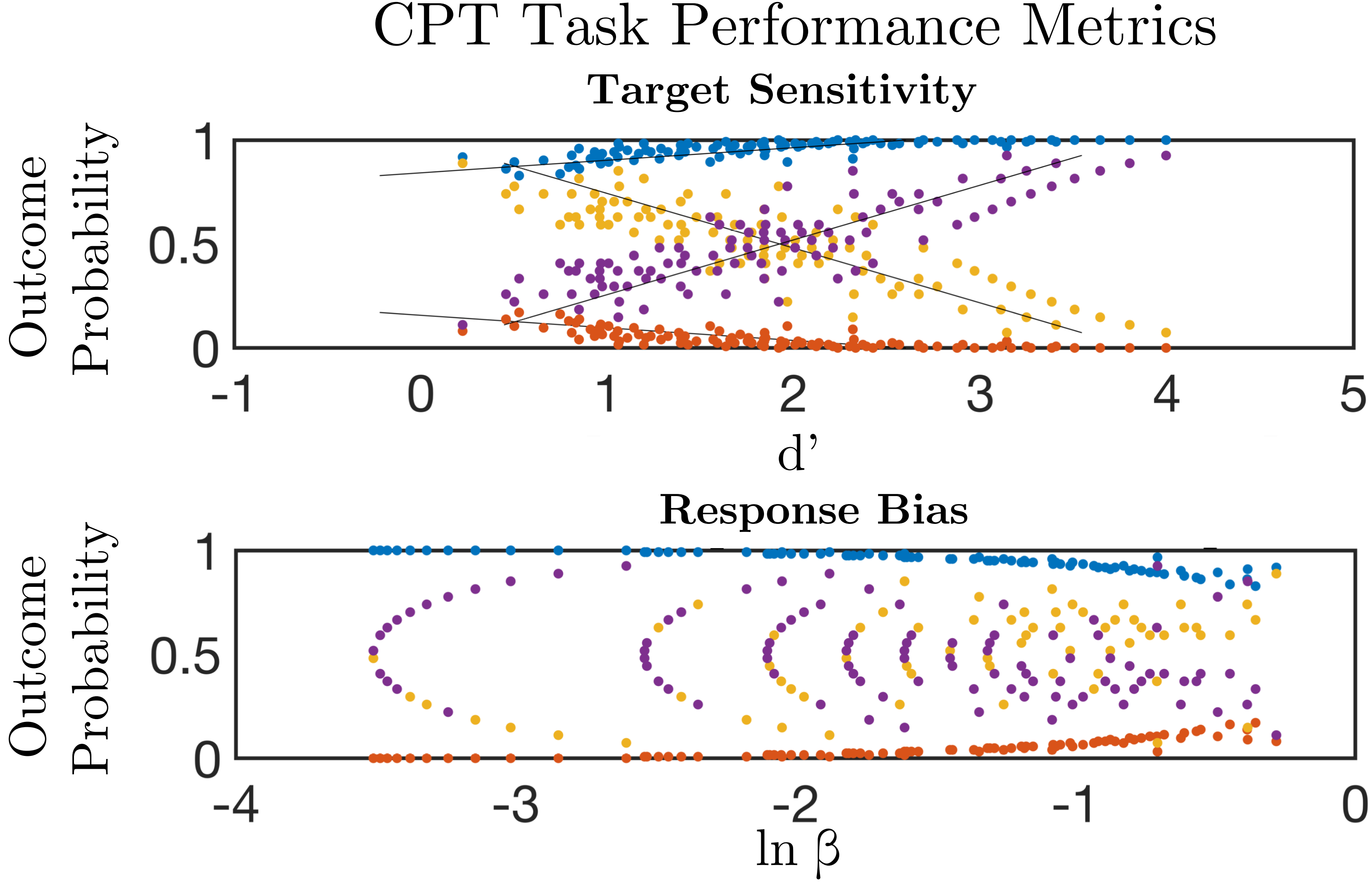


Figure 1 Signal detection theory metrics were used to estimate discriminative sensitivity (d') and overall response bias (ln β) for targets versus lures in the Continuous Performance Task (CPT). d' increased linearly with higher probability of a Correct Rejection (purple) and response to target (Hits, blue); and declined with greater False Alarm responses (yellow) and Miss rate (red) to targets (top). The probability of a Correct Rejection and response to target was a non-linear decreasing function of increasing response bias (bottom). Greater false alarm rates were indicative of elevated response bias and lower target-lure discrimination.

