Supplementary Table S1. mPFC and right TPJ coordinates taken from fMRI studies of imitation-inhibition (contrast: incongruent > congruent), which were used to generate our *a priori* region of interest mask.

Brain region	Reference	Montreal Neurological Institute co-ordinates		
		x	y	z
Anterior medial prefrontal cortex	Brass et al., 2001	6	60	21
	Brass et al., 2005	1	51	12
	Brass et al., 2009	1	39	22
Right temporoparietal junction	Brass et al., 2005	56	-55	26
	Brass et al., 2009	55	-42	30
	Mengotti et al., 2012	56	-36	32
	Spengler et al., 2009	55	-42	30
	Wang et al., 2011*	66	-40	28

To generate the mask, spheres with a 15mm radius were centred on each of these coordinates.

* The coordinates we cite from Wang and colleagues (2011) are taken from an uncorrected analysis p < 0.001, K=30.

Note: We contacted Bien and colleagues (2009) to request coordinates from their incongruent > congruent contrast, but the corresponding author was unavailable.

Supplementary reference:

Mengotti, P., Corradi-Dell'Acqua, C., & Rumiati, R. I. (2012). Imitation components in the human brain: an fMRI study. *Neuroimage*, *59*(2), 1622-1630.

Supplementary Table S2. Clusters revealed from the PsychoPhysiological Interaction (PPI) analysis. Congruency*form*belief interaction, with rTPJ as the seed region.

Region	Number of voxels	T	p cluster corrected (FWE)	Montreal Neurological Institute co-ordinates		
				x	y	z
a) Anterior mPFC-right TPJ region-of-interest, p<0.005, k=5						
Anterior mPFC	6	3.07	0.687	6	59	4
b) Whole-brain, p<0.005, k=10						
Right middle superior temporal gyrus	11	5.54	0.999	51	-19	-5
Right dorsal superior frontal sulcus	31	3.71	0.945	21	33	40
				30	17	46
Dorsomedial prefrontal cortex (BA6, preSMA)	24	3.47	0.978	3	29	64
Left anterior superior frontal gyrus extending into middle	26	3.36	0.971	-15	50	64
				-21	44	34

