

Hemisphere-Specific Properties of the Ventriloquism Aftereffect

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Introduction

Vision plays an important role in the calibration of the auditory space, e.g., in **ventriloquism aftereffect (VA)**.

What is the reference frame?

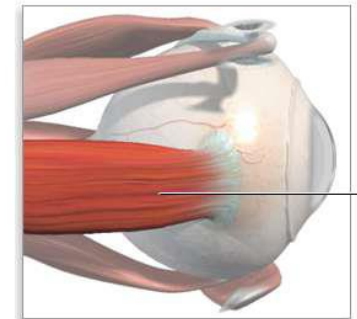
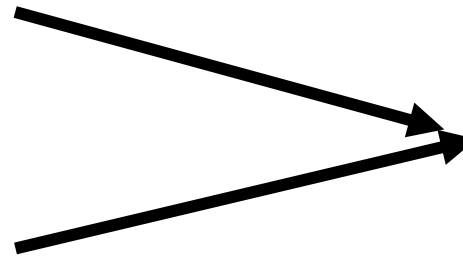


Eye-centered?



Head (ear) -centered?

?



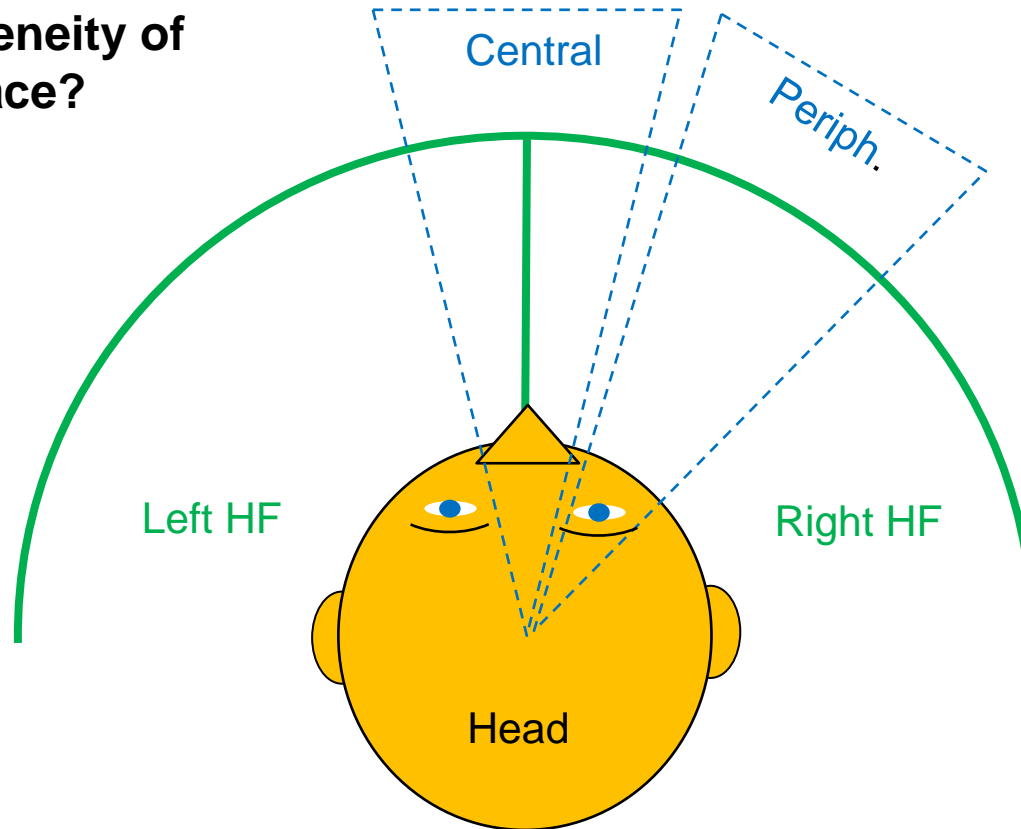
Oculomotor?

Kopco (2009) showed that for VA induced in center the RF is mixed.