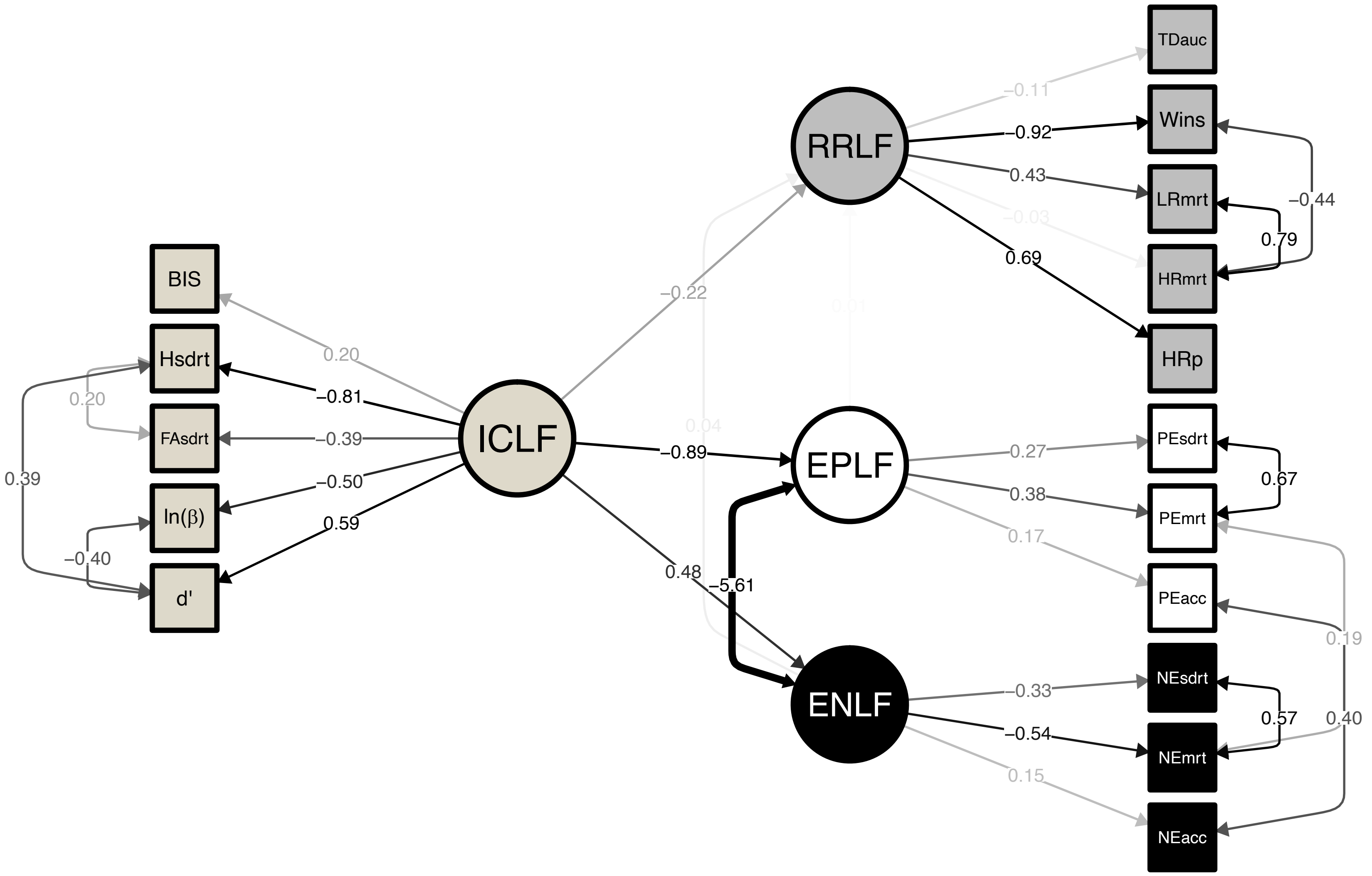


Figure 2 Structural equation model of latent factors underlying inhibitory control (ICLF), risky reward processing (RRLF), and responsivity to positively (EPLF) and negatively salient emotional faces (ENLF; RMSEA $= 0.047$, TLI $= 0.926$, CFI $= 0.945$). Inhibitory control was observed to be a significant effector of lower risk taking ($p = 0.026$) and responsivity to both negative ($p = 0.007$) and positive ($p = 0.02$) emotional faces. No significant relationship was observed between RRLF and EPLF/ENLF. The ENLF manifested as fast and accurate responses to negative emotions, whereas EPLF was an indicator of longer looking times leading to correct recognition. ICLF effected faster looking time to all emotions at the expense of recognizing happy face expressions. Paths are faded to indicate statistical significance and strength of association. Numerical edge labels provide standardized estimates.

