Fall 1998 Answer Key

1a. In a study of memory processes, animals were presented with a one-trial avoidance task. As soon as they stepped across a line down the center of their cage they were shocked through a grid in the floor of the cage. Learning (avoidance) would be present if the animals took longer to cross over the line on subsequent trials.

One independent variable in this study is the site at which these animals had electrodes implanted in their brains (Neutral Site, Area A, or Area B). After crossing the line and receiving a shock to their feet, a small amount of electrical stimulation was sent to one of these three sites. Each group was further divided based on the second independent variable — the time delay between crossing the line and receiving electrical stimulation to their brain electrodes. A third of each group was given the stimulation 50, 100, or 150 milliseconds after crossing the line and receiving foot shock.

If the brain area stimulated is involved in memory, stimulation would be expected to interfere with consolidation and retard learning of the avoidance response. The dependent variable was the number of seconds it took the animal to cross the line on the second trial. Thus, longer times to cross the line correspond to greater learning and shorter times correspond to lesser learning.

Below are the means and a partially completed StatView source table for this experiment. Complete the source table and analyze/interpret the results as completely as possible. Be sure to interpret the results in terms of the nature of the experiment. Stim Time (A) represents the delay before stimulating the brain electrode (1 = 50 ms, 2 = 100 ms, 3 = 150 ms) and Stim Site represents to location of the brain stimulation (1 = Neutral, 2 = A, 3 = B). [25 pts]

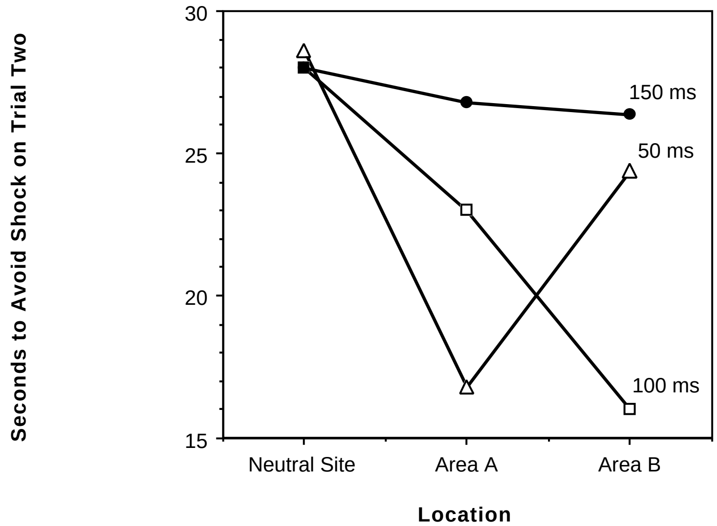
ANOVA Table for DV (Time to cross)

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Stim Time	2	188.578	94.289	3.217	.0518	6.434	.571
Stim Place	2	356.044	178.022	6.074	.0053	12.147	.868
Stim Time * Stim Place	4	371.956	92.989	3.172	.0248	12.690	.770
Residual	36	1055.200	29.311				

Means Table for DV (Time to cross)
Effect: Stim Time * Stim Place

	Count	Mean	Std. Dev.	Std. Err.
100 MS, Neutral Site	5	28.000	4.690	2.098
100 MS, Site A	5	23.000	4.743	2.121
100 MS, Site B	5	16.000	5.612	2.510
150 MS, Neutral Site	5	28.000	5.612	2.510
150 MS, Site A	5	26.800	5.404	2.417
150 MS, Site B	5	26.400	4.159	1.860
50 MS, Neutral Site	5	28.600	7.403	3.311
50 MS, Site A	5	16.800	5.718	2.557
50 MS, Site B	5	24.400	4.722	2.112

First, construct a graph:



For Tukey's analysis here, I'd obtain a q of 4.7 (k=9, df=36), which would yield a critical mean difference of 11.4. So only those means that differed by 11.4 or more would be different. Therefore, the animals crossed the line significantly faster when Area A is shocked after 50 ms compared to the neutral site. Further, the animals crossed the line significantly faster when Area B was shocked after 100 ms compared to the neutral site. Shocking any area of the brain after 150 ms doesn't appear to disrupt learning, nor does shocking the neutral site.

