

Loss of Action-related Function in The Blind Extrastriate Body Area

Or Yizhar^{1,2}, Zahar Tal³, Amir Amedi²
 1 Department of Cognitive Sciences, The Hebrew University of Jerusalem, Jerusalem, Israel; 2 Baruch Icker School of Psychology IDC, Herzliya, Israel; 3 School of Psychology and Education, University of Coimbra, Coimbra, Portugal

Introduction

Retention of visual streams

Parameter Estimate (beta)

ITS LH (Ventral Stream) Precuneus RH (Dorsal Stream)

location blind shape blind location sighted shape sighted

Sireem-Amit et al., 2011

Task Specific Sensory Independent

V1: Visual motion processing, visual localization, visual orientation
 MIP: Visual motion processing, visual localization, visual orientation
 LOC: Visual motion processing, visual localization, visual orientation
 MIP: Visual motion processing, visual localization, visual orientation
 EBA: Visual motion processing, visual localization, visual orientation

Haimes & Amedi, 2020

EBA responds to movements

L. EBA

Z - SCORE

Time (s)

R. hand mark foot Attention

Assafev et al., 2004

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Methods

Experiment 1

Active unilateral movements

8 congenitally blind
9 healthy sighted

Right Toes Left Toes Left Toes Right Toes

9 X 2 cycles

Somatotopic preference

Sighted n=9 Blind n=8

Foot Hand Face

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Experiment 2

Resting state functional scan

9 congenitally blind
20 healthy sighted

Connectivity ROIs

Ventral Stream SMA + Cingulate Premotor Cortex Primary Motor Cortex Occipulum
 Primary Visual Cortex Dorsal Stream Extrastriate Body Area Primary Somatosensory Cortex

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Results

EBA' responds to movements in the sighted but not in the blind

RFX GLM

Sighted n=9 Blind n=8

EBA ROI analysis

GLM parameter estimate

Right foot Right hand Face Left hand Left foot

Blind n=8 Sighted n=9

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EBA's resting state connectivity is less expansive in the blind brain

Sighted n=20 Blind n=9

Congenital blindness alters the EBA's connectivity profile

Sensorimotor ROIs

GLM parameter estimate

S1 M1 PMc SMA Operculum

Blind n=8 Sighted n=20

Visual ROIs

GLM parameter estimate

V1 Ventral Stream Dorsal Stream

Blind n=8 Sighted n=20

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Discussion

- Vision is crucial for the development of the action-related function of EBA
- From a predictive processing standpoint, EBA can be seen as an important site for generating predictions (models) and for calculating errors
- EBA could be superseded by other areas (presumably parietal cortices) in the blind that are closer to somatosensory inputs, and thus more computationally efficient

Feedforward connections

Medzhabi et al., 2016

Predictive processing

Keller et al., 2018

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