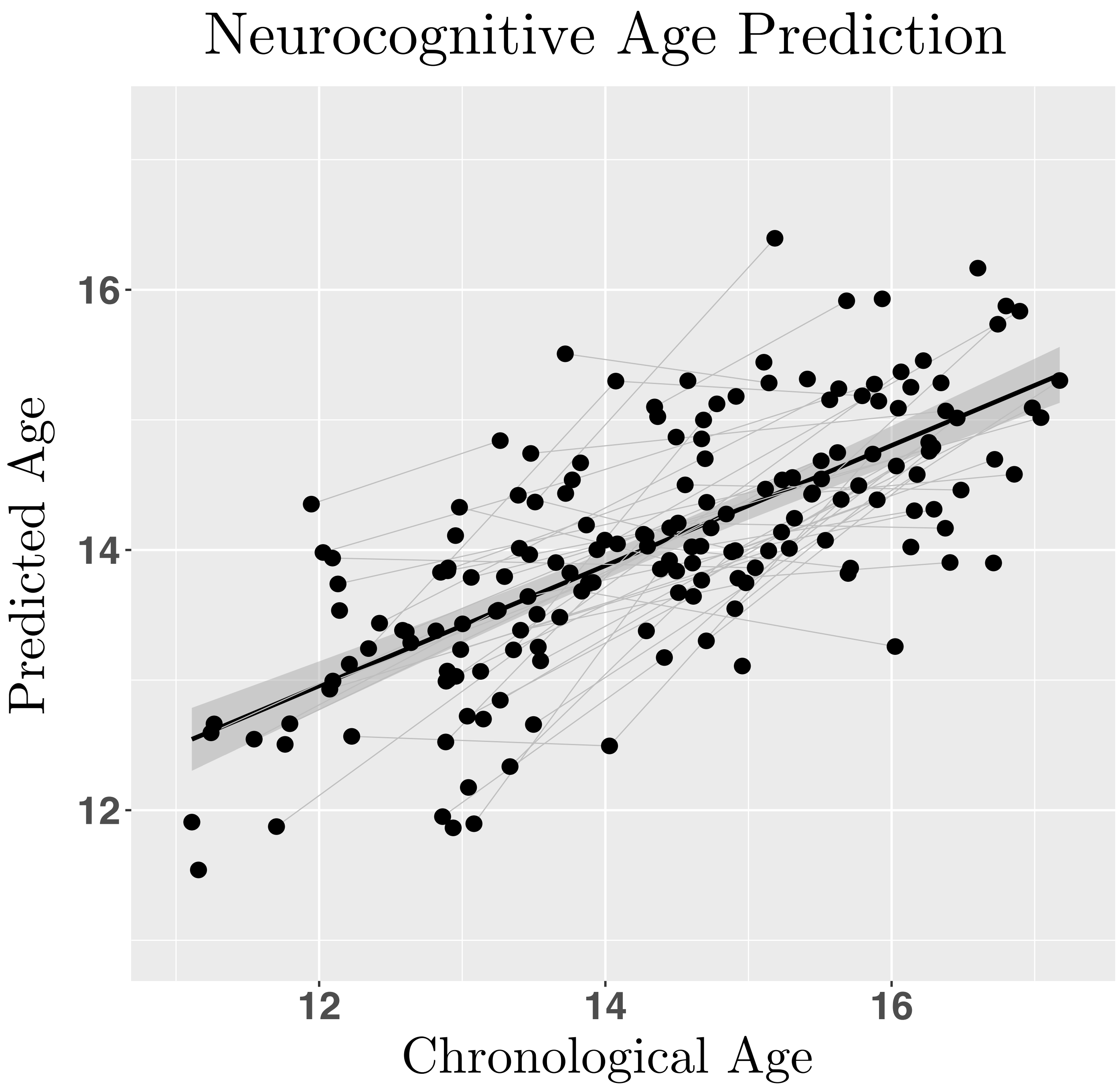
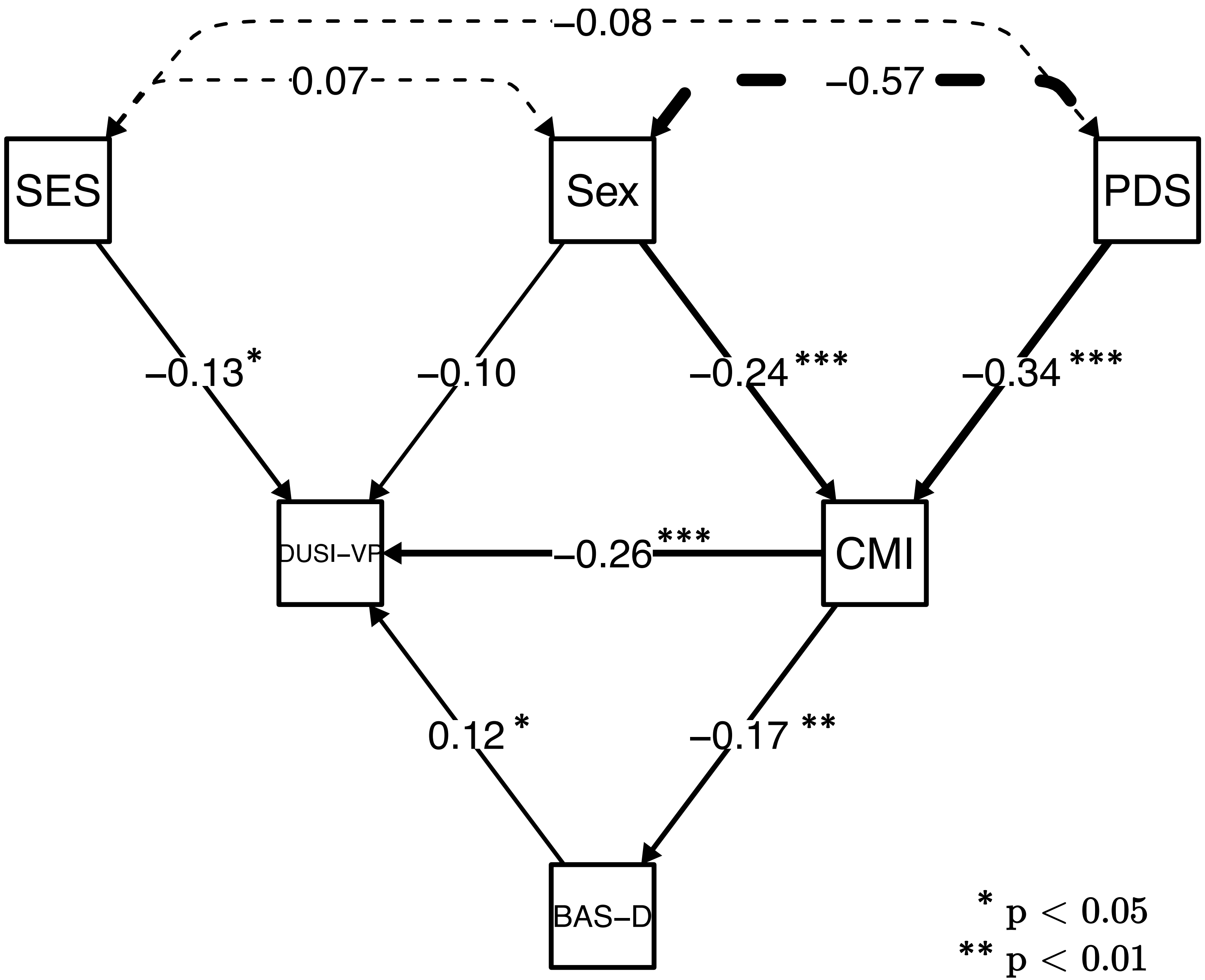


Figure 3 Regularized regression was used to estimate neurocognitive age in a training sample with leave-one-out cross validation to estimate linear model hyperparameters (lambda = 0.083; L2-norm ridge regression with alpha = 0) minimizing mean squared error for predicting age with inhibitory control, risk/reward processing and emotional processing latent factors in a test sample (50% participants split into train/test datasets). Model performance was assessed by computing the ratio between the mean cross-validated error and variance of observed age in the validation dataset ($R^2 = 0.51$). The neurocognitive maturity index is computed by subtracting the predicted neurocognitive age from the chronological age.

