Your name: ________________________

9.63 –Laboratory in Visual Cognition
Mid-term exam

SHORT QUESTIONS 1 – 9 – ANSWER ALL THE QUESTIONS FOR A TOTAL OF 30 POINTS (estimated time: 20 minutes) – GIVE SHORT ANSWERS

QUESTION 1 (2 pts): In CogLab 2, Visual Search, what was the dependent variable, and what were the two independent variables? [[RT, and set size/conjunction v. feature]]

QUESTION 2 (2 pts): Give one example of a visual search asymmetry, and briefly say why [[O vs Q, etc]]

QUESTION 3 (3 pts): The data of an old-new visual memory experiment are as follows (in term of d prime): 4.9, 4.8, 4.65, 5, 4.82, 4.61, 4.3, 4.7. What can you conclude? [[ceiling effect]]

QUESTION 4 (3 pts): Is "IQ" measurement an ordinal, interval or ratio factor? Say briefly why [interval, see the slide: no absolute zero and it is meaningless to say that X is twice as smart than Y]]

QUESTION 5 (4 pts): Which type of measurement scale is the variable "d prime" ? Briefly justify why giving 2 reasons. [[ratio, it has a true zero, and twice d' value means twice more sensitivity than a single d' prime value]]

QUESTION 6 (4 pts): Name a real life situation in which you might care more about a person's signal detection sensitivity (d' prime) than the number of correct answers they get. [[anything will do – in class I said something about somebody who always says you look good no matter what, and how that doesn't let you know if you really look OK today if you ask that person]]

QUESTION 7 (4 pts): You are designing an experiment about facial emotion detection. Is "emotion" a continuous or a discrete factor? Justify briefly your answer. [[it could be both, depending on how you treat it: categorically or on a continuus scale – anything that make sense is good here]]

QUESTION 8 (4 pts): Give one example of a real life example or application where having a low d prime between HIT (correct yes answer) and False Alarm is an advantage. [[slide say face deformation, but any example that make sense is good]]

QUESTION 9 (4 pts): In signal detection theory, your decision depends on the signal, measured by the sensitivity measure termed "d prime". What is the other measurement (not d prime measure) you need to take into account when taking a decision? Describe briefly this other measurement and how you would calculate it, using HIT and FA. [response bias, C; must write the formula]].

INTERPRETATION QUESTIONS: ANSWER ALL THE QUESTIONS 10 – 18 (FOR A TOTAL OF 70 POINTS) (estimated time: 1 hour)

QUESTION 10 (5 pts):

An experiment group in 9.63 asks people to remember a list of words. Half of the subjects see a list of toys and half see a list of trucks. To test whether subjects can remember more toy words or more truck words, they use a one-tailed paired t-test and find a significant difference (people remember more trucks). Is this the correct what to do this analysis? If not, what statistics should the group have done? [[not correct; it should not be paired because they are different groups of subjects, and it should not be 1 tailed because it is interesting no matter which way direction the effect is in]]

QUESTION 11 (6 pts) One of the new results on the attentional blink paradigm is the "spreading of sparing" phenomena.

a.) Explain briefly what it is
b.) Illustrate the "spreading of sparing" phenomena by explaining what the experimental conditions to compare are.

QUESTION 12 (6 pts):

a.) Draw a graph representing an interaction between two factors, but no main effect of either factor. [[a cross-over interaction, with an X]]

b.) Draw a graph representing a main effect of variable 1, a main effect of variable 2 with an interaction.

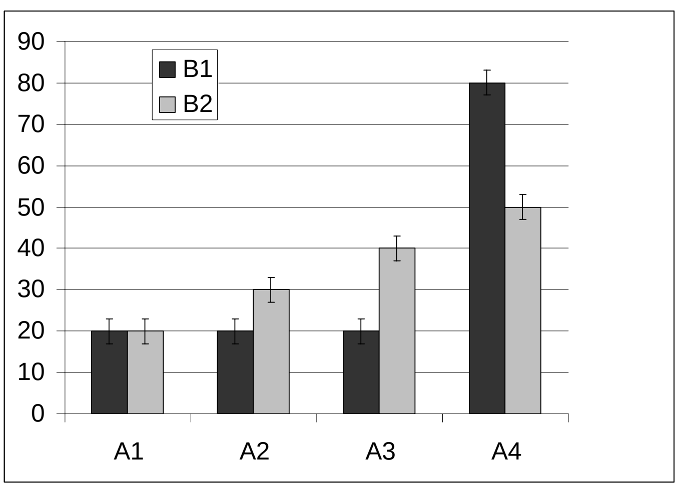
c.) Draw a graph representing a main effect of variable 1, a main effect of variable 2 with NO interaction.

d.) Draw a graph representing No interaction and no main effects of either variable.

