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**Citation:** Freeman, E. D. ORCID: 0000-0001-7234-824X (2018). Sounds From Silent Motion: Survey Supports Sensory Disinhibition. Poster presented at the AVA Christmas Meeting, 10 December 2018, Birkbeck, University of London.

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# Sounds from silent motion

## Survey supports sensory disinhibition



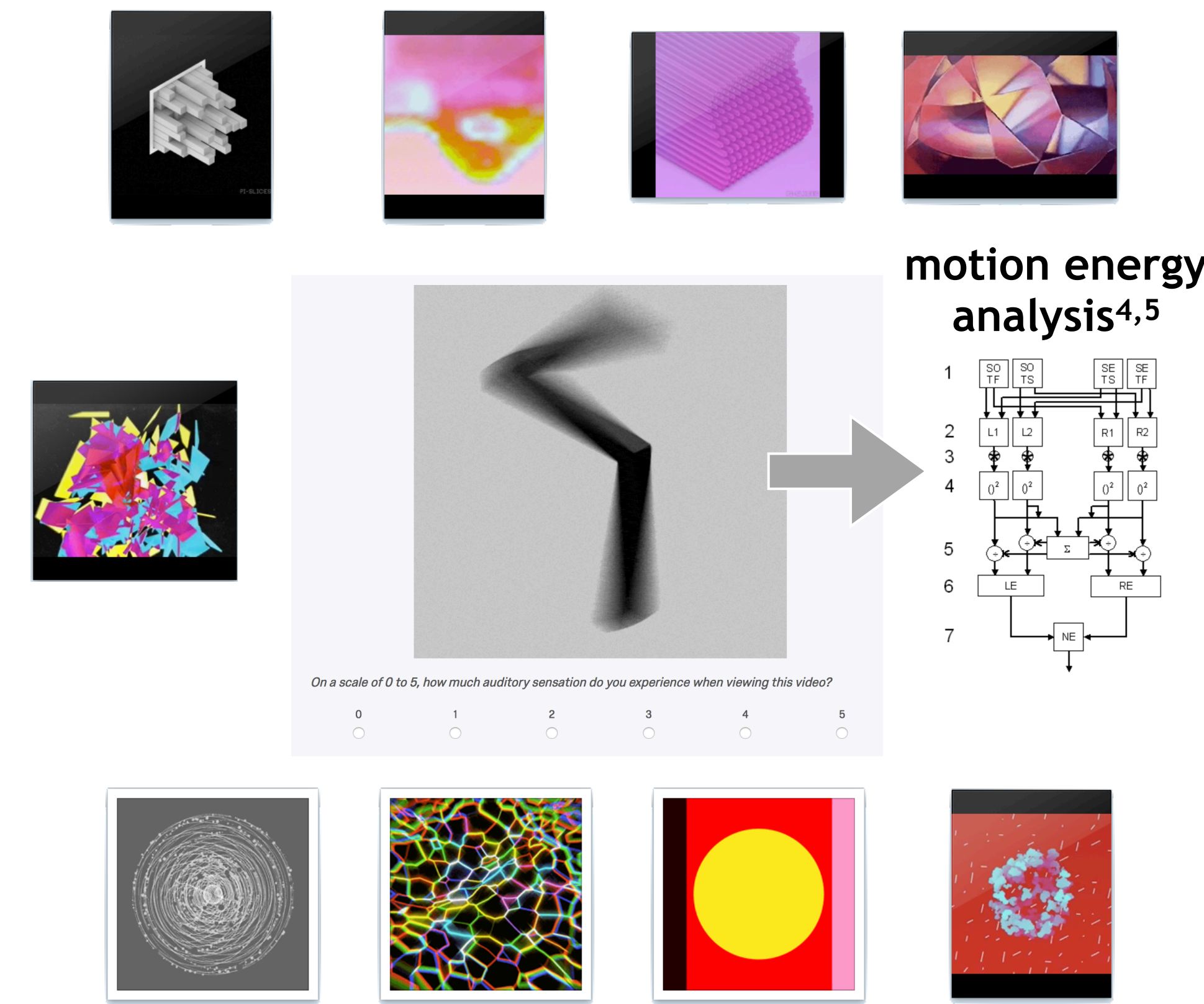
### Background / Questions

- Some people 'hear' what they see: flashing displays, people walking, any movement
- We call this the **visual-evoked auditory response** or '**visual ear synaesthesia**' (vEAR)<sup>1,2</sup>
  - Can auditory sensation be evoked by raw motion energy (ME), rather than by learned expectations?
  - What traits are associated with vEAR?
  - Is cortical excitability/disinhibition a possible mechanism? <sup>3</sup>

