Hypothesis Testing - Interpretation

LAVC / Raskoff / Stat

When you are doing a hypothesis test for significance (is there a relationship between your variables? Can you reject the Null Hypothesis?), there are specific consequence of your decision about whether to accept or reject the null hypothesis.

- *If you accept the null hypothesis*, there is no relationship between your variables. That's all you need to say – although do name your variables. (Don't just say, "There is no relationship between my variables." Say "There is no relationship between gender and study hours." Or whatever your variables are…)
- *If you reject the null hypothesis*, there is a relationship between your variables and, well, this is where it gets fun. (Why fun? Because you're learning things about real people!)

Remember that your goal in interpretation is to state the nature of the relationship IN YOUR OWN WORDS so that anyone could understand what you learned about people.

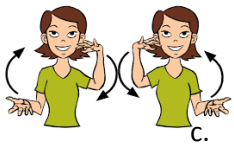
Here's an outline of what to do with what test, *if you reject the null*…

1. **T-test (t statistic; df = N_1+N_2-2) (This is the test if you have one interval variable and one nominal or ordinal but with only two categories)**
    a. *H_0 rejected:* There is a relationship between (variable) and (variable).
    b. What's the *pattern?* Go to the means for each of the two categories/groups and talk about which group has the higher or lower mean (or both). (Who smiles more? Men or women?) You should also mention variability – does one group or another have a higher or lower standard deviation?

2. **ANOVA (F statistic; df_{btween} and df_{within}) (This is the test if you have one interval variable and one nominal or ordinal but with three or more categories)**
    a. *H_0 rejected:* There is a relationship between (variable) and (variable).
    b. What's the *pattern?* Go to the means for each of the categories/groups and talk about which group has the higher or lower mean (or both). (Who visits the doctor more? People with HMO insurance, traditional insurance or no insurance?) You should also mention variability – does one group or another have a higher or lower standard deviation?

3. **Pearson's r (df = N-2) (This is the test if you have all interval variables)**
    a. *H_0 rejected:* There is a relationship between (variable) and (variable).
    b. Interpret the *direction* of the relationship.
        i. Look at the sign of r…
        ii. If the sign is positive, there is a positive relationship between the variables – thus if one has high values the other will as well. (Do people who support legalizing pot also support legalizing prostitution or do they oppose legalizing prostitution?)
        iii. If the sign is negative, there is a negative relationship between the variables – thus if one has high values the other will have low values (Do people with more education have less children, or more children than those with less education?)
    c. Interpret the *strength* of the relationship.
        i. Look at the absolute value of the number of r…
        ii. Use the Correlation Strength legend to judge the strength of the relationship, based on r.

Positive relationship



Negative relationship

Correlation Direction (Pearson's r)
Positive
X↑Y↑or X↓Y↓
Negative-Inverse
X↑Y↓or X↓Y↑

Correlation Strength (Pearson's r, phi, C, V)
1.00 - perfect
0.60 – strong
0.30 – moderate
0.10 – weak
0.00 – none

iii. If it is a strong relationship (0.6 or higher), the pattern applies to most people; if it is moderate, it applies to some people, not everyone; if it is weak, it applies to a few people, not most people.)

d. Interpret *how much we know*…
   i. Find r^2, a P.R.E. measure (Proportion Reduction in Error)
   ii. r^2 is a proportion – thus turn it into a percent. (*100)
   iii. This percent tells you how much of the D.V. is explained by the I.V.. The I.V. explains that percent of the D.V.. (Replace I.V. and D.V. with the variable names – and explain it in your own words.)

e. Add in Regression analysis
   i. Do a scatterplot
   ii. Add the regression line (do at least three predictions using the regression equation)
   iii. 'Read' the graph: Does the relationship appear to be positive or negative? How strong is it – do the data points cluster around the Regression line or are they scattered further from it? And, most importantly, how good will our predictions be? If we know X and predict Y, will that be a good prediction (yes, if it looks strong) or a poor prediction (if it looks weaker)?

4. Chi Square (χ^2 statistic, df = (#r-1)(#c-1)) (This is the test if both variables are nominal ordinal)

a. *H_0 rejected:* There is a relationship between (variable) and (variable).

b. What's the *pattern or direction* of the relationship?
   i. Go to the cross-tab table, *percentage in the direction of the Independent Variable (I.V.).* (Find the I.V. – do the I.V. categories label the rows or the columns? If rows, do row percents; if columns, do column percents.)
   ii. Then *compare in the other direction*. Be sure to use the wording in that order – if you are comparing within a row (because you percentage in columns), use the category of that row to start your sentence. (Having percentaged each marital status [I.V] column, using the row of those who own guns (D.V), we find that those who own guns are more likely [highest percent in that row] to be married than those who are never married, aka single [lowest percent in that row].)

I.V. categories label the columns?
Percentage down (in those columns) and **Compare across** (within at least one row, others if there are more than two)
I.V. categories label the rows?
Percentage across (in those rows) and **Compare down** (within at least one column, others if there are more than two)

c. Interpret the *strength* of the relationship.
   i. Find phi ϕ, C, or Cramer's V correlation coefficient(s), whichever is appropriate for the size of the cross-tab table. (ϕ is for 2x2 tables, C for square tables [#r=#c], and V can be used for any table)
   ii. Use the Correlation Strength legend (right) to judge the strength of the relationship, based on phi/C/V. (Phi, C, and V do not identify direction – the percentaging in 3b took care of that.)

Correlation Strength (Pearson's r, phi, C, V)
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0.10 – weak
0.00 – none

   iii. If it is a strong relationship (0.6 or higher), the pattern applies to most people; if it is moderate, it applies to some people, not everyone; if it is weak, it applies to a few people, not most people.)

d. Interpret *how much we know*…
   i. Find Lambda, a P.R.E. measure (Proportion Reduction in Error, just like r^2) (If it is not provided, you may skip this.)
   ii. Lambda is a proportion – thus turn it into a percent. (*100)
   iii. This percent tells you how much of the D.V. is explained by the I.V.. The I.V. explains *that* percent of the D.V.. (Replace I.V. and D.V. with the variable names – and explain it in your own words.)