

# Rapid topographic reorganization in adult human primary visual cortex (V1) and consequent perceptual elongations are mediated by GABA



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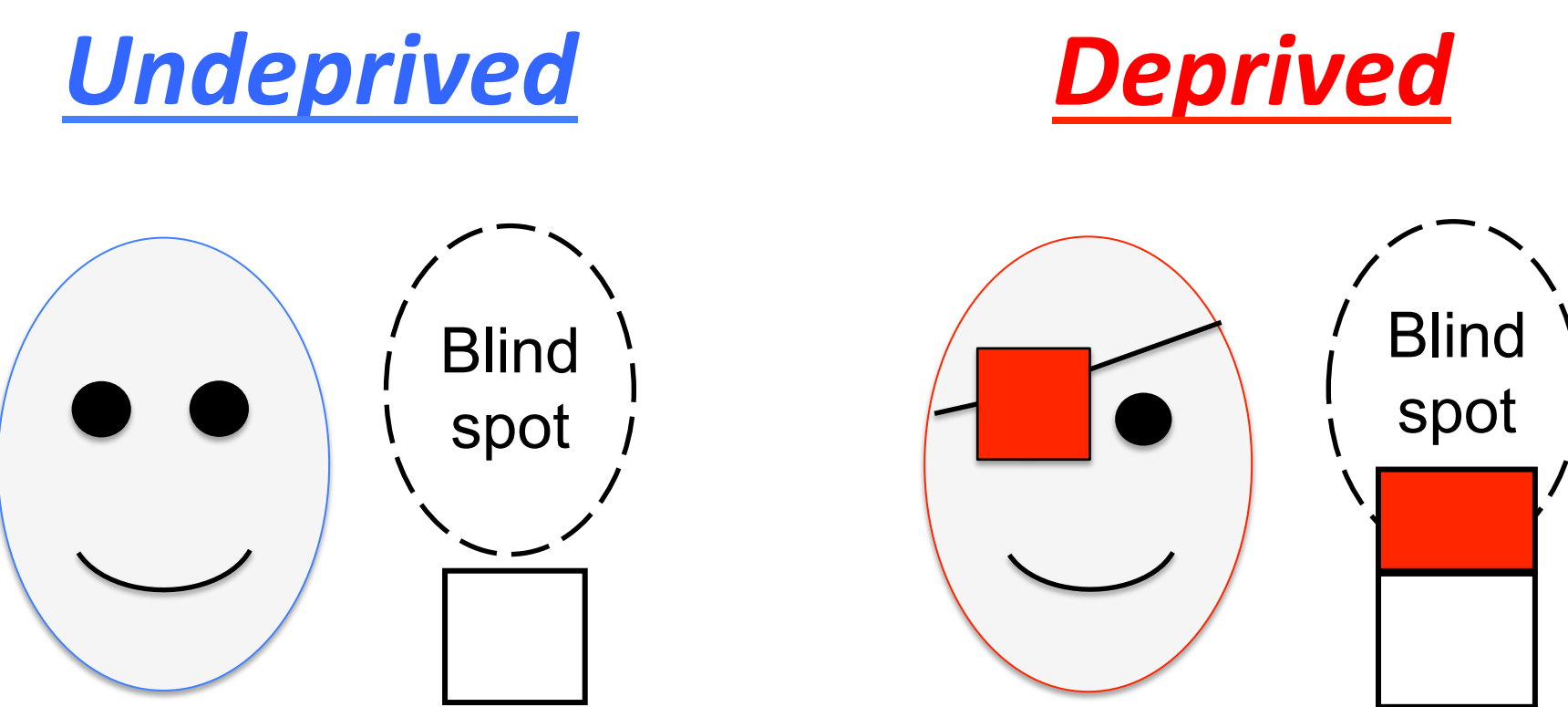
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## Background

Recent work from our lab has demonstrated rapid topographic reorganization in adult human V1 and consequent perceptual elongation following short-term deprivation<sup>1</sup>.