### On-line video rating survey

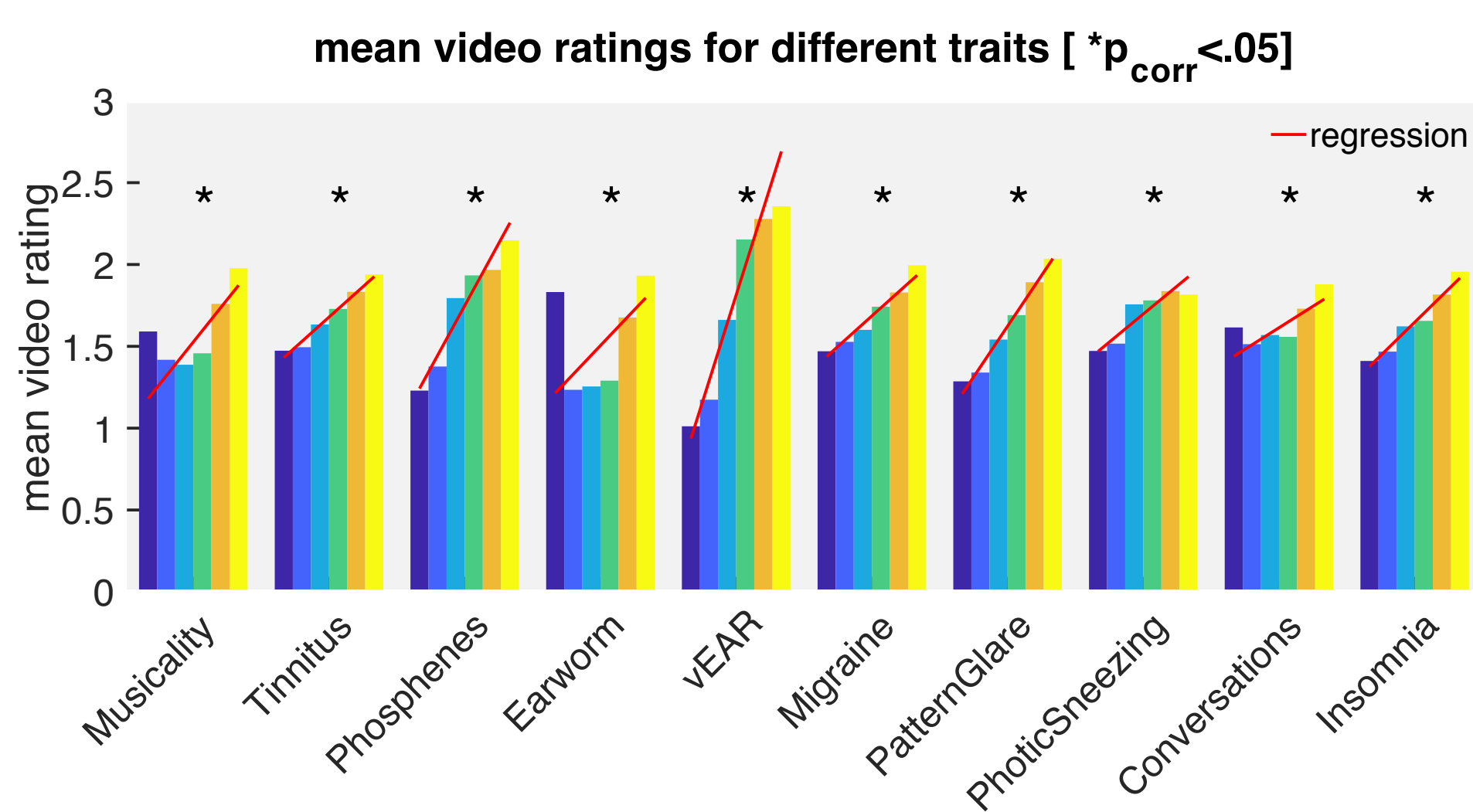
- [tinyurl.com/vEARsurveyNS](http://tinyurl.com/vEARsurveyNS)
- >7000 worldwide participants followed link to our survey from popular press
- 20 short silent videos, looping:
  - "How much auditory sensation do you experience when viewing this video?" [0 to 5]
  - Motion energy (ME) analysis of videos <sup>4,5</sup>
  - Trait questions, self-assessed, randomly reverse-coded
  - e.g. self-rated vEAR, musicality, auditory-evoked visual phosphenes, earworms (involuntary musical imagery), tendency to suffer migraines, pattern glare, difficulty following conversations in noisy backgrounds

