



**LIGHTCAP**

**ESR3**  
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**ULiege, Belgium**

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12 April 2022

LightCap Midterm Review Meeting





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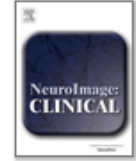
LIGHTCAP



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Brain functional MRI responses to blue light stimulation in Leber's hereditary optic neuropathy

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# Blue light activates pulvinar nuclei in longstanding idiopathic photophobia: A case report

Athanasios Panorgias <sup>a</sup>, Danielle Lee <sup>b</sup>, Katie E. Silva <sup>b</sup>, David Borsook <sup>b, c</sup>, Eric A. Moulton <sup>b, c, d, 1</sup> ✉

**3 TESLA !**

## Current Biology

Volume 16, Issue 16, 22 August 2006, Pages 1616-1621



Report

## Daytime Light Exposure Dynamically Enhances Brain Responses

Gilles Vandewalle <sup>1</sup>, Evelyne Balteau <sup>1</sup>, Christophe Phillips <sup>1</sup>, Christian Degueldre <sup>1</sup>, Vincent Moreau <sup>2</sup>, Virginie Sterpenich <sup>1</sup>, Geneviève Albouy <sup>1</sup>, Annabelle Darsaud <sup>1</sup>, Martin Desseilles <sup>1, 3</sup>, Thien Thanh Dang-Vu <sup>1, 4</sup>, Philippe Peigneux <sup>1</sup>, André Luxen <sup>1</sup>, Derk-Jan Dijk <sup>5</sup>, Pierre Maquet <sup>1, 4</sup> ✉

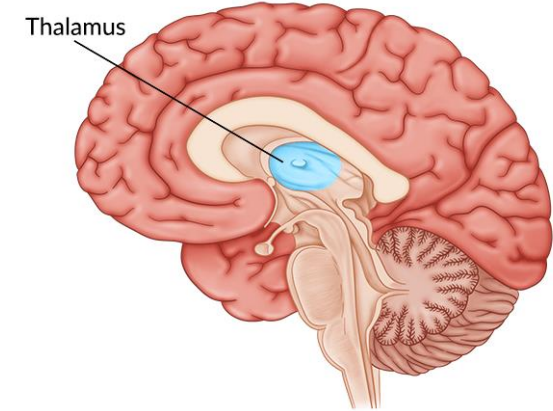
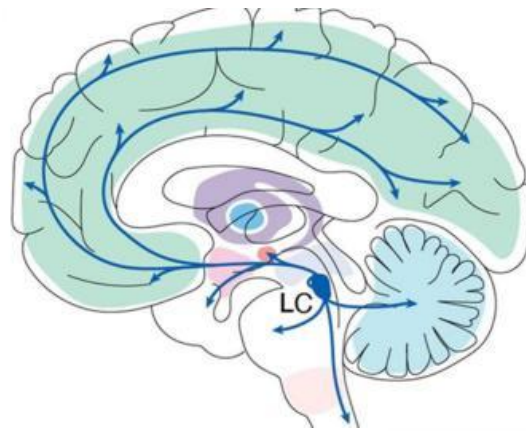
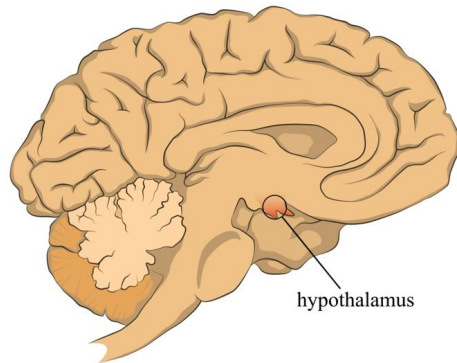


# OBJECTIVES

- **1. Study the impact of blue-enriched light on subcortical structures while engaged in different non-visual cognitive processes.**



# REGIONS OF INTEREST





# OBJECTIVES

- **1. Study the impact of blue-enriched light on subcortical structures while engaged in different non-visual cognitive processes.**
- **2. Assess the modulatory impact of time-of-day & ageing**



# PARTICIPANTS

## Study population

- Young healthy participants (age 22 – 30y)
  - N= 60
  - 50 % female
  - BMI range: 18 – 25 mg/kg
- Older adults (age 60 – 75y)
  - N = 20
  - BMI range : 18 – 29 mg/kg

## Exclusion criteria:

- Depression (Q), anxiety (Q)
- Addiction, other psychiatric disorders
- Diabetes, smoking, use of psychoactive drug
- Recent transmeridian travel (< 2 months)
- Night shift work (< 1 year)
- Sleep questionnaires



# PROTOCOL OVERVIEW

## 1) Recruitment /Screening

- Mood, sleep, etc. questionnaires
- Exclusion criteria: BMI > 25, psychiatric disorder, chronic medication, etc.