Figure 4 Path Analysis was used to test the hypothesis that delayed cognitive maturation (CMI) effects greater pursuit of rewards/desires (BAS-D), which, in-turn, mediates the risk for violent outcomes in adulthood (DUSI-VP) determined by CMI. Pubertal development (PDS) and sex were significant covariates of cognitive maturation. Males with higher scale of physical development were more likely to show delayed cognitive maturation (i.e., lower inhibitory control, greater risk taking, emotion desensitization) compared to their peers. No significant effect was found between sex and risk. A negative correlation between Sex and PDS suggests females developed earlier or more quickly. Higher SES was found to ward off violence risk in adolescence. The structural model fit and full mediation ($Z = -3.50$, $p < 0.001$) was found to be significant compared to a null model ($RMSEA = 0.001$, $TLI = 1.070$, $CFI = 1.00$). Dashed lines indicate estimation of free covariant parameters determined by model fit. Asterisks indicate significance.



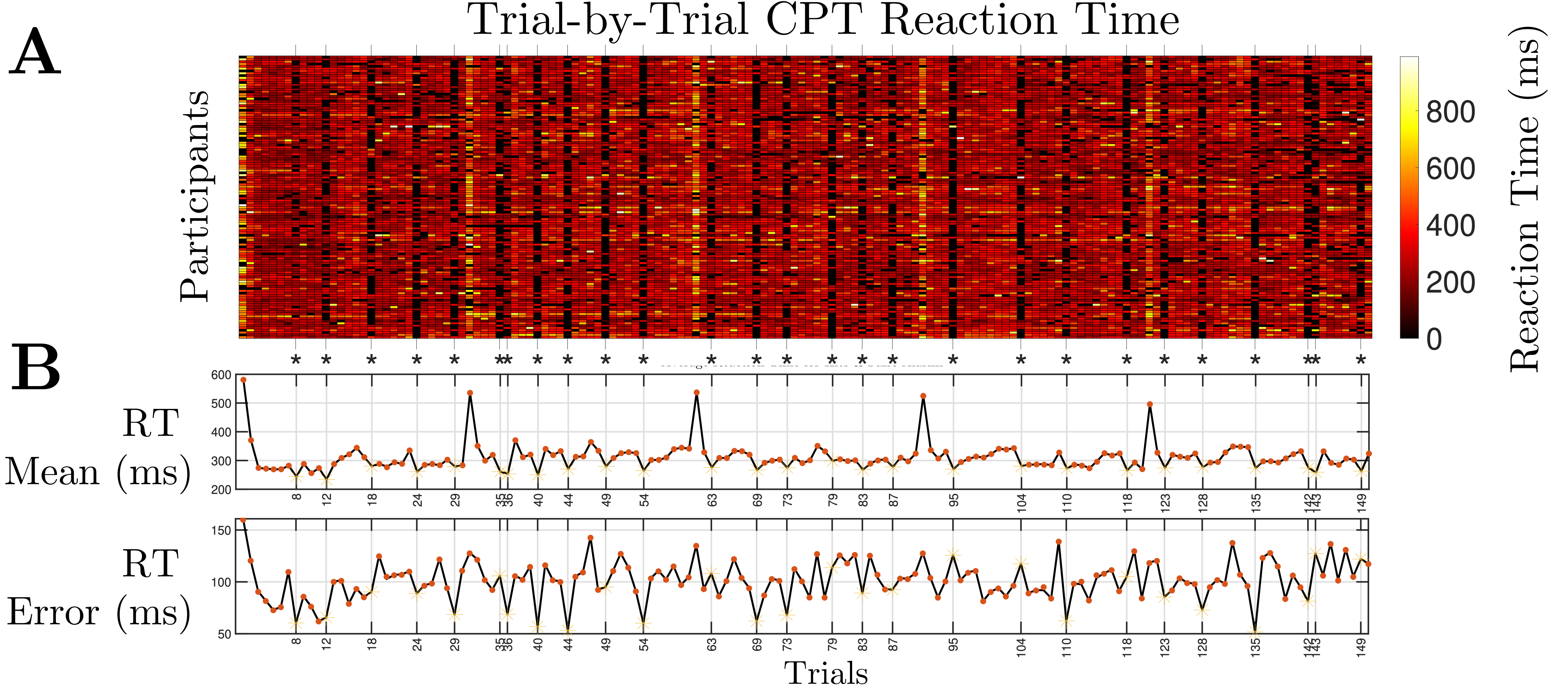


Figure S1 Trial-by-trial reaction time displayed as a heat map for all (A) and summarized across participants (B). The average response time (RT) did not significantly vary throughout the task except at the beginning of a block (B, top) while the standard RT error across participants showed significant cross-trial variance (B, bottom) indicating differences in reflexive inhibition and motor task learning. False Alarm trials (asteriks) were found to generally show consistently lower RT error compared to target trials (dots), suggesting a gating mechanism of motor inhibition.

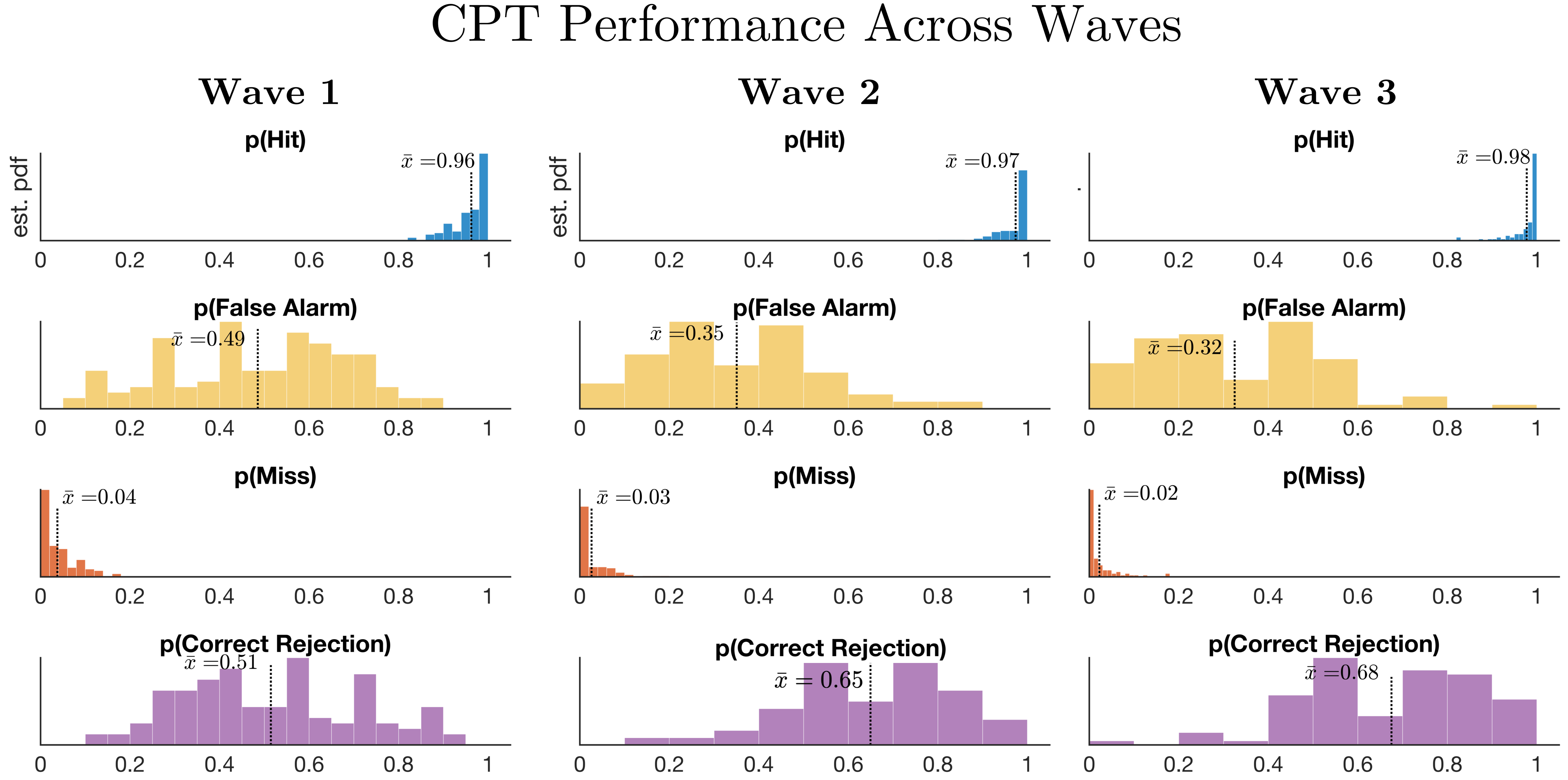


Figure S2 Overall performance in the CPT improved across waves hinting at an underlying developmental effect of inhibitory control between ages 11 and 18. Participants were more likely to make correct responses (blue, top) to targets and avoid False Alarms (yellow) as they become older. This was mirrored with less missed responses (red) and correct rejections of lures (purple) indicating stable attention and refined inhibition. Y axis represents the estimated probability distribution count values and the X axis the probability of a Hit, False Alarm, Miss or Correct Rejection.