### Abstract videos -> ME analysis



### Video rating associated with all tested traits

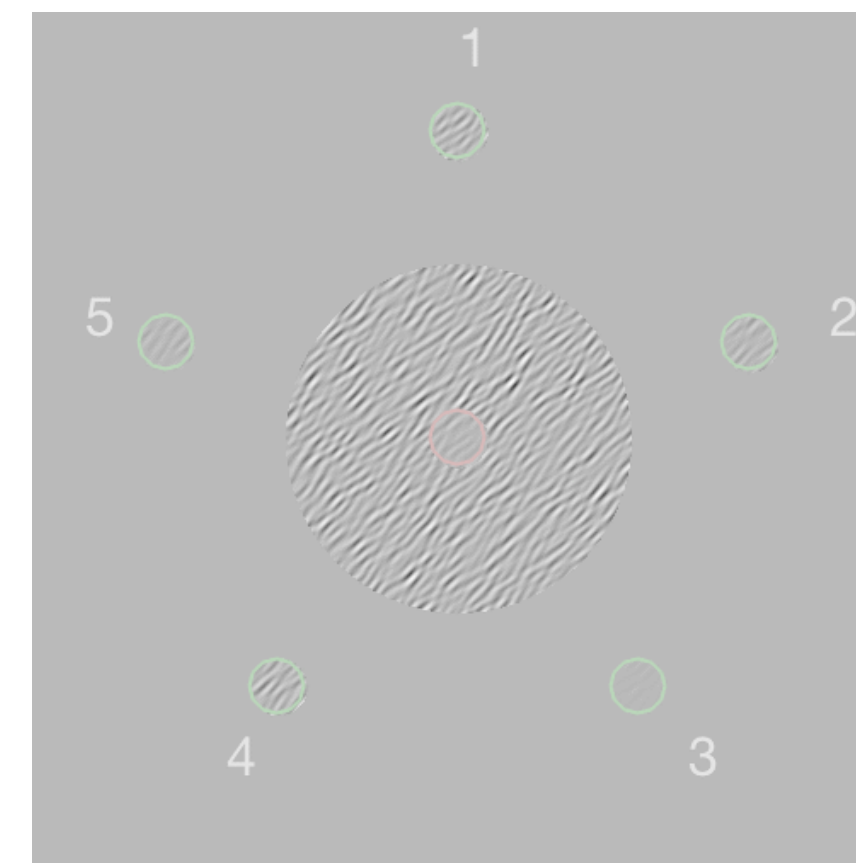
- Stronger traits, higher video ratings



- 'Yea-saying' bias? Unlikely given reverse-coding

### Surround suppression test

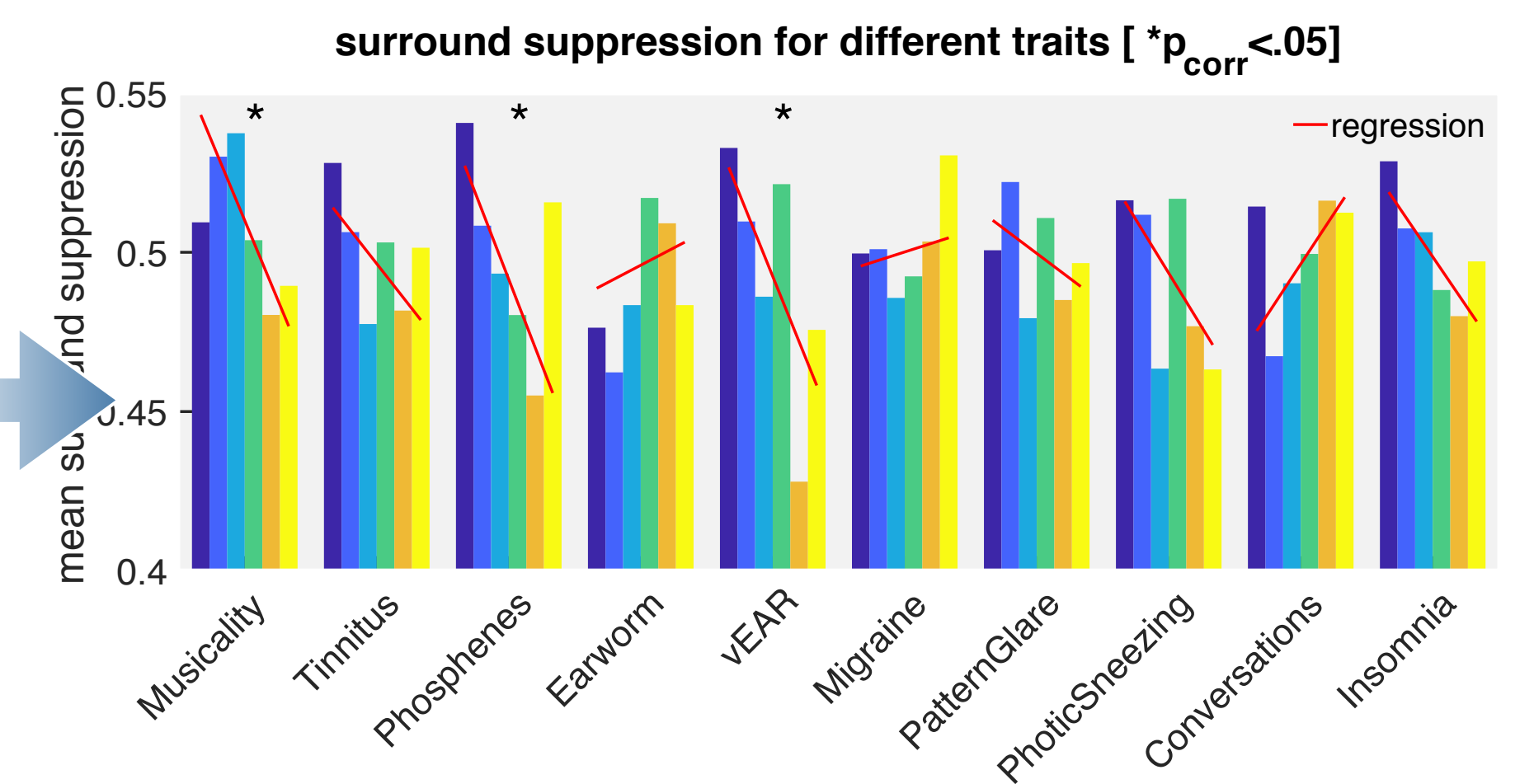
