

# Can “Equivalent Eccentricity” Account For Amblyopic Vision ?

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R

Identify one  
unflanked letter

S  
HRO  
N

Identify one  
flanked letter

## PURPOSE

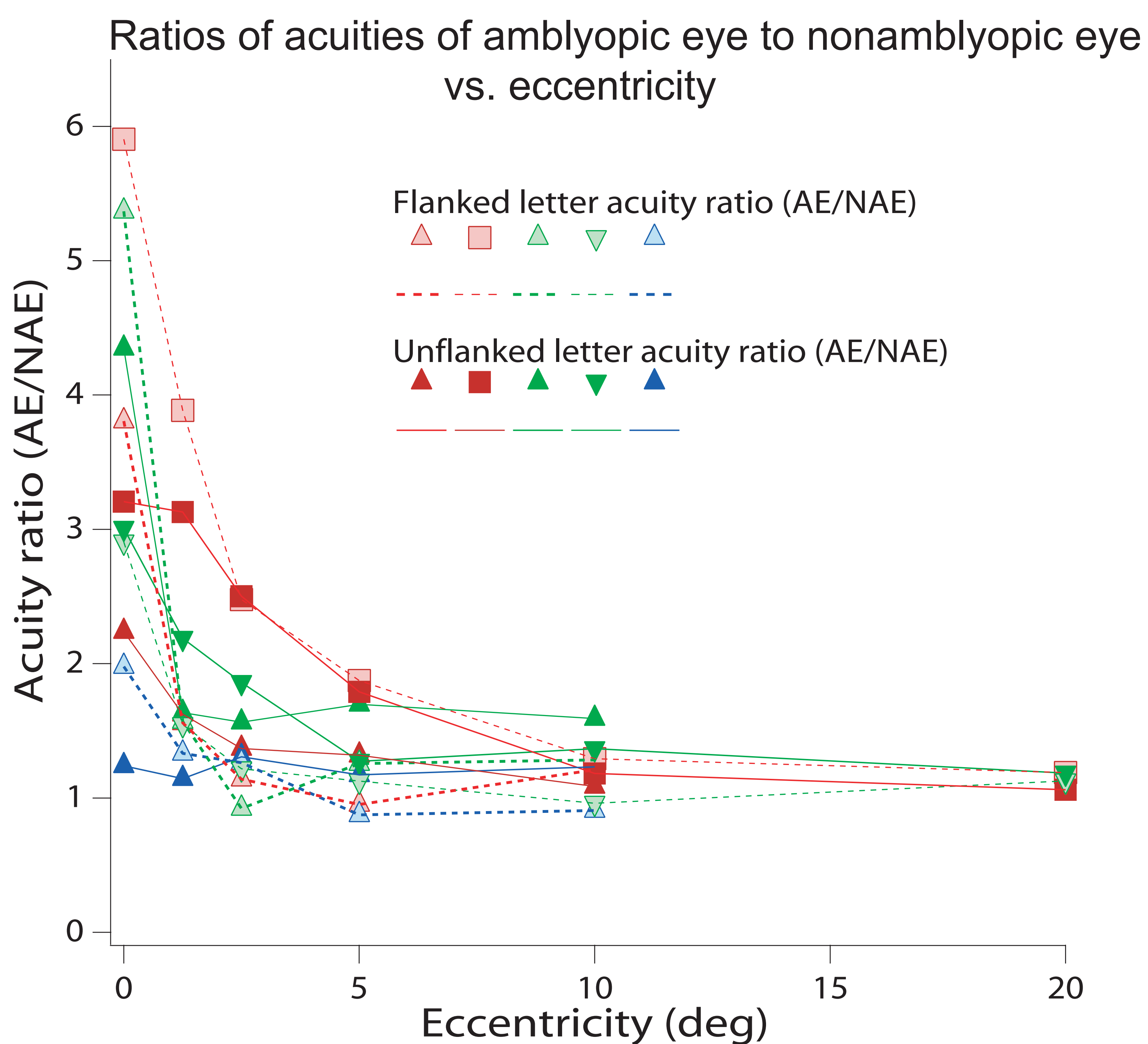
Crowding is a well-known characteristic of central vision in amblyopia. Here we ask whether an equivalent-eccentricity model can explain the increased crowding in the central field of amblyopes. Specifically, we ask whether, given a specific unflanked letter acuity level, we can predict the flanked acuity of the amblyopic eye based on that of the normal periphery.

