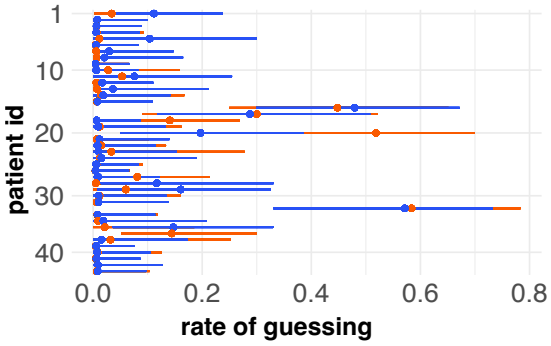
A **Robust logistic regression with `guessing` parameter**

$$\mu_i = \beta_0 + \beta_{pat,i} + \beta_{eye,i} + \beta_{clr,i} + \beta_{eyeXclr,i} + \beta x_i$$

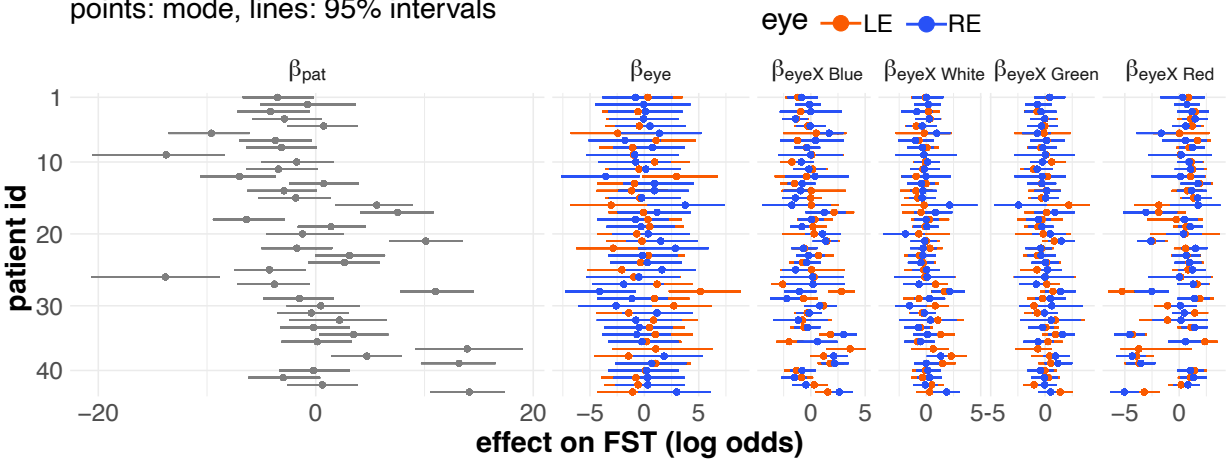
$$\theta_i = \underbrace{\alpha_{eye,i}\frac{1}{2}}_{\text{'guessing'}} + \underbrace{(1-\alpha_{eye,i})logistic(\mu_i)}_{\text{logistic regression}}$$

$$y_i \sim Bernoulli(\theta_i) \qquad y_i = \begin{cases} 1 & \text{if correct} \\ 0 & \text{if wrong} \end{cases}$$

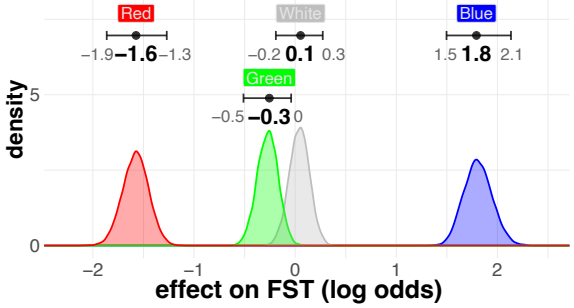
B **Estimate of 'guessing' (α_{eye})**
points: mode, lines: 95% intervals



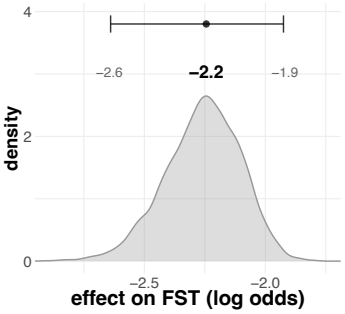
C **Estimate of effect of patient(β_{pat}), eye(β_{eye}), eyeXclr($\beta_{eyeXclr}$)**
points: mode, lines: 95% intervals



D **Estimate of color effect (β_{clr})**
points: mode, lines: 95% intervals



E **Overall mean (β_0)**
point: mode, lines: 95% intervals



F **Effect of intensity (β)**
point: mode, lines: 95% intervals

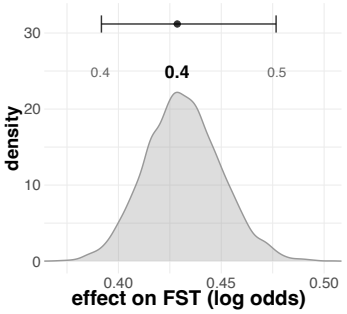


Figure S1

Analysis of FST

A. FST Model. Patient's responses y_i (correct or wrong) to a light stimulus were analyzed with a logistic regression model. In a typical FST experiment, the intensity of the light stimulus (x_i, measured in dB) is gradually decreased as the subject pushes a bottom if they can perceive the light. We used multilevel (hierarchical) modeling, to estimate the effect of different light stimulus color (β_{clr}), patient (β_{pat}), and patient eye (β_{eye}) on the probability of correctly detecting the light stimulus. In order to allow higher freedom for estimates of each eye to vary at different light color we added an interaction term for patient eye and light color ($\beta_{eyeXclr}$). We included this interaction term based on the a priori hypothesis that the progression of disease and/or degeneration may differ between the left and right eyes, which could result in differences in responses to stimuli of different colors. The probability of seeing the light stimulus is given by the logistic model and a 'guessing' parameter (α), which is estimated for each eye. This parameter accommodates data points that do not conform well with the logistic regression.

B-F. Posterior estimates of FST model. B. Estimates of 'guessing' (α) for each subject' eye. Although most of the subjects had a relatively small 'guessing' estimate (α) with the mode and 95% interval below 0.1 (=10% guessing), there were notable exceptions with very large guessing values (mode > 0.2) C. Estimates for effect of patient and eye. β_{pat} vary widely whereas β_{eye} and $\beta_{eyeXclr}$ variation is relatively smaller. Most of the patients have similar estimates for LE and RE although some patients seem to have a significant LE/RE difference. D. Estimated effect of color. There was a clear effect for the light color, with subjects being more sensitive to blue light than red light (Red < Green, White < Blue). E. Overall mean estimate. Each parameter was constrained so that $\Sigma\beta_k = 0$ (sum to zero constrain) and the effect of each parameter is shown as deviation from the overall mean (β_0). F. Estimate of effect of light intensity (db).