- Contrast matching of centre with Collinear vs Orthogonal surround <sup>5</sup>; 14 randomised trials



- Contrast suppression points to inhibition in visual cortex <sup>6</sup>

### Diverse traits associated with reduced surround suppression

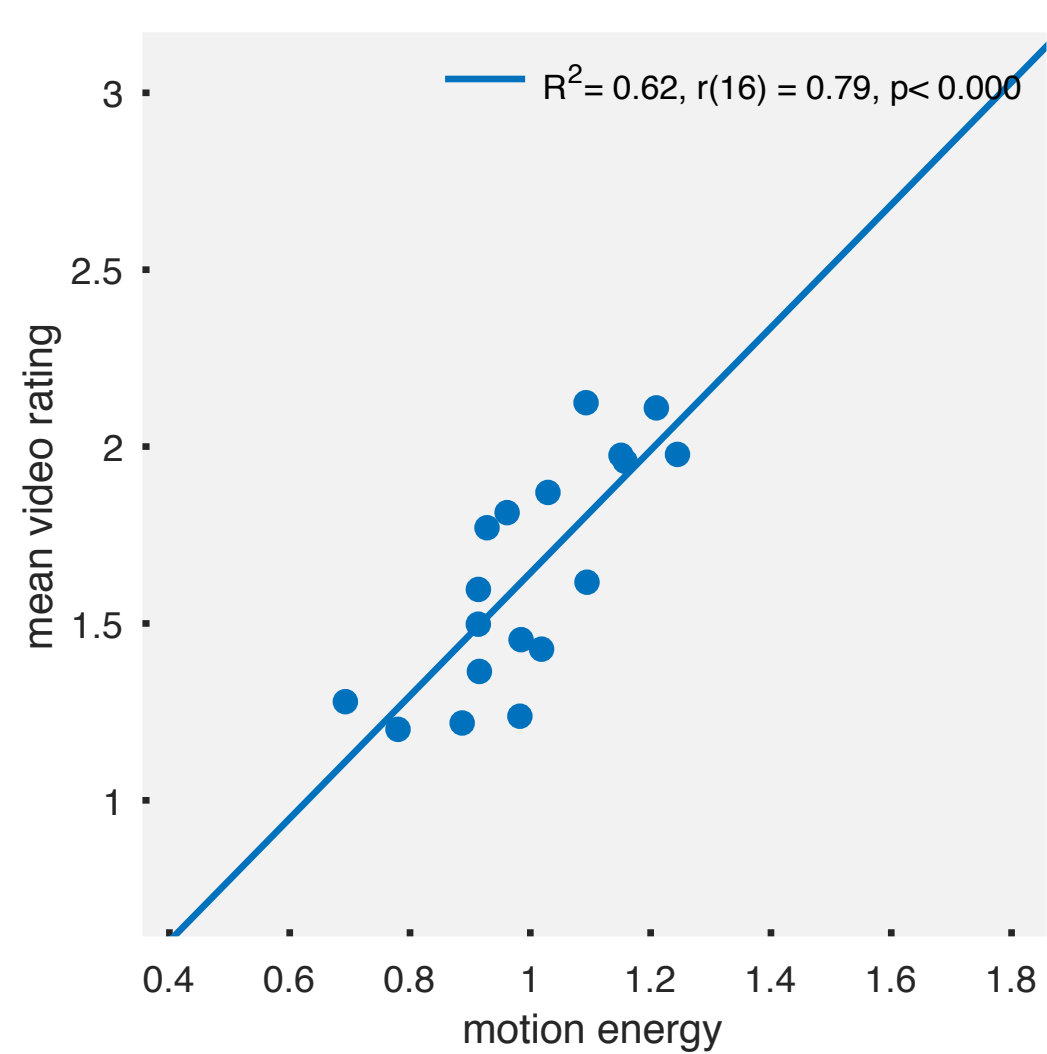
- Musicality, auditory-evoked phosphenes, self-assessed vEAR



