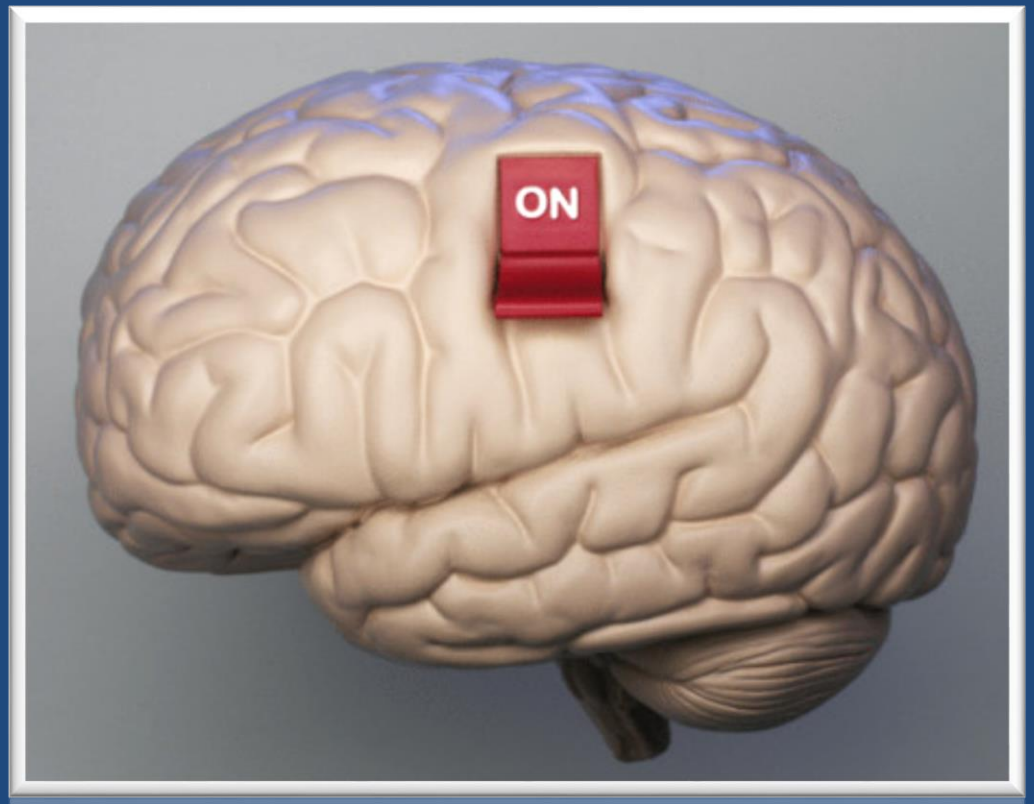


Insula

Very commonly done……..

and is complete nonsense

Are these activations specific to visual imagery?


ON

Need to find unusual activations

Option One: Proportion of studies in which our regions are active

Middle Frontal Gyrus
Precentral Gyrus
Lateral Occipital Cortex, Superior Division
Paracingulate Gyrus
Supramarginal Gyrus, Posterior Division
Inferior Frontal Gyrus, pars opercularis
Precuneus
Frontal Operculum Cortex
Planum Temporale
Intracalcarine Cortex
Frontal Operculum Cortex
Insular Cortex
Lingual Gyrus
Hippocampus
Inferior Temporal Gyrus, Temporooccipital part

Option One: Proportion of studies in which our regions are active

Right	**Precuneus**	
Left (> Right)	**Lingual Gyrus**	BA17 + 18
Right	**Hippocampus**	Subiculum
Right	**Inferior Temporal Gyrus**	Temporo-occipital part

Option Two

Use Bayes' theorem to formally compare the rate of activation in:

1. the visual imagery literature

2. the wider neuroimaging literature

Left	Anterior intra-parietal sulcus	hIP1	(5.7)
Left	Anterior intra-parietal sulcus	hIP3	(5.1)
Right	Lateral Occipital Cortex	Superior Division	(3.9)
Left	Lingual gyrus	BA18	(4.0)
Right	Hippocampus	cornu ammonis	(23.7)

Forward inference?