## METHODS

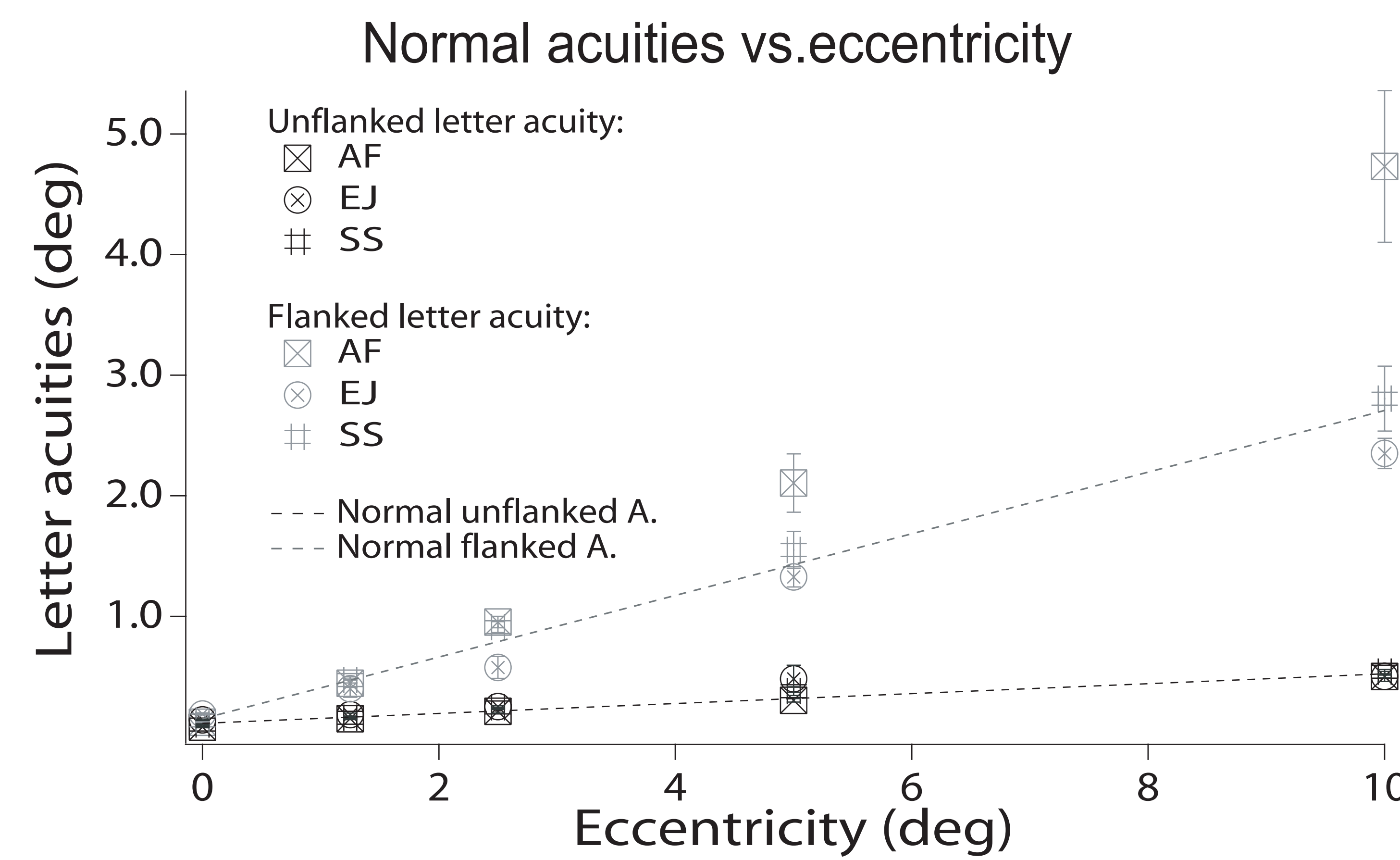
We measured both unflanked and flanked letter acuity at 5 different eccentricities, from the fovea to 10 degrees in the lower visual field of three normal observers, and both foveal acuities of thirteen amblyopic observers. Here unflanked acuity is the ordinary isolated letter acuity and flanked acuity measures the critical spacing for crowding (Bouma, 1970 \*). The test stimuli for measuring acuity are shown above. The equivalent eccentricity is the eccentricity in the normal periphery that yields the same acuity as the amblyopic fovea.

