# What does varying the standards in an MMN paradigm really do?

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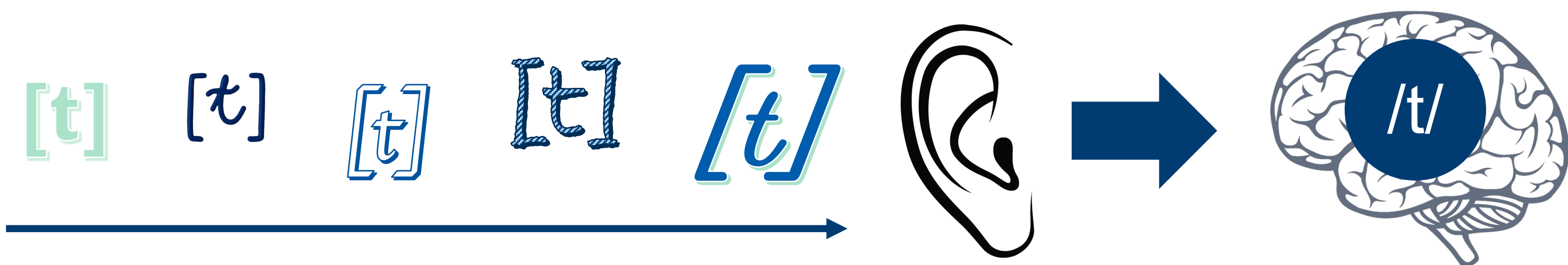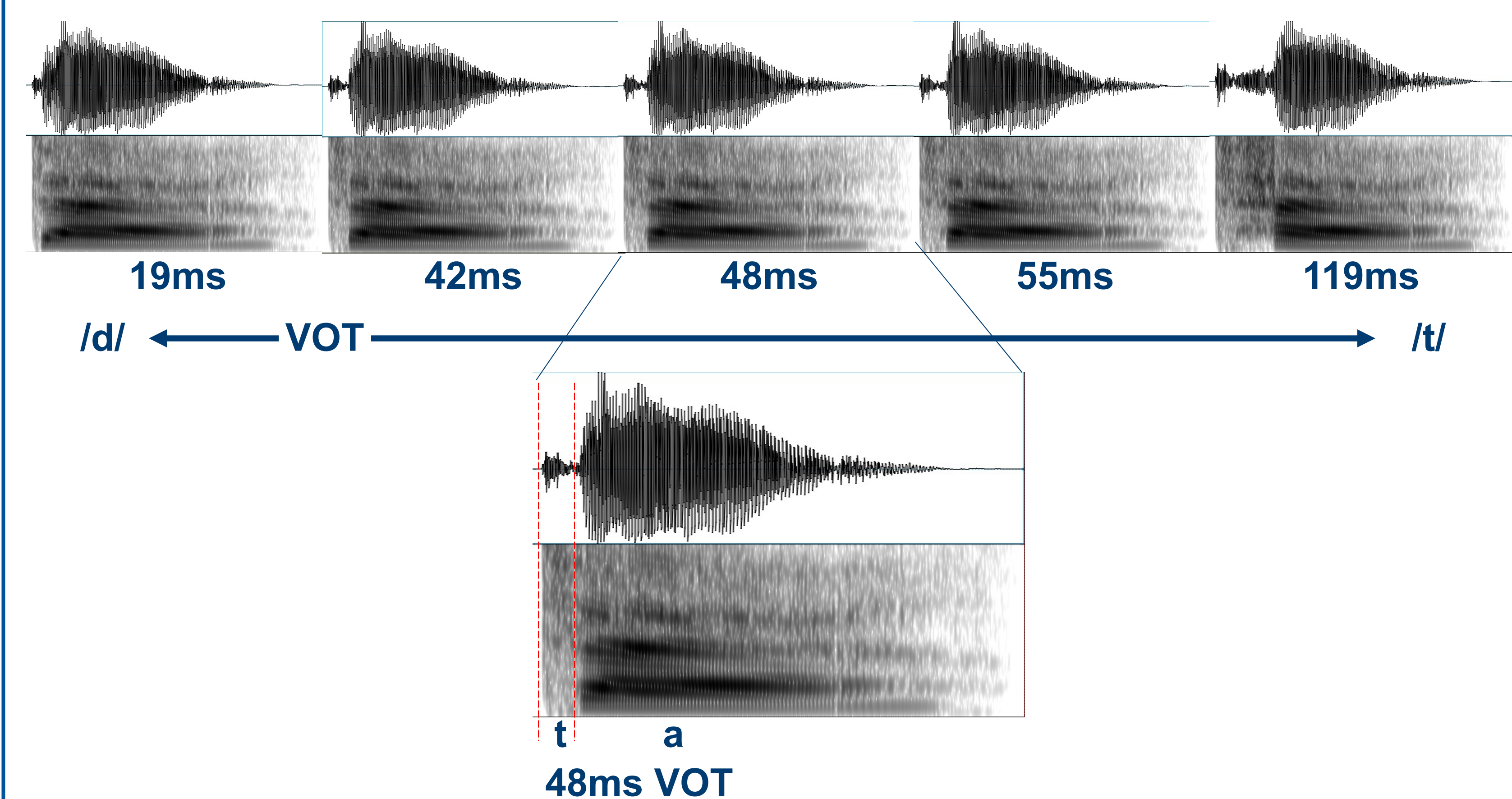
## Background

- MMN reflects a difference between a deviant and the memory trace of standards.

