Psychology of Perception

Psychology 4165, Section 582

Continuing Education Online Class

Summer 2016

Lewis O. Harvey, Jr. – Instructor
Steven M. Parker–Teaching Assistant

Thatcher Illusion (Thompson, 1980)

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Syllabus Topics and Reading Assignments

Week 1	30 May	**Memorial Day**	**Holiday**	
Week 1	31 May	Psychophysics	Study Guide 1	(W 1)
Week 1	1 June	Psychophysics	Homework 1	(W 1)
Week 1	2 June	Vision	Quiz 1 opens	(W 2)
Week 1	3 June	Vision	Homework 2	(W 2)
Week 1	4 June	Midnight Saturday	Quiz 1 closes	
Week 2	6 June	Spatial Vision	Study Guide 2	(W 3)
Week 2	7 June	Spatial Vision		(W 3)
Week 2	8 June	Object Perception	Homework 3	(W 4)
Week 2	9 June	Object Perception	Quiz 2 opens	(W 4)
Week 2	10 June	Color Vision	Homework 4	(W 5)
Week 2	11 June	Midnight Saturday	Quiz 2 closes	
Week 3	13 June	Color Vision	Study Guide 3	(W 5)
Week 3	14 June	Space Perception		(W 6)
Week 3	15 June	Space Perception	Homework 5	(W 6)
Week 3	16 June	Attention	Quiz 3 opens	(W 7)
Week 3	17 June	Attention	Homework 6	(W 7)
Week 3	18 June	Midnight Saturday	Quiz 3 closes	
Week 4	20 June	Motion	Study Guide 4	(W 8)
Week 4	21 June	Hearing		(W 9)
Week 4	22 June	Hearing	Homework 7	(W 9)
Week 4	23 June	Audition	Quiz 4 opens	(W 10)
Week 4	24 June	Audition	Homework 8	(W 10)
Week 4	25 June	Midnight Saturday	Quiz 4 closes	
Week 5	27 June	Music-Speech	Study Guide 5	(W 11)
Week 5	28 June	Vestibular		(W 12)
Week 5	29 June	Touch		(W 13)
Week 5	30 June	Taste-Smell	Quiz 5 opens	(W 14 & 15)
Week 5	1 July	Taste-Smell		(W 14 & 15)
Week 5	2 July	Midnight Saturday	Quiz 5 closes	

Textbook for the Course

Wolfe, J. M., Kluender, K. R., Levi, D. M., Bartoshuk, L. M., Herz, R. S., Klatzky, R. L., . . . Merfeld, D. M. (2015). *Sensation and Perception*. Sunderland, Massachusetts: Sinauer Associates, Inc.

Note: The numbers in parentheses above refer to chapters in the Wolfe (W) text. Please read the indicated chapter before the class meeting. At the beginning of each week, a study guide will be available to focus your reading and listening to the lectures. It will also prepare you for the weekly quizzes. These five quizzes (one for each week) will be available on Thursday of each week and will close on Saturday evening at midnight. During the first four weeks there will be eight homework assignments: two per week. The final week is free of homework so you can devote more time to your final research project (lab 4).

Office Hours

Name	Lewis O. Harvey, Jr.	Steven M. Parker
Office	MUEN D251b	MUEN D251
Hours	Online by appointment	Online by appointment
Telephone	303-492-8882	
email	lewis.harvey@colorado.edu	steven.parker@colorado.edu
web	http://psych.colorado.edu/~lharvey/	

Lewis O. Harvey, Jr.–Instructor
Steven M. Parker–Teaching Assistant

Laboratory Schedule

1.	31 May 2016	**Lab 0**: Doing Computer-Controlled Experiments Start CITI Certification
2.	2 June 2016	**Lab 1**: Face Recognition (30 Points)
3.	6 June 2016	Work on Lab 1
4.	8 June 2016	Lab 1 Report Due **Lab 2**: Loudness Scaling (40 points) Formulate Lab 4 Projects
5.	13 June 2016	Work on Lab 2 Group Project Approval
6.	15 June 2016	Lab 2 Report Due (40 points) **Lab 3**: Stroop Effect (50 Points) **Lab 4**: Group Projects
7.	20 June 2016	Work on Lab 3
8.	22 June 2016	**Lab 3 Report Due (50 points)** **Lab 4**: Group Projects
9.	27 June 2016	**Lab 4**: Group Projects
10.	29 June 2016	**Lab 4 Project Presentations** (20 points)
	1 July 2016	**Lab 4 Project Report due** (40+20 points)