## RESULTS

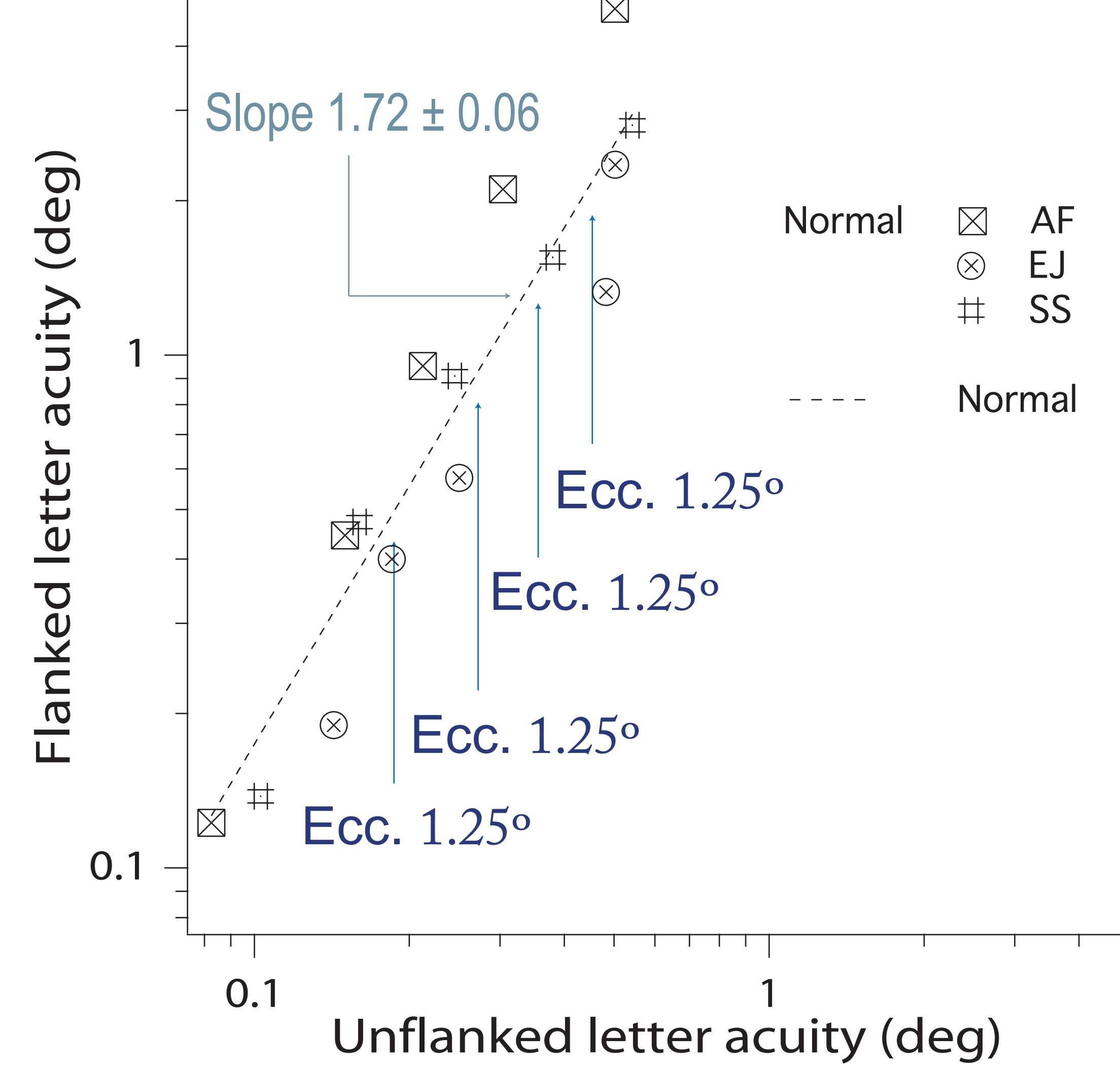
1. The amblyopic acuity deficit is confined to the central field.