- Disinhibition may link these phenomena

### Video ratings correlate with video motion energy (ME)

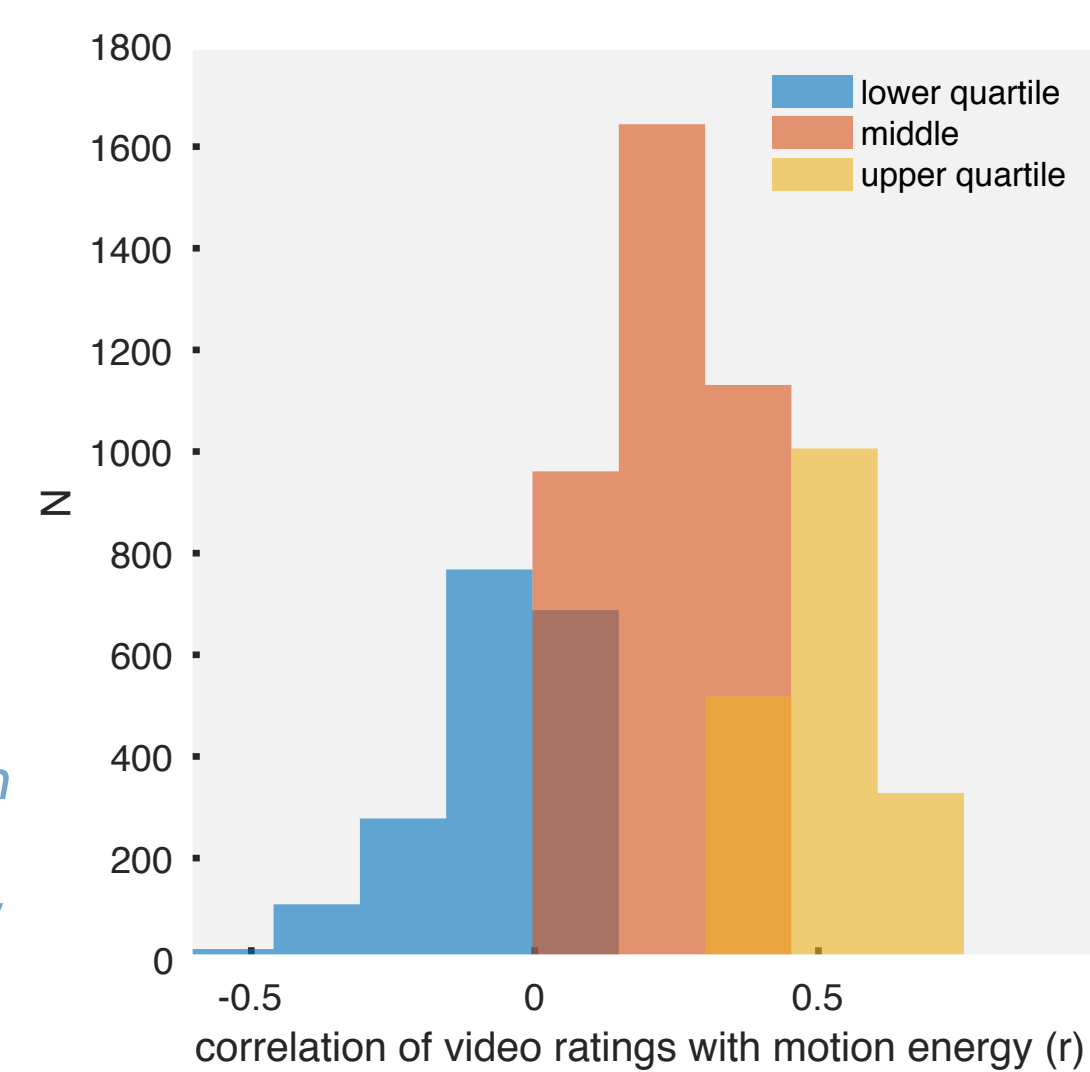
- Videos with higher motion energy get higher ratings on average