Specifically, we patched one eye, depriving the cortical representation of the blind spot (BS) of its typical visual input.

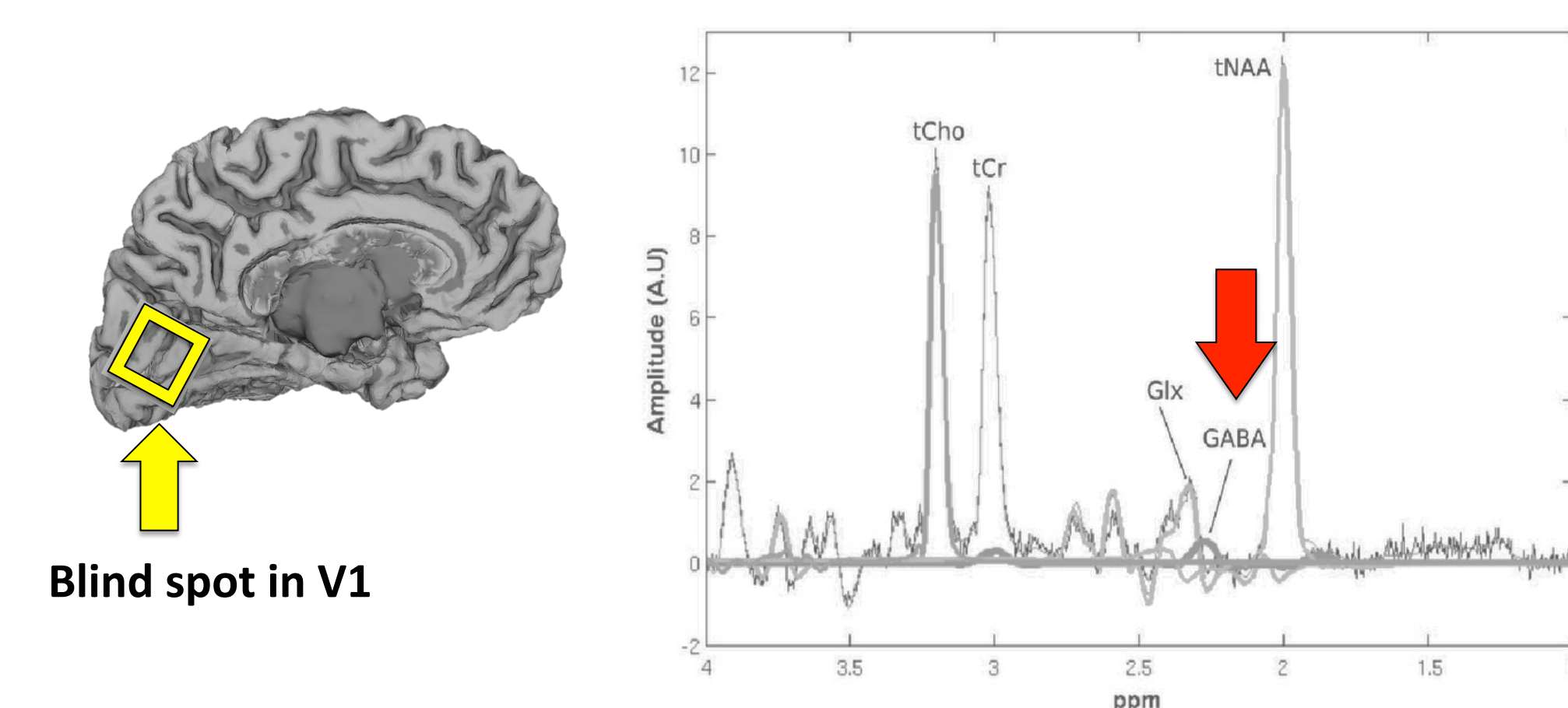
After **10 minutes**, this portion of V1, which typically responds to stimuli inside the BS only, began responding to stimuli *outside* of the BS, and these stimuli were perceived as elongated (e.g., squares were perceived as rectangles), extending toward the BS.



