A widespread task-related hemodynamic response in human V1 is modulated by task difficulty

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NIH National Institute of Mental Health | NIH National Eye Institute

Aim

Are task-related hemodynamic responses modulated by task difficulty and reward?

Are they linked to arousal?

Background

Task-related hemodynamic responses:

- Endogenous responses in the absence of a visual stimulus at the earliest stages of visual cortical processing.
- Spatially global and entrained to task timing.

Experimental Protocol

Easy or ***Low Reward***

~90% correct — stakes: $0.25

Hard or ***High Reward***

~70% correct — stakes: $1.10

- Orientation discrimination task; tone feedback.
- Separate runs (of 15 trials) for four conditions (easy vs. hard, low reward vs. high reward).

Task Difficulty

fMRI responses in ipsilateral V1:

Pupil responses:

Reward

fMRI responses in ipsilateral V1:

Pupil responses:

V1, Ipsilateral hemisphere: widespread hemodynamic activity unrelated to visual stimulus or spatial attention

Conclusions

- **Task-related responses entrained to task timing.**
- **Pupil dilation also modulated by difficulty, reward, and correct/incorrect feedback.**

-> Task-related responses reflects arousal.

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