a) In order to test the hypothesis that rTPJ and anterior mPFC are functionally connected, we first searched within our anterior mPFC-rTPJ mask. At the initial threshold (p < 0.005, K=10), no clusters emerged. In an exploratory analysis, we lowered the cluster extent (K=5) and a cluster emerged in anterior mPFC. **b)** To test a second hypothesis, which proposed that rTPJ might be functionally connected with parts of the motor system, we performed a whole-brain analysis. For both analyses, subpeaks more than 8 mm from the main peak in each cluster are listed.
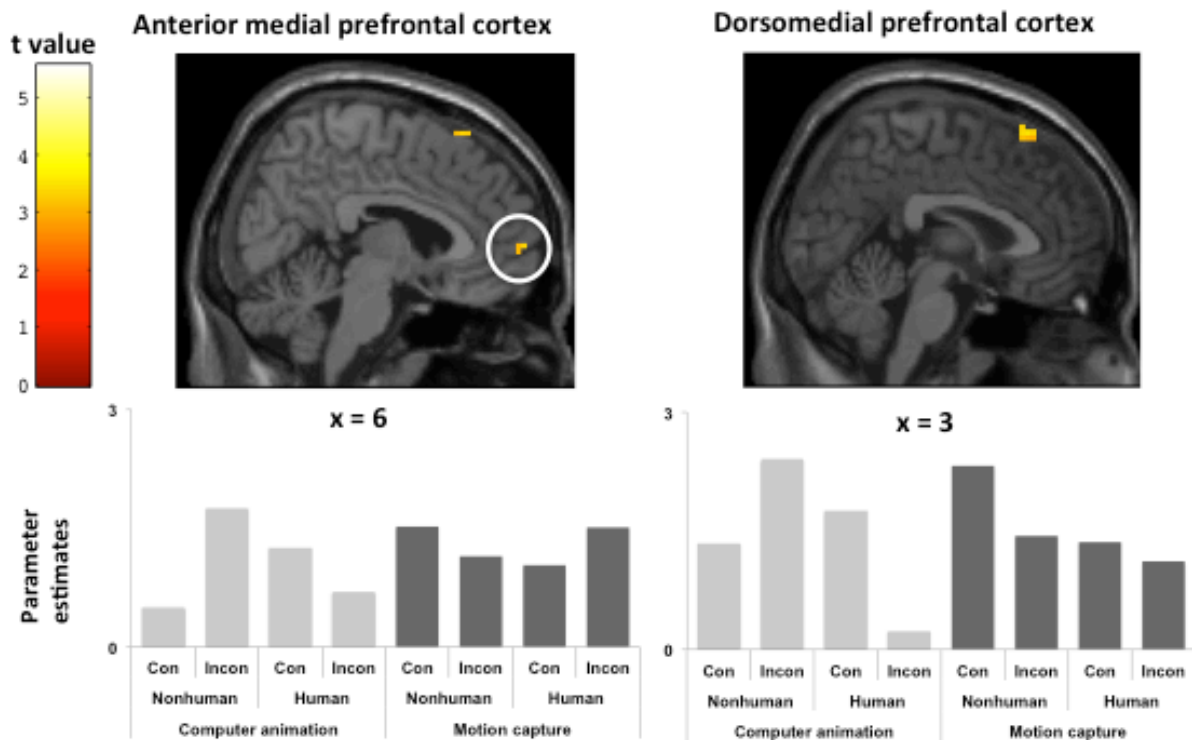
Supplementary Figure S1.
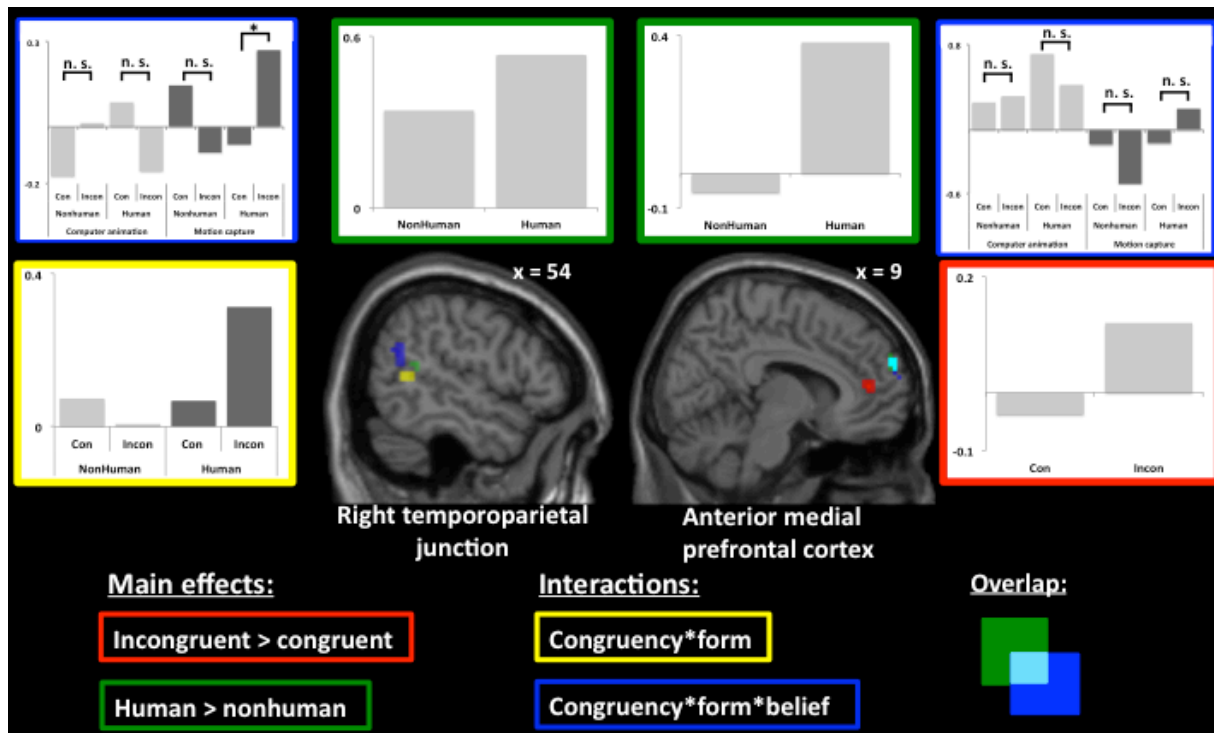
Supplementary Figure S1. Neuroimaging data. Displayed on a template brain are main effects and interactions from our factorial design ($p < 0.005$, K = 10 voxels) and plotted alongside are parameter estimates extracted from the peak voxel. Analyses were performed within a mask that comprised two regions of interest: anterior medial prefrontal cortex (anterior mPFC) and right temporoparietal junction (rTPJ; see Figure 1C and Table S1). Two main effects are displayed. Anterior mPFC shows a main effect of congruency (incongruent > congruent; red), whereas anterior mPFC and rTPJ show a main effect of form (human > nonhuman; green). Two interactions are also shown. Right TPJ shows a congruency x form interaction, which is manifest as a greater difference between incongruent than congruent trials for human than nonhuman form (yellow). In addition, anterior mPFC and rTPJ show a congruency x form x belief interaction (blue). Of these main effects and interactions, only the congruency x form x belief interaction in rTPJ survived family-wise error correction for multiple comparisons ($p < 0.05$). To explore the three-way interaction in rTPJ further, four paired t-tests were performed on parameter estimates taken from the peak-voxel. A significant

