

A

$$\vec{\mu}_i = \vec{\beta}_0 + \beta_{pat,i} + \beta_{eye,i} + \beta_{clr,i} + \beta_{eyeXclr,i}$$

$$\Sigma_{color} = \text{diag}(\vec{\sigma}) \times \Omega_{clr} \times \text{diag}(\vec{\sigma})$$

$$\vec{\mu}_i = [\mu_{before,i}, \mu_{peak,i}, \mu_{after,i}]$$

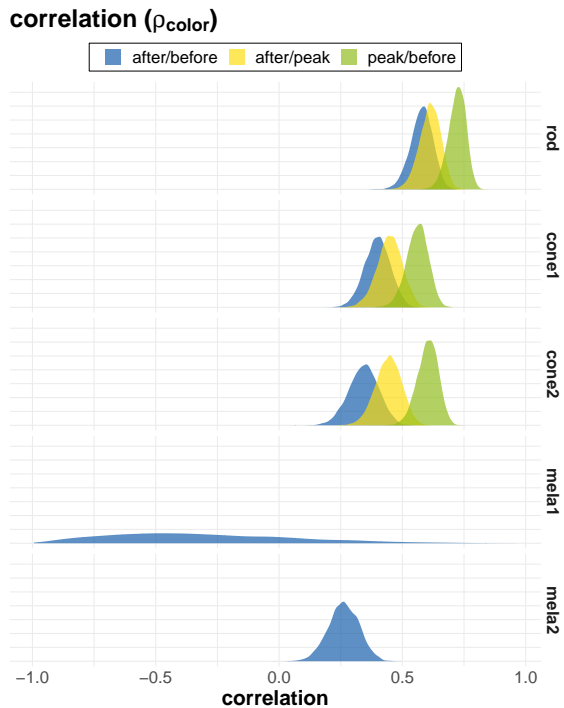
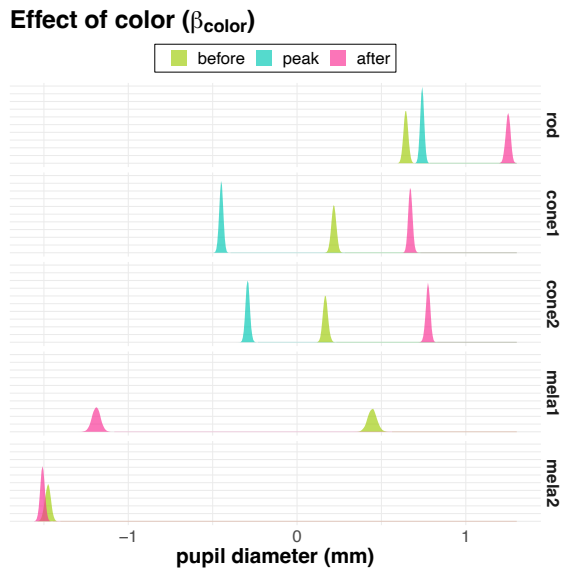
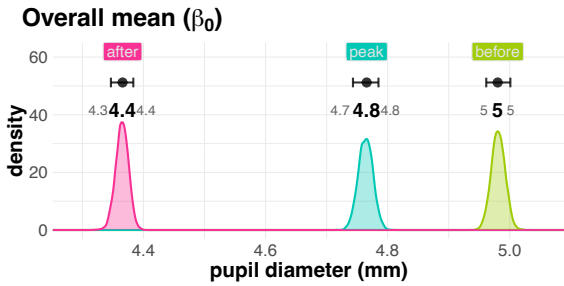
$$\vec{\sigma} = [\sigma_{before}, \sigma_{peak}, \sigma_{after}]$$

$$\vec{x}_i = t_\nu(\vec{\mu}_i, \Sigma_{clr})$$

$$\vec{x}_i = [x_{before,i}, x_{preak,i}, x_{after,i}]$$

$\Sigma \beta_k = 0$
 $k = pat, eye, clr, eyeXclr$

B Estimated effect of predictors



patient(β_{pat}), eye(β_{eye}), eyeXstim($\beta_{eyeXstim}$)

