

Noise masking and crowding reveal two very different kinds of spatial integration



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DEMOS

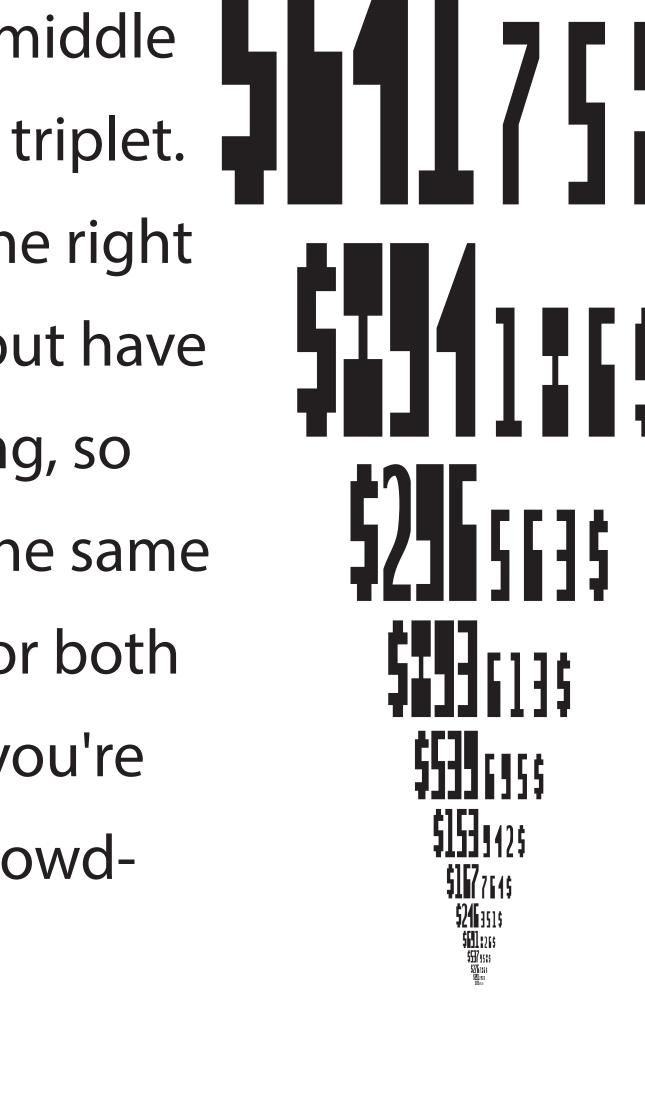
Masking Identification becomes harder as the

noise radius grows, up to a point. We call that radius the masking distance.



Crowding

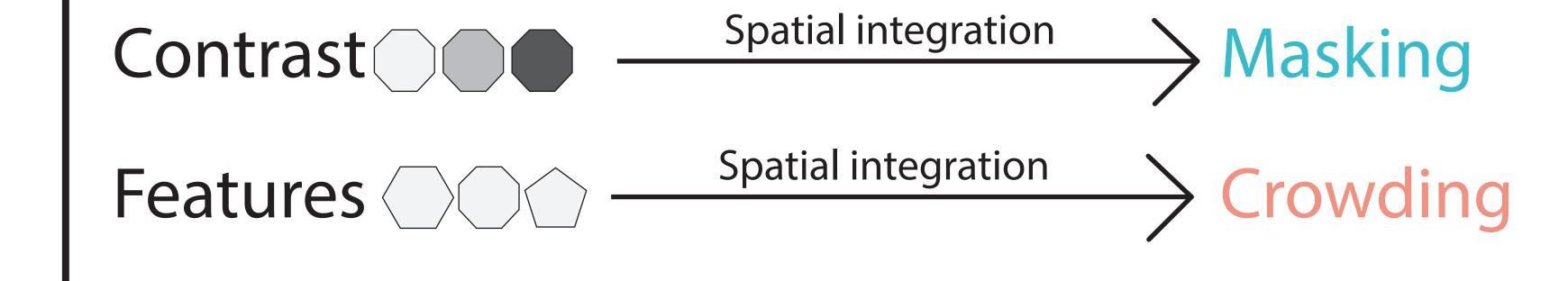
Identify the middle digit in each triplet. Triplets on the right are smaller but have larger spacing, so you'll have the same thresholds for both sides when you're limited by crowd-



QUESTION

Is there a universal mechanism that captures how the visual system integrates information over space?

