

# Supplementary Information

## Depth Perception Changes Following Adaptation to Cue-dependent Invariants

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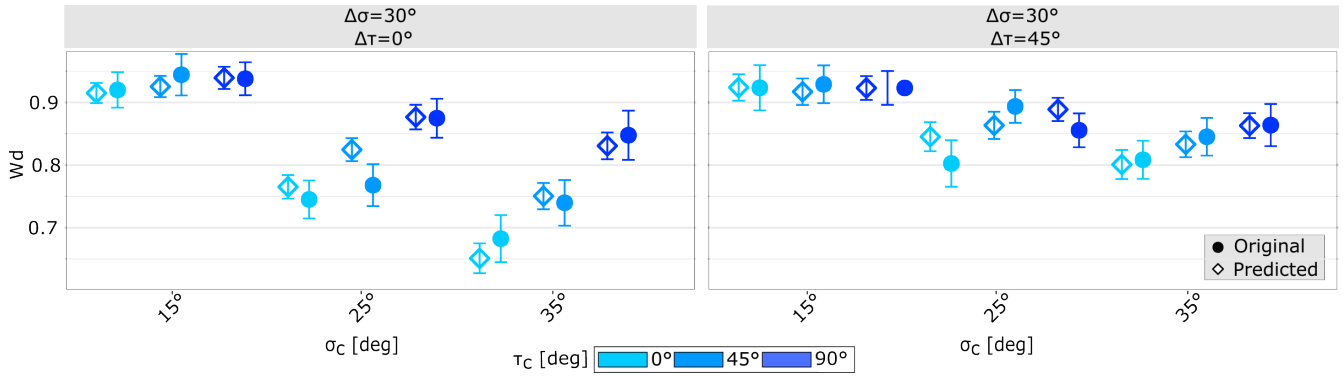


**Figure S 1. Original vs. predicted data across experimental conditions.** Comparison of participant-averaged ( $n = 29$ ) original and mixed-model predicted disparity cue weights  $w_d$  from the perceptual judgment Task across slant values ( $\sigma_c = 15^\circ, 25^\circ, 35^\circ$ ), grouped by tilt values ( $\tau_c = 0^\circ, 45^\circ, 90^\circ$ ) using different fill-in colors. The mean of the original data (circles) and model predictions (diamonds) are shown with 95% confidence intervals (CI, error bars).

| Model | $(\Delta\sigma, \Delta\tau)$ | AIC       | BIC       | $R_c^2$ | $R_m^2$ | RMSE  | Sigma |
|-------|------------------------------|-----------|-----------|---------|---------|-------|-------|
| glmer | (30,0)                       | -1365.302 | -1308.775 | 0.388   | 0.205   | 0.144 | 0.123 |
| glmer | (30, 45)                     | -1839.577 | -1782.876 | 0.286   | 0.073   | 0.121 | 0.107 |

**Table S 1.** Model metrics for generalized linear mixed-effects models (GLMM, fitted with `glmer`) investigating the effect of  $\sigma_c$  and  $\tau_c$  effects on the disparity weights. Metrics include Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC),  $R_c^2$  (explaining fixed and random effects variance), marginal  $R_m^2$  (explaining fixed effects variance), root mean square error (RMSE), and residual standard deviation (Sigma).

| Model | Group | $(\Delta\sigma, \Delta\tau)$ | AIC     | BIC     | $R_c^2$ | $R_m^2$ | RMSE | Sigma |
|-------|-------|------------------------------|---------|---------|---------|---------|------|-------|
| lmer  | ATD   | (30,0)                       | -157.12 | -110.99 | 0.80    | 0.28    | 0.10 | 0.10  |
| lmer  | .     | (30, 45)                     | -192.18 | -145.96 | 0.78    | 0.25    | 0.09 | 0.09  |
| lmer  | AD    | (30,0)                       | -162.54 | -114.90 | 0.84    | 0.15    | 0.10 | 0.11  |
| lmer  | .     | (30, 45)                     | -203.80 | -156.25 | 0.84    | 0.11    | 0.09 | 0.09  |
| lmer  | AT    | (30,0)                       | -208.32 | -160.43 | 0.74    | 0.32    | 0.10 | 0.10  |
| lmer  | .     | (30, 45)                     | -282.58 | -234.86 | 0.77    | 0.1     | 0.07 | 0.08  |

**Table S 2.** Model metrics for linear mixed-effects models (LMM, fitted with `lmer`) investigating the effect of training on the disparity weights. Metrics include Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC),  $R_c^2$  (explaining fixed and random effects variance), marginal  $R_m^2$  (explaining fixed effects variance) computed with Nagelkerke method<sup>1</sup>, root mean square error (RMSE), and residual standard deviation (Sigma).