- Supports relatively direct pre-cognitive route from visual motion to audition

### Grouping people by ME sensitivity

- Correlation of video ratings to ME varies between individuals

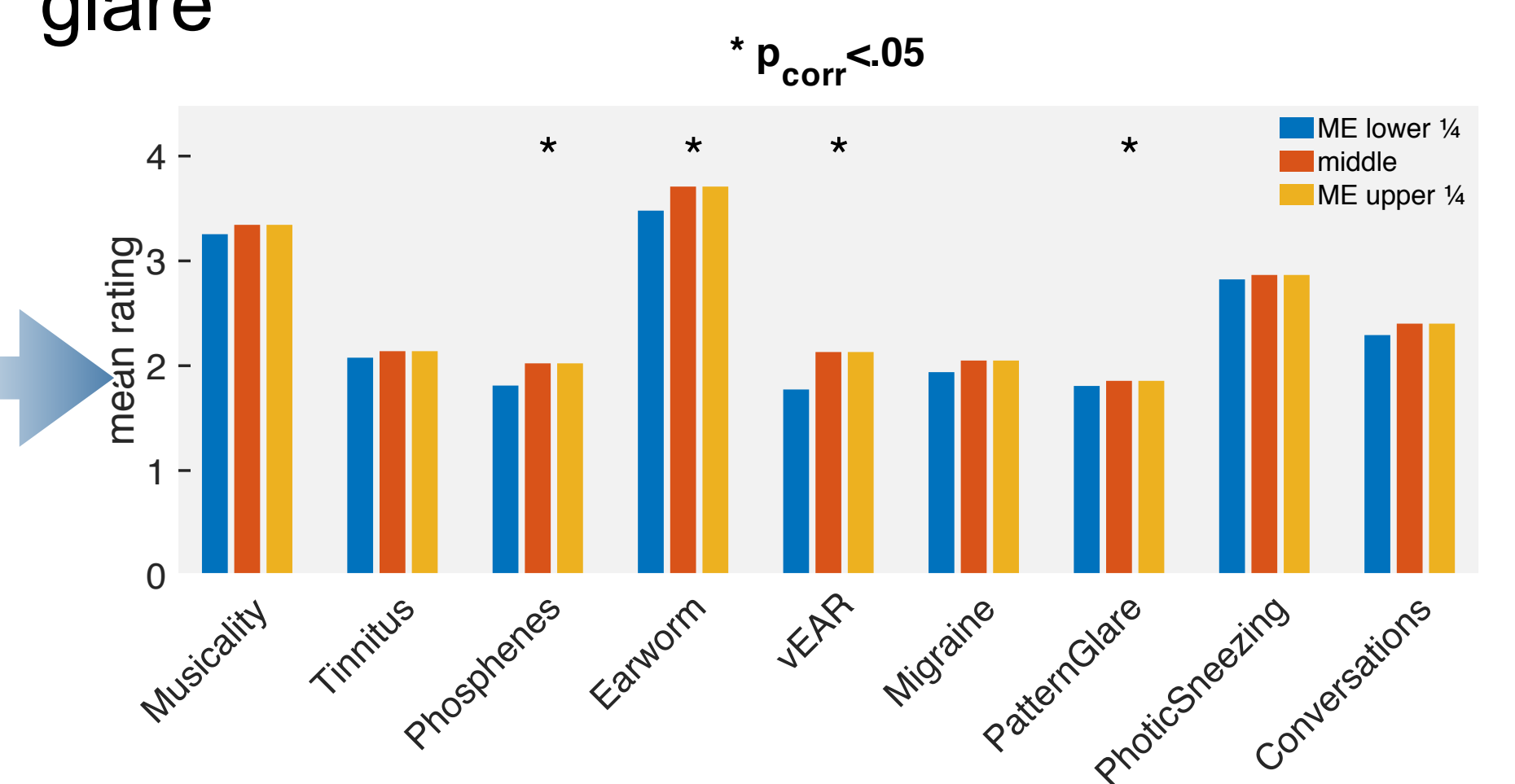


People whose ratings do not correlate much with video motion energy