## 2) Structural/Adaption session

- Blood sample (genotyping)
- Structural MRI
  - Whole brain (MP2rage)
  - Diffusion (NODDI)
  - Locus coeruleus

## 5) Cognitive tests

- Extensive test battery

## 3) Before fMRI

- Loose sleep-wake schedule (7 days)
- Actigraphy
- 3 days before fMRI
  - No alcohol
  - No caffeinated drinks
  - No intensive activity or sport

## 4) fMRI

- Acquired in the morning after participant wake ups (1.5hr)
- 5 min bright light adaption period
- 45 min dim light
- fMRI session

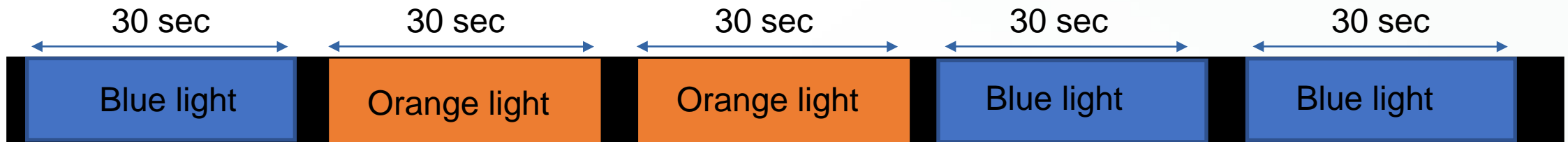




# ODDBALL TASK



SSSSDSSSSDSSSDSSSSDSSSDSSSSSSSDSSSD...



**Light Conditions** : Blue enriched polychromatic light (390.16), monochromatic orange light (9.34), dark ( $1 < \text{lux}$ )

**Light Block** : 30 sec, 15 blocks

**Oddball duration** : 12 min

Inter target interval  $>6$  sec and 20% of targets



# WHERE ARE WE?

20 young healthy participants



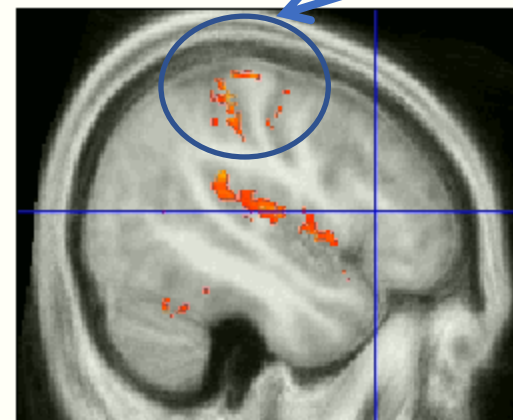
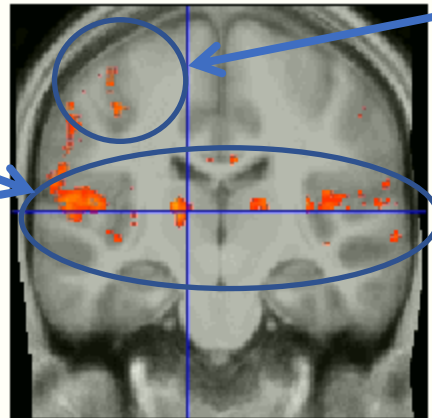
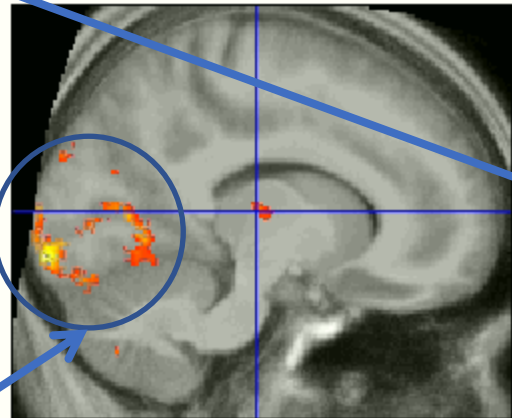
Temporal Lobe:  
• Planum temporale  
• Superior temporal gyrus

