| Test | | Why do we use the test? | Assumption tests | Test functions | Summary statement |
| --- | --- | --- | --- | --- | --- |
| All | |  |  |  | **Statement:** describe the direction of the trend (if trend is significant & test provides that information).  **Parentheses:**   * Test used * Test statistic * Degrees of freedom * P-value |
| One-sample t-test | One-tailed | When we want to compare our data (x) to a known population mean (mu) in one direction | Normally distributed data   * *shapiro.test()* on raw data for each group OR residuals. | *t.test(x,* ***mu = Y****, alternative = “greater”)*  *t.test(x,* ***mu = Y****, alternative = “less”)* |  |
| Two-tailed | When we want to compare our data (x) to a known population mean (mu) in either direction | *t.test(x,* ***mu = Y****, alternative = “two.tailed”)*  **(DEFAULT is two-tailed)** |  |
| Two-sample t-test | One-tailed | When we want to know if group 1 (x) is greater or less than group 2 (y) | Normally distributed data   * *shapiro.test()* on raw data for each group OR residuals. | *t.test(x, y,* ***alternative = “greater”****)*  *t.test(x, y,* ***alternative = “less”****)* |  |
| Two-tailed | When we want to know if our groups differ in either direction | *t.test(response ~ group,* ***alternative = “two.sided”****)* |  |
| Pooled t-test | When we want to compare two group means and the means have equal variance. | Homoscedascity (equal variance)   * *leveneTest()* in package *car*   Normally distributed data   * *shapiro.test()* on raw data for each group OR residuals. | *t.test(response ~ group,* ***var.equal = TRUE****)* |  |
| Separate variance t-test | When we want to compare two group means | Normally distributed data   * *shapiro.test()* on raw data for each group OR residuals. | *t.test(response ~ group,* ***var.equal = FALSE****)*  *t.test(group1, group2,* ***var.equal = FALSE****)*  **(DEFAULT is separate variances)** |  |
| Paired t-test | When we want to compare two group means and each observation is paired with the other group | *t.test(response ~ group,* ***paired = TRUE****)*  *t.test(group1, group2,* ***paired = TRUE****)* | **Parentheses**   * Mean difference |
| Independent t-test | When our groups are not paired | *t.test(response ~ group,* ***paired = FALSE****)*  *t.test(group1, group2,* ***paired = FALSE****)*  **(DEFAULT is independent)** |  |
| Mann-Whitney U test | | When we want to know whether two independent groups differ, and the data do not meet the T-test assumptions |  | *wilcox.test(response ~ group, paired = FALSE)*  **(DEFAULT is independent)** | **Parentheses**   * Report sample sizes (n) for each group. |
| Wilcoxon ranked-signed test | | When we want to know whether two dependent groups differ. Similar to paired t-test. |  | *Wilcox.test(response ~ group, paired = TRUE)* |  |
| ANOVA | One-way | When we want to compare more than two groups and one covariate. | Homoscedascity (equal variance)   * *leveneTest(response~group)* in package *car*   Normally distributed data   * *shapiro.test()* on raw data for each group OR residuals. | *aov(response ~ group)*  *anova(“aov model”)* gives you the analysis of variance table | **Statement**   * Do not state the trend in this sentence, as this test does not provide this information. |
| Kruskal-Wallis test | | When we want to compare more than two groups, and the data do not meet the ANOVA assumptions. |  | *Kruskal.test(response ~ group)* |  |
| Tukey’s (honest significance) test | | When we want to assess the difference between all pairwise comparisons from an ANOVA |  | *TukeyHSD(model)* | **Statement**   * Try to group comparisons together if they all differ from one group, e.g. X differs from all other groups.   **Parentheses**   * If your summary statement has “X” group differs from all groups, your p value can be greater or less than some value to cover all comparison p-values, e.g. “P < 0.05” for all comparisons. You do not need to state all p-values. |
| Bonferroni test | | If we are only interested in a subset of comparisons from our ANOVA test. |  | *glht(anova.model,*  *linfct = mcp(treatment =*  *c("group1 - control = 0",*  *"group2 - control = 0")))*  *Package: multcomp* |  |
| Correlation coefficient | | If we want to compare two continuous variables and the direction and magnitude of their relationship |  | *cor.test(x, y)*  *cor(x, y)* | Parentheses   * Report R |
| Linear regression | | If we want to know the relationship between continuous variables, and the equation that describes it. | Residuals plot  qqplot(model$residuals) | *lm(response ~ predictor, data = data)*  *summary(model) to get regression results* |  |