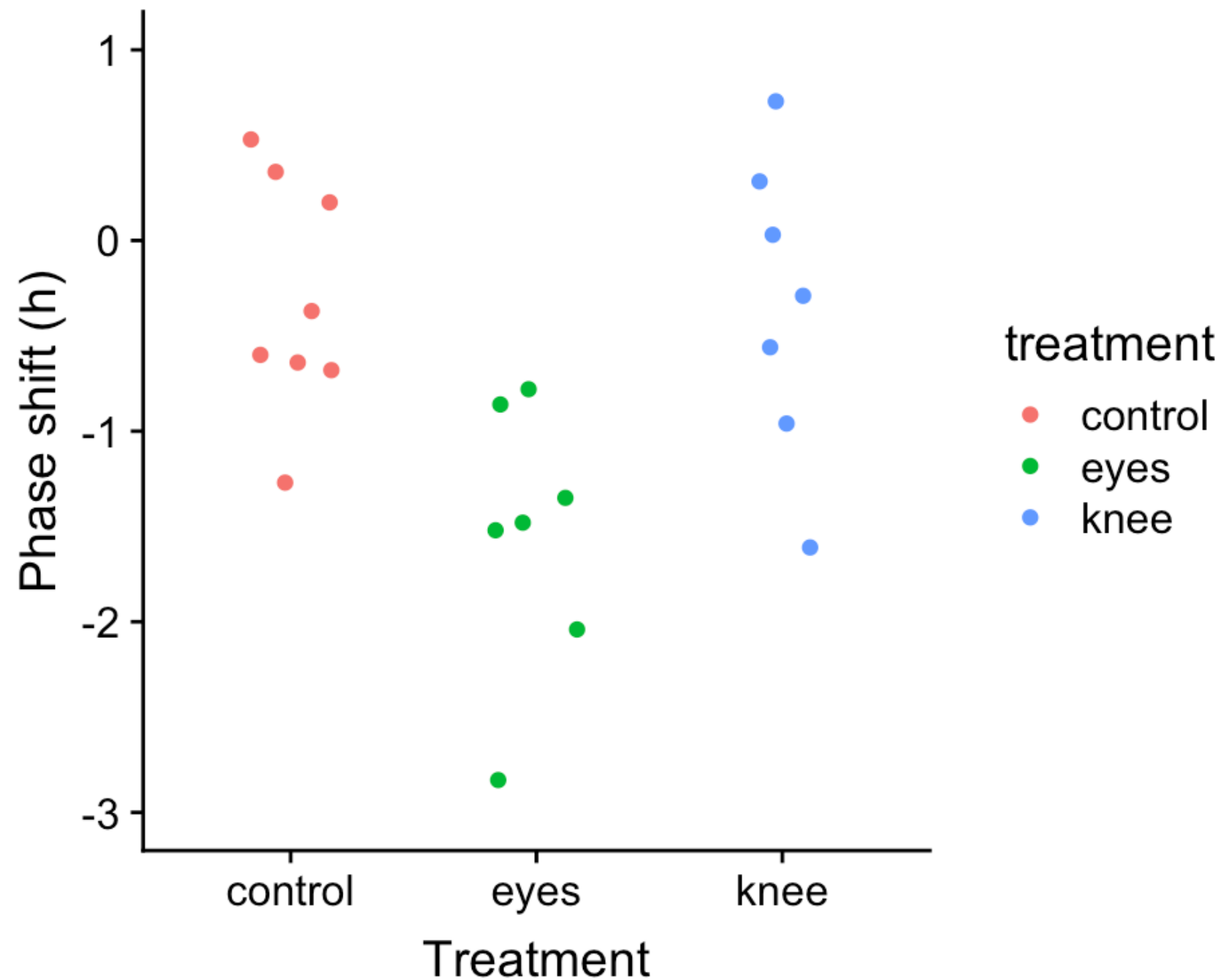
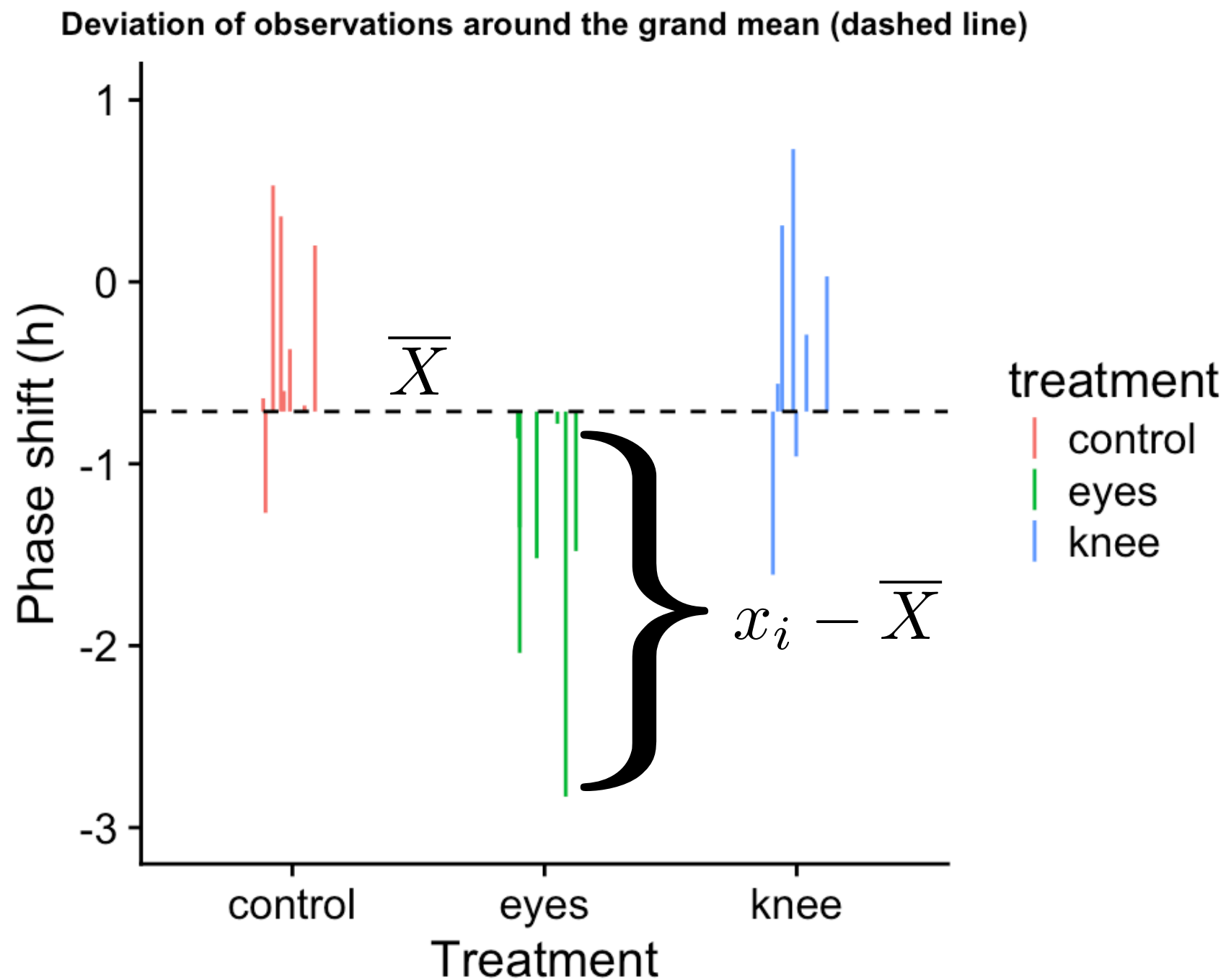