People whose ratings correlate strongly with video motion energy

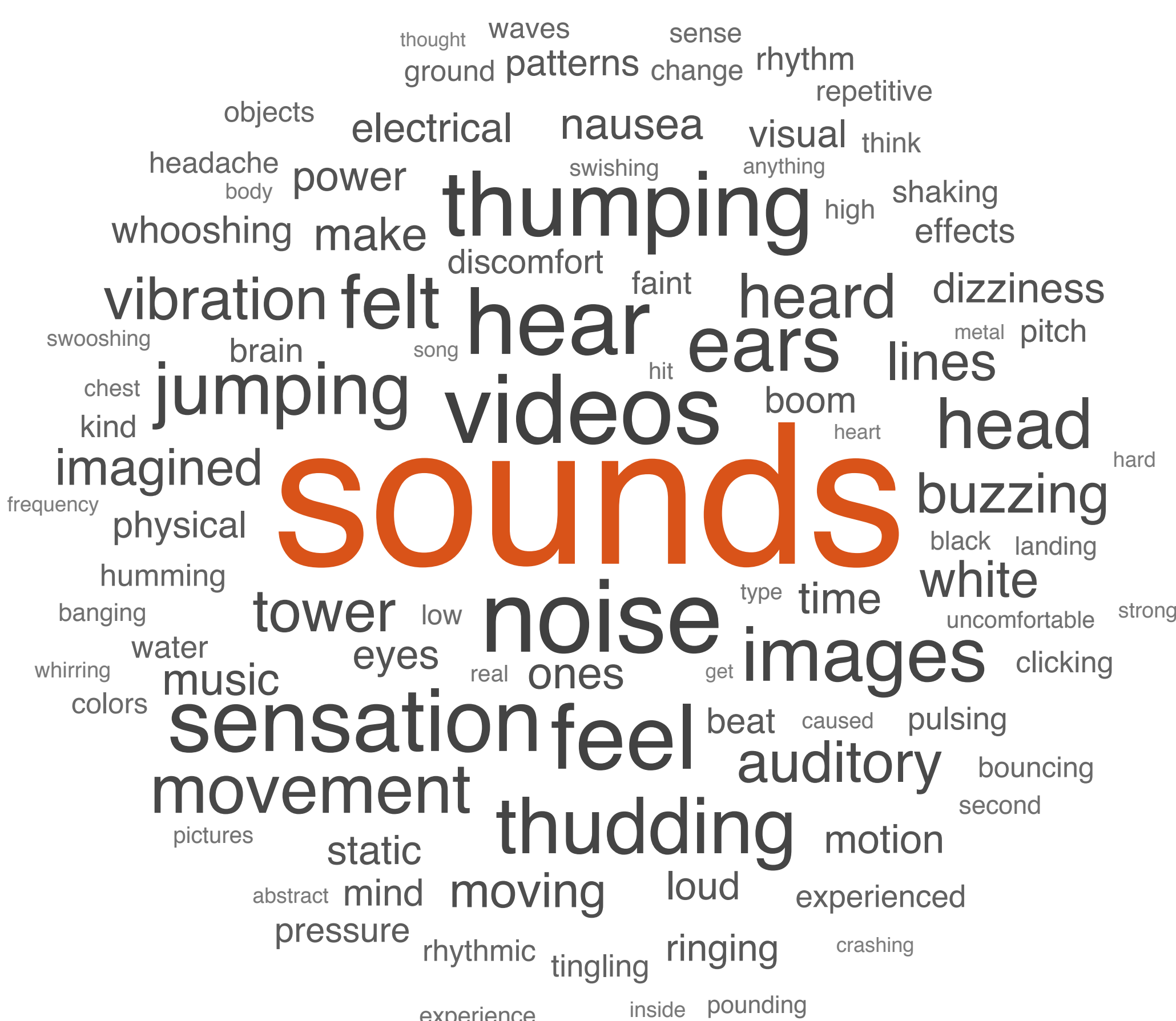
### Sensitivity to motion energy predicts specific traits

- ME sensitivity predicts vEAR, auditory-evoked phosphenes, earworms and pattern glare