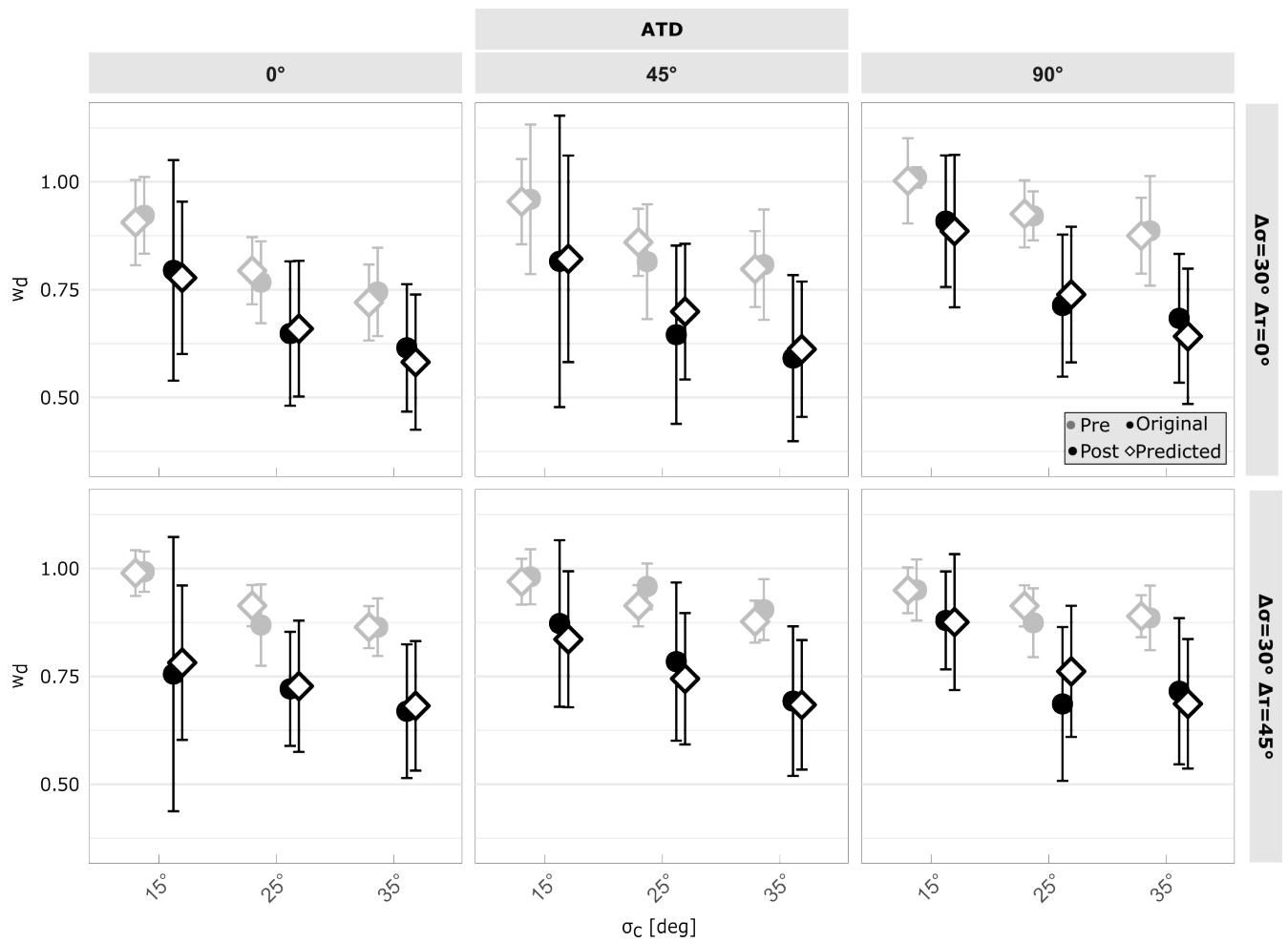


**Figure S 2. Original pre- and post-training disparity cue weights vs. pre- and post- predictions for ATD group.** Disparity cue weights  $w_d$  before (gray circles) and after training (black circles) with mixed-model predictions (white diamonds with matching borders) for the ATD experimental group. The plot shows central slant values ( $\sigma_c = 15^\circ, 25^\circ, 35^\circ$ ) on the x-axis, with columns grouping data by tilt ( $\tau_c = 0^\circ, 45^\circ, 90^\circ$ ), and rows representing different discrepancy conditions. The mean ( $n = 9$ ) of the original data model predictions are shown with 95% confidence intervals (CI, error bars).