Analysis of Variance (ANOVA)

Does the mean of at least one of the groups differ from the others?

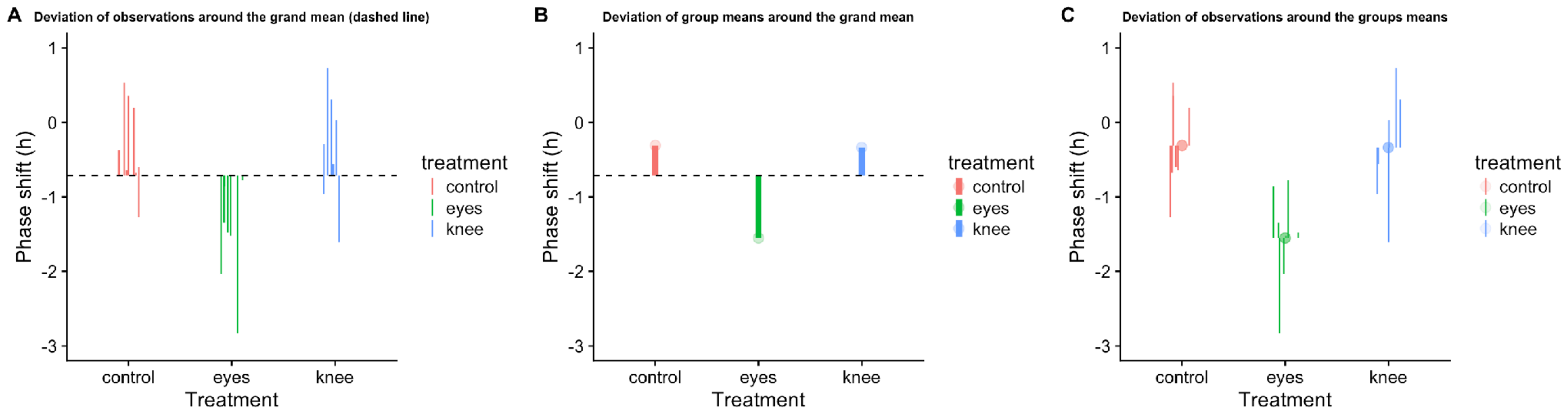


Sum of squared deviations



$$SS_{\text{total}} = \sum_i (x_i - \bar{X})^2$$

Partitioning of sums-of-squared deviations into "between groups" (group) and "within groups" (error) components



$$SS_{\text{total}} = SS_{\text{group}} + SS_{\text{error}}$$

Mean squared deviations

$$MS_{\text{total}} = \frac{SS_{\text{total}}}{df_{\text{total}}} = \frac{SS_{\text{total}}}{N - 1}$$

$$MS_{\text{group}} = \frac{SS_{\text{group}}}{df_{\text{group}}} = \frac{SS_{\text{group}}}{k - 1}$$

$$MS_{\text{error}} = \frac{SS_{\text{error}}}{df_{\text{error}}} = \frac{SS_{\text{error}}}{N - k}$$

ANOVA test statistic

$$F = \frac{\text{between group variation}}{\text{within group variation}} = \frac{MS_{\text{group}}}{MS_{\text{error}}}$$

If $F \gg 1$, is evidence that groups means differ

F-distribution

The sampling distribution of the F -statistic is called the **F -distribution**

The F -distribution is determined by two parameters, the degrees of freedom associated with "groups" and "error" (residuals)

$$F_{k-1, N-k}$$