Current study

Motivation: Auditory spatial representation is likely non-uniform, e.g., based on 2 channels aligned with hemispheres (Grothe et al., 2010).

Non-homogeneity of auditory space?

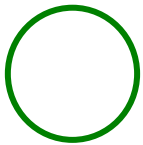


Questions:

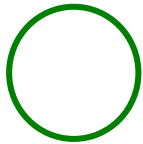
- Is VA induced in periphery the same as in center (no effect for AV aligned, local for AV misaligned)?
- is RF of VA the same as in center (central - 2 hemifields, peripheral - 1 hemifield)?

Basic Approach

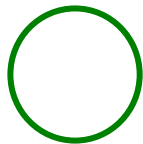
1. Pre-adaptation baseline: Measure auditory saccade accuracy



2. Adaptation phase: Present combined visual-auditory stimuli, with visual location shifted



3. Compare auditory saccade accuracy pre- and post-adaptation



Methods

Illustrated for Central Experiment
(Kopco et. al, 2009)

Induce shift:

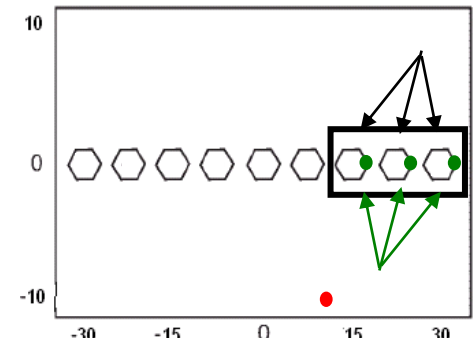
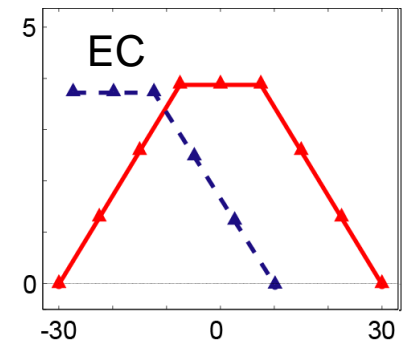
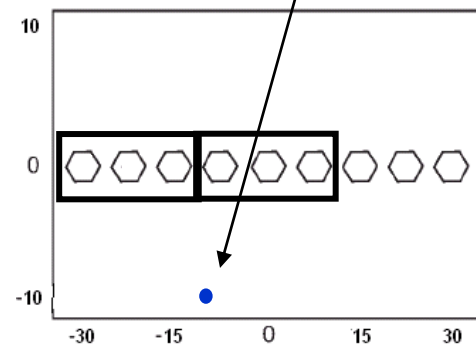
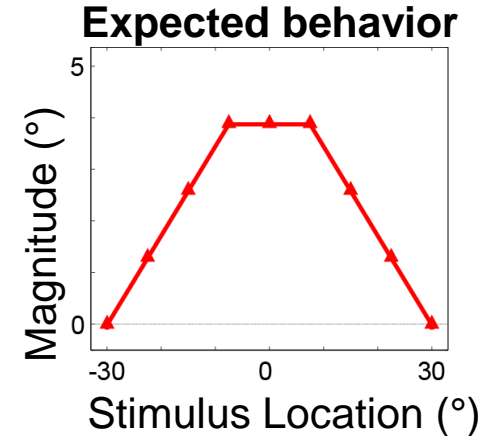
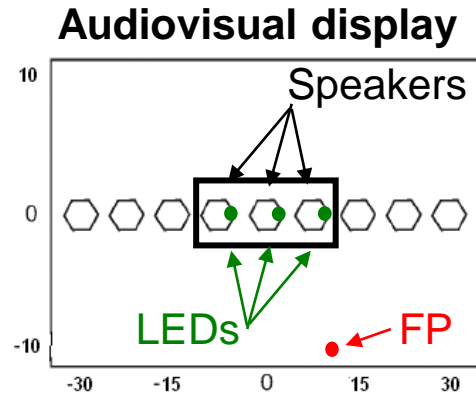
- in only one spatial sub-region
- from a single fixation point