**But what is the mechanism underlying these rapid neural and perceptual changes?**

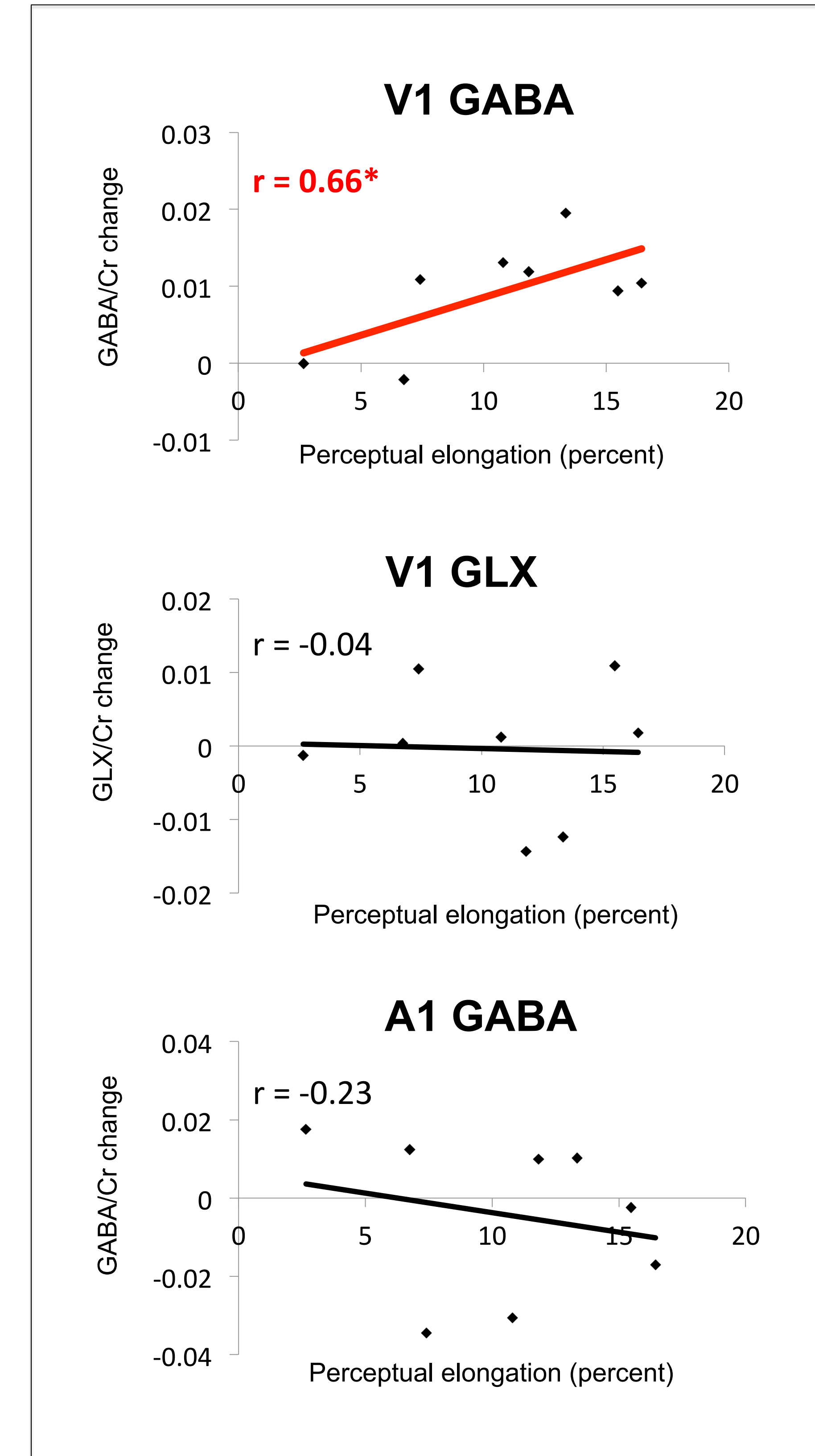
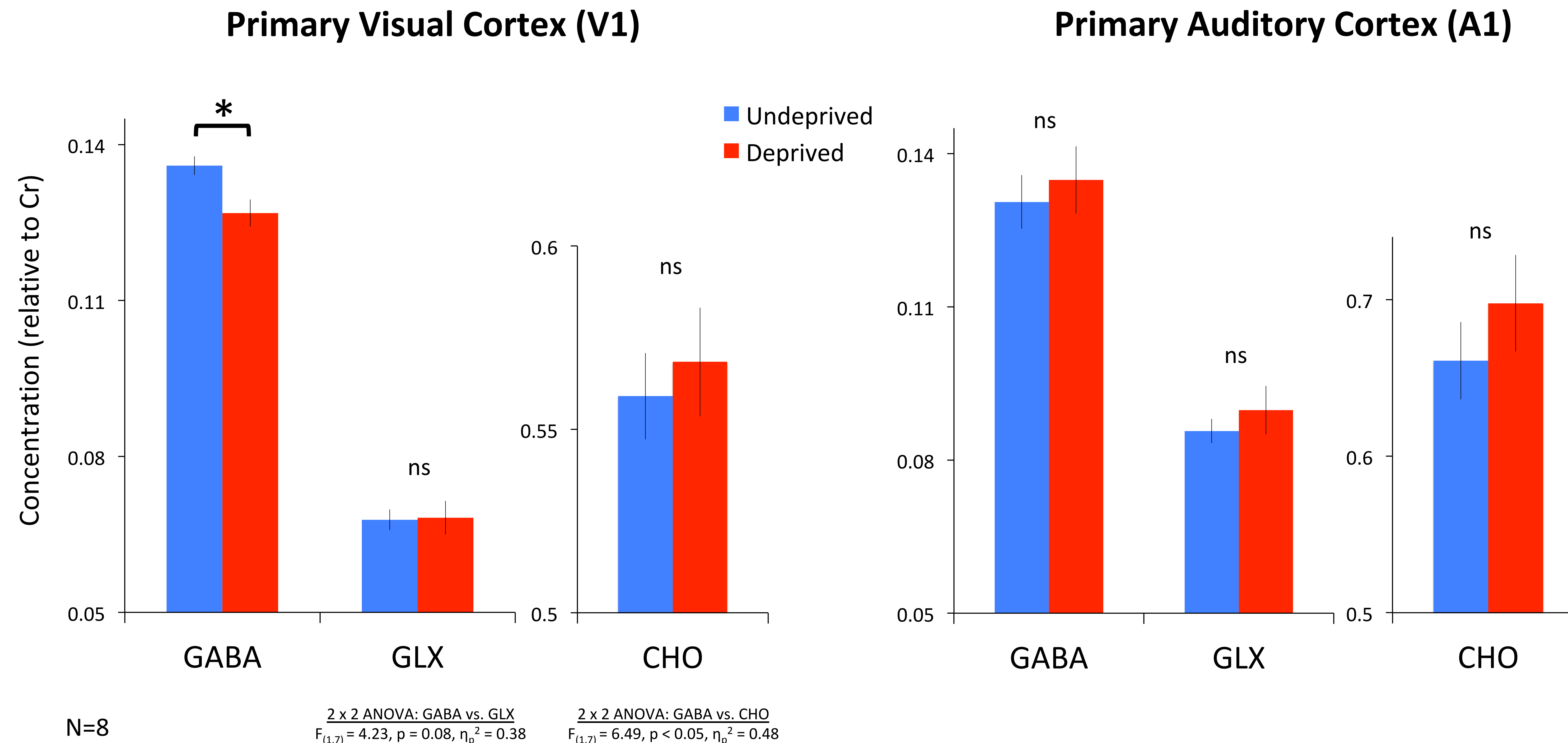
The short time scale of these changes suggests the **disinhibition of preexisting connections**, rather than the growth of new connections, as the underlying mechanism.