Remember that lower RTs are indicative of poorer performance (interference with the memory of painful shock, so they are more willing to cross over the line), so it appears that the neutral site is really neutral (not involved in memory for this task). Next, it appears that waiting until 150 ms after they cross the line is too long to disrupt the memory, which makes it equivalent to the neutral site. From the RTs at sites A and B, it appears that memory is disrupted maximally (sig faster RT than neutral site) for Area A at 50 ms and Area B at 100ms. So my interpretation of the results would be that both Areas A and B are involved in the formation of memory for the shock event, but that the information flows through Area A first and then through Area B. Stimulating Area B before 100 ms (i.e., at 50 ms) is premature, because the info has not arrived at that site by then. Stimulating Area A after 50 ms (i.e., at 100 ms) is too late, as the info has already passed along (possibly to Area B??).

1b. Suppose that you had analyzed the *same* data as a one-way ANOVA on Stim Site (i.e., exact same scores, but ignore Stim Time as a factor). How would your source table look for this one-way ANOVA? [10 pts.]

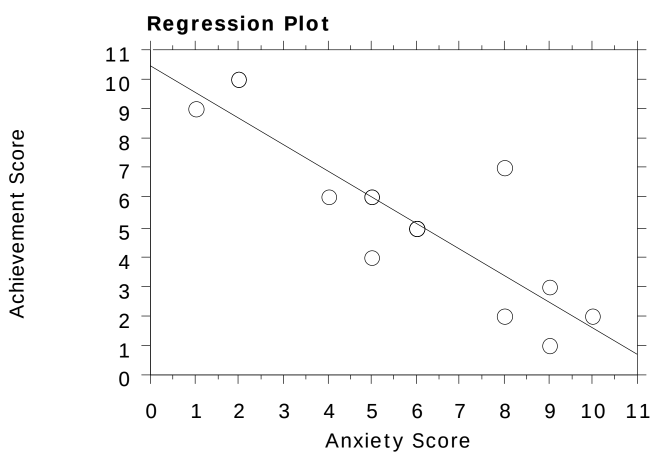
SOURCE	SS	df	MS	F
Stim Place	356	2	178	4.7
Error	1616	42	38	
Total	1972	44		

The first step is to recognize that the SS, df, and MS for Stim Place would not change at all (the 3 marginal means would be the 3 means for the one-way ANOVA, and $MS_{Treatment}$ is due to the variance of the group means). Next, recognize that the Total SS and df would not change. Thus, the SS_{Error} would be the sum of SS_{Error} and $SS_{Stim\ Time}$ and $SS_{Interaction}$ from the two-way ANOVA. The same would be true for the df.

2. You've just completed a research proposal. Suppose that later you decide to conduct a senior thesis and you use your proposal from this course as the basis of the thesis. You have several discussions with your advisor about the design of your study, after which the design is substantially changed. You then set up the study, collect all the data and perform analyses on the data. You write your thesis based on the study, but you receive substantial feedback from your advisor, requiring you to undertake substantial revisions to your thesis. You then go on to graduate school, and after a couple of years you hear from your advisor that your thesis is about to be published in a journal article with four other studies, all of which are related to your thesis topic. Your advisor informs you that you are the third of three authors on the paper. Use the Fine & Kurdek paper to analyze the situation and guide you in your response to the advisor's actions. (Note that I'm more interested in your reasoning, using the arguments in the Fine & Kurdek paper, than I am in your ultimate decision about how to respond.) [10 pts]

OK, admittedly you don't have a great deal of information in this brief sketch of the situation. First of all, I would recognize that the ultimate publication involves 5 studies, of which only one is the work of the student. Second, I would recognize that the student appears to have made substantial contributions to the work on the thesis, which would likely justify authorship. I would then approach the decision from the perspectives of beneficence, justice, and parentalism. I would argue that the advisor is behaving parentally, because the advisor is not consulting with the student prior to making authorship decisions. I would argue that the advisor is being somewhat beneficent, in that the student appears to be considered in the advisor's decision about authorship. However, I would argue that it would be unjust to leave the student off the list of authors, given the level of involvement in that student's thesis. The only real question that I might have would involve the second author. Was the second author's contribution to the overall paper such that the student in question should only receive the third-author position?