Test to see if shift generalizes
to the same sub-region in:

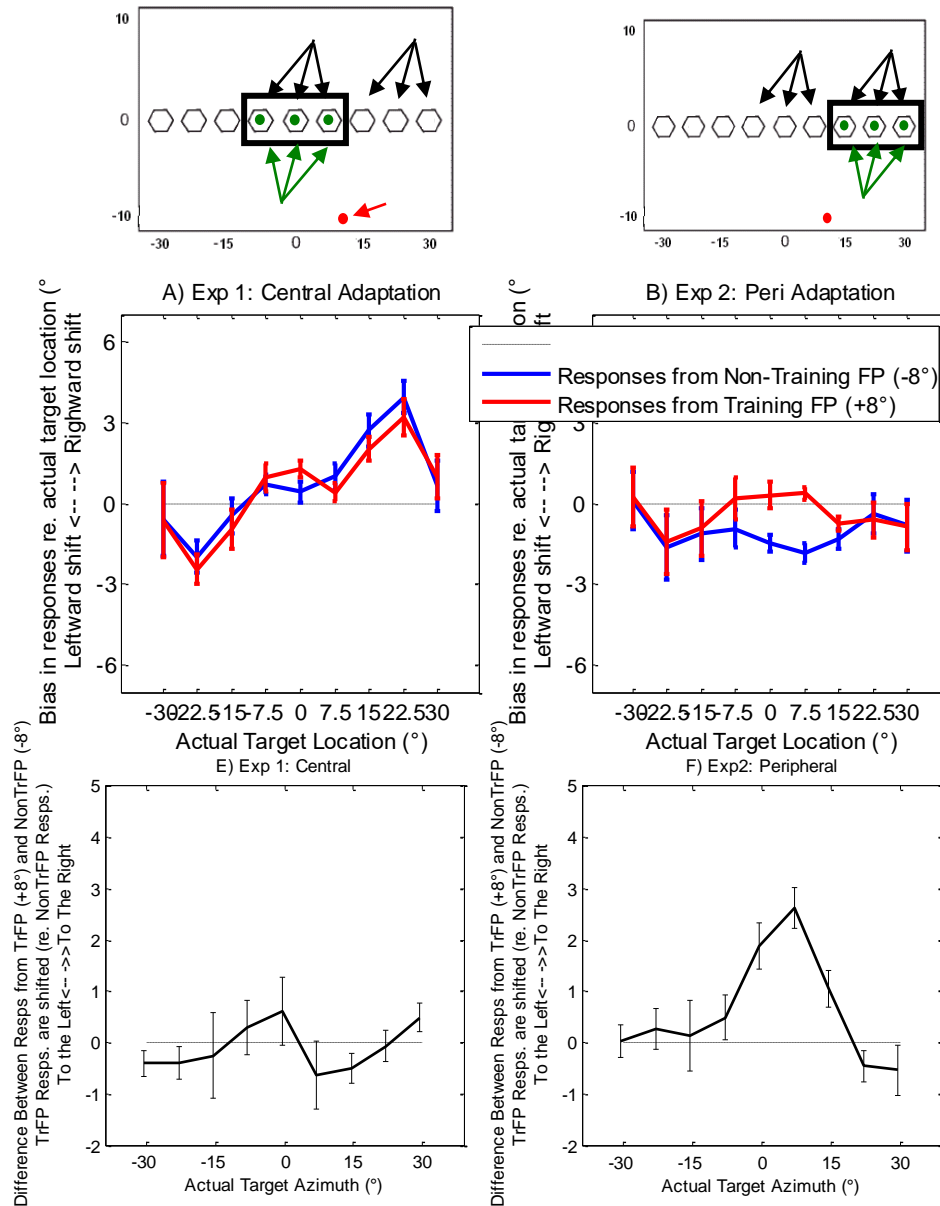
- **head-centered space**
- **eye-centered space**