- The "various-standard" oddball paradigm: Varying standards belonging to the same category elicits a categorical representation.

- When standards are [ta]s with different VOTs, the elicited categorical representation is the phoneme representation /t/ [1].
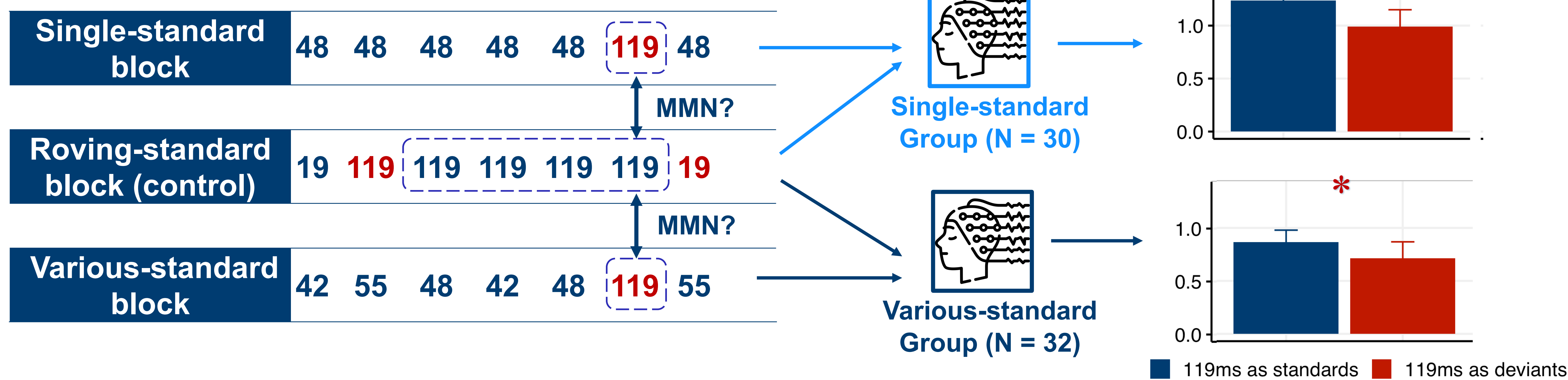


- ***Does the memory trace contain only a phoneme representation?***

- Studies adopting this paradigm have assumed that varying the standards precludes an acoustic MMN [2,3].

- Our lab found a within-category MMN that relies on acoustic details:

## Previous experiment (for details, see Poster B26)

### Stimuli: /d-t/ continuum [4]



| 19ms | 42ms | 48ms | 55ms | 119ms |

/d/ ← VOT → /t/

t  a
48ms VOT

## Design and results (previous experiment)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Single-standard block | 48 | 48 | 48 | 48 | 48 | **119** | 48 |
| Roving-standard block (control) | 19 | **119** | 119 | 119 | 119 | 119 | **19** |
| Various-standard block | 42 | 55 | 48 | 42 | 48 | **119** | 55 |

MMN?
MMN?

Single-standard Group (N = 30)

Various-standard Group (N = 32)



