Sounds from silent motion

Survey supports sensory disinhibition

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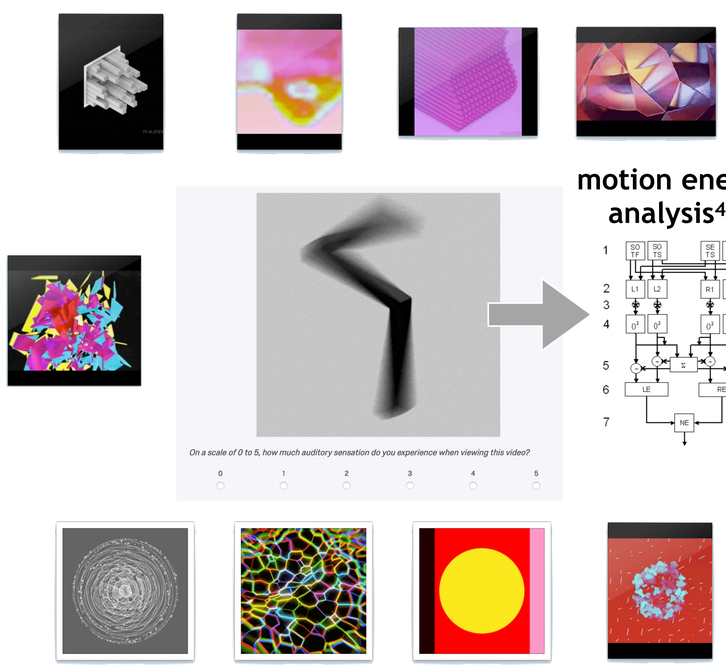
Background / Questions

- 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)[1,2]
  - *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?* [3]

On-line video rating survey

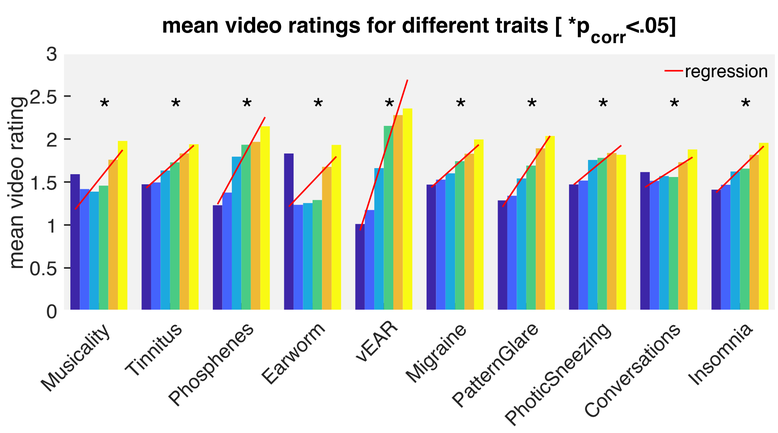
- tinyurl.com/vEARsurveyNS
- >7000 worldwide participants followed link to our survey from popular press
- 20 short silent videos, looping:
  - *"How much auditory sensation do you experience when viewing this video?"* [0 to 5]
  - Motion energy (ME) analysis of videos [4,5]
  - Trait questions, self-assessed, 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

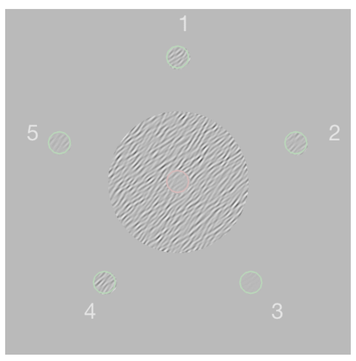
- Stronger traits, higher video ratings



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

Surround suppression test

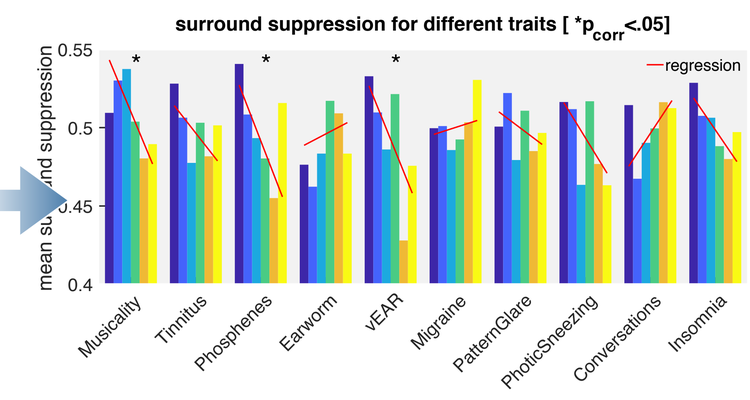
- Contrast matching of centre with Collinear vs Orthogonal surround [5]; 14 randomised trials



- Contrast suppression points to inhibition in visual cortex [6]

Diverse traits associated with reduced surround suppression

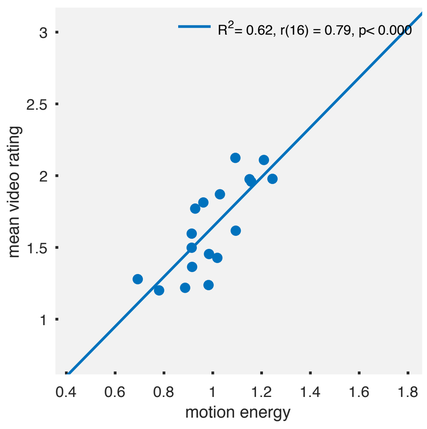
- Musicality, auditory-evoked phosphenes, self-assessed vEAR



