

Supplementary Information

Development of Stimuli

The imitation inhibition task used in Experiment 2 in the present study is a modified version of a previously existing paradigm (Brass et al., 2000; Catmur & Heyes, 2010). In order to avoid any own-sex bias, we decided to use a hand stimulus which was rated as neutral. 51 participants (19 males, $Mean_{age} = 23.49$, $SD_{age} = 3.12$) other than the ones who participated in the current study were asked to rate 18 white Caucasian hand stimuli (9 male hands, 9 female hands) on a scale of 1 to 9, with 1 being “extremely masculine,” 9 being “extremely feminine” and 5 being “neutral.” An average of the rating score was obtained for each hand stimulus. The hand which had an average rating closest to 5 (Mean = 5.08) was taken as the final stimulus as it was considered to be rated most “neutral” amongst all other stimuli. In the present experiment, we again asked all participants to rate the hand they saw in the imitation inhibition task on the same scale: 1 to 9, with 1 being “extremely masculine,” 9 being “extremely feminine” and 5 being “neutral.” The mean of the hand ratings was 5.27; thus, on average, participants perceived the hand as ‘neutral.’

Table S1.1. Responses in each MD network fROI for spatial and imitative compatibility when individual contrasts were thresholded at $p < .001$, uncorrected.

ROI	ROI size	Inter-subject overlap	Average ROI mask size	Spatial Compatibility			Imitative Compatibility		
				t	p-value	p-FDR	t	p-value	p-FDR
L_SPL	1173	0.92	413	1.71	0.047	0.063	1.49	0.072	0.137
L_IPS	287	0.86	85	1.36	0.090	0.097	2.91	0.003	0.043
L_IPL	641	0.82	89	1.91	0.032	0.055	2.70	0.005	0.043
L_MFG	536	0.84	140	2.37	0.012	0.035	0.99	0.165	0.240
L_PrecG	338	0.86	103	1.76	0.043	0.062	0.33	0.371	0.396
L_IFG	181	0.74	58	0.11	0.457	0.457	0.77	0.223	0.297
L_Insula	197	0.7	48	2.45	0.010	0.035	0.55	0.294	0.336
L_SMA	294	0.88	86	3.00	0.002	0.019	0.03	0.489	0.489
R_SPL	1181	0.9	415	1.66	0.052	0.064	2.32	0.012	0.050
R_IPS	227	0.84	71	1.36	0.091	0.097	2.21	0.017	0.053
R_IPL	599	0.76	111	1.89	0.034	0.055	2.40	0.011	0.050
R_MFG	535	0.88	144	3.61	<0.001	0.007	1.80	0.039	0.093
R_PrecG	269	0.74	56	2.06	0.024	0.048	1.57	0.064	0.128
R_IFG	265	0.7	56	2.34	0.013	0.035	1.81	0.041	0.093
R_Insula	184	0.78	44	2.22	0.017	0.037	0.67	0.255	0.314
R_SMA	328	0.84	101	2.32	0.013	0.034	1.05	0.150	0.240

Table S1.1. Responses in each MD network fROI for spatial and imitative compatibility when individual contrasts were thresholded at $p < .001$, uncorrected. Cells in bold show fROIs which survived correction for multiple comparisons ($p < .05$, FDR corr.).

Table S1.2. Responses in each ToM network fROI for spatial and imitative compatibility when individual contrasts were thresholded at $p < .001$, uncorrected.

ROI	ROI size	Inter-subject overlap	Average ROI mask size (voxels)	Spatial Compatibility			Imitative Compatibility		
				t	p-value	p-FDR	t	p-value	p-FDR
DMPFC	576	1	0.58	-1.23	0.88	0.88	-0.09	0.54	0.82
MMPFC	494	1	0.56	-0.02	0.49	0.88	-0.56	0.71	0.82
VMPFC	382	1	0.44	-0.96	0.82	0.88	-0.93	0.82	0.82
RTPJ	1018	1	0.92	1.20	0.12	0.47	0.78	0.22	0.82

Table S2.1 Small volume correction (SVC) with MD network mask for the general compatibility effect and the sex*compatibility interaction.