■ 119ms as standards  ■ 119ms as deviants

### Within-category MMN found. But where does this within-category MMN come from?

**Acoustic account:** The memory trace in various-standard paradigm still contains fine-grained acoustic information.
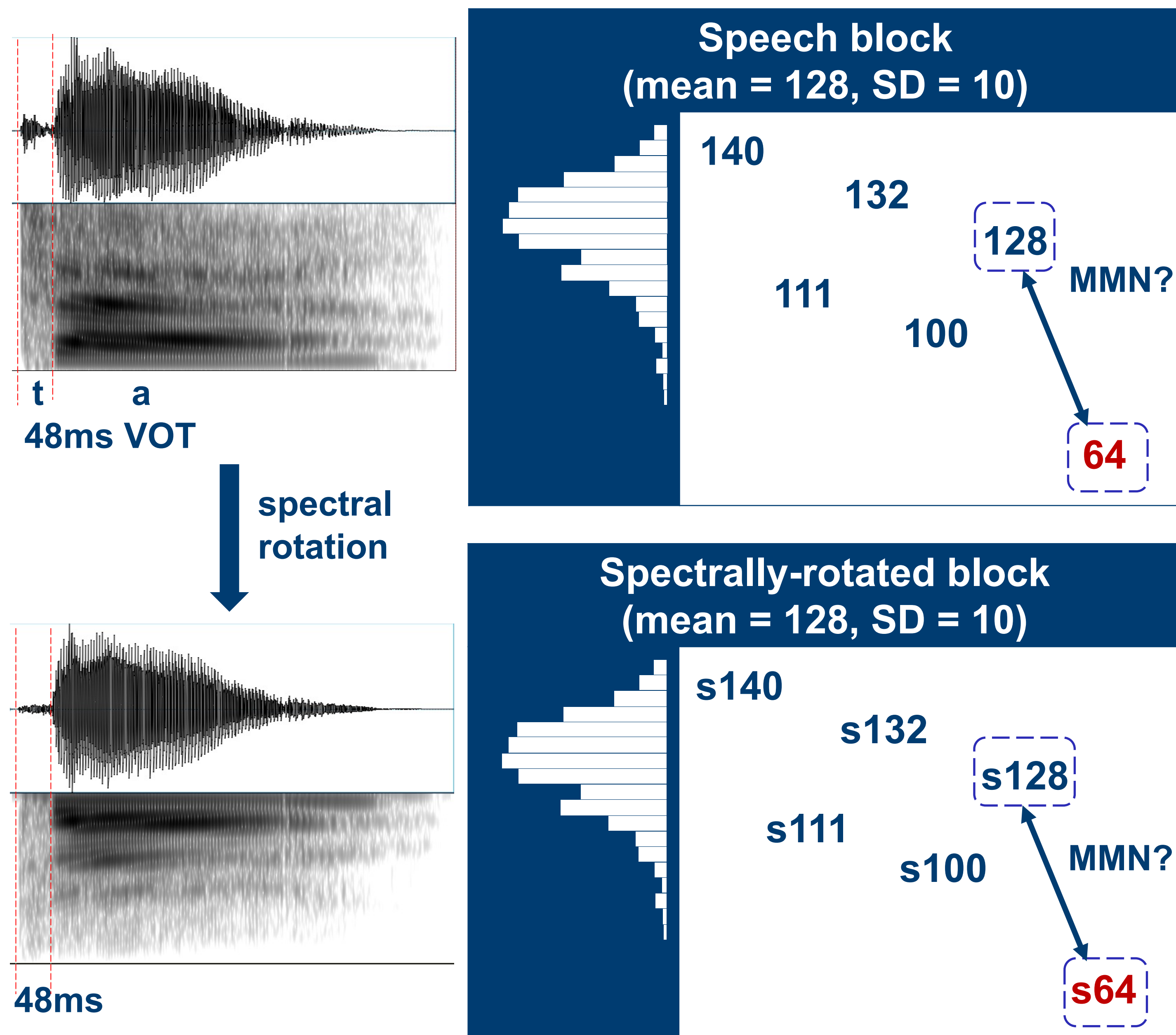
/t/ + VOT
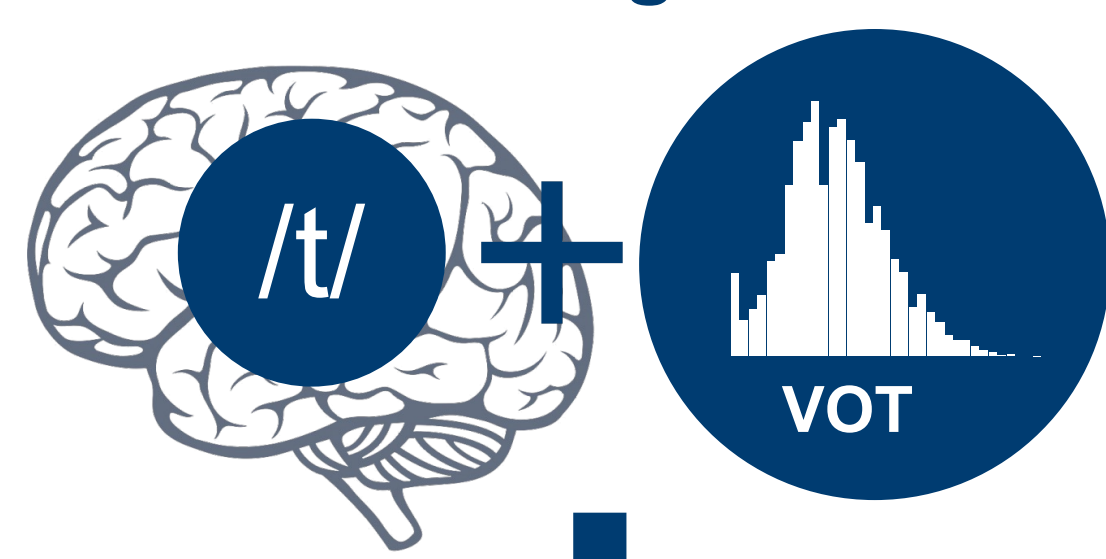
The acoustic information is a statistical summary of the presented stimuli [5].