2. Normal peripheral vision has substantially poorer flanked than unflanked acuity.



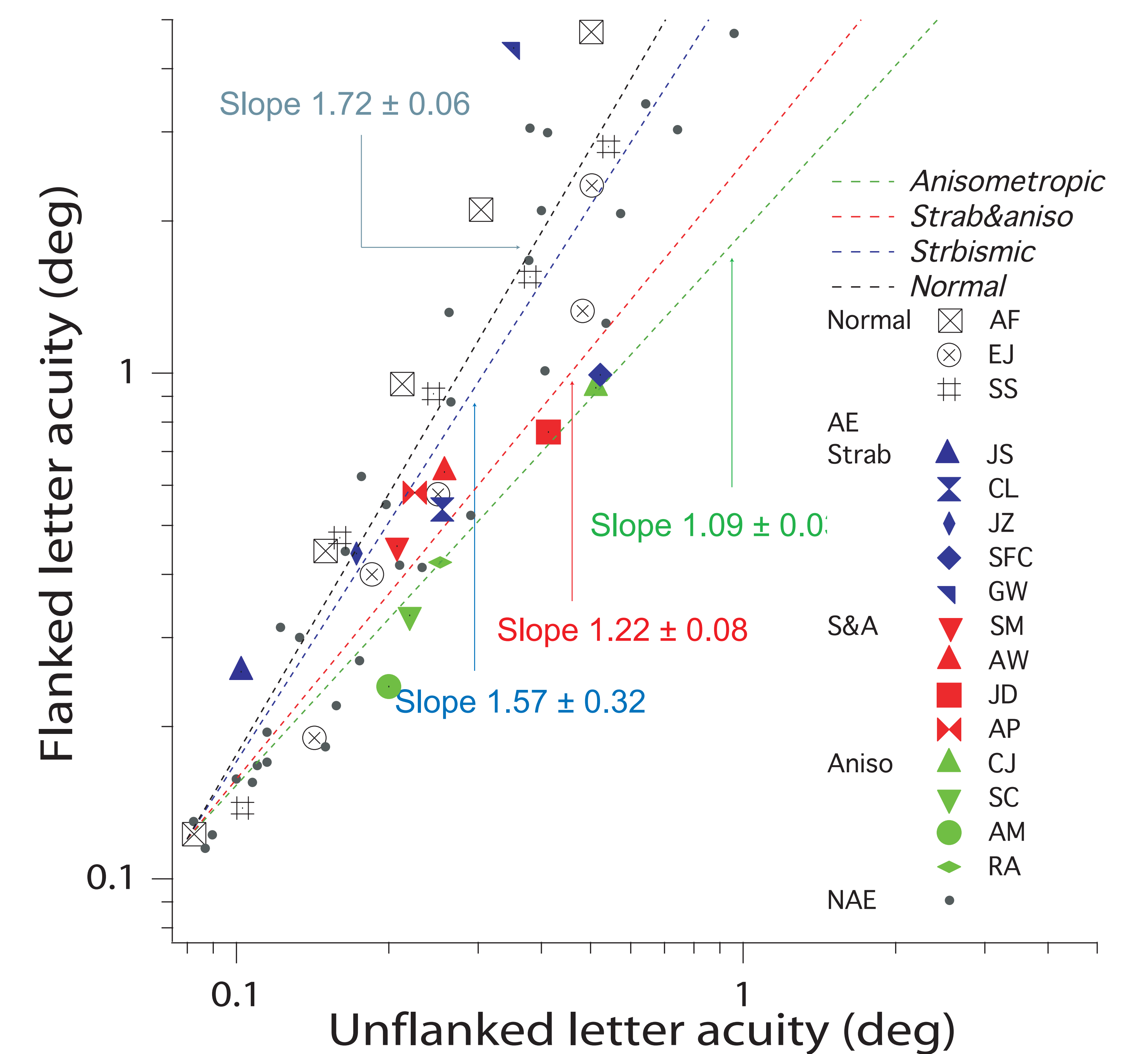
## Normal flanked vs. unflanked acuity



Flanked acuity is much poorer than unflanked acuity in the periphery. The regression line has a log-log slope of  $1.72 \pm 0.06$ . Does the central vision of the amblyopic visual system follow the same relationship?

3. Normal periphery predicts strabismic amblyopic acuities.

## Flanked vs. unflanked letter acuities in the central field of amblyopic visual system



## CONCLUSION

Equivalent eccentricity predicts the critical spacing of crowding in strabismic amblyopia, but not in anisometric amblyopia whose flanked vs. unflanked acuities plot has a slope close to 1 on the log-log axes, indicating that the critical spacing of crowding is proportional to the unflanked acuity.

The fair agreement of equivalent eccentricities estimated by measuring unflanked and flanked letter acuities suggests that equivalent eccentricity provides a reasonable account of acuity and crowding in strabismic amblyopia.

\* Bouma H. (1970) Interaction effects in parafoveal letter recognition. *Nature*, 226, 177-178.

Levi, D. M., Song, S., & Pelli, D. G. (2007). Amblyopic reading is crowded. *Journal of Vision*, 7(2). In press.