Here, using magnetic resonance spectroscopy (MRS) and psychophysics, we tested the hypothesis that rapid topographic reorganization in adult human V1 is mediated by **GABA** (the primary inhibitory neurotransmitter in the brain).



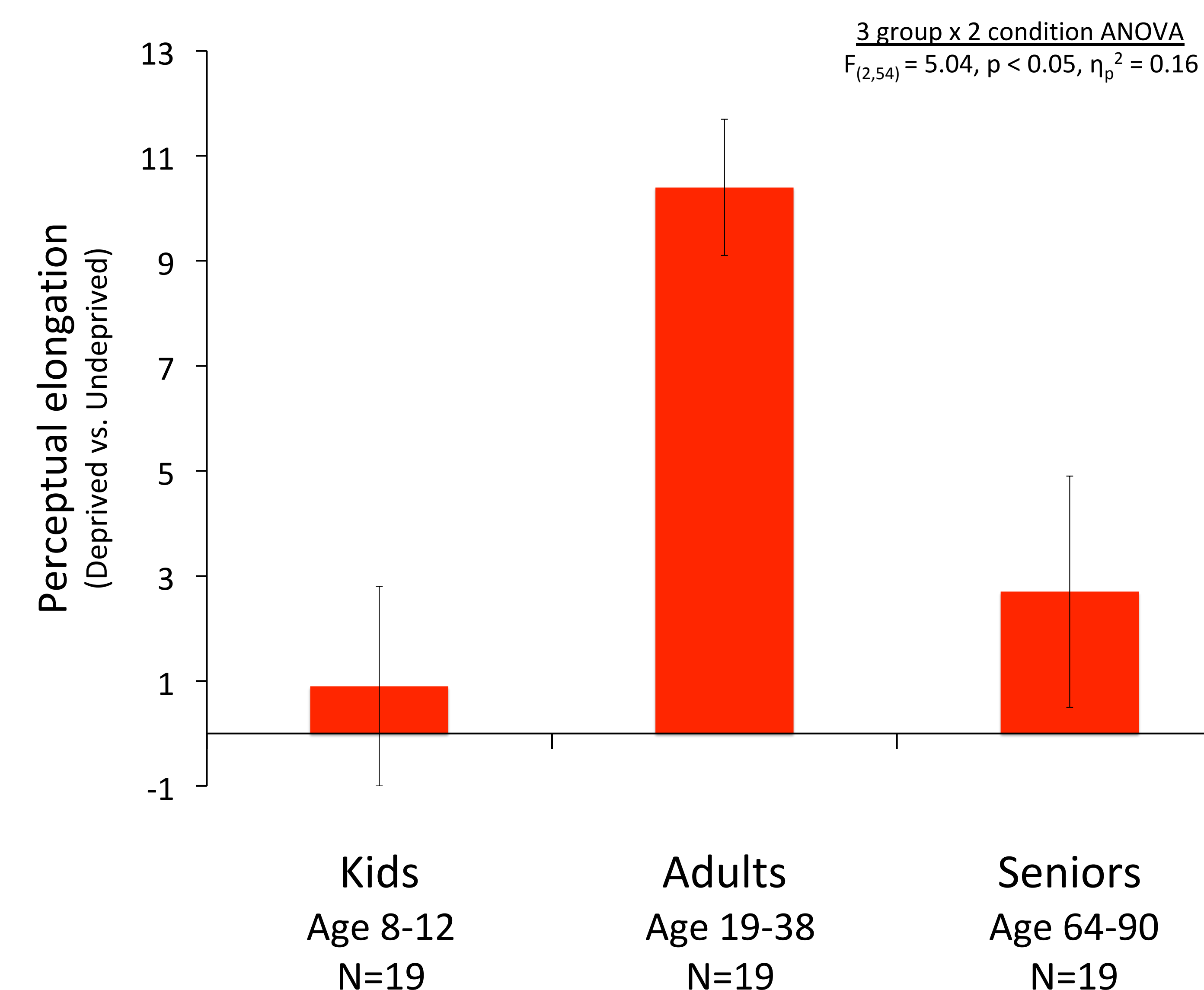
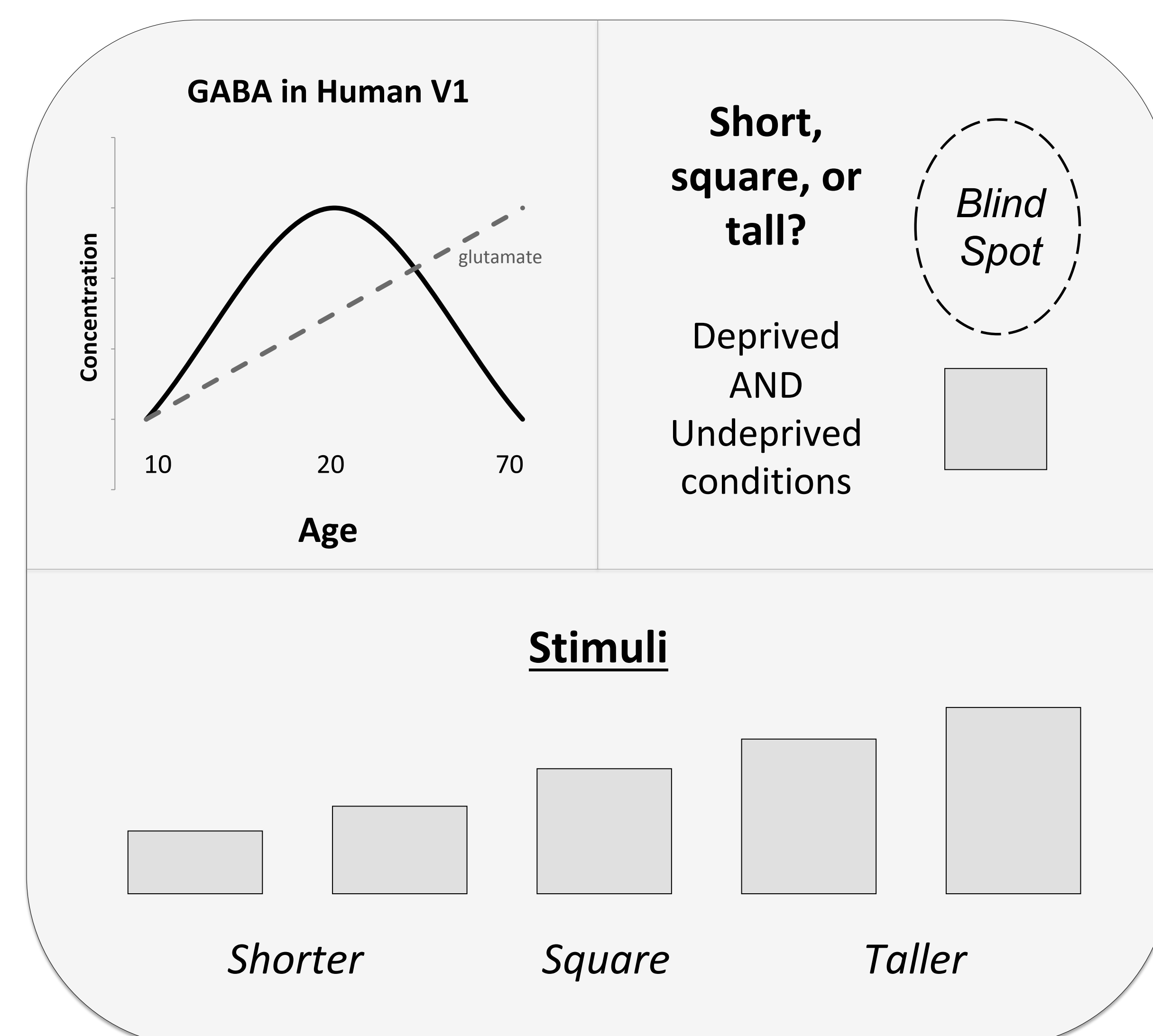
## Rapid reduction in V1 GABA following short-term deprivation

