

# Attention modulates neuronal correlates of interhemispheric integration and global motion perception

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In early interhemispheric areas of the human brain, information from the left and right visual hemifields (VHFs) is processed contralaterally in the hemisphere. Despite this segregation, there is a perceptual experience of a unified, coherent, and nonrepetitive global motion from the two VHFs and achieving this perceptual experience will remain largely unknown. In this study using fMRI, we explored candidate areas that are involved in interhemispheric integration and the perceptual experience of a unified, global motion across VHFs. Similarly, one-dimensional, compound general objects in both VHFs. The real image in the left VHF area remained stationary, but in the experimental condition, it appeared to have local

motion because of the perceived global motion of the object. This perceptual effect could be weakened by directing attention from the global motion through a demanding fixation task. Results show that the lateral occipital area, including the medial temporal complex, plays an important role in the perceptual experience of a unified global motion across VHFs. In early areas, including the lateral geniculate nucleus and V1, we observed correlations of this perceptual experience only when attention is not directed away from the object. These findings reveal the effect of attention on interhemispheric integration in motion perception and imply that both the bilateral activity of higher-order areas and feedback mechanisms leading to bilateral activity of early areas

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pla role in he percep al e perience of a nified i al field.

In rod c ion

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 T , S , S , & H (G , 2000; , 1988).  
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 ( HF) (A. T. S , , & S , 2004; T , M , H , - , L , & D , 1998; L & , 2004). H  
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 1  
 - B . H , , 1, 2 , 3 ,  
 F , 1998). T (L & R , 2000; & A  
 . A  
 D , 1990). (C & M - (G , H , & B , 1999), MRI  
 & , 2009; C MT+ (B , B , M , & B , 2002; H , K , & G , 2007; , A -E , P , & T , 2006). F  
 C , H (2009), MRI . L , EEG , (L & R -  
 . T , 2000). T ,  
 ( 1) (LOT) , MT+. I -  
 , 1 . T MT+ , . . .  
 , 1. . (2004) MT+ LOT T  
 . T EEG MRI , HF  
 , MT+, MRI . I , P -  
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 . H , (F 1, ) . T P -

HF , , . T L ,  
 . (2006) MRI  
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 MRI  
 (G , H , & B , 1999),  
 & , 2009; C MT+ (B , B , M , & B , 2002; H , K , & G , 2007; , A -E , P , & T , 2006). F  
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 HB KD.

**MR da a acq i i ion**

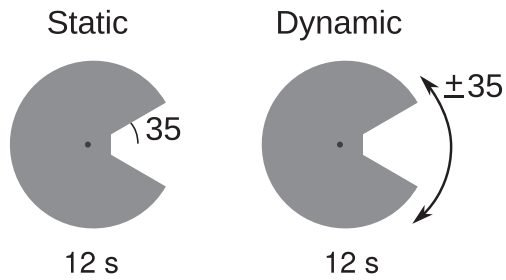
M T (M T , S AG, E 3  
 G ) 12- - . A  
 T1- -  
 TR = 2600 ; = 1 × 1 × 1 3 ;  
 FO = 256 × 224 2 ; TE = 3.02 2 ; = 8°;

P - . N . I ,  
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**Me hod**

**Par icipan**

B DTK, SE, CO, . I



30° × 22°

CIE

$x = 0.357, y = 0.351.$

**Simili**

J A /~ /P J / ( :// ). A . . T

G ( 377.25 / <sup>2</sup>, 6 × 6

” 503 / <sup>2</sup>. T . B P -

T F 2. A . T . D

’ 480 . F , . T . I P - ,

**Experimental procedure and fixation task**

C MRI . E 12 , 12 . T (F 2). E 10 250 , 10 . I . I . T 200 1750 2250 , : : 665 / <sup>2</sup>; : 747 / <sup>2</sup>; ( : 585 / <sup>2</sup>), :

MR ( ORP 904 MRI P , PA, SA). I , C D ” , . D , .

