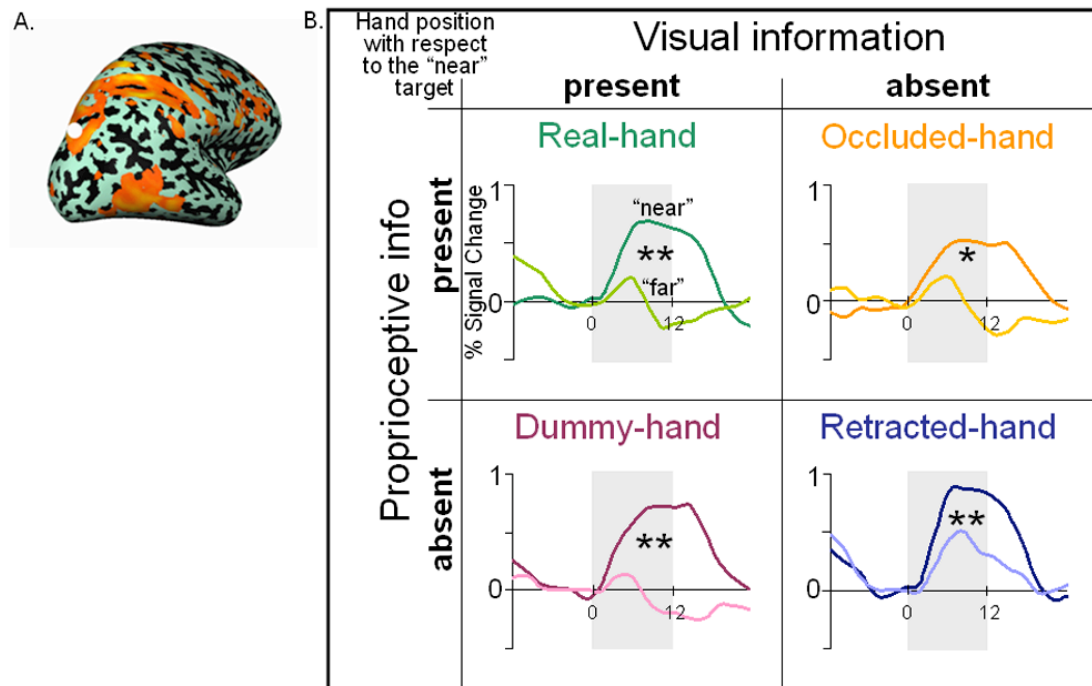


Supplementary information



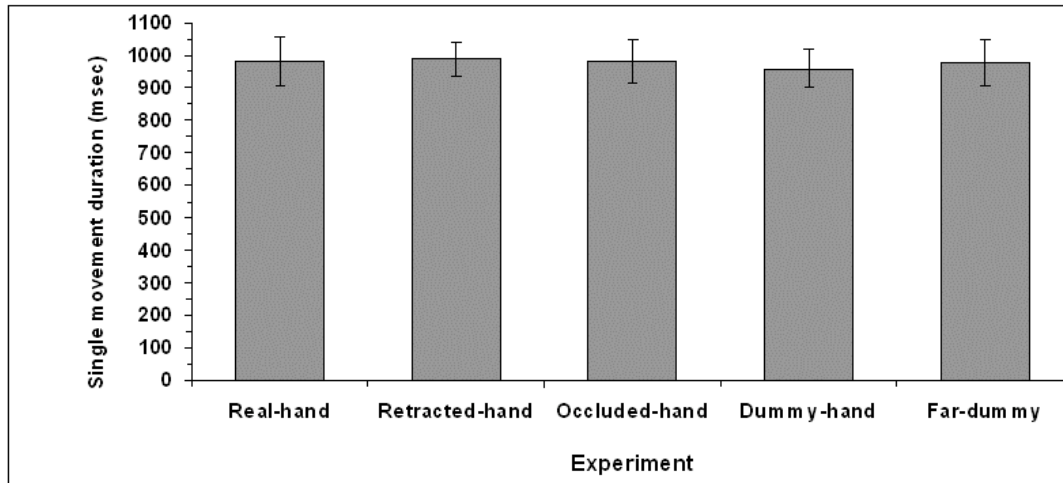
S1. IPTO shows selectivity for visual stimuli in near space, regardless of hand position

[A] Areas showing significant preference for the “near” over the “far” condition in the *Real-hand experiment* superimposed on a representative inflated right hemisphere. The white filled circle represents the average location (center of gravity) of the ROI between subjects. [B] Averaged hemodynamic response curves of the percent signal change for the “near” condition (dark colors) and the “far” condition (light colors). For each subject, clusters of voxels showing significantly greater activation for the “near” (compared to the “far”) condition in the *Real-hand experiment* (within the posterior IPS) were selected as the ROI. These clusters were then closely examined in the three other experiments. The gray background denotes the time of presentation of the visual stimuli (in seconds). Asterisks denote statistical significance between the averaged time courses, * = $p < 0.05$; ** = $p < 0.01$. Note that the both visual and proprioceptive information of the hand position did not modulate the preference for

the “near” stimulus, suggesting that this preference is independent of the hand position.