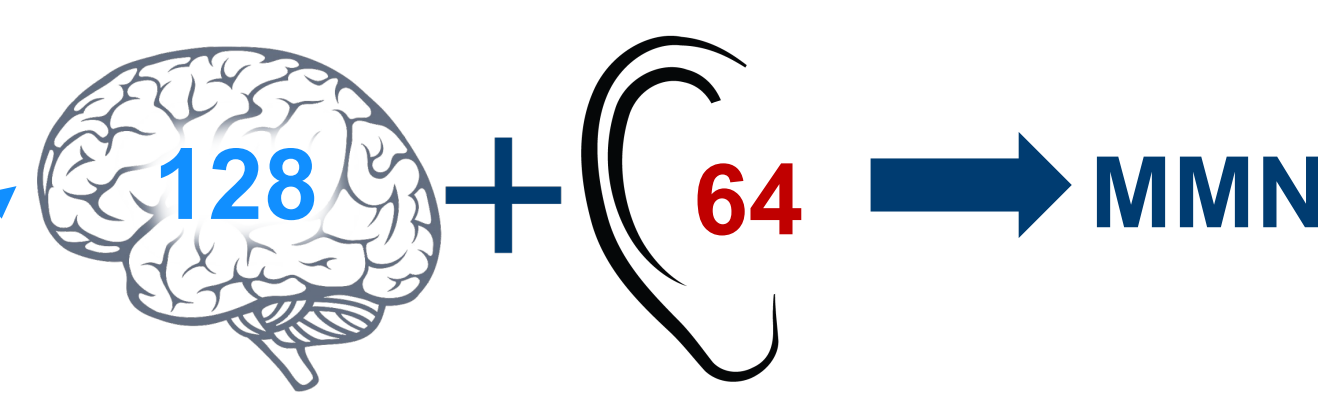**Phonetic account:** The phoneme representation itself contains phonetic information (~60ms) [6].

/t/ ••• VOT

The phonetic information is from long-term memory and is insensitive to the presented VOT.
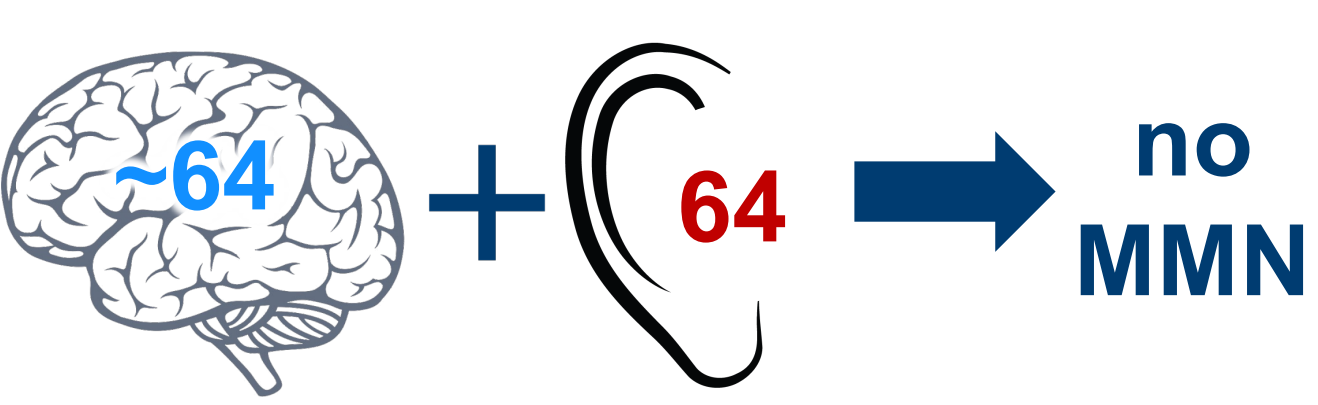
## Planned experiment



t  a
48ms VOT

spectral rotation

48ms

**Speech block (mean = 128, SD = 10)**

140
132
111
128
100
MMN?
64

Speech Group

**Spectrally-rotated block (mean = 128, SD = 10)**

s140
s132
s111
s128
s100
MMN?
s64

Spectrally-rotated Group

## Predictions

**Acoustic account**

128 + 64 → MMN

**Phonetic account**

~64 + 64 → no MMN

s128 + s64 → MMN

$$Amplitude = Group + Stimulus + Group \times Stimulus$$

Speech
Spectrally-rotated

standard (128)
deviant (64)