Original Articles

1.	30 May 2016	No Assignment
2.	31 May 2016	(Swets, 1961)
3.	2 June 2016	(Schiller, 2010)
4.	6 June 2016	(Schiller & Carvey, 2005)
5.	8 June 2016	(Owens, Antonoff, & Francis, 1994)
6.	10 June 2016	(Jacobs & Nathans, 2009)
7.	14 June 2016	(Kaufman & Rock, 1962)
8.	16 June 2016	(Most & Astur, 2007; Most, Scholl, Clifford, & Simons, 2005)
9.	17 June 2016	(Nuthmann, 2014; Psalta, Young, Thompson, & Andrews, 2014)
10.	21 June 2016	(Plomp, 1964)
11.	23 June 2016	(Plomp & Levelt, 1965)
12.	27 June 2016	(Poeppel, Emmorey, Hickok, & Pylkkänen, 2012)
13.	28 June 2016	(Held, 1965)
14.	29 June 2016	(Guterstam, Petkova, & Ehrsson, 2011; Slater, Spanlang, Sanchez-Vives, & Blanke, 2010)
15.	30 June 2016	(Gelstein et al., 2011; Savic, Berglund, Gulyas, & Roland, 2001)

Copies of these papers are available to download for reading through D2L using your CU IdentiKey ID. See the reference section at the end of the syllabus for complete citation information.

Conditions Under Which the Course Operates

Lecture:

There are five quizzes given during the A term, indicated on the syllabus. The quizzes go on-line on Thursday of each week and close Saturday evening at midnight. At the beginning of each week we will post a guide to the week's material to focus your reading and to prepare you for the quiz.
There are eight homework assignments during the first four weeks of the A Term. Each homework is made available on Wednesday or Friday (consult the syllabus) and will be due two days later.

Original Articles Reading:

There are 19 original journal papers that are assigned as part of the course. These papers will form the basis of a 6–10 page paper about experimental design and drawing conclusions from data. This paper is due on Friday, 1 July 2016, and is worth 50 points.

Laboratory:

The laboratory is not optional in PSYC 4165. There are four assignments in the laboratory. These assignments will be graded and the sum of the four grades will be your laboratory grade. All lab assignments must be written and printed with a computer word processor and all graphs must be prepared using computer graphics. We will use the open source statistical package R, in connection with RStudio, which are powerful, free, and run on Macintosh, Windows, and Linux computers. They are available for download at: https://www.r-project.org and https://www.rstudio.com, respectively. The experiments in the laboratory part of the course are based on PsychoPy, a free, open source system for designing and running psychological experiments. It is especially designed for creating and presenting visual and auditory stimuli and collecting responses. It may be downloaded for your Macintosh, Windows or Linux computer at: http://www.psychopy.org

Grading:

Your final grade is computed from your exam scores, homework grades, and the laboratory grade. The total possible points in the course is 850:

500	Five Quizzes
200	Laboratory Grade
80	Eight Homeworks
50	Analytic Paper (1 July 2016)
20	Participation

850	Total Possible Points

Your final letter grade in the course will be assigned in the following manner. A "Reference Score" will be calculated by taking the mean of the top three in the class. Your grade will be determined by how well you have done in comparison to this reference score:

	A >96.6%,	A- >93.3% of the reference score
B+ >90.0%,	B >86.6%,	B- >83.3% of the reference score
C+ >80.0%,	C >76.6%,	C- >73.3% of the reference score
D+ >70.0%,	D >66.6%,	D- >63.3% of the reference score
	F <63.3%	

It is therefore possible for the entire class to receive the grade of A. By the same token, it is also possible that very few people would receive an A, depending on the spread of grades across the class.

Comments About The Psychology Of Perception

Why Take This Course?

There are three reasons to take this course:

1. To gain an understanding of the capabilities and limitations of our perceptual experiences;

2. To sharpen your ability to critically evaluate the results of experiments in light of theories of perception;

3. To gain practical skills in the use of computers for designing experiments, for analyzing and graphing data, and for preparing written laboratory reports.

The study of perception is the oldest part of modern psychology. It developed from trying to answer two questions posed by philosophers: "How do we know what we know?" and "Why do things appear the way they appear?" Since most of what we know about the outside world comes to us through our sensory systems, our sensory capabilities were the first to be studied extensively. Perceptions are derived from neural and psychological mechanisms that operate on sensory information. We will study the limits of our sensory and perceptual abilities and learn how to characterize the unreliability that results from these limits.

Prerequisites:

A broad understanding of the basic concepts from a general psychology course is assumed. You will be using methods of inferential statistics, such as those taught in Psychology 2101, to evaluate the results of your experiments. A facile ability with these methods in particular and with mathematical concepts through algebra and trigonometry are required. A familiarity with calculus is helpful but is not necessary. Please work through the eight questions on the next two pages. If you find these questions very difficult and you don't even know how to find out how to answer them, you probably are not ready to take this course.