(MRS + psychophysics)



## Perceptual elongations parallel GABA concentrations across the lifespan

(psychophysics)

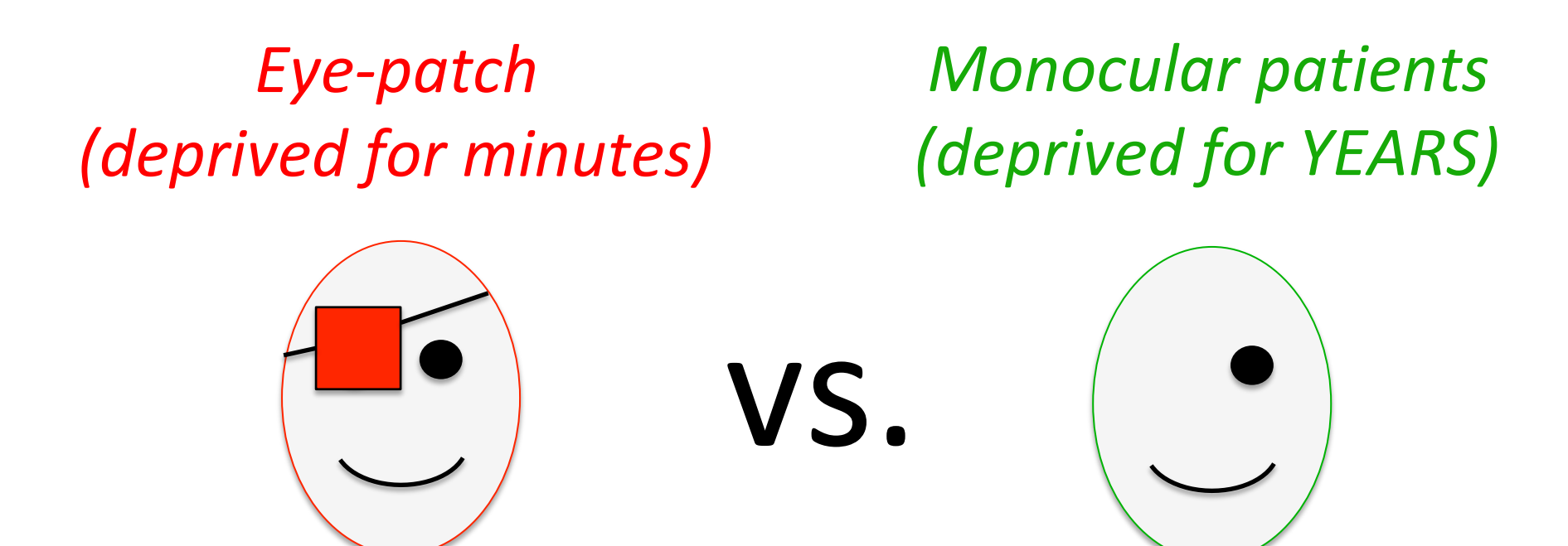


## Conclusion

We provide converging **neural (MRS)** and **behavioral (psychophysics)** evidence that rapid topographic reorganization in adult human V1 is mediated by GABA.

## Future directions

Is disinhibition the only mechanism, or are there additional mechanisms that continue to drive topographic reorganization during long-term deprivation?



## References:

1. Jamal, Y.A. and Dilks, D.D. (2020). Rapid topographic reorganization in adult human primary visual cortex (V1) during non-invasive and reversible deprivation. *PNAS*.