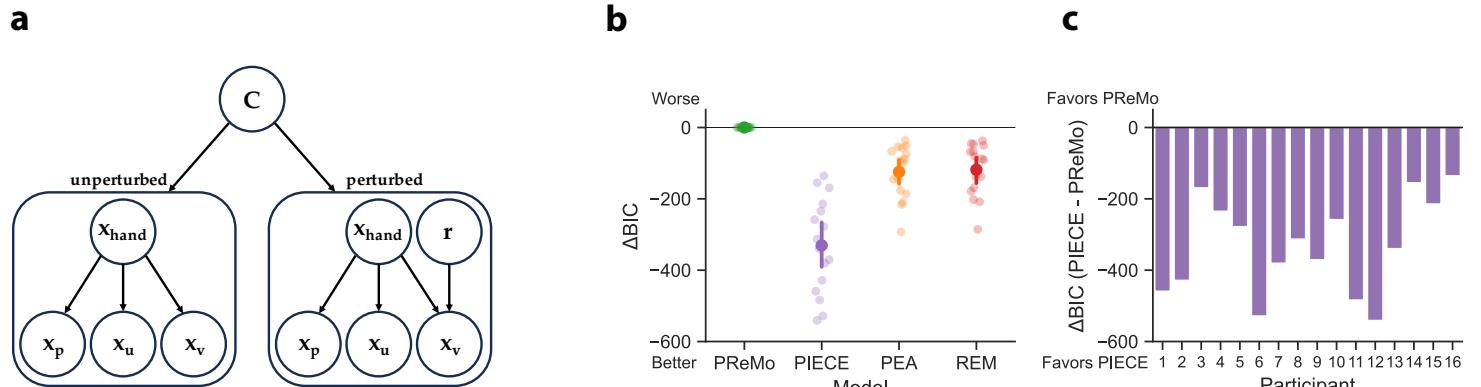
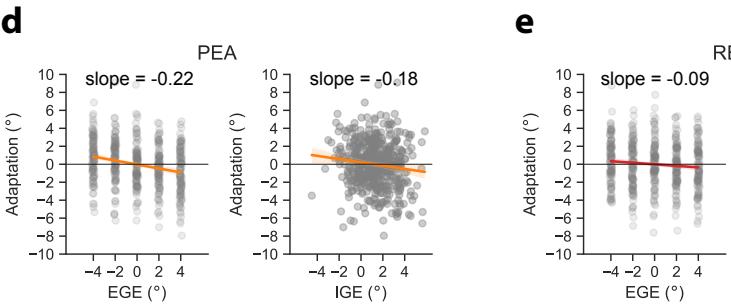
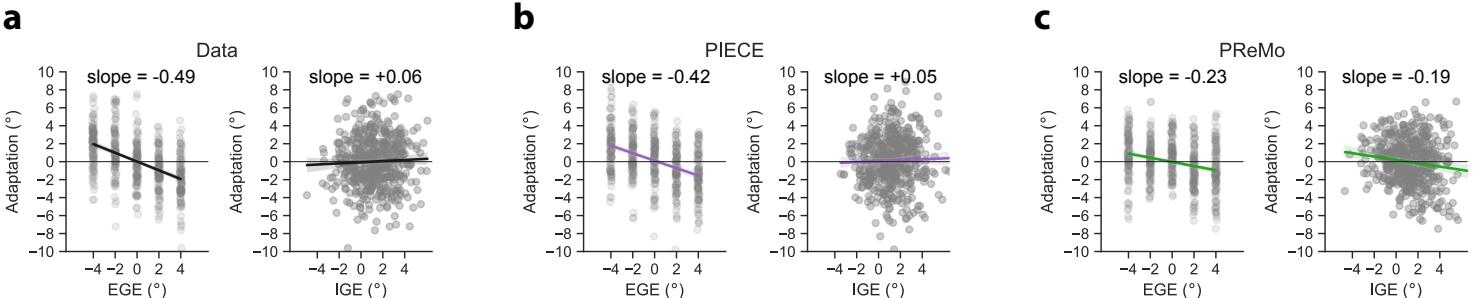


**Figure 1. Replication of EGE-IGE experiment of Ranjan & Smith (MLMC 2018).** (a) Experimental set-up. (b) Decomposition of total error into EGE (visuomotor rotation) and IGE (intrinsic motor noise) components. (c-d) Population-averaged adaptive responses were binned based on the level of EGE (shade of red) and IGE (shade of blue) and plotted as a function of EGE in c, and as a function of IGE in d. The vast majority of the variance in adaptive responses (99.1%) was explained by EGE. (e) Regression coefficients from an analysis of unbinned data. For all participants, sensitivity to EGE was much higher than the sensitivity to IGE, which was close to zero. Error bars represent bootstrapped 95% CIs and dots represent individual participants.



**Figure 2. Generative model and model selection.** (a) Graphical representation of PIECE. The ideal observer uses proprioceptive ( $x_p$ ), motor prediction ( $x_u$ ), and visual cues ( $x_v$ ) to compute posterior probabilities of  $C$ , the causal node, and whether the feedback was perturbed or not. In the perturbed case, visual feedback is a function of both the actual hand position,  $x_{hand}$ , and the rotation,  $r$ . The posterior on  $C$  weights the observer's estimate of  $r$ , which is computed with the Kalman filter. (b) Direct comparison of BIC scores of each model to PReMo's BICs. Lower scores indicate a better model fit. (c-e) For all 16 participants, PIECE outperformed each of the other three models.



**Figure 3. Posterior predictive check via simulation of adaptation data using MLEs of each model's parameters.** (a) Representative data from a single participant. Adaptive responses are a linear function of EGE and remain statistically independent of IGE. (b) PIECE model mimics the empirical data. Slope values indicate similarly high sensitivity to EGE and low sensitivity to IGE as those empirically observed. (c-e) PReMo, PEA, and REM all fail to capture the accurate parsing of errors into EGE and IGE. Thick colored lines and shading represent line of best fit and associated bootstrapped 95% CI (difficult to see in some cases, due to low variability), respectively.