One-way and Factorial ANOVA

Key words:

ANOVA	Post HOC VS planned comparisons
Univariate vs bivariate outliers	Cohen's D
t-test	Effect size
Familywise error	Kruskal-Wallis test
Decisionwise/testwise error rate	omega-squared
Total sums of squares	ETA squared
Model sum of squares	Kruskal-Wallis test
Residual sum of squares	Brown-Forsythe or Welch *F* Ratio
Bonferroni	orthogonal

ANOVA – more than 2 variables/groups
t-test is similar but limited to 2 groups

ANOVA tests the null hypothesis, that the means for all group are identical.
The alternative hypothesis means that AT LEAST one group is not equal (its different).

Why not just run multiple t-tests??

Think about it, running stats with a p value of less that 0.05 means than less than 5% of the results may be explained by random variance.
With one test – less than 5% due to chance
With 2 or 3 tests – the likelihood of it being due to chance goes up bc 5% plus 5% plus 5% etc (not quite this linear but you get the idea)

Familywise error = not the error of any specific test (which is always controlled by alpha) but rather the error of a series of tests.

the probability of making at least one type I error amongst a series of comparisons

The decisionwise or testwise error rate (αDW) is the alpha level used for each comparison
ANOVA allows researchers to evaluate all of the mean differences in a single hypothesis test using a single α-level and, thereby, keeps the risk of a type I error under control no matter how many different means are being compared.
Benefit of ANOVA – can test multiple variables in one singular test. Which is dictated by 1 p value. So the familywise error is controlled by default.
Multiple t tests inflate type 1 error rate
ANOVA – higher sample size, gives it a bit more power if assumptions are met.

ANOVA = Decreased **familywise error** rate

How many independent variables are involved in an ANOVA?? (1-way = 1 independent variable etc)

One-way = e.g. cognitive trainings impact on depression. 1 independent factor – training.
Two- way = e.g. cognitive training (either high or low intensity) impact on depression. Now there are 2 independent factors – training and intensity.
Three-way

Practice Exam 1

1. Central limit theory suggests that:
   a. As the sample size increases, so does the normality of the distribution
   b. As the sample size increase, the normality of distribution decreases
   c. A the sample size increases, the skew to the right increases
   d. As the sample size decrease, the skew to the left increases

2. Which of the following would be used to measure the internal consistency of a data set:
   a. Pearsons correlation
   b. Cronbach's Alpha
   c. Sample size
   d. P value

3. A non statistically signifcicant ($p>0.05$) Shapiro Wilkes test suggests that the data:
   a. Is normal
   b. Is not normal
   c. Is not non-Normal
   d. Is non-normal
   e. That more testing needs to be done

4. What number would 2.2e-5 indicate?
   a 11
   b -3.2
   c .000022
   d .0000022
   e 44

5. The whiskers on a box plot show:
   a. the distribution of data
   b. The lower quartile (25^{th} percentile)
   c. The upper quartile (75^{th} percentile)
   d. The range of data

6. The "box" on a boxplot indicates _____.
   a. The distribution of data
   b. The lower and upper quartiles
   c. The median
   d. The range of data