**ROI localisation**

ROI (LGN), 1, 2, 3, 3A/B, 4, LO-1 (8 H ), - -

F 3. T 12- 10 . T 250 , 10 H , D ,

H . M (2002) , MT+. MT+ 6.75° , 9°

. E 12 , 12- D 12- 12 , ,

. I , - MST, . I , -

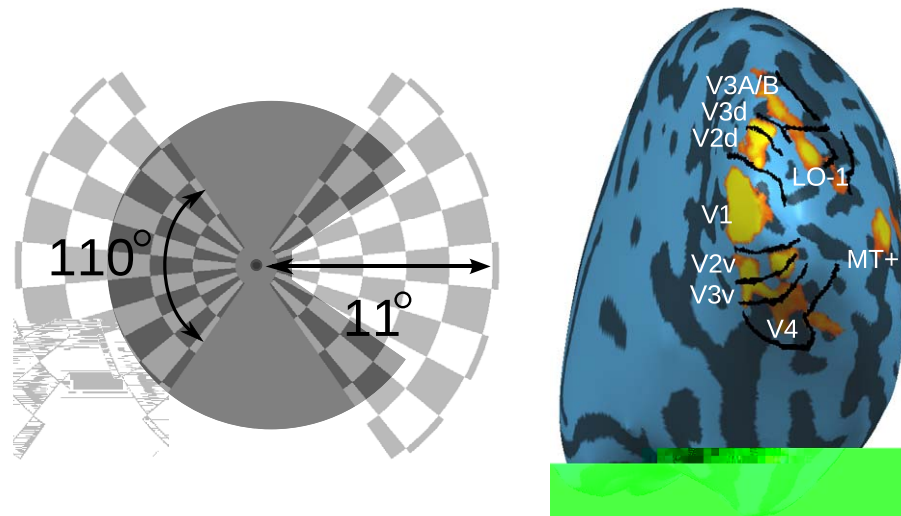


Figure 3. ROIs were identified using wedges texture-mapped with counter-phase contrast reversing checkerboard patterns in early visual areas (the Pac-man figure in the background is shown here for visualization purposes; it was not present in the actual experiment). For MT+, moving random dots were used as a localizer. Boundaries between early visual areas were drawn using the results of a separate retinotopic mapping session for each participant. The image on the right shows ROIs and visual area boundaries on an inflated brain of one participant.

M, MT (H., 2002; M., 2000). H., MT+.

**MR da a proce ing and anal i**

F, B, M, Q, T, N, (B, I, B, P, 3-D, 0.015 H) (A. M. S, 1999). N, MRI, A.

**Re ino opic mapping im li**

A, R, T, 30°, 10°, 360°, 12, 10<sup>-4</sup>, 2°, 1°, 14°, E, 10, F, 3A/B, LO-1, LO-2, L, H (2006) (T, 1997). T

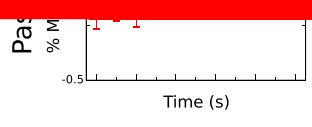
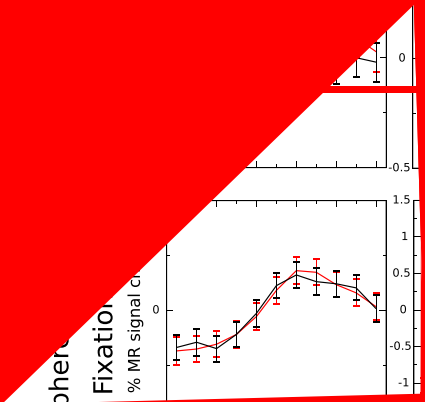
B, MR (E, G, & 1997; S, 1995). (F, 5), 12, A,

F... , P - (F P - 6). not : ( ) D  
P - t ( . ,  
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**Beha ioral e perimen**

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( . O ) -  
12 . F ,  
.A ,





**E e- racking e perimen**

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Average % MR signal difference

Passive View

Discussion

3A/B, LO-1, MT+ LGN MT+ & B, 2005; S K (B  
P - SC 2004). M LGN (SC), MT (B  
LGN, P - C, 2004). I SC MT (B, 2004; MT+  
I LGN T  
T 1, 2, 3  
HF C MT  
T (G, 2000; N & C, 1996). I K (2011), MRI DTI, S  
1997). M MT+ MT  
L MT+ 1 T MT  
L (A. T. S, 2004; T S MT (C & M, 1990; G & S, 2011) MT (C 3 3A/B, 1, 2, 3 (C & M -  
(2009) 1 LOT LOT (, 2004). T (, 1990). T HF MT  
MT+, 1 (, 2004). T MRI, MT  
1990) (B & B, 2005; C & M, 2004). H 2, 3 (B & B, 2005; 1, 2, 3, -  
L & R MT+, 2000). T (B & B, 2005; T MT+  
S, P LGN (L & R, 2000; & H, 2004). G E (B & B, 2005; C MT+  
B, 2005), MT+ 1 (B & O'C, R, K, T, & S, 1997; S, 2002). M  
2004) 1 ( (G, 1999) LGN  
S 1. LGN (O'C, F, P, & K, 2002).  
T T

.T , ,76% ) .T  
 HF , P - ( P -  
 .T ( P -  
 (L & R , 2000; LOT 3A/B, MT+, LO1). H ,  
 & F , 1998). P RF MT LOT  
 70°  
 (B , 2013; B , M , & , 1998; M ,  
 B , & , 1995). M MT RF  
 RF  
 (B , 2009;  
 C , 2011; , 2006;  
 H , 2007). M , -  
 (O'C , D , & K , 1999; R ,  
 L , & S , , 1998),  
 S , 2004, 2005) (M M &  
 , 2002; T & T , , 1999) (S  
 HF MT.  
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R - , P -  
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.T  
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 ,  
 LOT 3A/B, MT+, LO1). H ,  
 LOT

**Concl ion**

T ,  
 . O  
 3A/B, LO-1, MT+  
 ( ) ,

*Keywords: global motion perception, interhemispheric integration, fMRI, visual brain, perceptual experience of unified visual field*

**Ackno ledgmen**

S S T  
 R C T 1001" (108K398),  
 E C M C I  
 R " (PIRG-GA-2008-239467),  
 T A S D  
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 C G (P30 NS057091). HB KD  
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 C : H B  
 E : @  
 A : D P & N  
 M R R C , B  
 , A , T

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