Published in final edited form as:

Optom Vis Sci. 2019 February ; 96(2): 143. doi:10.1097/OPX.0000000000001341.

Authors' response: Visual Acuity Is Not the Best at the Preferred Retinal Locus in People with Macular Disease

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In our paper entitled “Visual Acuity Is Not the Best at the Preferred Retinal Locus in People with Macular Disease”,¹ we reported that the preferred retinal locus does not correspond to the retinal location with the best visual acuity for five participants with macular disease. Our paper attracted the commentaries of Markowitz and Daibert-Nido,² which can be summarized as follows: our paper did not address the role of oculomotor functions; Markowitz and his colleagues had already reported that the preferred retinal locus is not the location with the highest retinal sensitivity³; and the concept of a functional retinal locus.

The main goal of our paper was to test the hypothesis that the preferred retinal locus corresponds to the location with the best acuity (p. 830), but not the role of oculomotor functions. This does not, however, mean that we do not value the importance of oculomotor functions on the functional vision for people with macular disease, as can be seen by several of our recent studies.⁴⁻⁵ (and Chung and Kumar. IOVS 2016;57:E-Abstract 4304, Chung et al. IOVS 2017;58:E-Abstract 5628) In addition, our paper did allow for the effects of fixational eye movements because the acuity stimuli were presented for 300 ms.

Markowitz and Daibert-Nido claim that “the time honored consensus that levels of visual acuity are directly correlated to highest retinal sensitivity”. Unfortunately, they did not provide any citations to this claim. Retinal sensitivity (a detection task) and visual acuity (a resolution task) represent two different measurements of visual functions, and are subjected to different limiting factors.⁶ Thus we believe that the retinal location with the highest retinal sensitivity does not necessarily have to be the same location with the highest visual acuity. This is especially so in diseased eyes when the integrity of the retina and the area of the relatively “healthy” retina must be taken into account. Indeed, there is evidence that retinal sensitivity does not correlate with visual acuity in diseased eyes.⁷ Although Shima et al.³ reported a significant correlation between visual acuity and retinal sensitivity, their acuity stimuli were presented on a computer display, instead of being delivered to specific locations on the retina, as we did¹. Hence, they did not have the information on the retinal loci adopted by their participants for acuity measurements, and thus they did not have evidence that the retinal location with the highest retinal sensitivity was also the location with the highest acuity. Additionally, when they compared the preferred retinal locus with the location with the highest retinal sensitivity, they referred to the *eccentricity* of the locations. This is problematic because two retinal locations could have the same eccentricity but their locations could be very different. We were hoping to compare our results with theirs, but unfortunately, no data were presented in their publication.

Markowitz and Daibert-Nido² also claimed that our data showed that the preferred retinal loci were generally located in areas close to the locations with the highest “retinal sensitivity”, thus supporting their proposed concept of a functional retinal locus. While we do not object to the concept of a functional retinal locus, the critical issue is how large of an area should be considered as the functional retinal locus, because any two separated locations could fall within the same functional retinal locus as long as the area of the locus is large enough. Further, a careful examination of Figure 2 in our paper would reveal that for each of the participants (even with S4 excluded), there are definitely several retinal locations not in the near vicinity of the preferred retinal locus that yielded better acuities than that at the preferred retinal locus.

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