QUESTION 13 (6 pts):

Below is a graph of results for an experiment of detection with two factors: factor A with conditions, A2, A2, A3 and A4; and factor B with conditions B1, and B2. Based on the graph result

a.) is there a main effect of factor A ? justify briefly why [Yes]
b.) is there a main effect of factor B ? justify briefly why [No]
c.) is there an interaction ? justify briefly why [No]
d.) Let's imagine the Y axis (dependent factor) represent percent correct of detection. In another experiment, all results of B2 are at zero. Is there still an interaction? Justify your answer. [detection of zero is a floor effect, cannot interpret the data]



QUESTION 14 (8 pts):

For a new video game picturing super-heroes all together (the 4 fantastics, Spiderman, Superman and Batman) you are designing a short trailer. You decide to design an RSVP task, where snapshots of super-heroes are shown in a rapid succession. You know that your viewers will not be necessarily experts at playing video games but will be looking for the new characters in the trailer.

a.) You do not want viewers to have an "attentional blink" between images, but you want to have the images shown very rapidly. Which short image duration(s) or ranges of duration, do you use so that all the super-heroes snapshots are seen?

b.) You want to insist on the 4 fantastics characters, and make sure they are seen as a group. Would you put them all in a row, or would you spread them among the other super heroes' characters? Justify briefly your answer. [[anything that make sense will be accepted: as a group, putting them in a row, due to the spreading of attention might be more efficient, but any other answer that will make sense will be accepted]]

QUESTION 15 (9 pts):

You are running an experiment with 3 different conditions and plan to run only 3 observers to start with. Each condition takes about 5 minutes to run.

a. Would you present the conditions to each of the 3 observers in the same order (A, B, then C)? Why not? [[their could be order effects, you need to counterbalance so they don't always do C last when they are tired, etc]]
b. In what order would you present the conditions? (Write both an example order and the name of the counterbalancing scheme) [[Draw a 3x3 Latin square and say that it is a Latin Square]]
c. What is one potential confound having to do with this order of presentation? How many subjects would you need to avoid this confound? [[Some conditions still follow each other more often than others. So if say, A is really tiring and B always follows A, they might do worse on B than C even if B isn't easier really. A full counterbalance (a full factorial design) would require 3*2*1 = 6 observers]]

QUESTION 16 (10 pts): You are living in a colony on Mars. Someone in the colony has become sick with an infectious disease that could destroy the colony, but you don't know who it is. You've been put in charge of designing a test to detect the disease to try to save the colony.

a.) Explain what a false negative and a false positive are in the context of this test. [[a false negative would be saying someone doesn't have the disease when really they do; a false positive would be saying they have it when they don't]] b.) In this particular circumstance, would you be more worried about false negatives or false positives? [[false negative; if you didn't figure out who had it the whole colony would die]]

c.) What is a time where you would be more worried about the other kind of error? (e.g., if you chose 'false positive' in B, write about a time you'd be more worried about a 'false negative', and vice versa). [[some time when saying something has something when they don't is very very bad]]

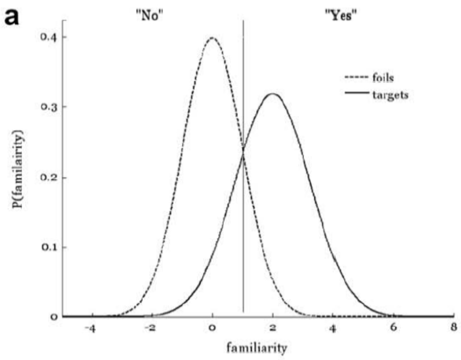
QUESTION 17 (10 pts): You are interested in whether the Fusiform Face Area (FFA) encodes information about the gender of a face. You've already run an experiment where you show a series of all female faces and all male faces and subtract them, but the FFA showed no difference in overall activity between those blocks of stimuli.

