

Modeling the frequency-of-seeing curves in patients with glaucoma as a weighted sum of typical psychometric functions

Eiji Murotani (Kahoku Eye Clinic, Japan)

✉ emurotani@gmail.com

Purpose

- To demonstrate computationally that the frequency-of-seeing (FOS) curves in patients with glaucoma can be modeled as a weighted sum of typical psychometric functions.

Methods

- The author prepared a set of psychometric functions that represent each threshold from <0 to 40dB, using zero function (<0 dB) and cumulative gaussian function with the same slope (0~40dB) (Fig. 1A).
- A weighted sum of these functions was calculated based on the following weights assigned to each threshold: $\lambda(0<\lambda<1)$ for <0 dB, $(1-\lambda)\varphi(\mu, \sigma)$ for 0~40dB, where $\varphi(\mu, \sigma)$ is the gaussian density function with mean μ and standard deviation σ (Fig. 1B).

Results

- The weighted sum resulted in a flat and shallow sigmoid curve, which was similar to the FOS curves at regions with glaucomatous damage (Fig. 1C).
- The decrease in maximum response probability corresponded to λ , and the steepness of slope was linked to σ . Furthermore, the luminance of inflection point agreed with μ .

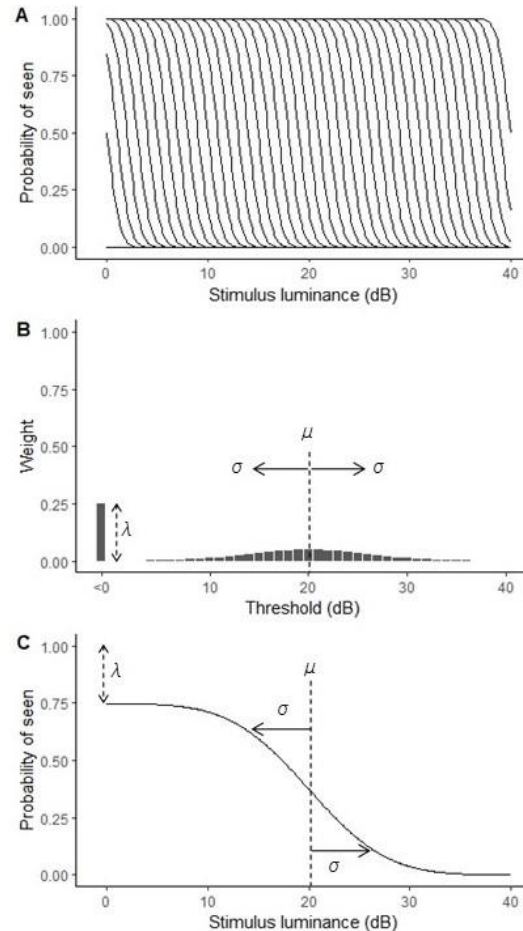


Fig. 1 Schematic representation of the model.

Examples

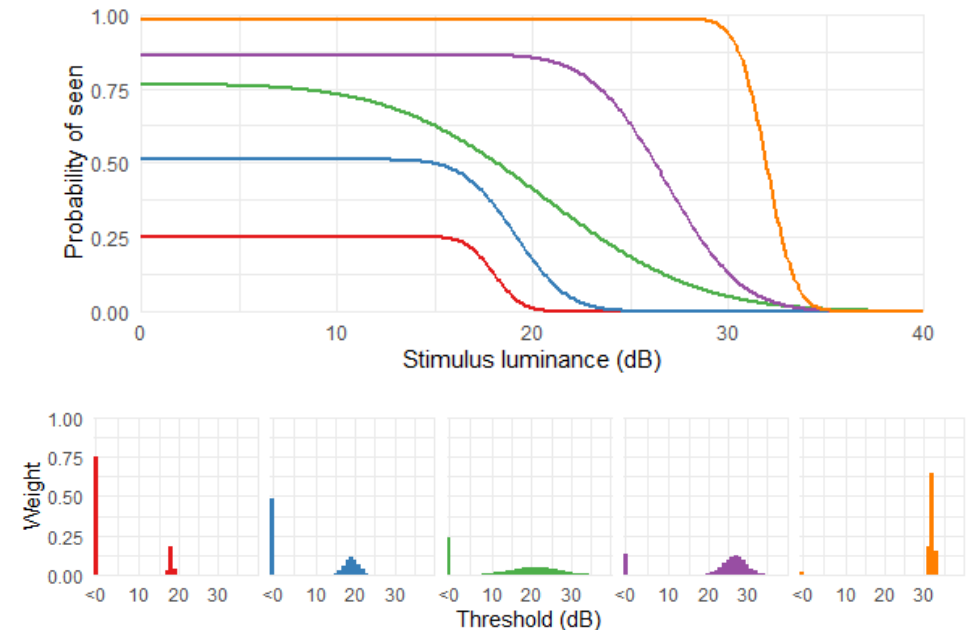


Fig. 2 FOS curves (upper panel) corresponding to different weight distributions (lower panel). The colors were changed for clarity.

Conclusions

- This result raises the possibility that a single FOS curve in patients with glaucoma may consist of multiple psychometric functions.

The author has no conflict of interest to disclose.