3. An investigator studying the relationship between anxiety and school achievement selects a random sample of 15 fifth-grade students, all aged 10 years. Each student is given an anxiety test (high scores signifying high anxiety) and then these measures are paired with the student's score on an academic achievement test. Below is a set of output from StatView. Interpret the results as completely as you can. *Then*, offer at least three interpretations for the results that you've obtained. [15 pts]



Y = 10.503 - .89 * X; R^2 = .759

Regression Summary
Achievement Score vs. Anxiety Score

Count	15
Num. Missing	0
R	.871
R Squared	.759
Adjusted R Squared	.740
RMS Residual	1.427

ANOVA Table
Achievement Score vs. Anxiety Score

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	83.134	83.134	40.836	<.0001
Residual	13	26.466	2.036		
Total	14	109.600			

Regression Coefficients
Achievement Score vs. Anxiety Score

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	10.503	.879	10.503	11.943	<.0001
Anxiety Score	-.890	.139	-.871	-6.390	<.0001

First of all, I would note that there is a significant negative linear relationship between achievement and anxiety, because r = -.871 and F(1,13) = 40.836, $p < .05$. The variables appear to be closely related, because r^2 is .759, so the two variables share ~76% of their variance.

Here are three possible interpretations of the results: (1) anxiety affects achievement, such that as people become more anxious, they perform more poorly; (2) achievement affects anxiety, such that as people perform more poorly, they become more anxious; and (3) intelligence is the (hidden) causal factor, because when people are really smart, they are less anxious about everything and they also perform well on achievement tests, and when people are really dumb, they are anxious about everything and perform less well on achievement tests. [Note that the first two answers are related to the causal arrow problem and the third answer is a third variable explanation.]

4. Until the 1960's, people believed that infants had little or no pattern vision during the early weeks or even months of their lives. Fantz was one researcher who showed that infants were, in fact, sensitive to patterns [Fantz, R. L. (1963), Pattern vision in newborn infants, *Science, 140*, 296-297.] Below are data from 14 infants under 48 hours old. They were all exposed to a series of targets, presented in a random sequence to each infant. Three of the targets contained black-and-white patterns: a schematic face, concentric circles, and a section of newspaper. The fourth target was an unpatterned white circle. A blue background was provided in all cases to provide a contrasting background. The dependent variable is the length of gaze (in seconds) of an infant for a particular target. Systematically different lengths of gaze should indicate that the infants could see differences in the targets. Otherwise, they should look at all the stimuli for about the same lengths of time. Complete the source table below, then analyze the results as completely as you can. [15 pts]

ANOVA Table for Stimulus

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Subject	13	11.229	.864				
Category for Stimulus	3	5.992	1.997	17.503	<.0001	52.508	1.000
Category for Stimulus * Subject	39	4.451	.114				

Means Table for Stimulus
Effect: Category for Stimulus

	Count	Mean	Std. Dev.	Std. Err.
Face Pattern	14	1.679	.590	.158
Circle Pattern	14	1.421	.743	.199
Newspaper Pattern	14	.971	.329	.088
White Pattern	14	.879	.444	.119

Because of the significant F-ratio (17.503, $p < .05$) I would reject H_0. Thus, I know that the time infants spend looking at the four types of stimuli does differ. I would conduct a post hoc analysis to determine which specific patterns differ. With 4 treatments and df_{Error} of 39, I would obtain a q of 3.79. Thus, my HSD = .34. Infants look at a face pattern significantly longer than at newspaper or the white pattern, though faces did not differ from the circle pattern. Infants looked at the circle pattern significantly longer than at the newspaper or the white pattern. Infants looked at the newspaper and the white pattern for about the same amount of time.

5. According to the APA ethical guidelines, you are allowed to use deception, but only under certain conditions. Clearly specify the conditions under which deception is permissible. Then use the Ross, et al. article to address some important concerns about using deception in psychological research. How would you characterize the impact of knowledge among potential participants about potential deception on their responses in an experiment? You should pay particular attention to the notion of demand characteristics (after defining what they are). [15 pts]

In essence, one can use deception when the participant is unlikely to be harmed by the deception, when the researcher cannot use a design that has no deception, and when the deception will be explained to the participant through debriefing. The Ross, et al. article raises concerns about the efficacy of debriefing, suggesting that process debriefing may be necessary to achieve sufficient inoculation against the deception. (You would need to give more detail here, I'm just giving you a brief outline of an answer.) Then, I was expecting people to talk about the fact that as participants become aware of the widespread use of deception, they may behave differently in psychological studies. That is, if they expect that every study involves deception, that may work as a demand characteristic, leading the participant to behave in an abnormal fashion.