a.) Sketch out an experiment you would do to examine in more depth whether the FFA encodes gender, using one of the other methods we discussed in the fMRI lecture. Include whether your design would be event-related or blocked, what your conditions would be, and your hypothesis about what would happen if the FFA did encode gender and if it didn't. [[NOTE: LONG ANSWER -- either a classification paradigm or an adaptation paradigm – the classification one would be blocked and the adaptation one would probably be event-related but could be blocked]]

b.) What do the colored blobs represent when people display fMRI data on a picture of a brain (Hint: it is not the activity level of a particular condition)? [[the p-value of the difference between two conditions]]

QUESTION 18 (10 pts) : CHOOSE 18A *OR* 18B

QUESTION 18 A



The graph above represents what somebody's memory might look like in an experiment where they were shown a list of words and then given a test to see if they remember those words. It represents, using a signal detection theory graph, how familiar they are with both the words they have seen and the words they haven't. The words they've seen before – *targets* – are in general more familiar to them (further to the right on the x-axis) than the words that they did not see – the *foils* -- but not always. However, because memory is not perfect, sometimes the foils seem familiar as well. The vertical decision-line represents what level of familiarity with a word an ideal observer would use to decide whether to say "yes" or "no" at the test when asked whether they'd seen the word before (the observer's criterion; they'd say yes to items to the right of the line and no to items to the left of the line).

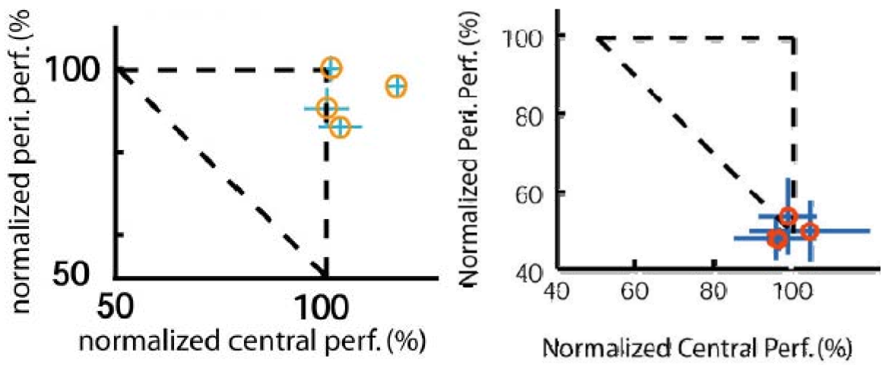
a) Shade the area of the graph that represents items to which this observer would false alarm. [[the area under the "foils" line that is to the right of the vertical bar]]

b) If instead of making decisions with no bias, this person rarely missed any items they'd seen before, but also made many false alarms, where would the vertical criterion line be in the graph? [[the vertical line would be to the left of where it is now]]

c) Draw a new graph just like the one above, but in a circumstance where the observer's memory for the words was perfect (they made no misses and no false alarms). [[the two Gaussians shouldn't overlap and the line should divide them perfectly]]

QUESTION 18 B

2)



These graphs represent performance from two different divided attention tasks (Task 1 and Task 2). In both cases, observers were performing one task in central vision (the x-axis) and one task in peripheral vision (the y-axis). The 100% marks on the x and y-axes represent how well the observers did when they were performing each of those tasks alone. The dots represent how well the same observers did on the two tasks when they were performing both tasks at once (e.g., a circle whose x-coordinate is 95% means that when doing both tasks at once, the observer performed 95% as well at the central task as they did when performing the central task alone).

a. In which task (Task 1 or Task 2) were observers successfully able to divide their attention and perform both tasks? Explain. [[Task 1, since they are able to do both tasks at near 100% of their performance when doing each of them alone]]

b. If you gave the observers in Task 2 a different set of instructions, say, rewarding them a great deal of money for every trial they were correct on the peripheral task, where would you expect their performance to be? (Draw the dots on the graph). [[In the upper left corner; they wouldn't be able to do both tasks still, but would prioritize the peripheral task over the central task]]

EXTRA CREDIT POINT QUESTION (10 pts): choose question 19 OR answer to both Question 18 above.

QUESTION 19 Describe an experiment of visual search that will test the role of distractor resemblance to the target, on target detection (describe the hypotheses, independent factor(s), the dependant factor, the type of stimuli, the experimental procedure and the expected results).

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