points: mode, lines: 95% intervals, oragne:LE, blue:RE

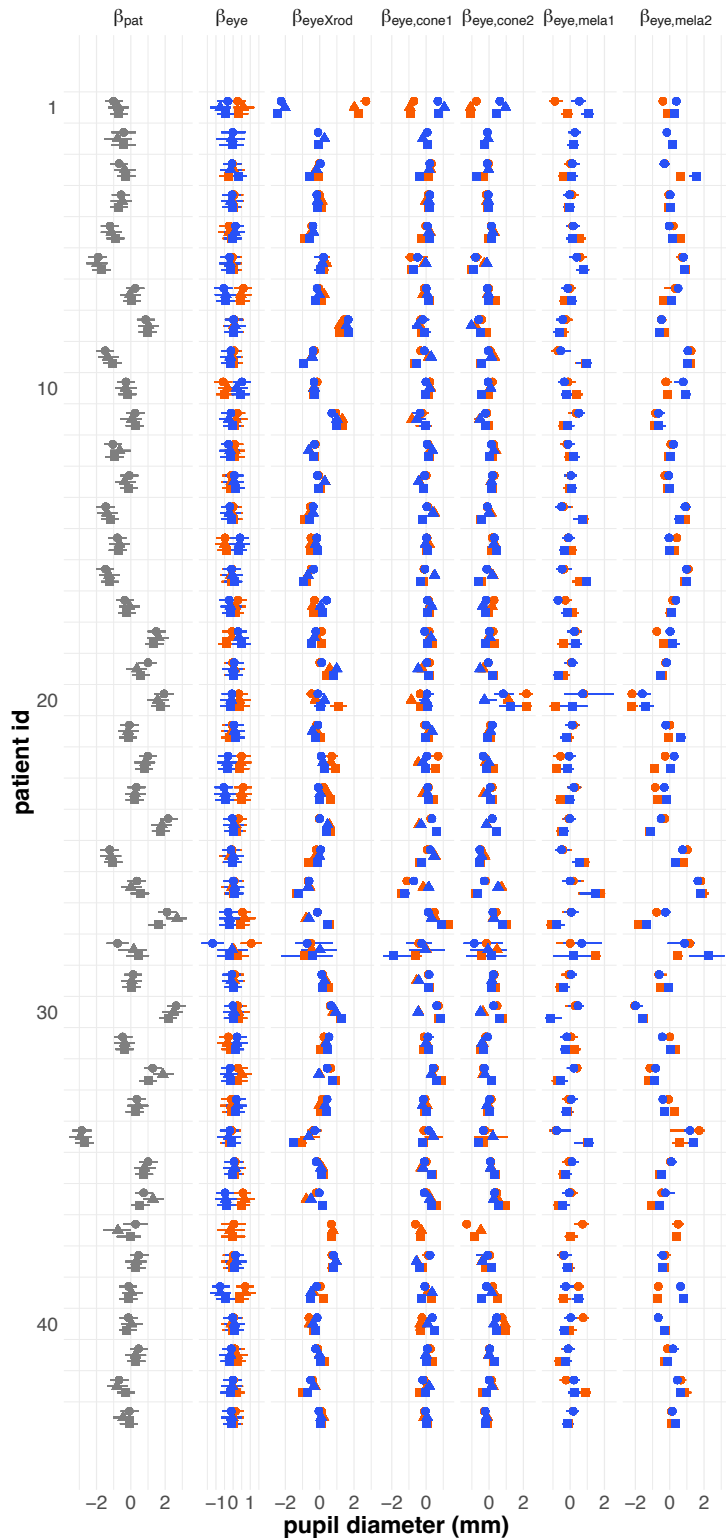


Figure S3

Analysis of Chromatic Pupillometry

A. Pupillometry model. Before, peak, and after were defined as the pupil diameter values before light stimulation (0 – 200 ms), peak value following light stimulation (200-2000 ms, defined only for rod, cone1, and cone2 stimuli), and value of the relatively flat region following light stimulation (3000 – 6000 ms) respectively. These pupil diameter measurements (x_{before} , x_{peak} , x_{after}) were modeled as a multivariate distribution, taking into account their inter-correlation. We used the t -distribution for robustness since some values may have been influenced by measurement artifacts (see Methods for details). Note that de degrees of freedom ν is also a parameter that is estimated from the data. Similar to the FST analysis, we incorporated patient (β_{pat}), eye (β_{eye}), color (β_{clr}), and an interaction term for eye and color ($\beta_{eyeXclr}$) to allow estimation of overall trends while allowing for flexibility in accounting for specific trends in each eye/color combination if strong evidence exists. Parameters were 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). The correlation between measurements was estimated for each stimulation condition (ρ_{clr}).

B. Posterior estimates of PM model. Estimates for effect off *patient*, *eye*, *eyeXclr* are shown per patient (rows). Note that for each patient id there are three estimates for before, peak, and after (shown as different shapes). Most of the variance in the data is explained by patient-to-patient variation ($\beta_{pat} > \beta_{eye}, \beta_{eyeXclr}$). Before, peak, and after values had a high correlation for rod, cone1, cone2, and mela2 stimulations. This trend is disrupted for the correlation between before and after measurements for mela1, which show most of the posterior distribution with negative correlation values. This indicates that, pupil diameter changes in mela1 are larger when pupil diameter is larger before the light stimulus.