INTRODUCTION



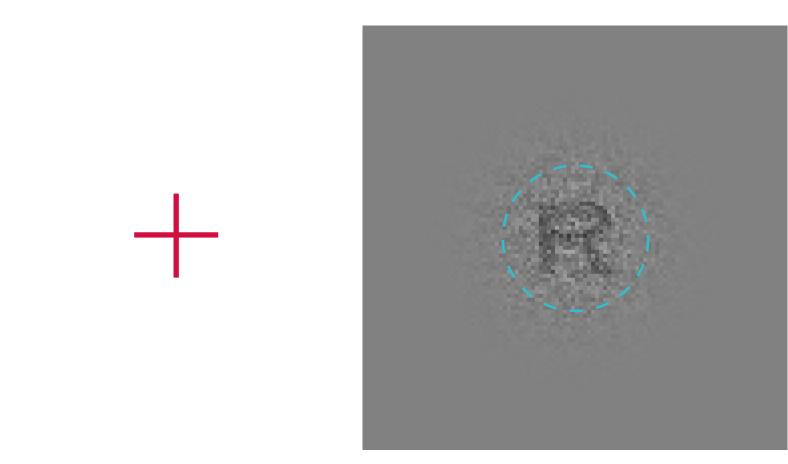
METHODS

Masking

Design: superimpose gaussian noise. Manipulate letter size, noise radius and eccentricity.

Task: identify the letter (new data).

Measure masking distance: radius beyond which further noise no longer increases threshold.

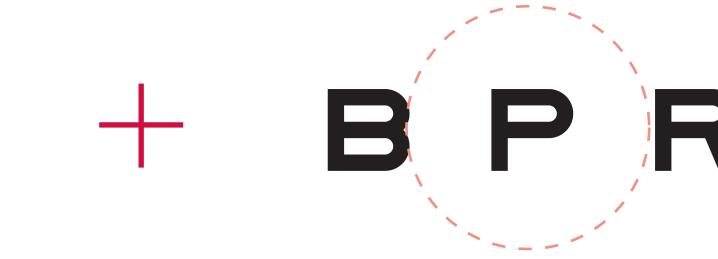


Crowding (published data, Pelli et al. 2016.)

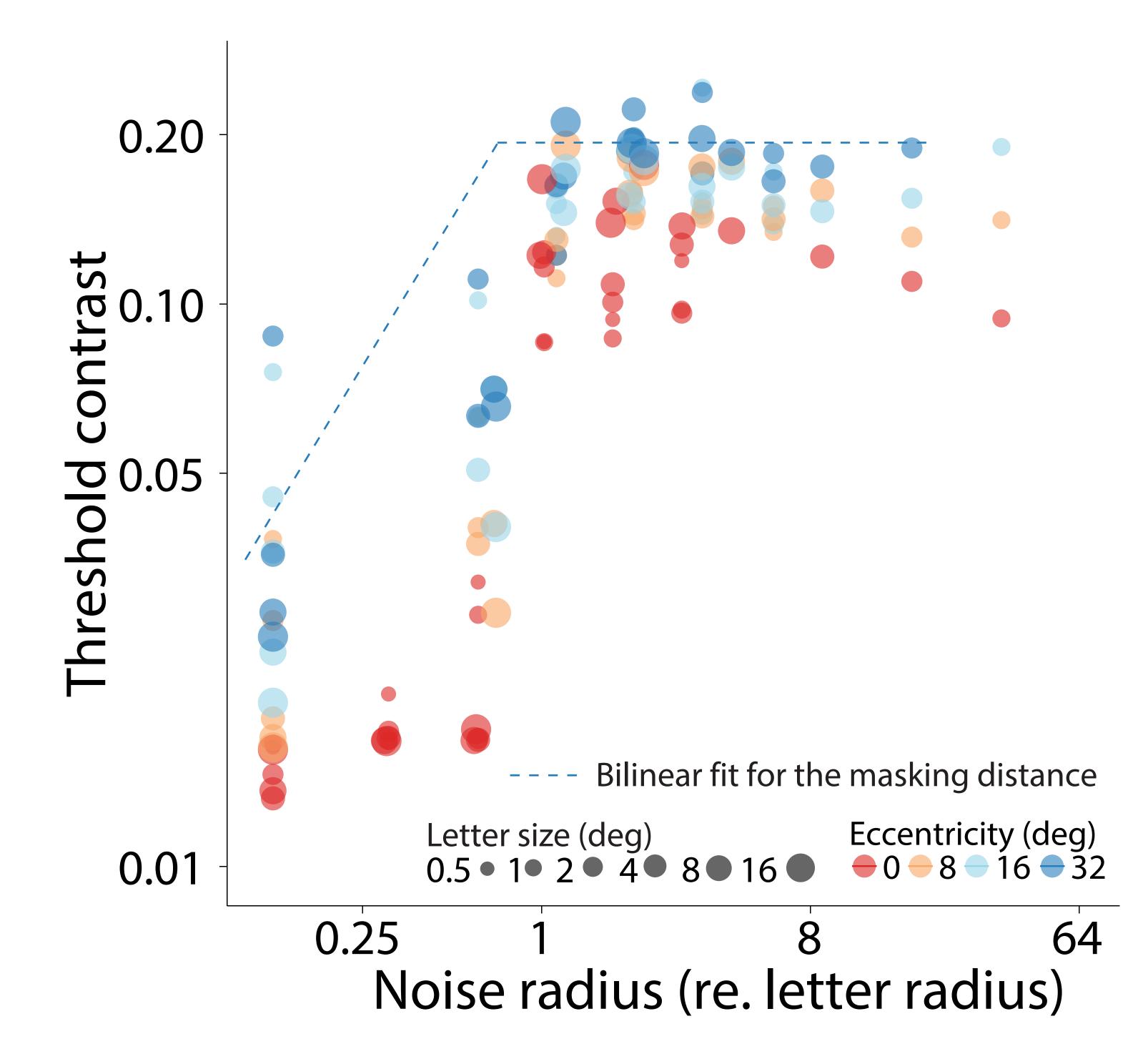
Design: manipulate letter size, letter spacing and eccentricity.