Region	Cluster Size	P FWE Corr	t-value	MNI coordinates		
				x	y	z
GENERAL COMPATIBILITY (Incompatible>Compatible)						
Left inferior parietal lobule (extending into the left postcentral gyrus)	382	<0.001	8.40	-39	-40	43
			5.57	-48	-40	61
			5.31	-36	-43	67
Left intraparietal sulcus	79	0.005	6.50	-36	-52	46
			4.27	-30	-61	49
Left precentral gyrus	180	<0.001	6.38	-27	-7	70
			5.11	-33	-4	52
			4.78	-42	-1	55
			4.32	-27	-10	55
			4.22	-39	-4	52
Left superior parietal lobule	14	0.249	5.31	-27	-52	70
			3.95	-15	-55	73
			3.80	-12	-58	70
Right middle frontal gyrus	86	0.004	5.12	27	-1	70
			4.04	42	2	58
L insula	21	0.149	4.67	-36	17	-2
Right inferior parietal lobule (extending into the right intraparietal sulcus and postcentral gyrus)	270	<.001	4.50	48	-34	37
			4.47	39	-46	67
			4.46	48	-34	43
			4.41	45	-43	64
			4.41	42	-34	40
			4.39	33	-37	37
			4.38	54	-40	40
			4.35	45	-40	52
			4.29	36	-46	46
			4.28	39	-46	52
Right superior parietal lobule	29	0.086	4.40	36	-52	67
			3.97	42	-52	52
SEX*COMPATIBILITY						
[Female (Incompatible>Compatible) > Male (Incompatible>Compatible)]						
<i>No suprathreshold clusters</i>						

Table S2.1. Regions surviving a voxel-level threshold of $p < .001$ and 10 voxels are reported for the general compatibility effect and sex*compatibility interaction, small volume corrected using the MD mask. Subclusters at least 8 mm from the main peak are listed. Bold font indicates clusters that survive correction for multiple corrections using a family-wise error (FWE) correction ($p < .05$). MNI = Montreal Neurological Institute.

Table S2.2. Small volume correction (SVC) with ToM network mask for the general compatibility effect and the sex*compatibility interaction.

Region	Cluster Size	P FWE Corr	t-value	MNI coordinates		
				x	y	z
GENERAL COMPATIBILITY (Incompatible>Compatible)						
Right temporo-parietal junction	10	0.124	3.60	57	-43	37
(supramarginal gyrus)			3.54	51	-40	34
SEX*COMPATIBILITY						
[Female (Incompatible>Compatible) > Male (Incompatible>Compatible)]						
<i>No suprathreshold clusters</i>						

Table S2.2. Regions surviving a voxel-level threshold of $p < .001$ and 10 voxels are reported for the general compatibility effect and sex*compatibility interaction, small volume corrected using the ToM mask. Subclusters at least 8 mm from the main peak are listed. Bold font indicates clusters that survive correction for multiple corrections using a family-wise error (FWE) correction ($p < .05$). MNI = Montreal Neurological Institute.

Table S3. Showing Mean RT and SD for each condition of the imitation task for both males and females.

	Spatially Compatible		Spatially Incompatible		Imitatively Compatible		Imitatively Incompatible	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Males	666.20	157.50	699.42	159.76	675.00	158.56	690.62	158.93
Females	736.94	130.34	787.83	134.19	754.88	133.91	769.99	130.65

Table S4.1. Responses in each MD network fROI for the MD network localizer contrast.

ROI	ROI size	Inter- subject overlap	Average ROI mask size (voxels)	t	p-value	p-FDR
L_SPL	1173	1	117	11.69	<.0001	<.0001
L_IPS	287	1	28	11.15	<.0001	<.0001
L_IPL	641	1	64	10.30	<.0001	<.0001
L_MFG	536	1	53	11.08	<.0001	<.0001
L_PrecG	338	1	33	10.40	<.0001	<.0001
L_IFG	181	1	18	9.38	<.0001	<.0001
L_Insula	197	1	19	12.26	<.0001	<.0001
L_SMA	294	1	29	14.56	<.0001	<.0001
R_SPL	1181	1	118	11.36	<.0001	<.0001
R_IPS	227	1	22	10.18	<.0001	<.0001
R_IPL	599	1	59	9.25	<.0001	<.0001
R_MFG	535	1	53	11.61	<.0001	<.0001
R_PrecG	269	1	26	9.43	<.0001	<.0001
R_IFG	265	1	26	9.13	<.0001	<.0001
R_Insula	184	1	18	12.43	<.0001	<.0001
R_SMA	328	1	32	11.38	<.0001	<.0001

Table S4.1. All MD network fROIs were significantly responsive to the Hard>Easy contrast and survived correction for false discovery rate ($p < .05$).

Table S4.2. Responses in each ToM network fROI for the ToM network localizer contrast.

