Exam 2 PS217, Fall 1995

1. Suppose that you are interested in whether the type of mood reflected by a word (happy, neutral, or sad) affects how well the word is remembered. You construct a list of 6 happy words (e.g., joyful, bright), 6 neutral words (e.g., derive, convey), and 6 sad words (e.g., gloomy, lonely). You present the list repeatedly to 8 participants until they can recite the entire list correctly twice in a row. One week later, each subject attempts to recall the entire list. You repeat this procedure for each word list, for a total of 24 participants. The number of items correctly recalled as a function of the type of word is seen below. Analyze the results of this experiment as completely as possible, including whatever interpretation seems appropriate. [20 pts]

	Happy	Neutral	Sad	
	5	4	3	
	6	3	4	
	4	5	2	
	5	3	1	
	3	1	2	
	6	3	4	
	2	2	3	
	5	3	1	
T (ΣX)	36	24	20	G = 80
Mean	4.5	3.0	2.5	$\Sigma X^2 = 318$
SS	14	10	10	

ANOVA Table for Recall

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Mood	2	17.333	8.667	5.353	.0132	10.706	.788
Residual	21	34.000	1.619				

Means Table for Recall
Effect: Mood

	Count	Mean	Std. Dev.	Std. Err.
Happy	8	4.500	1.414	.500
Neutral	8	3.000	1.195	.423
Sad	8	2.500	1.195	.423

OK, you wouldn't have been able to use StatView, but your source table should look something like the one above. You would need to look up your $F_{Crit}(2,21) = 3.47$, which would still lead you to reject H_0. (With StatView all that you'd need to do is to look at the P-Value and determine that it's below .05.) Having done so, you would next need to compute HSD to determine which means differed. With q = 3.57, HSD = 1.61. Thus, Happy mood leads to significantly more words recalled than Sad, but no other differences were significant.

2. How likely is it that the Happy group in the preceding experiment was randomly selected from a population with $\mu = 5$ words correctly recalled? [5 pts]

For this single-sample t-test, you need the sample mean (4.5) and the standard error of the sample mean (.5). (You could get the standard error by dividing the standard deviation (1.414) by the square root of n (8).) You're testing H_0: $\mu = 5$. With t = 1.0, you should expect that you will end up retaining H_0, but it's always good form to look up the tCrit(7) = 2.365 before concluding that you would retain H_0. That is, it appears that the sample mean could have been drawn from a population with a mean of 5.

3. How does an independent groups design differ from a repeated measures design? Why would a repeated measures design be preferred to an independent groups design? When would the independent groups design be preferred to the repeated measures design? [10 pts]

In an independent groups design, a participant is exposed to only one level of the IV and provides a response under that condition. In a repeated measures design, a participant is exposed to all levels of the IV and provides a response under each of those conditions.

A repeated measures design is preferred because it is more powerful and more efficient.

However, you would need to use an independent groups design when your study did not lend itself to a repeated measures design. Generally, you can't use a repeated measures design when you make a fairly permanent change in the participant. That is, when exposure to one level of the factor is likely to have had such an impact that exposure to other levels will not provide reasonable data. Here are a couple of examples: teaching X (a language, how to do a type of math problem, etc.) via different methods is best done as an independent groups design because once the participant learns X by one method it makes no sense to try to teach the participant X by a different method; cutting into the brain to Area X to see if it differs from cutting to Area Y is probably best done as an independent groups design (the cut to Area X can't be undone before proceeding to cut to Area Y). Except under fairly unusual circumstances, you cannot use a repeated measures design when dealing with nonmanipulated characteristics of the participant (gender, age, IQ, etc.). That is, those characteristics cannot take on different values for an individual.

4. Dr. Justin Case was interested in determining if temperature had an impact on performance on a quiz. He took a class of 100 statistics students and randomly assigned a quarter of the class to a room where the temperature was 50°, another quarter was assigned to a room where the temperature was 70°, another quarter was assigned to a room where the temperature was 80°, and the final quarter was assigned to a room where the temperature was 100°. The students all took the same quiz (max.score = 10). Using the summary data below, conduct as complete an analysis of this experiment as you can, then provide a detailed interpretation of the results of the experiment. [20 pts]

	50°	70°	80°	100°	
T (ΣX)	130	195	182	190	G = 697
Mean	5.2	7.8	7.3	7.6	$\Sigma X^2 = 5355$
SS	188	46	77	78	

SOURCE	SS	df	MS	F
Treatment	**107.9**	**3**	**35.96**	**8.9**
Error	**389**	**96**	**4.05**	
Total	**496.9**	**99**		

With $F_{Crit}(3,96) = 2.71$, you would reject H_0. Then, to determine which of the means came from populations with different means, you would compute HSD. With q = 3.7, HSD = 1.49. Thus, performance was worse when people were in a room that was 50° compared to rooms that were 70°, 80°, or 100° (none of which differed). Thus, it appears that people perform worse when the room is cold compared to rooms that are warm.