Task: identify the middle letter.

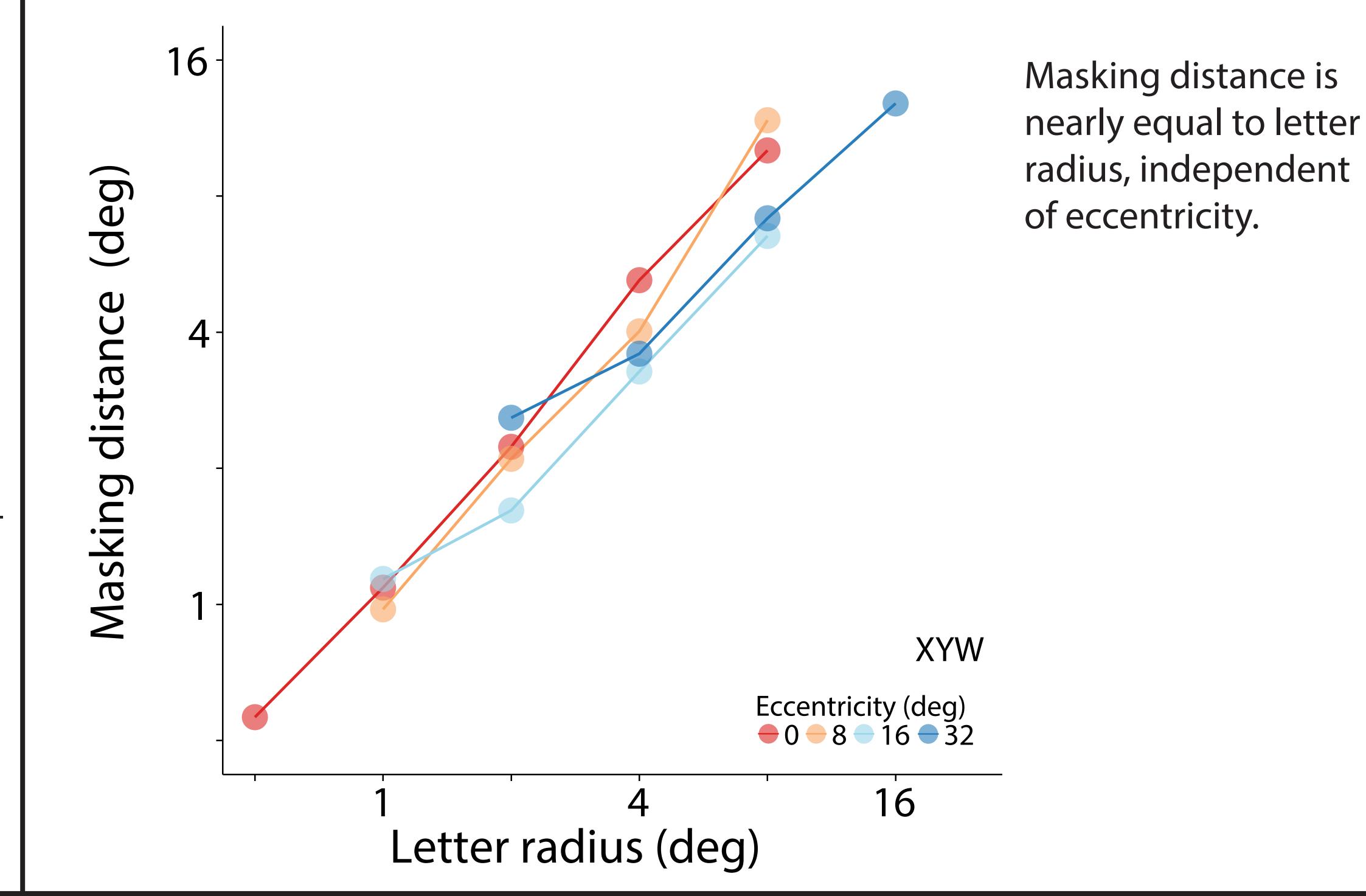
Measure crowding distance: minimal center-to-center spacing between letters that still permits identification.