Current Peripheral Experiment:

- **Same set-up, except 3 right-most speakers used for**



Results: AV-aligned Baseline

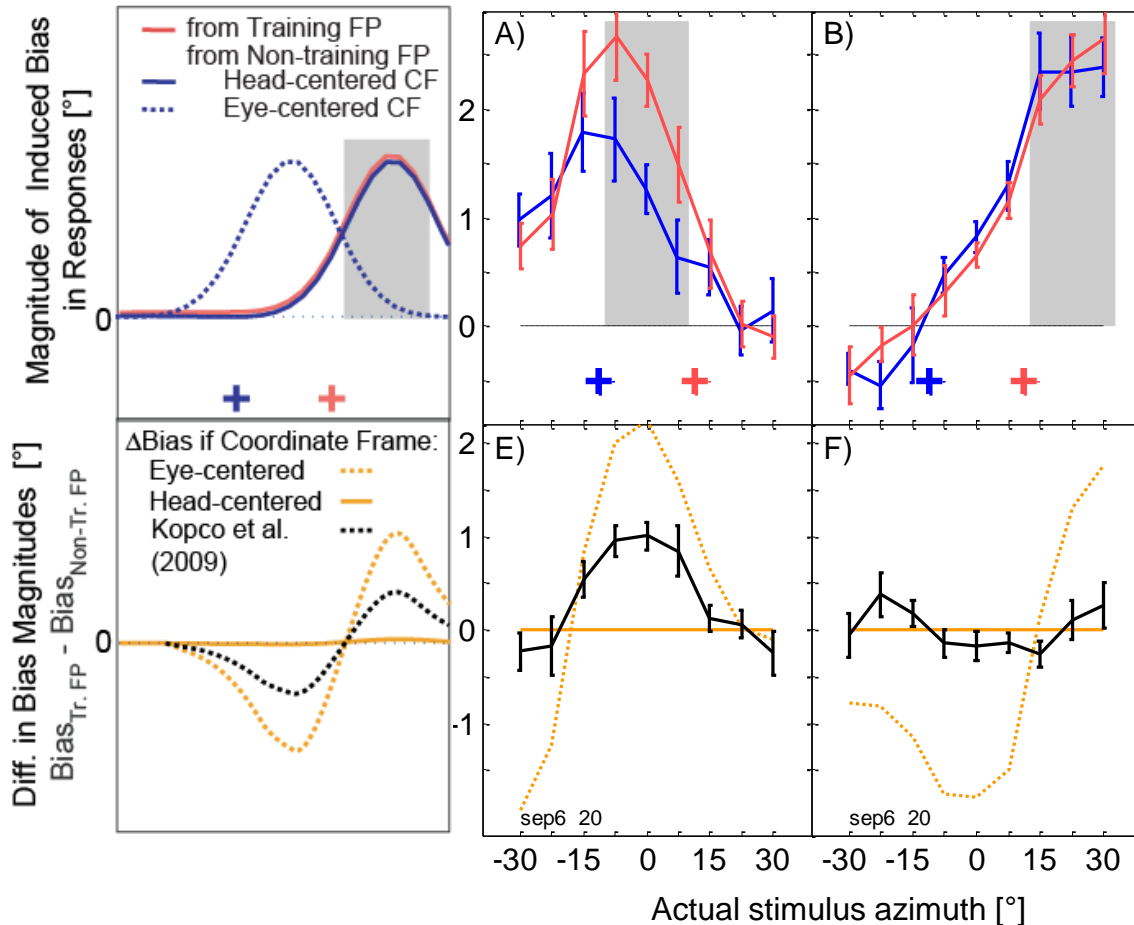
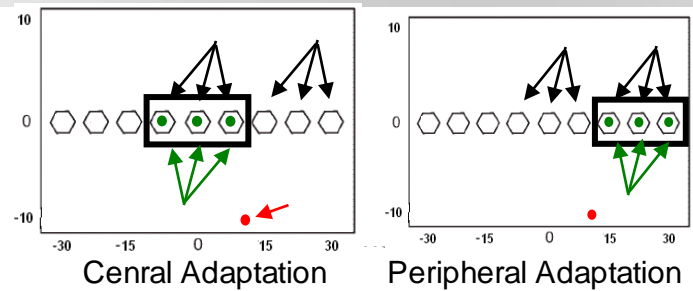


Central Experiment:
 - slight expansion outside training region,
 - independent of FP.

