

STAT 516 - Spring 2001 - Homework 7

Due: Monday, April 30th

These problems concern the ability of pre-school students to associate objects with words. The experiment randomly assigned 24 pre-schoolers to be exposed to the objects by either TV, Audio Tape, or Picture Books. The time they were exposed to the material was either 5 min, 10 min, 15 min, or 20 min. Unfortunately, some of the children became distracted over the longer time spans and were unable to complete the experiment. The response variable is a score based on how many of the objects they could identify, and how accurate their identifications were.

Medium Used	Time of Exposure			
	5 min	10 min	15 min	20 min
TV	49	50	43	53
	39	55	38	48
Audio	55	67	53	85
	41	58		
Written	66	85	69	85
	68	92	62	

1) Analyze this data as a two-way ANOVA with interactions.

a) Write down the model equation being fit.

b) Why can't we use the MEANS statement in PROC GLM for this data?

c) Check the assumptions.

d) In terms of both your model equation and the statement of the problem, explain what hypotheses are being tested by the p-values in the Type I and Type III tests respectively. Assuming that the assumptions were true, say if you would accept or reject the null hypothesis in each case. (i.e. *The Type I test for time is testing the null hypothesis that $\alpha_5 = \alpha_{10} = \alpha_{15} = \alpha_{20}$ given that medium is included in the model. That is, it tests whether time of exposure has any effect after accounting for medium. With a p-value of 0.0007 we conclude that time still has an effect.*)

2) Analyze this data as an ANCOVA with the time being a continuous variable

a) Test whether the slopes are the same for each medium, and if so, use the ANCOVA model without interactions. If the slopes are not the same, then include the interaction in the model.

b) Write down the model equation you are using, and get estimates of the parameters in it. Identify these parameters so that a reader could understand what the equation was saying.

c) Check the assumptions.

d) In terms of your model equation and the statement of the problem, explain what hypotheses are being tested by the p-values in the Type I and Type III tests respectively. Assuming that the assumptions were true, say if you would accept or reject the null hypothesis in each case.