- Disinhibition may link these phenomena

Video ratings correlate with video motion energy (ME)

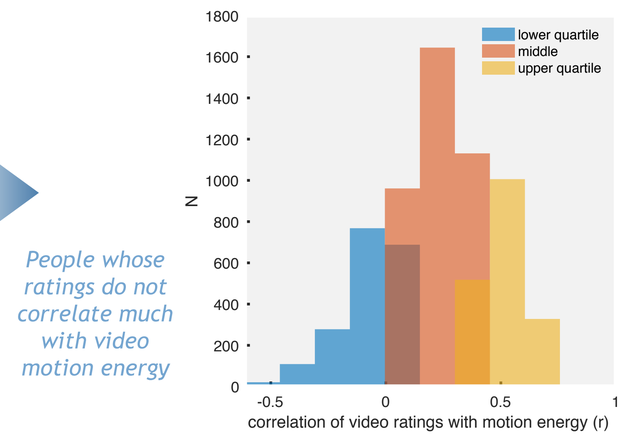
- Videos with higher motion energy get higher ratings on average



- 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

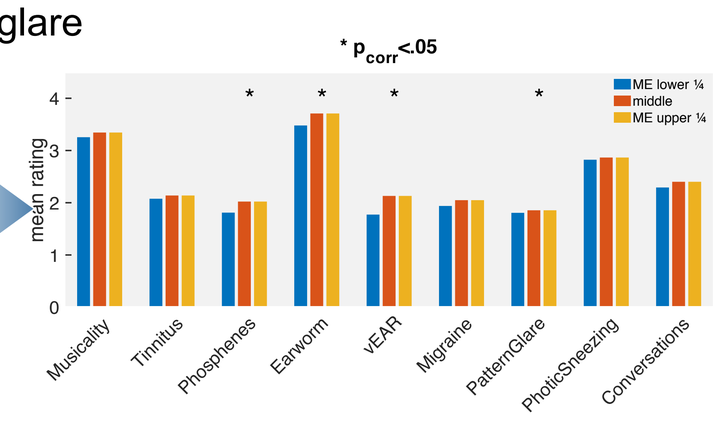


People whose ratings do not correlate much with video motion energy

People whose ratings correlate strongly with video motion energy

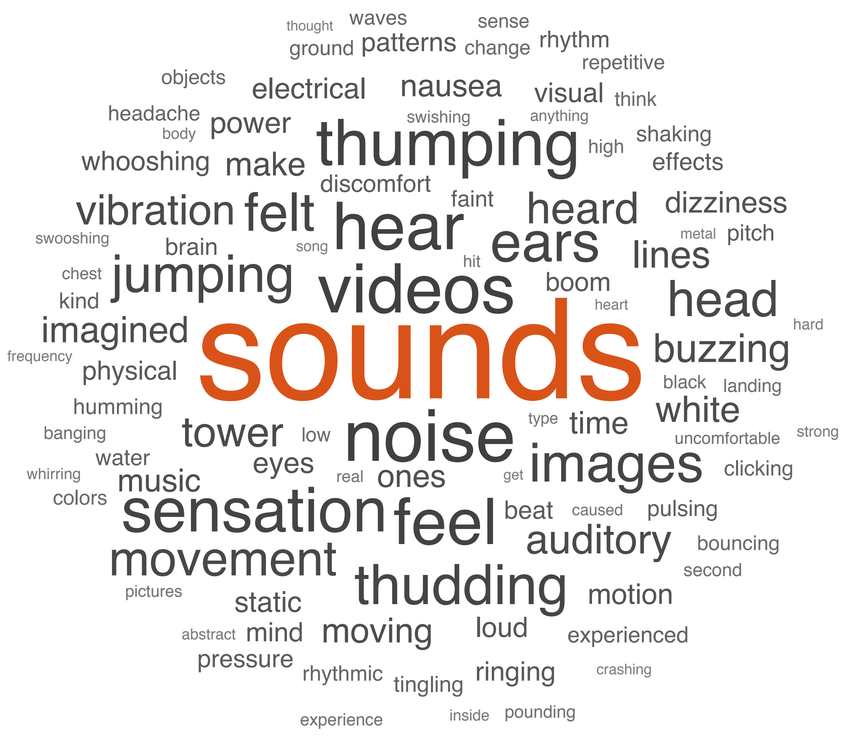
Sensitivity to motion energy predicts specific traits

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

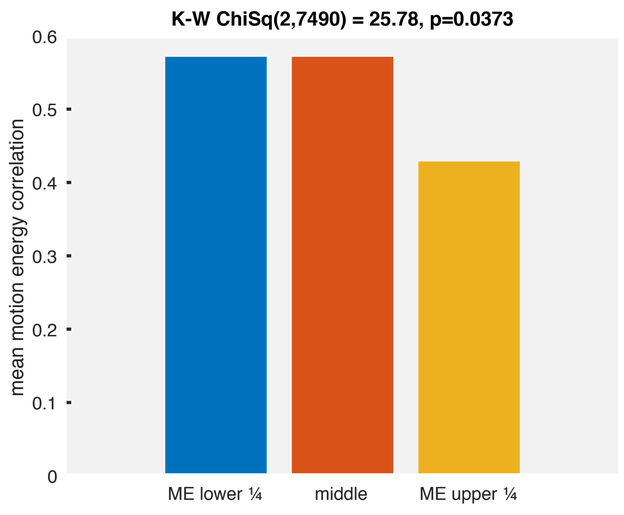


- These phenomena may be related to increased cortical excitability / disinhibition [7,8]

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*** [1]

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