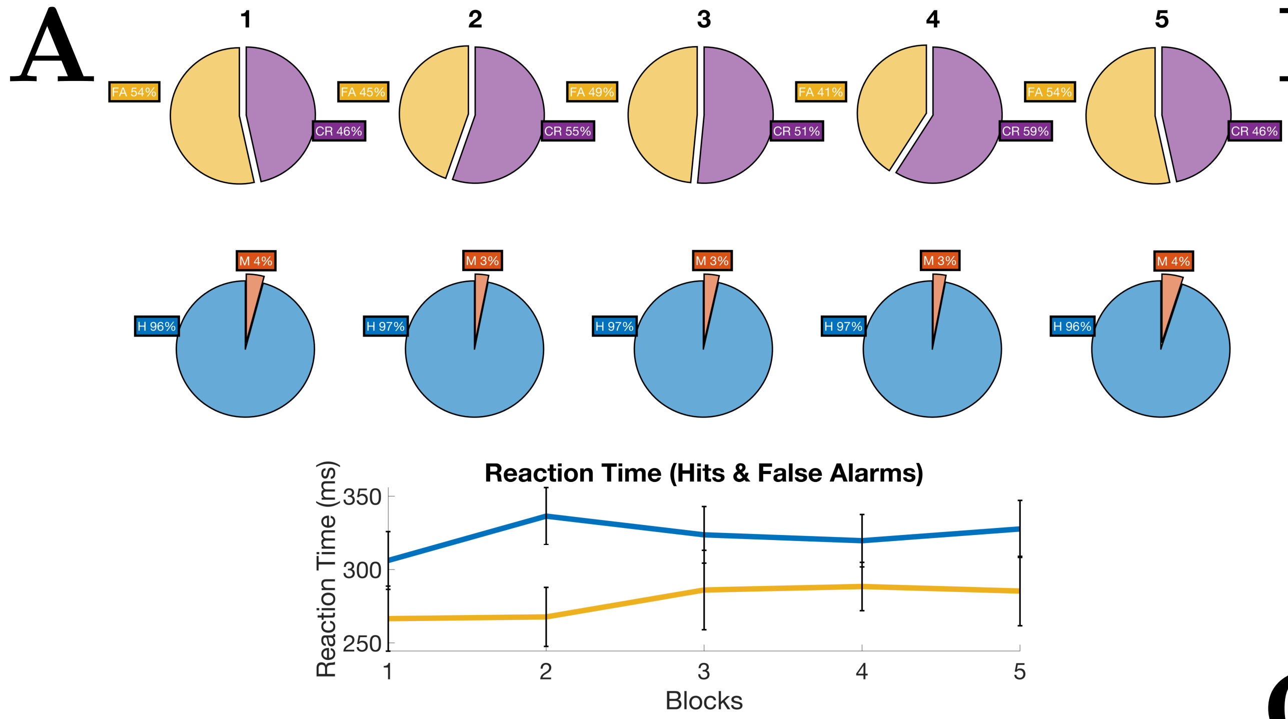
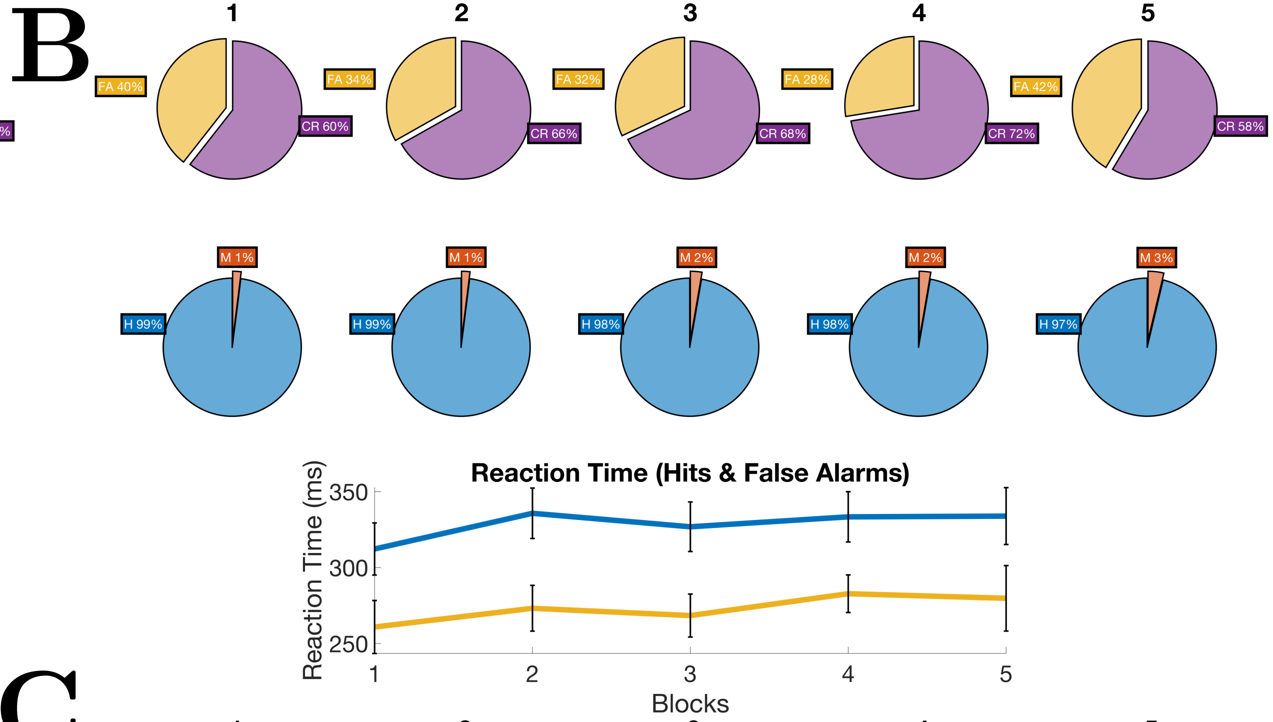
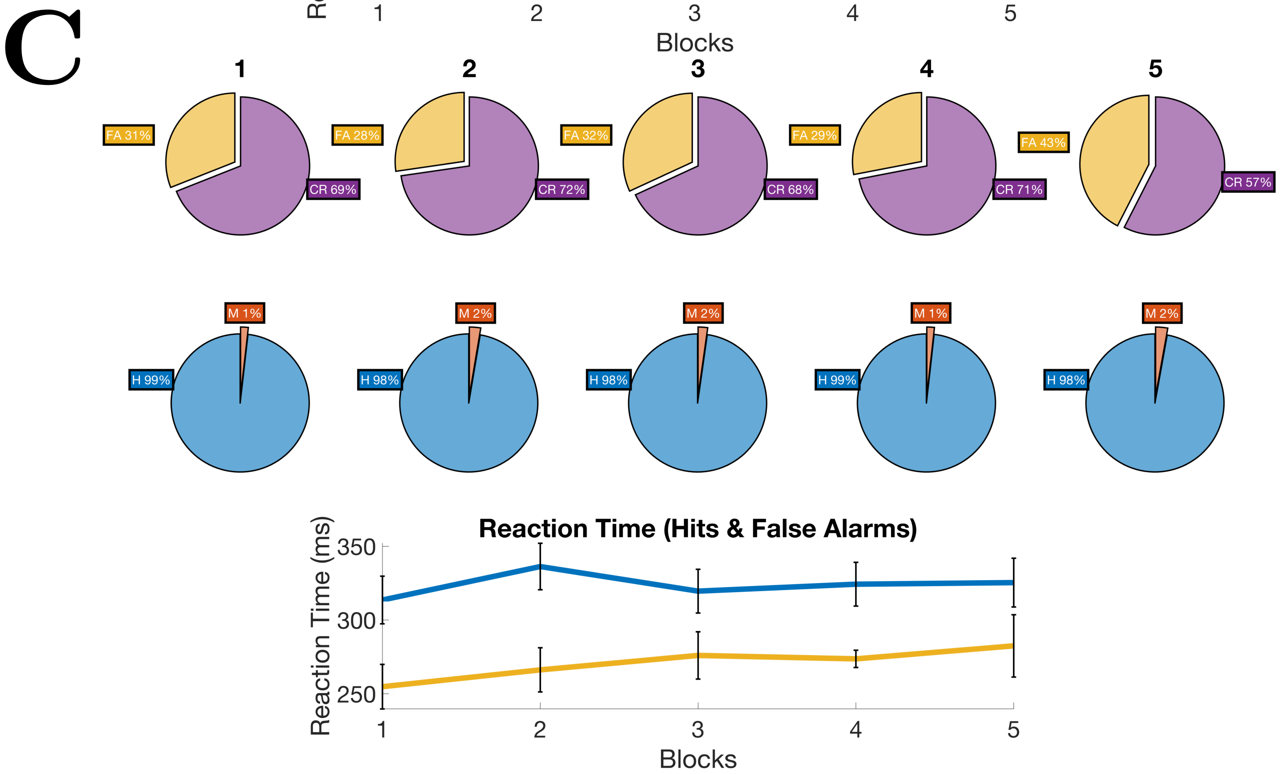


Figure S3 Responses compared by block also showed age improvement, with a constant effect of task learning across blocks comparing waves one (A), two (B), and three (C). The pie charts (top) show participants reliably performed better on each successive block (30 trials each), indicating motor learning evidenced by less False Alarms (yellow), and greater number of Hits (blue). Respondents were typically more cautious in block two and button presses became more consistent as task performance improved (line chart, bottom). The final block shows a weak exhaustion effect of decreased performance and slightly longer RTs across waves.