Peripheral Experiment:
 - FP-dependent shift in the central region.

AV signals presented within one hemisphere cause hemisphere-specific adaptation, dependent on hemisphere of FP.

Results: AV-shifted



Central experiment:
Mixed of head- and eye-centered RF

Peripheral experiment:
Almost purely head-centered RF

Inconsistent RF if one training region vs. other.

Summary

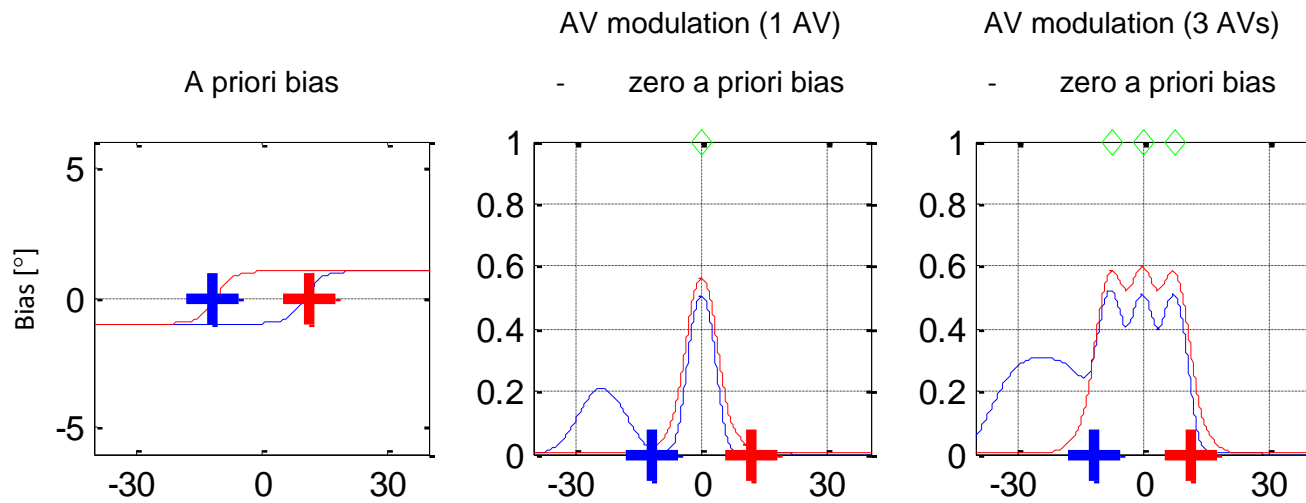
- The VA is a **multifaceted** process, dependent on both the format of the **neural representation of space** in hearing vs. vision, and on the **reference frame** used by the two senses.
- **Representation of space:** in the periphery, FP-dependent adaptation was induced by the AV stimuli even when the AV-stimuli were presented from matching locations and no VAE was induced → adaptation induced within one hemifield is FP-dependent, adaptation induced in two hemifields is not.
- **Reference frame:** RF of VAE is a **mixture of eye-centered and head-centered** coding in **the central region**, but **mostly head-centered**, independent of the direction of the eye gaze, **in the periphery**.
- Current results show that there are **hemisphere-specific adaptation processes** in visual recalibration of auditory space, resulting in different **FP-dependent patterns** of adaptation depending on the **region in which adaptation is induced**.

Thanks to:

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Attempt to model



Attempt to model

$h = 1, s = 1, c = 0.75, w = 0.55, w_E$
 $= 0.35, \sigma_H = 2.5, \sigma_E = 15$