# RESULTS

## Brain responses during oddball task

**IPS**

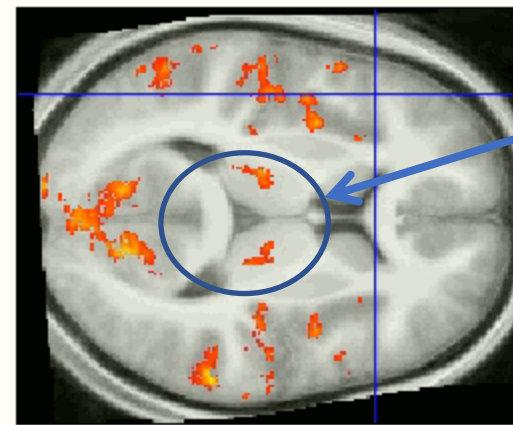
Parietal Lobe:  
• Supramarginal gyrus  
• Superior temporal gyrus  
• Superior parietal lobule



**Occipital Lobe**

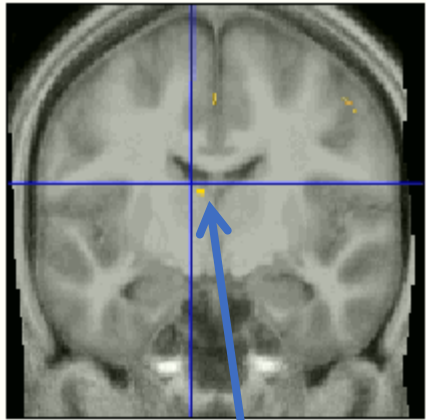
P value uncorrected <math><0.001</math>

**Thalamus**

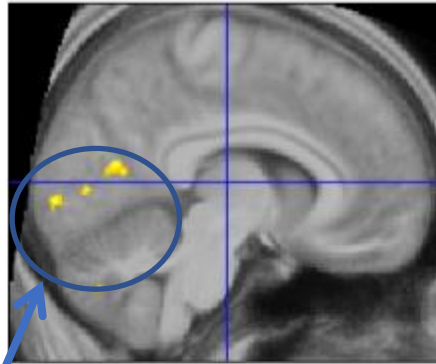




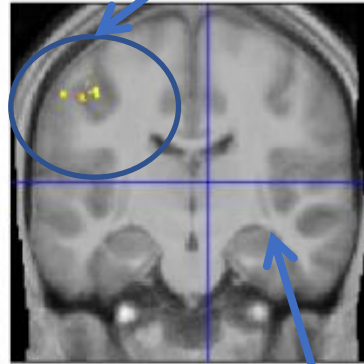
# blue light vs orange light



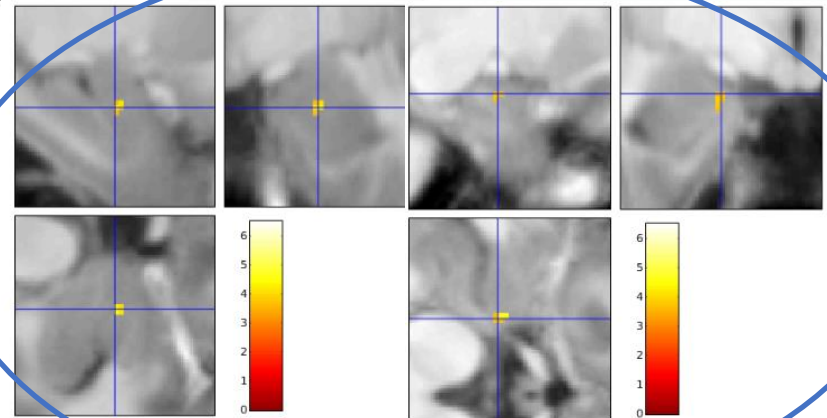
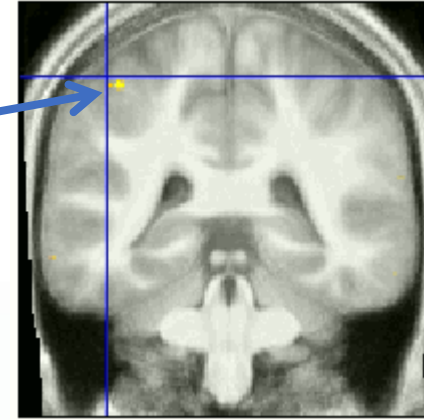
thalamus



occipital pole



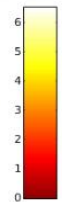
IPS



amygdala



P value uncorrected <0.001





## Perspective for 2022?

- Overall target sample size of project (N=60)
- Study aging (N=20)
- Study time-of-day
  - Evening session (N = 20)



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# THANK YOU!

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