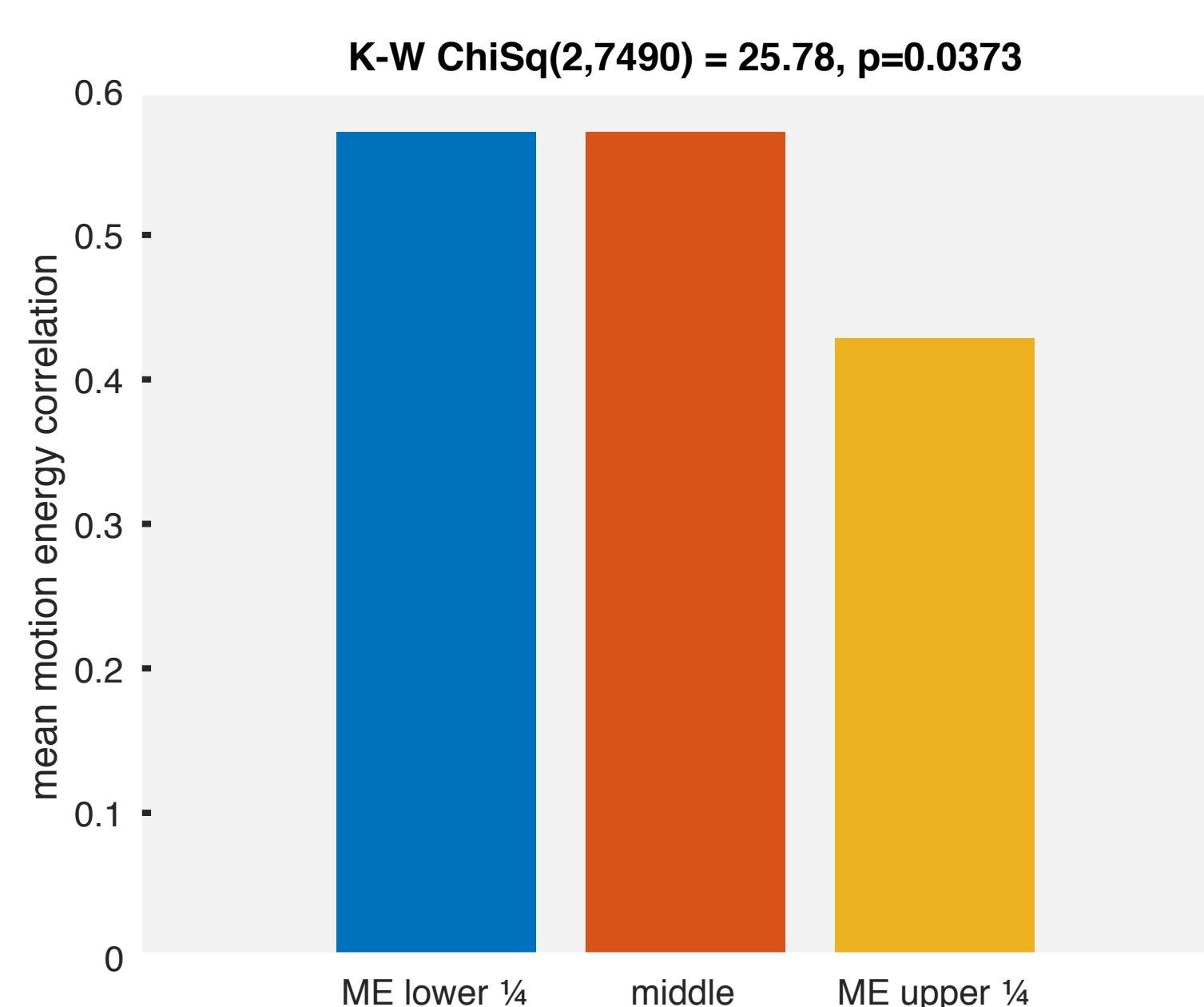


- These phenomena may be related to increased cortical excitability / disinhibition <sup>7,8</sup>

### Free-text descriptions of videos



### ME sensitivity predicts less surround suppression



- Supports reduced inhibition in vEAR

### Conclusions

- vEAR is evoked by abstract videos with high motion energy.
  - independent of prior audiovisual associations
  - Bypasses semantics and controlled imagery
  - **Direct crosstalk from vision to audition**
- Visual-ear synaesthesia (vEAR) correlates with diverse sensory phenomena
  - auditory-evoked phosphenes, earworms and pattern glare
  - reduced surround suppression in vEAR points to sensory disinhibition
  - **Supports disinhibition theory of synaesthesia and related phenomena <sup>1</sup>**

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