Grad Stats Exam 2 Spring 2001

Question 1

Results from a treatment study of children with attention-deficit/hyperactivity disorder (ADHD) were recently released (Greenhill et al., 2001). This study was an experimental trial to evaluate the impact of methyphenidate (MPH) as a treatment drug and to identify optimal doses for different children. This example is based (quite loosely) on that research. (My apologies to the clinical students if my predictions are off base.)

One hundred children with ADHD participated in the clinical trials. One half of these children had been identified from pretest as low in symptomatology (exhibiting a few hyperactive behaviors), while the other half of the children were identified as high in symptomatology (exhibiting many hyperactive behaviors). Each child received 3 different MPH doses (placebo, low, and high) over a 3-week period. More specifically, each child received the placebo for one week, the low MPH dosage for one week, and the high MPH dosage for one week (assume there were no carryover effects of dosage level from week to week; also assume the order of dosage condition given was counterbalanced across children).

At the end of each week, each child was rated by his/her mom as to the degree of hyperactivity the child exhibited during that week.

Part A.

You are to set up a complete source table for this research, filling in the:

- **source column** (i.e., defining effects or error for each row of the table)**,** and
- **the degrees of freedom for each row.**

Also,

- **clearly label the areas of the table that are between- and within-children**
- **mark the rows that test each of the hypotheses listed below in Part B. Label each row that tests a hypothesis by putting two asterisks and the hypothesis tested (e.g., **H3).**

Note: You do not need to show us explicitly how you make each contrast for this design (i.e., you do not need to set up a -2 +1 +1 contrast for a 3-level variable if that is the effect you want to test). Instead just make sure to label the variable name for each row in such a way that the effect you are testing is clear. For example, if you're testing the effect of a within-participants factor that pits score for condition A versus scores for conditions B and C, call it AvsBC (do not call it W2). As always, make the comparisons in your table orthogonal to one another.

Please read Part B on the next page before setting up your source table.

Part B.

Before you set up the source table, read the following hypotheses and incorporate them into the effects you list in the table.

1. The researchers expected to find that high-symptom children would be rated as having somewhat higher levels of symptoms than low-symptom children, on average.

2. Researchers expected moms to rate children as having shown fewer symptoms when they were taking any level dosage of MPH than when they received a placebo for the week.

3. In general, the researchers expected children's hyperactivity at the end of each week to be lower when the children had received high MPH dosage levels than when they had been given low MPH dosage levels.

4. The researchers hypothesized that the best dosage to reduce hyperactive behaviors would depend on children's pretest symptomatology. In particular, children with high pretest symptoms were expected to show a larger (low versus high) dosage effect than children with low pretest symptoms.

Question 2

A study is conducted to look at weight gain in newborn infants. Some developmental psychologists hypothesize that babies will better thrive if they can hear their mothers' heartbeat. To evaluate this hypothesis, fourteen newborn infants who are being kept in the hospital for three days or more following delivery are randomly assigned to one of two different conditions. In one, they are exposed to a regular heartbeat sound; in the other they are not. Their weights are evaluated on three successive days. Additionally, for each baby, data on the length of the gestation period is available. In sum, the following data are available on each baby in the dataset:

COND	+1 if exposed to heartbeat; -1 if not
WGT1	weight on day one (in ounces)
WGT2	weight on day two (in ounces)
WGT3	weight on day three (in ounces)
GEST	gestation period (in weeks)

Initially a 2 X 3 repeated measures analysis of variance is conducted on these data, treating day as a within-subject factor with three levels and condition (exposed to heartbeat versus not) as a between-subject factor. Means from this analysis are presented in the first set of output, printed on the next page.

The following dependent variables are constructed to conduct the analysis:

AVE = (WGT1+WGT2+WGT3)/3
LIN = (WGT3 – WGT1)
QUAD = (2*WGT2 – WGT1 – WGT3)

The initial three PROC REG outputs (following the means) contain the results from these three variables regressed on COND.

Additionally, gestation period is mean-deviated (GESTD = GEST – 38.0714). And each of the three dependent variables (AVE, LIN, and QUAD) are regressed on COND, GESTD, and CXG (= COND * GESTD).

In light of the output below, answer the following questions.

1. Ignoring gestation period, is there evidence that across all 14 babies they are gaining in weight across the three days of this trial? (Give PRE, F*, n-pa, and pa-pc and a substantive conclusion for this comparison.)

2. Ignoring gestation period, is there evidence that the amount of weight gain across the three days depends on whether or not the babies are exposed to the heartbeat sound? (Give PRE, F*, n-pa, and pa-pc for this comparison. Additionally, write one sentence interpreting the direction of the difference if there is one.)

3. Provide an explanation for each of the effects estimated by the following parameter (you don't need an interpretation of the meaning of the numbers, just an explanation of the resulting effect each parameter is telling us about):

A. The intercept in Model 2 when LIN is regressed on COND.
B. The intercept in Model 5 where LIN is regressed on COND, GESTD, and CXG.
C. The slope for COND in Model 5 where LIN is regressed on COND, GESTD, and CXG.
D. The slope for CXG in Model 5.