## References

1. Nakagawa, S., Johnson, P. C. & Schielzeth, H. The coefficient of determination  $r^2$  and intra-class correlation coefficient from generalized linear mixed-effects models revisited and expanded. *J. Royal Soc. Interface* **14**, 20170213 (2017).

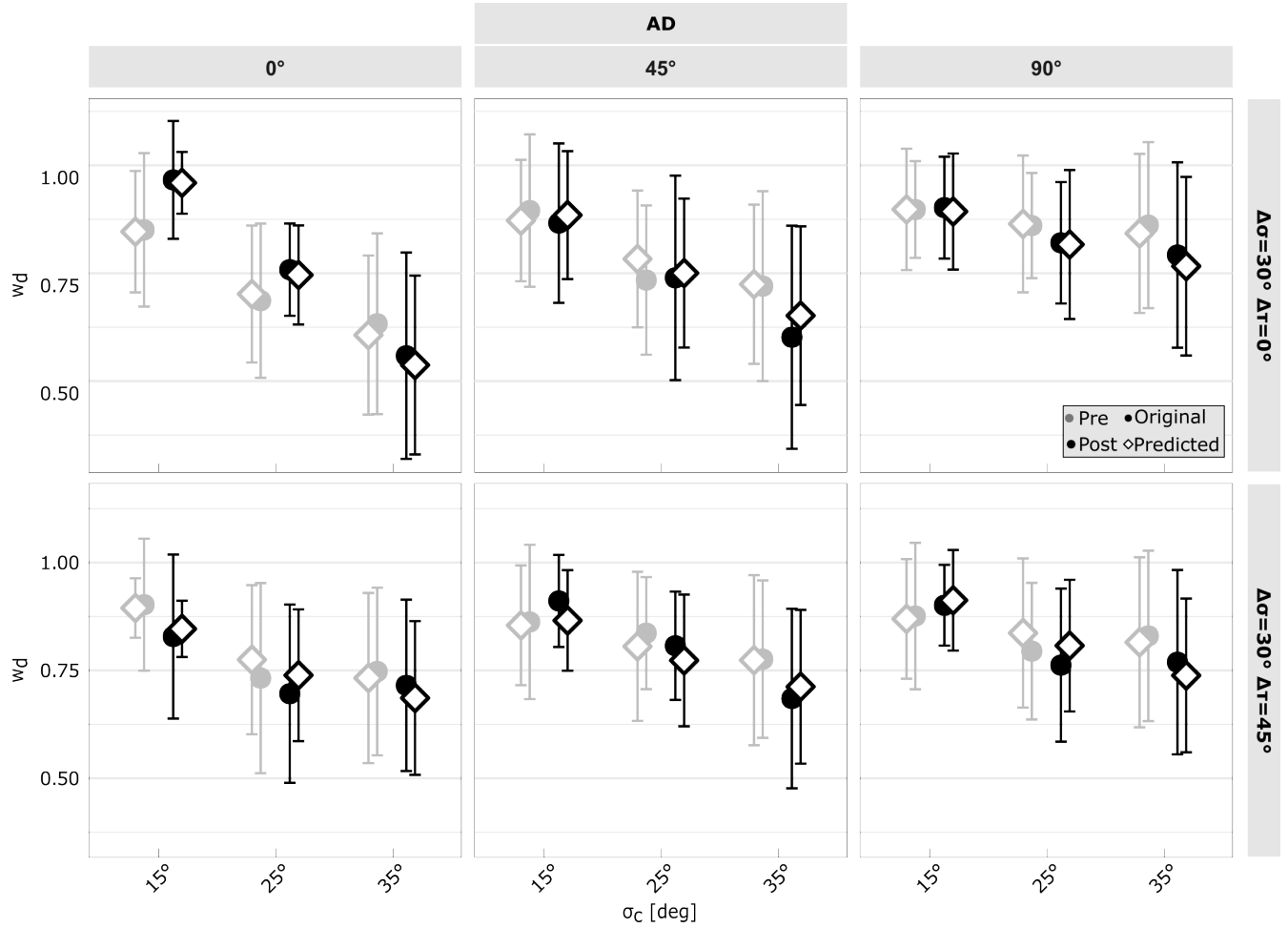


**Figure S 3. Original pre- and post-training disparity cue wights vs. pre- and post- predictions for AD group.** Disparity cue weights  $w_d$  before (gray circles) and after training (black circles) with mixed-model predictions (white diamonds with matching borders) for the AD experimental group. The plot shows central slant values ( $\sigma_c = 15^\circ, 25^\circ, 35^\circ$ ) on the x-axis, with columns grouping data by tilt ( $\tau_c = 0^\circ, 45^\circ, 90^\circ$ ), and rows representing different discrepancy conditions. The mean ( $n = 10$ ) of the original data model predictions are shown with 95% confidence intervals (CI, error bars).