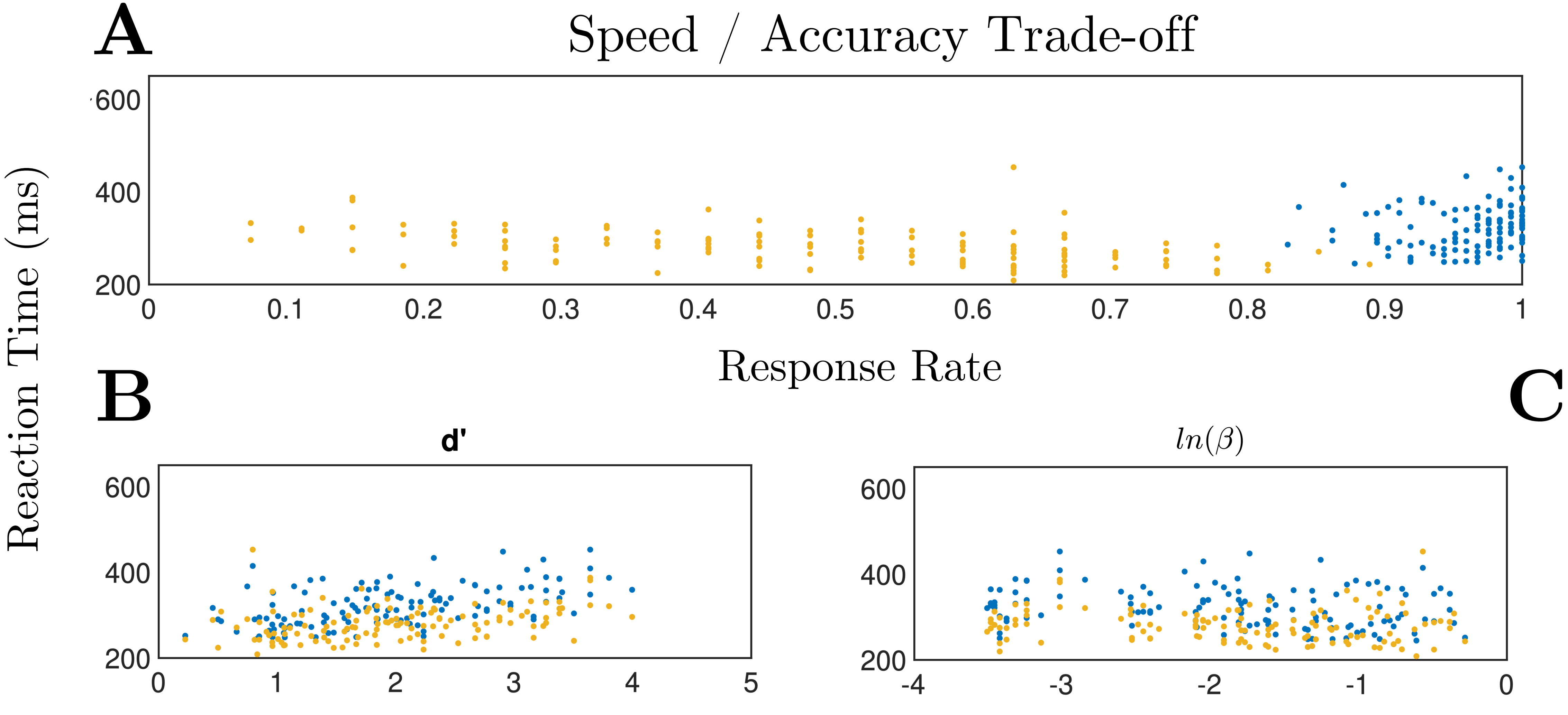


Figure S4 Speed and accuracy in the CPT task displayed an inverse relationship. Greater false alarm rates (yellow) were associated with faster response times (A) and lower discriminative sensitivity (B). No relationship was found between response bias and reaction time. False alarm rates were generally faster than correct responses to targets (blue, C).