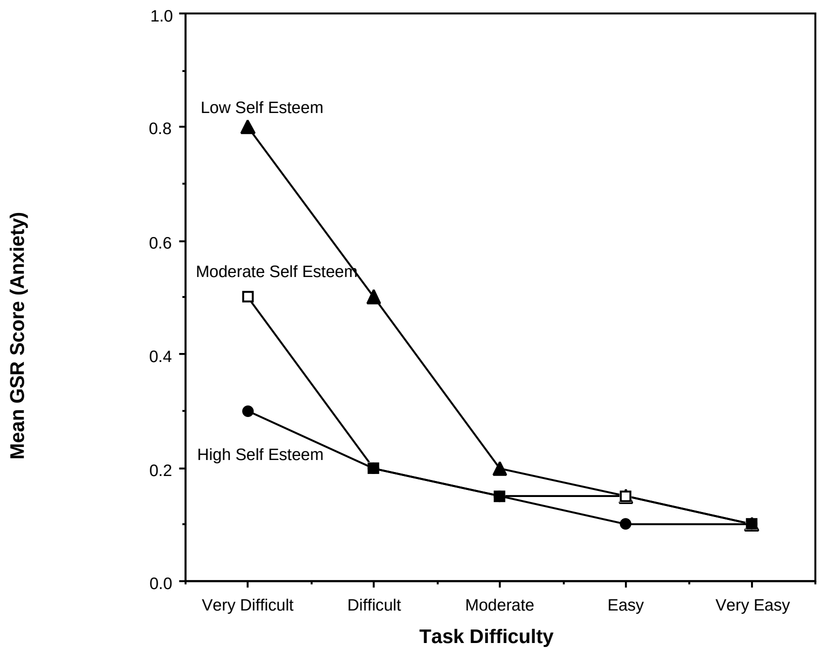
6. Suppose that you are designing an experiment examining the impact of self-esteem and task difficulty on anxiety. You plan to first measure the self-esteem of people, which will allow you to group them as having low, moderate, or high self-esteem. You will then give each of the participants each of 5 different sets of tasks, which vary in difficulty from very easy to very difficult. You decide to use galvanic skin response (GSR) as your dependent variable, so you hook up each participant with electrodes and attach them to your GSR recording device (polygraph). Each participant will work on a set of tasks for 15 minutes (presumably completing more of the easy tasks), after which their GSR will be measured and they will move on to the next task until they've completed all the tasks. Because you think that you're dealing with a fairly weak effect, you are confident that you need at least 50 data points in each of your cells. [15 pts]

a. Describe the nature of this design. This is a 3 (self esteem) x 5 (task difficulty) mixed design, with self esteem the independent groups factor and task difficulty the repeated factor.

b. How many participants will you need in all? (Show how you obtained your number.)

I would use complete counterbalancing for the repeated factor, which means that I need 5! participants, or 120 participants (which is more than the required 50). [Had I chosen to use incomplete counterbalancing, I would need to run 50 participants. Because 5 is odd, I would actually have 10 different running orders, which means that I would need to run in multiples of 10 participants.] Because I would need different participants for each level of self esteem, I would need a total of 360 participants. [Or 150 participants if I used incomplete counterbalancing.]

c. Provide a graph of a set of results that would indicate an interaction between your factors, then explain the source of the interaction.



On very easy tasks, self esteem doesn't seem to have much of an effect. However, as tasks become increasingly difficult, people with high self esteem exhibit only a modest increase in anxiety, which is also true for people with moderate self esteem (at least up to the point that the tasks are very difficult, at which point the anxiety levels appear to be higher than those seen for the people with high self esteem). People with low self esteem show steeply increasing anxiety as problems become more difficult (at least after the moderate level of task difficulty).

d. How would you describe your self-esteem variable? What implications would that have on your interpretation?

Self esteem is a non-manipulated characteristic of the participant. As a result, you would not be able to make any causal claims about the effect of self esteem. That is, if you found a difference, you could observe that people with high self esteem have lower GSR (anxiety) than people with low self esteem (for example), but you can't be sure that the difference is due to self esteem, per se.