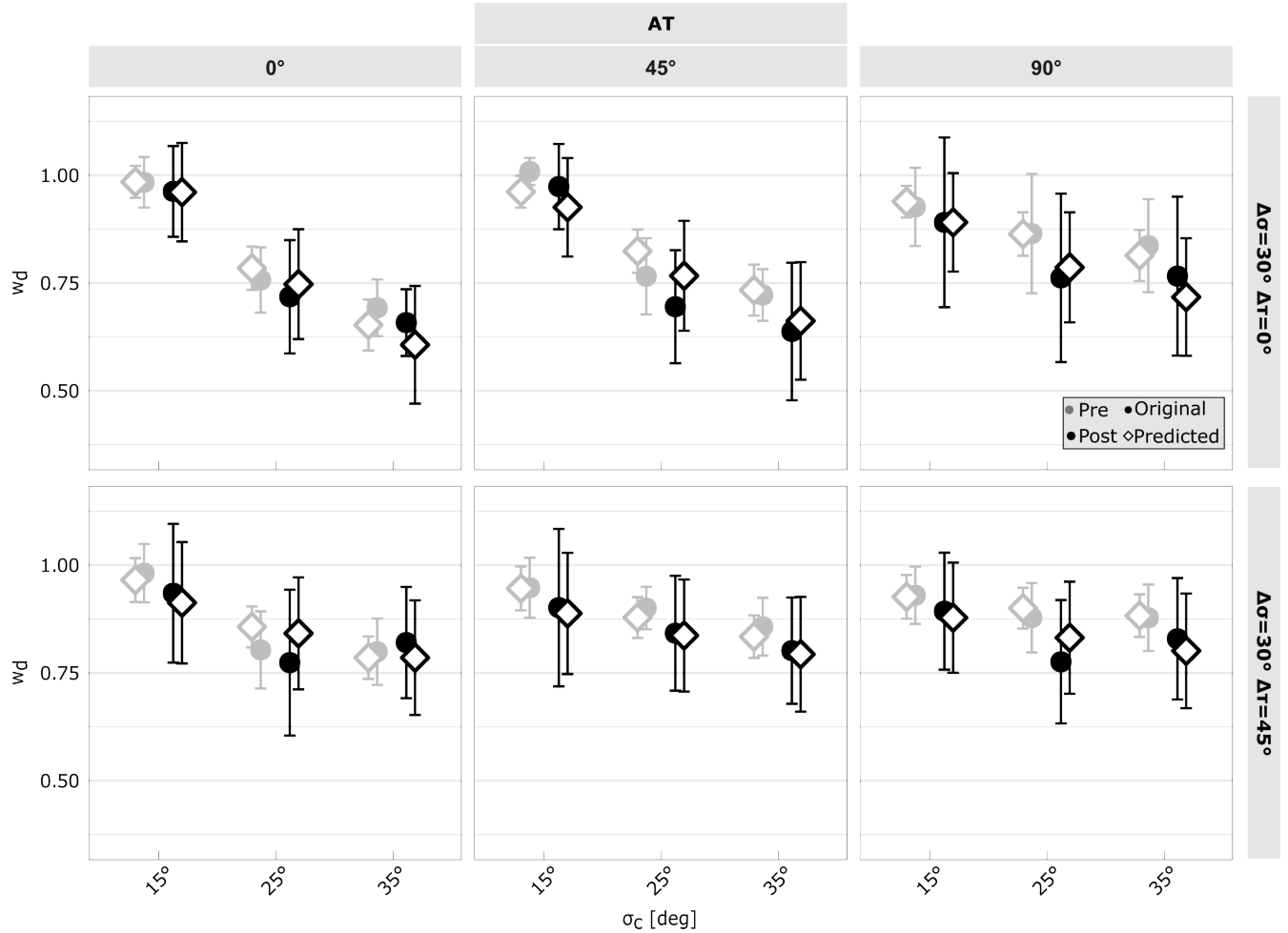


**Figure S 4. Original pre- and post-training disparity cue weights vs. pre- and post- predictions for AT group.** Disparity cue weights  $w_d$  before (gray circles) and after training (black circles) with mixed-model predictions (white diamonds with matching borders) for the AT experimental group. The plot shows central slant values ( $\sigma_c = 15^\circ, 25^\circ, 35^\circ$ ) on the x-axis, with columns grouping data by tilt ( $\tau_c = 0^\circ, 45^\circ, 90^\circ$ ), and rows representing different discrepancy conditions. The mean ( $n = 10$ ) of the original data model predictions are shown with 95% confidence intervals (CI, error bars).

| Group | $\sigma_c$ | $\tau_c$ | $(\Delta\sigma, \Delta\tau)$ | effect  | SE     | df    | t-ratio | p-value |
|-------|------------|----------|------------------------------|---------|--------|-------|---------|---------|
| ATD   | 15         | 0        | (30, 0)                      | -0.1281 | 0.0561 | 38.79 | -2.283  | 0.0280  |
| .     | 25         | 0        | .                            | -0.1343 | 0.0450 | 16.42 | -2.984  | 0.0086  |
| .     | 35         | 0        | .                            | -0.1383 | 0.0534 | 32.38 | -2.589  | 0.0143  |
| .     | 15         | 45       | .                            | -0.1223 | 0.0456 | 17.42 | -2.680  | 0.0156  |
| .     | 25         | 45       | .                            | -0.1606 | 0.0402 | 10.19 | -3.993  | 0.0025  |
| .     | 35         | 45       | .                            | -0.1858 | 0.0441 | 15.14 | -4.210  | 0.0007  |
| .     | 15         | 90       | .                            | -0.1165 | 0.0561 | 38.79 | -2.076  | 0.0445  |