ROI	ROI size	Inter-subject overlap	Average ROI mask size	t	p-value	p-FDR
DMPFC	576	1	57	7.097	<.001	<.001
MMPFC	494	1	49	7.065	<.001	<.001
VMPFC	382	1	38	5.704	<.001	<.001
RTPJ	1018	1	101	15.025	<.001	<.001

Table S4.2. All ToM network fROIs were significantly responsive to the Belief>Photo contrast and survived correction for false discovery rate ($p < .05$).

Table S5. Whole-brain analysis (Experiment 2).

Region	Cluster Size	P FWE Corr	t-value	MNI coordinates		
				x	y	z
(A) GENERAL COMPATIBILITY						
Left inferior parietal lobule	333	<0.001	5.28	-42	-28	43
			5.10	-48	-28	34
			3.91	-30	-49	43
Left middle frontal gyrus	130	0.018	5.05	-27	-10	49
Right inferior parietal lobule extending into the right postcentral gyrus	437	<0.001	4.85	45	-34	46
			4.81	48	-25	43
			4.28	30	-46	46
Right middle and superior gyri extending into the right posterior-medial frontal cortex	259	0.001	4.85	30	-4	52
			4.28	21	-7	64
			4.23	15	5	52
Left posterior-medial frontal	29	0.476	4.19	-9	-1	55
Right inferior frontal gyrus and right insula lobe	96	0.050	3.87	42	2	19
				48	8	22
				42	17	1
Right precuneus	36	0.374	3.77	12	-64	52
			3.56	18	-70	49
Right supramarginal gyrus	26	0.527	3.75	63	-40	31
			3.68	63	-49	28
Right cerebellum	12	0.805	3.68	36	-49	-35
(B) SPATIAL COMPATIBILITY						
Intraparietal sulcus extending into the right postcentral gyrus	136	0.019	4.65	33	-43	46
			3.87	48	-25	43
Bilateral posterior medial frontal	117	0.033	4.55	-6	-1	55
			4.22	9	5	52
			3.48	-9	5	46
Left precentral gyrus	26	0.538	4.49	-57	5	31
Left precentral gyrus	68	0.139	4.34	-24	-16	58
			4.28	-27	-10	52
Right precentral gyrus	27	0.521	4.30	63	8	28

Right insula lobe	46	0.282	4.23	39	14	1
Right superior frontal gyrus	122	0.028	4.16	27	-7	58
			4.15	27	-7	49
Left inferior parietal lobule	75	0.025	3.95	-36	-37	40
			3.66	-48	-31	40
Left insula lobe	17	0.702	3.92	-33	14	7
Left postcentral gyrus	13	0.780	3.69	-63	-16	34
Right precuneus	22	0.607	3.67	12	-70	46
			3.60	12	-61	46
	10	0.838	3.39	57	-16	22
(C) IMITATIVE COMPATIBILITY						
Right supramarginal gyrus and right postcentral gyrus	40	0.349	3.76	45	-34	43
			3.64	42	-34	55
Left inferior parietal lobule	15	0.666	3.50	-42	-28	40
(D) SEX*COMPATIBILITY (GENERAL)						
Right superior occipital gyrus	10	0.845	3.48	30	-67	28
(E) SEX*COMPATIBILITY (SPATIAL)						
Right superior occipital gyrus	10	0.838	3.65	33	-64	31
(F) SEX*COMPATIBILITY (IMITATIVE)						
No suprathreshold clusters						

Table 5. Regions surviving a voxel-level threshold of $p < .001$ and 10 voxels are reported for (A) general compatibility (B) spatial compatibility (C) imitative compatibility effects and sex*compatibility interactions separately for (D) general (E) spatial and (F) imitative compatibility effects. Subclusters at least 8 mm from the main peak are listed. Bold font indicates clusters that survive correction for multiple corrections using a family-wise error (FWE) correction ($p < .05$). MNI = Montreal Neurological Institute.

Table S6. Detailed table of fMRI studies using the imitation inhibition task and the contributions of ToM and MD networks in imitation inhibition.