RESULTS

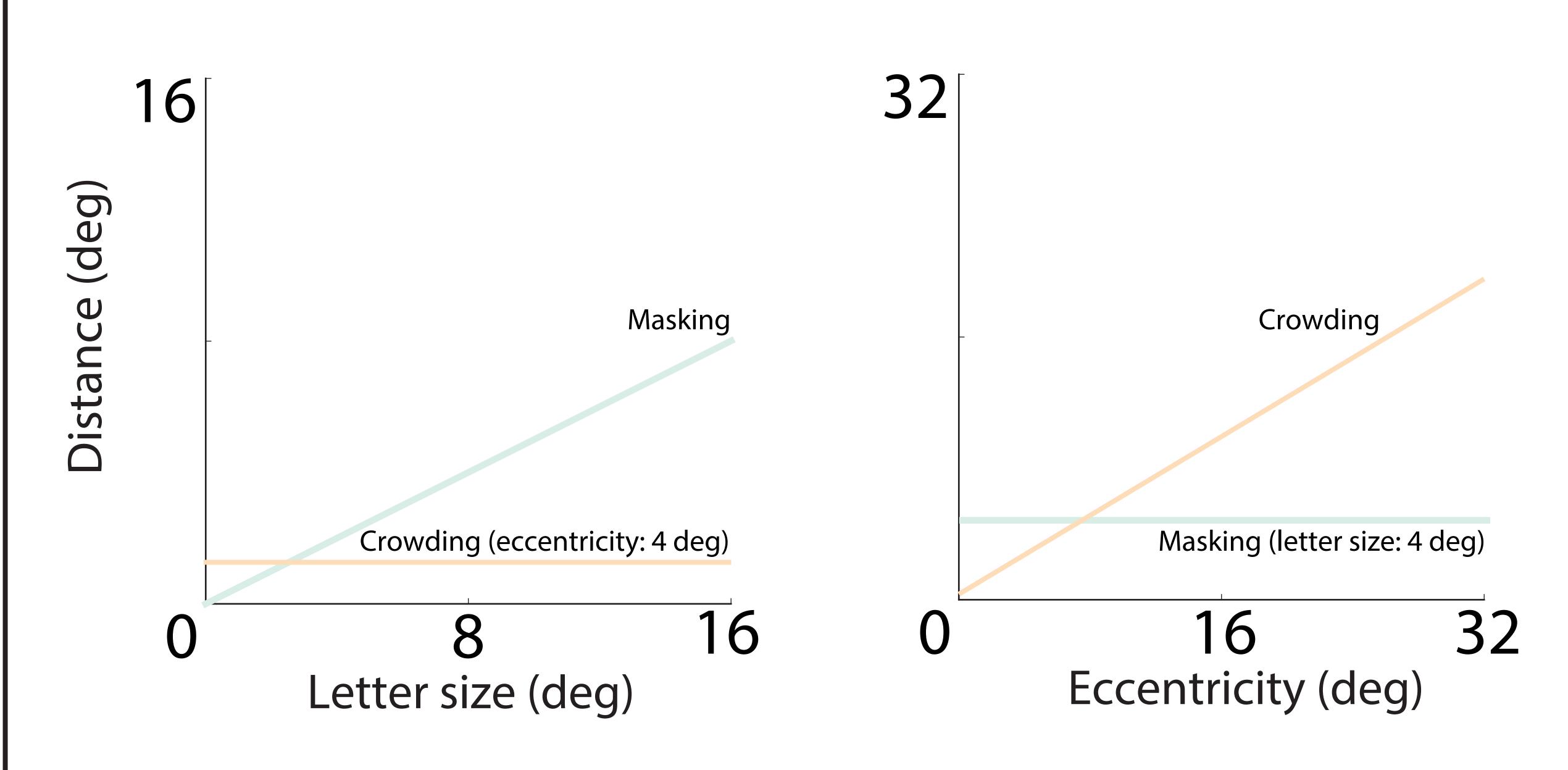


of masking. Dashed line is the fit for the largest letter at largest eccentricity.



For each eccentricity and letter size, we observe a saturation

DISCUSSION



Crowding distance is roughly 0.15 deg at fovea^[1], and is independent of letter size. Masking distance roughly equals letter radius, and is independent of eccentricity. The ratio of crowding to masking distance ranges widely, e.g. from just 2 for a 0.3 deg letter at 1 deg eccentricity, to 10 for a 2 deg letter at 32 deg eccentricity.

CONCLUSION

- The mechanism of spatial integration is very different in masking and crowding.
- Letter size, eccentricity and spacing determine which mechanism dominates.

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