| .     | 25         | 90       | .                            | -0.1869 | 0.0450 | 16.42 | -4.153  | 0.0007  |
| .     | 35         | 90       | .                            | -0.2332 | 0.0534 | 32.38 | -4.366  | 0.0001  |
| ATD   | 15         | 0        | (30, 45)                     | -0.1930 | 0.0624 | 24.48 | -3.092  | 0.0049  |
| .     | 25         | 0        | .                            | -0.1866 | 0.0538 | 13.38 | -3.468  | 0.0040  |
| .     | 35         | 0        | .                            | -0.1824 | 0.0599 | 20.84 | -3.046  | 0.0062  |
| .     | 15         | 45       | .                            | -0.1333 | 0.0541 | 13.69 | -2.463  | 0.0277  |
| .     | 25         | 45       | .                            | -0.1692 | 0.0505 | 10.17 | -3.351  | 0.0072  |
| .     | 35         | 45       | .                            | -0.1928 | 0.0532 | 12.70 | -3.627  | 0.0032  |
| .     | 25         | 90       | .                            | -0.1517 | 0.0538 | 13.31 | -2.822  | 0.0141  |
| .     | 35         | 90       | .                            | -0.2032 | 0.0599 | 20.81 | -3.393  | 0.0028  |
| AD    | 35         | 45       | (30, 45)                     | -0.0615 | 0.0250 | 30.90 | -2.466  | 0.0194  |
| .     | 35         | 90       | .                            | -0.0769 | 0.0365 | 98.07 | -2.104  | 0.0380  |

**Table S 3.** Statistical results of LMM post-hoc pairwise comparisons (Tukey's correction) for cue weighting analysis across different time points (pre-/post-training) and parameter combinations ( $\sigma_c$ ,  $\tau_c$ ) in the ATD, AD, and AT groups. The table reports the effect of cue weighting, standard error (SE), t-ratio, and  $p$ -values for each comparison.