Duration-Dependent fMRI Adaptation and Distributed Viewer-Centered Face Representation in Human Visual Cortex

[illegible][1], [illegible] [2] [illegible] [1]

[1] [illegible], 55455, A [illegible] [2] [illegible], A 95108, A

Two functional magnetic resonance imaging (fMRI) face viewpoint adaptation experiments were conducted to investigate whether fMRI adaptation in high-level visual cortex depends on the duration of adaptation and how different views of a face are represented in the human visual system. We found adaptation effects in multiple face-selective areas, which suggest a distributed, viewer-centered representation of faces in the human visual system. However, the nature of the adaptation effects was dependent on the length of adaptation. With long adaptation durations, face-selective areas along the hierarchy of the visual system gradually exhibited viewpoint-tuned adaptation. As the angular difference between the adapter and test stimulus increased, the blood oxygen level–dependent (BOLD) signal evoked by the test stimulus gradually increased as a function of the amount of 3-dimensional (3D) rotation. With short adaptation durations, however, face-selective areas in the ventral pathway, including the lateral occipital cortex and right fusiform area, exhibited viewpoint-sensitive adaptation. These areas showed an increase in the BOLD signal with a 3D rotation, but this signal increase was independent of the amount of rotation. Further, the right superior temporal sulcus showed little or very weak viewpoint adaptation with short adaptation durations. Our findings suggest that long- and short-term fMRI adaptations may reflect selective properties of different neuronal mechanisms.

Unlike the long-term adaptation designs traditionally used in psychophysical and single-unit studies, most of the fMRI adaptation studies, especially those related to object representations in occipital–temporal cortical visual areas, have used brief (e.g., 300 ms) adaptation times (Kourtzi and Kanwisher

[illegible] (Table 2) [illegible]
210-[illegible], [illegible] 64 [illegible].
[illegible] 4 [illegible]
0, 30, 90, [illegible] -
[illegible], 0, 30, 90 [illegible], 0.3-
0.4- [illegible],
0.3 , 2- [illegible],
0, 30, 90 [illegible],
0.3 , 2.7- [illegible] 2 [illegible],
[illegible], 3 [illegible]
(
) 9.4° × 9.4° [illegible].
3 [illegible],
64 × 8 [illegible], 128 [illegible] 4 [illegible]
(0, 30, 90,) [illegible] 8
[illegible] (Table 2002).
[illegible]
n [illegible] (10 [illegible]),
[illegible] 21 [illegible] .4(4(1.(4 8254.7(6740 -26 702 5( ).4( )-3 8254-2549)1)-30 702 5(25484( )-3 8)8((3 266.8(13 215

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(A), [illegible] ( ), [illegible] ( ) [illegible] ([illegible] 1999), (A [illegible] 2002), A ([illegible] 2000). [illegible] (A) [illegible] 3 5 ([illegible] 7) [illegible] ( ) [illegible] (P < 10^{-4}, [illegible]) [illegible] (1) [illegible] ([illegible]). [illegible] (1998), [illegible] ([illegible] 3 [illegible]), [illegible]

The fMRI Long-Term Adaptation Effect

A [illegible] 3 [illegible] A [illegible] (A A) [illegible] A ($F_{2,14}$ = 14.581, P = 0.001), [illegible] ($F_{2,14}$ = 16.028, P < 0.001), [illegible] ($F_{2,14}$ = 5.822, P = 0.017). A [illegible] 0, [illegible] 30, [illegible] 90 [illegible] ([illegible] 90 > [illegible] 30 > [illegible] 0). [illegible] ([illegible])

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Long-Term Adaptation

[illegible]

Figure 5.

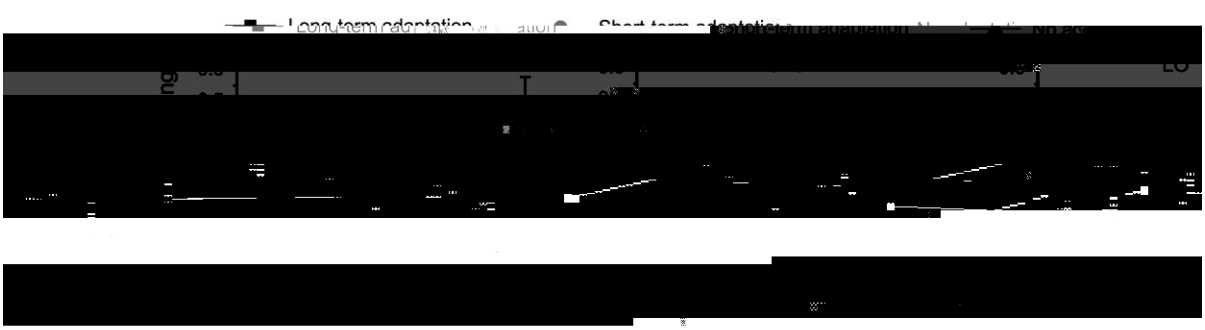

Figure 6.

(30° > 60°), 1999; 2006). 0). 30 30 ? 2

[illegible], [illegible] (90°) [illegible]
[illegible]
[illegible] A [illegible]
[illegible] 2 [illegible] (
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[illegible]).[illegible] A [illegible]
[illegible] 3 [illegible] (
1989; [illegible] 1992) [illegible]
[illegible] (. ., [illegible]) ([illegible]
[illegible] 2005). [illegible] (2005) [illegible]
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2203 (. -2 .7(8(.)-2-34636.3( )15.3( )8)16.3 17.29 -174.6( )-17 16. .5(;)-3 15.2( )13.8( )62( ) [illegible] 8 [illegible]

[illegible] 2 [illegible]

[illegible] ( ) ([illegible] 2005), [illegible] ([illegible] 2003). [illegible] ([illegible]) [illegible] ([illegible] 2000; [illegible] 2001; [illegible] 2003; [illegible] 2004; [illegible] 2005).

[illegible] 2 [illegible] ([illegible]