4. Write a five-o'clock news summary about the role of both heartbeat sound and gestation period in infant weight and weight gain, based on these data. (Focus on significant effects only.)

---------- COND=-1 ----------

Variable	N	Mean	Std Dev	Minimum	Maximum
WGT1	7	107.1428571	10.1723247	95.0000000	124.0000000
WGT2	7	107.0000000	10.1324561	96.0000000	125.0000000
WGT3	7	106.4285714	10.5964954	95.0000000	126.0000000

---------- COND=1 ----------

Variable	N	Mean	Std Dev	Minimum	Maximum
WGT1	7	106.5714286	10.3739601	92.0000000	120.0000000
WGT2	7	108.1428571	9.9235170	95.0000000	121.0000000
WGT3	7	110.1428571	9.8730031	97.0000000	123.0000000

Model: MODEL1
Dependent Variable: AVE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	7.14286	7.14286	0.070	0.7961
Error	12	1227.39683	102.28307		
C Total	13	1234.53968			

Root MSE	10.11351	R-square	0.0058
Dep Mean	107.57143	Adj R-sq	-0.0771
C.V.	9.40167		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	107.571429	2.70294903	39.798	0.0001
COND	1	0.714286	2.70294903	0.264	0.7961

Variable	DF	Type II SS	Squared Partial Corr Type II	Tolerance
INTERCEP	1	162003	.	.
COND	1	7.142857	0.00578585	1.00000000

Model: MODEL2
Dependent Variable: LIN

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	64.28571	64.28571	8.464	0.0131
Error	12	91.14286	7.59524		
C Total	13	155.42857			

Root MSE	2.75595	R-square	0.4136
Dep Mean	1.42857	Adj R-sq	0.3647
C.V.	192.91622		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	1.428571	0.73655754	1.940	0.0763
COND	1	2.142857	0.73655754	2.909	0.0131

Variable	DF	Type II SS	Squared Partial Corr Type II	Tolerance
INTERCEP	1	28.571429	.	.
COND	1	64.285714	0.41360294	1.00000000

Model: MODEL3
Dependent Variable: QUAD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	2.57143	2.57143	1.213	0.2922
Error	12	25.42857	2.11905		
C Total	13	28.00000			

Root MSE	1.45569	R-square	0.0918
Dep Mean	0.00000	Adj R-sq	0.0162
C.V.	.		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0	0.38905082	0.000	1.0000
COND	1	-0.428571	0.38905082	-1.102	0.2922

Variable	DF	Type II SS	Squared Partial Corr Type II	Tolerance
INTERCEP	1	0	.	.
COND	1	2.571429	0.09183673	1.00000000

Model: MODEL4
Dependent Variable: AVE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	3	852.73297	284.24432	7.445	0.0066
Error	10	381.80671	38.18067		
C Total	13	1234.53968			

Root MSE	6.17905	R-square	0.6907
Dep Mean	107.57143	Adj R-sq	0.5979
C.V.	5.74414		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	107.803041	1.75362246	61.474	0.0001
COND	1	-2.052194	1.75362246	-1.170	0.2690
GESTD	1	5.532986	1.17983204	4.690	0.0009
CXG	1	-0.463542	1.17983204	-0.393	0.7026

Variable	DF	Type II SS	Squared Partial Corr Type II	Tolerance
INTERCEP	1	144289	.	.
COND	1	52.288747	0.12045449	0.88683603
GESTD	1	839.696511	0.68742881	0.88683603
CXG	1	5.893601	0.01520144	1.00000000

Model: MODEL5
Dependent Variable: LIN

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	3	64.62649	21.54216	2.372	0.1316
Error	10	90.80208	9.08021		
C Total	13	155.42857			

Root MSE	3.01334	R-square	0.4158
Dep Mean	1.42857	Adj R-sq	0.2405
C.V.	210.93369		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	1.394720	0.85518923	1.631	0.1340
COND	1	2.187126	0.85518923	2.557	0.0285
GESTD	1	-0.088542	0.57536881	-0.154	0.8808
CXG	1	0.067708	0.57536881	0.118	0.9087

Variable	DF	Type II SS	Squared Partial Corr Type II	Tolerance
INTERCEP	1	24.151566	.	.
COND	1	59.390774	0.39543008	0.88683603
GESTD	1	0.215030	0.00236252	0.88683603
CXG	1	0.125744	0.00138290	1.00000000

Model: MODEL6
Dependent Variable: QUAD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	3	2.61458	0.87153	0.343	0.7947
Error	10	25.38542	2.53854		
C Total	13	28.00000			

Root MSE	1.59328	R-square	0.0934
Dep Mean	0.00000	Adj R-sq	-0.1786
C.V.	.		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-0.007811	0.45217492	-0.017	0.9866
COND	1	-0.410343	0.45217492	-0.907	0.3855
GESTD	1	-0.036458	0.30422196	-0.120	0.9070
CXG	1	0.015625	0.30422196	0.051	0.9600

Variable	DF	Type II SS	Squared Partial Corr Type II	Tolerance
INTERCEP	1	0.000758	.	.
COND	1	2.090570	0.07608718	0.88683603
GESTD	1	0.036458	0.00143413	0.88683603
CXG	1	0.006696	0.00026372	1.00000000