

## 群感受野技术在感知觉的脑机制研究领

(receptive field, RF)

(blood-oxygen level dependent, BOLD)

BOLD

pRF

(

pRF

pRF

)

pRF

### 1.1 刺激及程序

pRF

( 1)

(functional mag-

netic resonance imaging, fMRI)

(voxel fMRI )

[13, 20]

pRF

[1, 13, 20]

(population receptive field, pRF)

[1-4]

pRF

pRF

pRF

[25]

fMRI

pRF

### 1.2 数据分析

fMRI

pRF

pRF

BOLD

pRF

BOLD

[y(t)]

pRF

fMRI

pRF

BOLD

[p(t)]

fMRI

pRF

fMRI

(residual sum of squares, RSS)

pRF

pRF

Dumoulin

Wandell

[1]

pRF

pRF

pRF

[1, 4-9]

pRF

[g(x,y)]

3

2

pRF

x<sub>0</sub>

y<sub>0</sub>

pRF

σ

fMRI pRF

pRF

[4-6, 8-29]

2.4

“

pRF

(

)<sup>[25]</sup>

pRF

fMRI

pRF

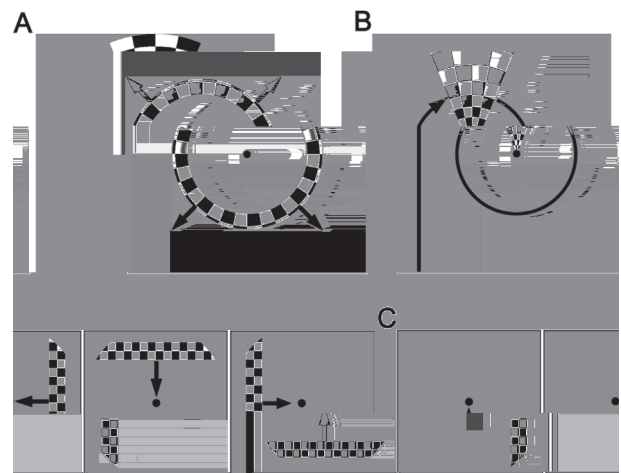
pRF

pRF

## 1 pRF技术的研究方法

pRF

fMRI pRF



1.

Fig. 1. Illustration of the stimuli which were used to estimate population receptive fields (pRFs) of voxels. A: Rotating wedge. B: Expanding ring. C: Drifting bar.

[s(x,y,t)]

1

0

pRF [g(x,y)]

[s(x,y,t)] pRF

[r(t)]

$r(t) = \int_{x,y} s(x,y,t)g(x,y)$

(hemo-

dynamic response function, HRF)  $h(t)$   $r(t)$

pRF BOLD

[p(t)]

$p(t) = r(t) * h(t)$

pRF BOLD [p(t)]

BOLD [y(t)] RSS

$RSS = \int (y(t) - p(t)\beta)^2$

RSS

pRF pRF

pRF

## 2 pRF技术的应用

fMRI pRF

pRF

[1, 9, 14, 21, 22] pRF [8, 10, 13, 20]

pRF [6, 23, 28, 29]

pRF ( pRF [25]

[24] [18, 19, 26])

### 2.1 基于pRF位置信息的应用

fMRI pRF

pRF

(visual field

map) [1, 9, 14, 21, 22]

fMRI pRF

pRF

(retinotopic mapping experi-

ment) a Y b h L

### 2.4 pRF技术的泛化应用(非视觉的pRF技术、注意野技术和群调谐技术)

fMRI pRF

pRF

pRF (attentional field, AF) [24]

( ) (topographic representation) [18, 19, 26]

(population tuning)

pRF pRF pRF

pRF pRF pRF

pRF pRF pRF

( ) ( )

pRF pRF pRF

pRF pRF pRF

( ) Thomas [25] pRF (primary auditory cortex, PAC)

fMRI [24]

Puckett

Harvey [19] fMRI

pRF pRF

Puckett [24] Dumoulin fMRI

Wandell pRF [1]

( )

pRF AF [24]

pRF [g(x,y)] AF

[h(t)] BOLD BOLD RSS

AF AF RSS AF AF

pRF pRF pRF

[22, 34] Sprague Serences [34]

pRF pRF [22]

pRF pRF

Harvey (numerosity) [18, 19]

fMRI

### 3 pRF技术的应用优势和局限

fMRI pRF

fMRI pRF

#### 4 总结和展望

fMRI pRF

fMRI

pRF pRF pRF pRF

Dumoulin Wandell pRF ( ) ( ) pRF

fMRI pRF (7T) ( 1 mm) 6 )

“ pRF ” pRF 1 pRF pRF

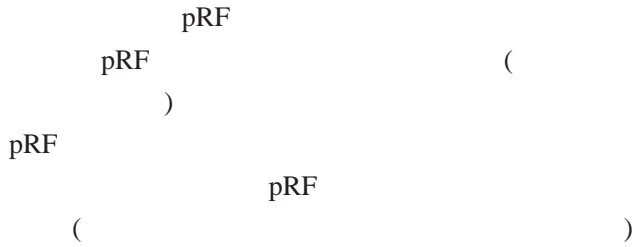
[g(x,y)] pRF pRF pRF pRF effect Flom 1963 (visual crowding)

pRF pRF pRF pRF pRF pRF pRF pRF

pRF pRF ( pRF ) pRF pRF pRF pRF

(model-free) ( pRF [37] pRF [38] pRF [39-44]

pRF pRF ( ) pRF pRF



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