You will learn modern statistical methods that go beyond the t-test and analysis of variance (ANOVA) that are common in introductory statistics courses. These modern methods include linear mixed-models (of which ANOVA is one part) that can handle within- and between-subjects variables as well as fixed-effects and random-effects variables. You will learn how to measure effect size and confidence intervals using bootstrapping techniques as an alternative to the deprecated use of significance testing. You will learn how to carry out these analyses using the R statistical package, a powerful, open-source, and free software platform for Macintosh, Windows and Linux computers.

You need to make a considerable commitment of time to do well in this class. For each credit hour of the course you should expect to spend 3 hours on class-related activities (studying, research, writing) per week. Since the class is a four-credit course, expect to spend 12 additional hours per week outside the class and laboratory.

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Skills Needed for Psychology of Perception

Question 1:
Rearrange the following linear equation to solve for *b*: $y = a + bx$

$b =$

Question 2:
Solve the following equation for *X*: $y = \log(x)$

$x =$

Question 3:
Compute the arithmetic mean and the standard deviation of this sample of numbers:
10.0, 9.0, 12.0, 11.0, 8.5, 13.0, 8.0, 10.0, 7.0, and 11.5:

$\mu =$

$\sigma =$

Question 4:
In an experiment you observe the number of times six different kinds of events occur. A theoretical model makes predictions about how often these events *should* occur. These data are presented in the table below. Compute the chi-square (χ^2) statistic to test if the observed data are significantly different from the predicted data. You may assume *n-1=5* degrees of freedom for the significance test.

	E1	E2	E3	E4	E5	E6
Observed Data	174.0	172.0	104.0	92.0	41.0	8.0
Predicted Data	175.5	167.8	106.5	90.4	44.3	6.5

$\chi^2 =$

Question 5:
In an experiment with two levels of an independent variable you observe the following values of the dependent variable for 10 subjects (five were tested under level 1 and five under level 2). Compute the mean of each column and calculate a t-test (or ANOVA if you wish) to test the hypothesis that there is not a significant difference between the means of groups:

Level 1		Level 2	
Subject	Dependent	Subject	Dependent
1	8.0	6	10.0
2	9.0	7	9.5
3	7.5	8	11.0
4	7.0	9	9.0
5	8.5	10	10.5
Mean		Mean	

$t(df) =$

$p =$

Question 6:
Convert the probability 0.8413447 to a quantile score based on the cumulative distribution function (CDF) of the unit normal Gaussian distribution (a quantile is a z-score). Such a transformation is achieved by the quantile function (`q <- qnorm(p)` in R, where p is the probability). What is the probability that a single sample drawn from a population having a Gaussian distribution with a mean of 0.0 and a standard deviation of 1.0 will have a value of 1.959964 or greater (use `pnorm(q)` in R)?

$q =$

$p =$

Question 7:
Using least-squares linear regression, compute the slope (a) and y-intercept (b) of the straight line, $y = a + bx$, that best fits this set of data. In R you can use `lm(y ~ 1 + x)`:

x	1.0	3.0	5.0	7.0	9.0
y	0.98	8.73	17.0	20.9	27.4

$a =$

$b =$

Question 8:
Plot the data in Question 7 on a graph using linear axes. The x-axis should have a range of 0.0 to 10.0 and the y-axis should range from 0.0 to 30. Use the plot() function in R.

Academic Integrity Policy

A university's intellectual reputation depends on maintaining the highest standards of intellectual honesty. Commitment to those standards is a responsibility of every student, faculty, and staff member on the University of Colorado at Boulder campus.

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Honor Code

A student-run Honor Code was instituted on the Boulder Campus in 2002. The intent of the Honor Code is to establish a community of trust where students do not plagiarize, cheat, or obtain unauthorized academic materials. An honor code council collaborates with the colleges and schools in addressing allegations and instances of academic dishonesty and in assisting to educate all members of the university community on academic integrity issues.

Breaches of academic honesty include cheating, plagiarism, and the unauthorized possession of examinations, papers, computer programs, as well as other class materials specifically released by the faculty.

A student accused of academic dishonesty will either accept the accusation made by a faculty member or request a hearing before a student panel, who will make a decision on the accusation of academic dishonesty. In addition to academic sanctions imposed by the faculty, students found guilty of academic dishonesty also face consequences from the honor code council ranging from attending a mandatory class in ethics to expulsion from the campus. More information about CU-Boulder's Honor Code may be found at www.colorado.edu/academics/honorcode/Home.html.

The following terms are clarified for the benefit of all members of the university community.

Cheating

Cheating is defined as using unauthorized materials or receiving unauthorized assistance during an examination or other academic exercise. Examples of cheating include: copying the work of another student during an examination or other academic exercise (includes computer programming), or permitting another student to copy one's work; taking an examination for another student or allowing another student to take one's examination; possessing unauthorized notes, study sheets, examinations, or other materials during an examination or other academic exercise; collaborating with another student during an academic exercise without the instructor's consent; and/or falsifying examination results.