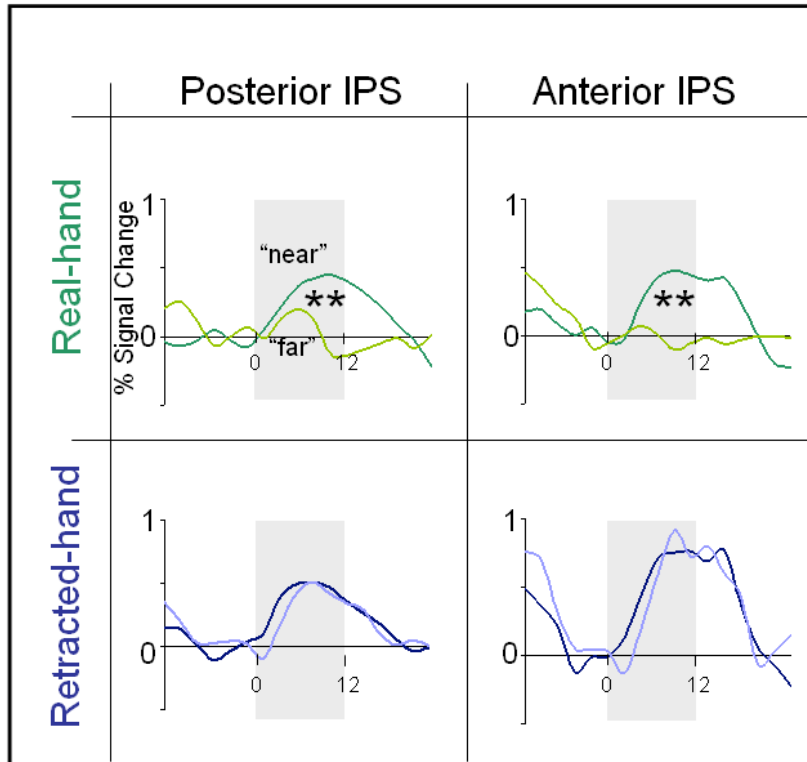
The most caudal aspect of the IPS, which joins with the transverse occipital sulcus, showed a highly significant preference for the “near” ball regardless of the hand position. Studies in humans reported sensitivity in this area to surface orientation (Faillenot et al., 2001; Shikata et al., 2003; Valyear et al., 2005), stereoscopic depth (Backus et al., 2001; Tsao et al., 2003), and depth perception (Brouwer et al., 2005). Several recent human fMRI studies reported topographic maps in the cIPS (Schluppeck et al., 2005; Silver et al., 2005). A nearby area has also been reported to respond to changes in posture during movements to bodily targets with no visual feedback (Pellijeff et al., in press).

Given these properties, and given the differences between the “near” and “far” stimuli (i.e., retinotopic position, disparity, etc.), it is understandable why this area shows differential activation for the two stimuli. However, the question why this area shows preference for the “near” ball over the “far” remains open. Weiss and colleagues (2000) reported that the greatest effect for near space in a line-bisection task was found in the dorsal occipital cortex. Quinlan and colleagues reported a gradient of response in the dorsal parieto-occipital sulcus for vergence changes that were highest for near vergence and lowest for far vergence (see Culham et al., 2006). These areas neighbor on the cIPS, so although we cannot isolate the spatial aspect from other retinotopic differences, it is possible that the preference for the “near” stimulus in cIPS was caused by the activation or enhancement of a representation of near space.



S2. Post-hoc motion analysis of the “near” ball showed no significant differences between experiments

Bars represent the averaged time for a single “near” stimulus movement across experiments. Error bars denote SEM. During the scanning, a sample of the experiments was videotaped and analyzed to assess whether the visual stimuli across different experiments were similar in temporal frequency. Of all 53 blocks that were taped, the number of movements was identical. We also randomly selected 55 movements from each experiment for a frame-by-frame analysis in order to analyze the movement frequency statistically. The results of a one way analysis of variance (ANOVA) test showed no significant differences in movement frequency across the five experiments $F(4, 216) < 1$, n.s.



