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Exam 2

PS 306, Fall 2003

As always, the Skidmore Honor Code is in effect, and you will have to write out the Honor Code and sign it at the end of the exam. Read each question carefully and answer it completely, showing all your work. Allocate your time appropriately (1 point = 1 minute). Good luck!

1. Dr. Melody Brooks is interested in assessing whether or not people eat more when they are anxious. She brings her participants into the lab one at a time and places a bowl of 30 salted peanuts in front of them, explaining that the participant should feel free to eat as many peanuts as she or he would like. Dr. Brooks then has half the participants fill out an ominous-looking consent form, absolving her of all liability should the experiment result in permanent damage to the participant. She then tells these participants that they will receive a series of painful electric shocks (though there will be “no permanent tissue damage”), to determine their tolerance for pain. The other half of the participants are given a standard consent form that simply describes the experiment and asks for the participant’s cooperation. Dr. Brooks then tells this group that they will be serving as a control group for an experiment and will have to wear a shock electrode and receive a mild electric shock, but that it will only feel like a mild tingle. (Dr. Brooks might well have seen the same movie you saw at the beginning of the semester.) Neither group actually receives a shock, with the threat of the different shock levels intended to create different anxiety levels. At the conclusion of the experiment, Dr. Brooks is surprised to see that there is no difference between the two groups in terms of peanuts eaten (M for the anxious group = 29.8, M for the non-anxious group = 29.5). What advice would you give Dr. Brooks about her experiment? Because you want to make the experiment more powerful, would you suggest using a repeated measures (within subjects) design? [10 pts]

2. Dr. Nick O. Thyme was interested in studying the effects of practice on performance on video games that involve a great deal of eye-hand coordination. He decides to conduct a two-factor mixed design, with amount of practice (3 hours, 6 hours, 12 hours) as the between (independent groups) factor and input device (keyboard, mouse, joystick) as the within-subjects (repeated measures) factor. He uses the score on a novel video game as the dependent variable. [15 pts]

a. Given the design specified above, if Dr. Thyme wants to have a minimum of 20 scores per cell (condition), tell him how many participants he would need to run.

b. Briefly describe a good procedure that Dr. Thyme might use to conduct his study.

c. Suppose that he runs the study and finds no main effects or interaction. What would you advise him to change in his study to make it more powerful? Do you think it would help if he were to run the study as a completely within (repeated measures) design?

3. A major research technique in the field of behavioral genetics is to breed animals selectively on the basis of particular characteristics exhibited by the animals and then to observe the relative performance of the offspring. Suppose that an experiment is conducted in which three strains of rats are to be compared. One strain was obtained by selectively breeding rats who performed exceptionally well in a maze-learning task (the “bright” rats); a second strain was obtained by selectively breeding rats who performed quite poorly on the same task (the “dull” rats); and a third strain consisted of rats who were bred without regard for maze-learning performance (the “mixed” rats). One group from each strain was raised under “enriched” conditions, and a second group was raised under “impoverished” conditions. The enriched environment consisted of a large cage containing objects for the animals to play with; the impoverished environment consisted of a similar cage containing nothing but the bare essentials of rat life (food and water dispensers). Following six months of exposure to one of the two environments, all of the rats were tested in a standard laboratory maze. There were eight rats randomly assigned to each of the six groups. The learning scores (trials needed to learn the maze) are presented below. Analyze the results as completely as you can, then provide a description of the findings. [15 pts]

ANOVA Table for Learning Score

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Environment		154.08			<.0001	23.092	.999
Breed		175.79			<.0001	26.345	.998
Environment * Breed		17.79			.2746	2.666	.262
Residual		280.25					

Means Table for Learning Score
Effect: Environment * Breed

	Count	Mean	Std. Dev.	Std. Err.
Enriched, Bright	8	2.750	1.165	.412
Enriched, Dull	8	8.875	2.167	.766
Enriched, Mixed	8	6.125	2.232	.789
Impoverished, Bright	8	8.000	2.449	.866
Impoverished, Dull	8	11.250	3.955	1.398
Impoverished, Mixed	8	9.250	2.712	.959

4a. Individuals who are identified as having an antisocial personality disorder also tend to have reduced physiological responses to painful or anxiety-provoking stimuli. In everyday terms, these individuals show a limited physical response to fear, guilt, or anxiety. One way of measuring this response is with the galvanic skin response (GSR). With GSR, higher scores indicate lower responsivity and lower GSR scores indicate greater responsivity. In the study summarized below, three groups of individuals were tested: Normal Personality, Antisocial Personality, and Agoraphobics. First, briefly tell me why a group of Agoraphobics (or some other clinically diagnosed group) would be included in such a study:

As you can see, a third of each group is given the GSR under ordinary circumstances (baseline), a third is given a moderately stressful situation, and a third is given a highly stressful situation. Complete the source table and interpret the results of this study as completely as you can. [20 pts]

ANOVA Table for GSR

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Group				34.5	<.0001	69.076	1.000
Stress				26.6	<.0001	53.222	1.000
Group * Stress				9.3	<.0001	37.311	1.000
Residual			6.0				

Means Table for GSR

Effect: Group * Stress

	Count	Mean	Std. Dev.	Std. Err.
Agoraphobic, 1Baseline	7	19.857	2.116	.800
Agoraphobic, 2Moderate	7	17.000	1.633	.617
Agoraphobic, 3High	7	13.714	1.113	.421
Antisocial, 1Baseline	7	22.000	3.109	1.175
Antisocial, 2Moderate	7	22.429	2.637	.997
Antisocial, 3High	7	22.429	2.225	.841
Normal, 1Baseline	7	21.857	2.410	.911
Normal, 2Moderate	7	17.429	4.117	1.556
Normal, 3High	7	11.000	1.414	.535

4b. What is your best estimate of the population variance (σ^2) from which these scores were selected? [2 pts]

4c. Suppose that you were to compute a one-way analysis of variance on these same data, looking only at the group factor. Complete the source table below to show what the one-way ANOVA would look like. [5 pts]

Source	df	SS	MS	F
Group				

4d. Compare your F-ratios for Group in the Two-Way ANOVA and in the One-Way ANOVA. Under which conditions would your F-ratio be larger? Under which conditions would your F-ratio be smaller? [3 pts]

5. Compare a 3x5 completely between (independent groups) and a 3x5 completely within subjects (repeated measures) designs to illustrate the efficiency of a repeated measures design. [5 pts]