Plagiarism

Plagiarism is defined as the use of another's ideas or words without appropriate acknowledgment. Examples of plagiarism include: failing to use quotation marks when directly quoting from a source; failing to document distinctive ideas from a source; fabricating or inventing sources; and copying information from computer-based sources, i.e., the Internet.

Unauthorized Possession or Disposition of Academic Materials

Unauthorized possession or disposition of academic materials may include: selling or purchasing examinations, papers, reports or other academic work; taking another student's academic work without permission; possessing examinations, papers, reports, or other assignments not released by an instructor; and/or submitting the same paper for multiple classes without advance instructor authorization and approval.

Reproduced from: http://www.colorado.edu/policies/academic-integrity-policy

Check out http://www.umuc.edu/writingcenter/plagiarism/ for explicit examples.

References

Gelstein, S., Yeshurun, Y., Rozenkrantz, L., Shushan, S., Frumin, I., Roth, Y., & Sobel, N. (2011). Human Tears Contain a Chemosignal. *Science, 331*(6014), 226-230.

Guterstam, A., Petkova, V. I., & Ehrsson, H. H. (2011). The Illusion of Owning a Third Arm. *PLoS ONE, 6*(2), e17208.

Held, R. M. (1965). Plasticity in sensory-motor systems. *Scientific American, 213*(5), 84–94. doi: doi:10.1038/scientificamerican1165-84

Jacobs, G. H., & Nathans, J. (2009). The evolution of primate color vision. *Scientific American, 300*(April), 53–63.

Kaufman, E. L., & Rock, I. (1962). The Moon Illusion. *Scientific American, 207*(1), 120–131. doi: doi:10.1038/scientificamerican0762-120

Most, S. B., & Astur, R. S. (2007). Feature-based attentional set as a cause of traffic accidents. *Visual Cognition, 15*(2), 125-132. doi: 10.1080/13506280600959316

Most, S. B., Scholl, B. J., Clifford, E. R., & Simons, D. J. (2005). What You See Is What You Set: Sustained Inattentional Blindness and the Capture of Awareness. *Psychological Review, 112*(1), 217-242.

Nuthmann, A. (2014). How do the regions of the visual field contribute to object search in real-world scenes? Evidence from eye movements. *Journal of Experimental Psychology: Human Perception and Performance, 40*(1), 342-360. doi: 10.1037/a0033854

Owens, D. A., Antonoff, R. J., & Francis, E. L. (1994). Biological motion and nighttime pedestrian conspicuity. *Human Factors, 36*(4), 718–732. doi: doi: 10.1177/001872089403600411

Plomp, R. (1964). The Ear as a Frequency Analyzer. *The Journal of the Acoustical Society of America, 36*(9), 1628-1636. doi: doi:http://dx.doi.org/10.1121/1.1919256

Plomp, R., & Levelt, W. J. M. (1965). Tonal consonance and critical bandwidth. *Journal of the Acoustical Society of America, 38*(4), 548–560.

Poeppel, D., Emmorey, K., Hickok, G., & Pylkkänen, L. (2012). Towards a new neurobiology of language. *The Journal of neuroscience : the official journal of the Society for Neuroscience, 32*(41), 14125-14131. doi: 10.1523/JNEUROSCI.3244-12.2012

Psalta, L., Young, A. W., Thompson, P., & Andrews, T. J. (2014). The Thatcher Illusion Reveals Orientation Dependence in Brain Regions Involved in Processing Facial Expressions. *Psychological Science, 25*(1), 128-136. doi: 10.1177/0956797613501521

Savic, I., Berglund, H., Gulyas, B., & Roland, P. (2001). Smelling of Odorous Sex Hormone-like Compounds Causes Sex-Differentiated Hypothalamic Activations in Humans. *Neuron, 31*(4), 661-668.

Schiller, P. H. (2010). Parallel information processing channels created in the retina. *Proceedings of the National Academy of Sciences, 107*(40), 17087-17094. doi: 10.1073/pnas.1011782107

Schiller, P. H., & Carvey, C. E. (2005). The Hermann grid illusion revisited. *Perception, 34*(11), 1375-1397.

Slater, M., Spanlang, B., Sanchez-Vives, M. V., & Blanke, O. (2010). First Person Experience of Body Transfer in Virtual Reality. *PLoS ONE, 5*(5), e10564.

Swets, J. A. (1961). Is there a sensory threshold? *Science, 134*(3473), 168–177.

Thompson, P. G. (1980). Margaret Thatcher: A new illusion. *Perception, 9*(4), 483–484.