S3. Left IPS also presents visual information with respect to the hand

Denotations as in Figure S2. Clusters of voxels within the anterior and posterior IPS were selected as a ROI (aIPS $n=10$, pIPS $n=7$) in the *Real-Hand experiment*. These voxels were then examined within the *Retracted-Hand experiment*. This hand-related modulation in the preference for the “near” ball is similar to our main finding in the right IPS (Figures 5 and 6 in the main text). This result suggests that the visual field *per se* (affecting the representation in the contralateral hemisphere) might not affect hand-related representation.

Supplementary discussion

The rubber-hand illusion

In healthy human subjects, viewing a dummy hand being stroked by a paintbrush in synchrony with feeling similar strokes on one's occluded hand can create a strong illusion of ownership of the dummy hand (the "rubber-hand illusion," Botvinick and Cohen, 1998). Furthermore, Ehrsson and colleagues (Ehrsson et al., 2004) reported activation in premotor cortex, which they suggested reflects the feeling that the rubber hand is indeed part of one's own body. In contrast, activity in parietal cortex was suggested to reflect the multisensory matching between the visual and tactile aspects of the stimulation in both time and posture (i.e., temporal synchrony between the visual and tactile inputs, and postural congruency between seen rubber hand and the felt hidden hand). Complementing Ehrsson and colleagues' results, we found activation in the parietal cortex during presentation of visual stimuli approaching the dummy hand, even though the real hand was retracted away. However, the frontal activation, prominent in the *Real-hand experiment*, was not repeated in the *Dummy-hand experiment*, presumably because in our experimental design the subjects did not experience the rubber hand illusion. Indeed, all subjects reported when questioned that they did not sense the rubber hand illusion during the experiment (see also Holmes et al., 2006, for similar findings). We therefore conclude that our results cannot be explained simply as a neural correlate of conscious perception of the rubber-hand illusion. Instead, we suggest that the resemblance in visual features between the rubber hand and the subjects' hands, established by placing the rubber hand in a naturalistic position, activated the mechanism of visual hand representation.

Visual attention to nearby objects

In our article we conclude that the preference for the “near” ball in the hand-related areas was not simply due to the representation of the hand (or dummy) as an attentionally-capturing object *per se*, but rather was specific for *hands in near space*. It still remains to be shown that this preference is unique to the representation of the *hands*, and cannot also be modulated by the presence of other objects in near space. Such an interpretation would therefore predict that *any* object of interest (regardless of whether it resembled the hand) would generate the same preference for stimuli near the attended object. Arguing against this possibility, electrophysiological (Graziano et al., 2000), neuropsychological (Farnè et al., 2000), behavioral (Holmes et al., 2006; Pavani et al., 2000), and neuroimaging studies (Lloyd et al., 2006) have shown that a misaligned dummy hand (i.e., positioned in an anatomically impossible orientation with respect to the body) does not produce the same effects as in the aligned configuration. These results strongly suggest that when a dummy hand is interpreted as an extrapersonal object, rather than as a body part, the multisensory representation of peri-hand space is not affected by it, even though it is placed in peripersonal space.

Table S1. Group results - fMRI peak activation coordinates within significant clusters of voxels showing visual-tactile multimodal properties with respect to the hand.

Area	BA	A. Real-Hand				B. Occluded Hand				C. Dummy-Hand			
		x	y	z	t	x	y	z	t	x	y	z	t
Inferior parietal lobe	40	46	-35	28	4.5								
	40	-53	-30	34	8					-50	-26	34	4.1
aIPS	40	41	-41	42	6.8								
	40	-36	-40	37	5.5					-35	-40	40	3.5
Superior parietal gyrus	5	30	-41	54	7.6	31	-40	55	3.6*	30	-41	55	5.8
Posterior STG	37	54	-40	22	4								
Postcentral gyrus	2	53	-17	36	4.6								
		-56	-19	31	5.3								
Postcentral gyrus	3	57	-18	22	4.7								
Precentral gyrus	4	54	-14	39	5								
PMv - Inferior frontal gyrus	44	47	12	23	3.8	52	12	11	2.4	53	11	12	2.5*
Inferior frontal gyrus	9	39	9	22	4								
Insula	13					42	-31	18	5	43	-24	16	5

The peak voxels represent clusters that show corresponding response to both a tactile stimulus on the left hand (with respect to the rest period) and preference for the “near” ball (with respect to the “far” ball).

pColS – posterior collateral sulcus; aIPS – anterior intraparietal sulcus; STG – superior temporal gyrus; PMv – premotor ventral; BA – Brodmann’s area; x,y,z – Talairach & Tournoux (1988) peak voxel coordinates in mm; *t* – peak voxel t-value; * - uncorrected for whole brain.

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