	Sample		No. of trials per condition	Design	Task Instructions	ROI/Whole brain		Regions			Thresholding
	M:F	Age				ROI	W B	mPFC	rTPJ	MD	
1. Brass, Zysset, & von Cramon, 2001	10 (4:6)	23.5	80 congruent, 80 incongruent	Mixed	Block1: tap index finger Block2: lift index finger		Y	Y (Frontopolar cortex, BA 10)	N	Y (MFG, Cuneus, Anterior parietal cortex)	p<.001, uncorrected
2. Brass, Derfuss, & von Cramon. 2005	20 (8:12) - 10 for Imi, 10 for Stroop	26	40 congruent, 40 incongruent, 40 baseline, 40 null	Event-related	Index finger for '1' Middle finger for '2'		Y	Y aFMC	Y (BA40)	Y	p<.001, uncorrected
3. Brass, Ruby, & Spengler, 2009	20		35 simultaneous congruent, 35 simultaneous incongruent, 35 delayed congruent, 35 delayed incongruent,	Mixed	Same as above Simultaneous: number cue appeared with irrelevant hand Delayed: response led to appearance of irrelevant hand	Y		Y (for simultaneous incongruent > congruent only)*	Y (for simultaneous incongruent > congruent only)*		P<.001, uncorrected
4. Spengler, von	18 (9:9)	25	72 incongruent, 72 congruent, 36 null	Event-related	Same as 2.	Y**		Y (overlap with	Y (overlap with	Y (see supple-	P<.05, corrected for

	Cramon, & Brass, 2009							self-referential and ToM tasks; -ve correlation with RT interference)	agency and ToM tasks)	mentary material: SII, MFG)	multiple comparisons	
5.	Bien, Roebroek, Goebel, & Sack, 2009	15 (5:10)	23	64 imitative congruent, 64 imi incongruent, 64 spat congruent, 64 spat incongruent	Mixed	Block 1: imitate finger movement (imitative trials) Block2: follow spatial cue for movement (spatial trials)		Y	N	N	Y*** (premotor cortex, bilateral posterior parietal and frontal /parietal opercular cortex, right STS)	P<.045, cluster size threshold = 50
6.	Crescentini, Mengotti, Grecucci, & Rumiati, 2011	19 (9:10)	24.6	60 biological congruent, 60 bio incongruent, 60 non-bio congruent, 60 non-bio incongruent	Mixed	Modified version of 1. With biological (human hand) and non-biological (white dot) stimuli; but ppts responded after movement offset instead of onset		Y	N	N	Y (only right Insula)	P<.05, corrected for multiple comparisons
7.	Cross & Iacoboni, 2013	24 (12:12)			Mixed	Block1: imitate finger movements Block2: imitate spatial dot movement		Y	N	N	N	P<.05, FWE corrected
8.	Mengotti, Corradi-Dell'Acqua, & Rumiati, 2012	22 (10:12)	24.4	80 per condition	Mixed	Task1: tap anatomical finger Task2: tap finger on same side of space		Y	N	N/Y (for only AN_NS over all others i.e. for the condition 'imi comp + spat incomp')	Y****	P<.05 FWE
9.	Cross, Torrisi,	25 (5:15);	19-39	80 imi congruent, 80 imi incongruent, 80	Block	Block1: lift index finger on finger		Y	Y	N	Y (ACC, bilateral insula extending	P<.05, FWE corrected

Losin, & Iacoboni, 2013	20 include d in analysi s		spat cong, 80 spat incong, 80 nulls		movement Block 2: lift middle finger on finger movement Block ¾: lift index/middle finger when dot moves						into frontal pole and orbitofrontal cortex, IFG, PrecG, SPL)	
10. Klapper, Rasey, Wigboldus, & Cross, 2014	19 (2:17)	21. 95	160 congruent, 160 incongruent	Event related	Index for '1' Middle for '2'	Y	Y	Y (at p<.005, uncorrected: incong>cong, human>non-human)	N/Y (at p<.005, uncorr for human>non-human) and 3-way cong x form x belief at p<.05 FWE corr			
11. Marsh, Bird, & Catmur, 2016	24 (7:17)	23. 71	80 imi cong, 80 imi incong, 80 spat cong, 80 spat incong	Event related	Lift index for '1' Lift middle for '2'		Y	N	N	Y (IFG, IPL, ACC); also left TPJ		P<.05, FWE corrected
12. Wang, Ramsey, & Hamilton, 2011	20 (5:15)	23	96 congruent (averted + direct gaze), 96 incongruent, 54 catch trials	Mixed	Block1: Hand open Block2: Hand closed		Y	Y (for averted incong > cong)	Y (for averted incong > cong)	Y (main effect:IPL, Cuneus); (averted: MOG, MTG, STS, temporal pole, IFG, precuneus, MFG, SPL, PMC, IPL, cuneus)		P<.05, FWE corrected