difference was observed between incongruent and congruent trials for the 'human hand with motion capture' condition ($p < 0.05$), whereas all other t-tests were not significant (all p values > 0.05). In addition, four paired t-tests were also performed on the three-way interaction in anterior mPFC, but none reached significance (all p values > 0.05).

Supplementary Figure S2.

PPI results
Congruency*Form*Belief interaction, rTPJ as the seed region

Supplementary Figure S2. PsychoPhysiological Interaction (PPI) results. We only visualise and offer interpretations for clusters emerging from the PPI analysis that were associated with our predictions. For a complete set of results, see Supplementary Table S2. Due to the exploratory nature of these analyses, any interpretation is necessarily cautious. Significant clusters emerged in two of our predicted regions. First, anterior medial prefrontal cortex (anterior mPFC; left panel) showed greater congruency effects in the absence or presence of both animacy cues. That is, the correlation between responses in rTPJ and anterior mPFC was greater for incongruent than congruent trials in the 'human-motion capture' condition and in the 'non-human computer animation' condition, compared to the other conditions. A possible interpretation of this pattern is that the relationship between these two regions indexes coherent pairings of animacy cues, such that fully present or fully absent cues to animacy increase functional coupling. This relationship could be specific to situations

involving social cues and the control of imitation, or it could relate to coherence between cues more generally; the present study cannot separate these possibilities. In contrast, a part of dorsomedial prefrontal cortex that corresponds to the pre-supplemental motor area (right panel) showed a greater congruency effect only in the absence of any cue to animacy. Only in the 'non-human computer animation' condition was there a greater correlation for incongruent than congruent trials, compared to all other conditions. This pattern of results is possibly informed by the reaction time data visualised in Figure 2B of the main text. When no cues to animacy are present, there is a significant reduction in the amount of interference, compared to all other conditions. In other words, in the absence of animacy cues, participants are quicker to inhibit imitative responses on incongruent trials, which suggests that the degree of automatic imitation is reduced when observing an agent that is clearly non-human. In such cases, the increased coupling between rTPJ and pre-SMA might index a signal from rTPJ to facilitate motor preparation, in order to execute the appropriate motor response. This proposed interpretation is consistent with the view that rTPJ is part of a brain network that distinguishes self from other. Hence, in situations where self-other ambiguity is reduced or absent, such as in the absence of animacy cues, rTPJ sends a signal to pre-SMA that facilitates motor execution. We emphasise that possible interpretations of the PPI findings reported are necessarily speculative at this stage, and encourage future research to explore connectivity analyses during imitation tasks further.