

Psychology

W2225y Attention and Perception 3pts. Fall 2013

Mon & Weds 2:40 - 3:55pm 614 Schermerhorn

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I. Bulletin description

W2225y Attention and Perception

H. Lau. MW 2:40 - 3:55PM. Room 614 Schermerhorn Hall

Prerequisites: PSYC W1001 or W1010 or instructor's permission.

Introduction to the theories and mechanisms of attentional selection in perceptual processes. Topics include classical theories of selective attention, modern neurocognitive models, clinical impairments of attention, and the relationship between attention and time.

II. The rationale for giving the course

This undergraduate lecture course will complement our curriculum in the following ways. Attention is one of the central topics in cognitive psychology, and is relevant to other courses currently offered in the curriculum (W2210, W2215, and W2220). However, competing theories on this topic abound, and the issues are often too complex to be explained in sufficient detail in one or two lectures. This introductory lecture course gives the topic a systematic treatment, reviewing some of the latest perspectives and findings that are at odds with traditional views. We also explore relationships between attention and other cognitive phenomena that are currently not covered in the curriculum, such as time perception. Finally, this course also complements nicely current courses on perception. The course W2230, for instance, focuses on the basic sensory aspects; this course uniquely focuses on the higher cognitive aspects of perception.

PSYC W2225 will fulfill the following degree requirements:

- For the Psychology major or concentration in the College and in G. S., for the Psychology minor in Engineering, and for the Psychology Post-bac, PSYC W2225 will meet the Group I (Perception and Cognition) distribution requirement.
- For the Neuroscience and Behavior joint major, PSYC W2225 will meet the fourth Psychology requirement: "One additional 2000 or 3000 level psychology course from a list approved by the Psychology Departmental advisor to the program."

- For the core science requirements of the College and G. S., PSYC W2225 will count as a single term of the requirement.

Enrollment will be capped at 95.

III. A full description of the content of the course

Over a century ago, the famous psychologist William James wrote that “Everybody knows what attention is.... It implies withdrawal from some things in order to deal effectively with others.” Whereas this statement is just as intuitively appealing today, modern researchers are still puzzled as to how attention exactly works. To what extent can we focus on one stream of information and block out others? When we are having an engaging conversation at a party, it seems that all the background chattering is blocked out. But when somebody whispers our name in the background – possibly gossiping about us - it grabs our attention all the same. Just what happens to unattended information? Is it processed or not? If so, to what degree? This course will address these and other important issues related to attention and perception. We review competing theories that were proposed in the early days of cognitive psychology, and look at how modern empirical evidence arbitrates between them. The empirical examples often involve some of the most dramatic illusions in visual perception, and can be experienced in everyday lives as well as in the laboratory. They include inattentional blindness and change blindness, two ‘tricks’ used for decades by professional magicians, but only recently studied scientifically. Then we also evaluate modern neurocognitive models, some of which are more ambitious in scope, intending to solve the more general puzzles of perception such as the classical ‘binding problem’. We also consider clinical cases of impairments of attention. Some patients with damage to the parietal cortex neglect half of their visual space, to which they could pay little attention. We assess how modern neurocognitive models explain these perplexing phenomena, and consider whether they are explanatorily superior to classical theories such as signal detection theory. Finally, we also consider the relationship between attention and time, such as whether we can attend to events that happened in the past, whether attention to one event impairs our attention to an immediate subsequent event (a phenomenon known as ‘attentional blink’), and whether attention speeds up perception.

IV. Course requirements (subject to minor revision)

There will be 3 in-class exams. The first two (20%, and 30% respectively) will be non-cumulative. The 3rd one, held on the last day of class (i.e. not the exam period), will be cumulative, testing the materials of the whole course (30%). On most Mondays, there will be an in-class, “open-book”, small reading quiz, and all the quizzes together count for 20% (only the best 4 out of 9 count; see next section for details). All exams and quizzes are in multiple choice format.

V. Reading list and weekly syllabus (tentative)

Sep 4 - class logistics / how to read journal articles / fMRI basics
Sep 9, 11 - early vs late selection debate / inattention blindness / TMS basics
Sep 16, 18 - change blindness / load theory
Sep 23, 25 - neuronal consequences of attention
Sep 30, Oct 2 - review session / EXAM 1 (20%)
Oct 7, 9 - psychophysics & SDT
Oct 14, 16 - theories and functions of consciousness
Oct 21, 23 - attentional blink / guest lecture by Dr Martijn Wokke (University of Amsterdam)
Oct 28, 30 - Prospective vs Retrospective attention
Nov 4, 6 school holiday /
Nov 11, 13 review session / EXAM 2 (30%)
Nov 18, 20 feature integration theory / guest lecture by Dr Ai Koizumi (Columbia)
Nov 25, 27 - neglect & extinction
Dec 2, 4 - wrap-up / review session
Dec 9 - EXAM 3 (30%)

Quizzes

Sep 9 - Rees G, Russell C, Frith CD, Driver J.
Inattention blindness versus inattention amnesia for fixated but ignored words.
Science. 1999 Dec 24;286(5449):2504-7

Sep 23 - Beck DM, Muggleton N, Walsh V, Lavie N.
Right parietal cortex plays a critical role in change blindness.
Cereb Cortex. 2006 May;16(5):712-7.

Sep 30 - Kastner S, De Weerd P, Desimone R, Ungerleider LG.
Mechanisms of directed attention in the human extrastriate cortex as revealed by
functional MRI. Science. 1998 Oct 2;282(5386):108-11

Oct 7 - Ko Y, Lau H. A detection theoretic explanation of blindsight suggests a link between
conscious perception and metacognition. Philos Trans R Soc Lond B Biol Sci. 2012 May
19;367(1594):1401-11.

Oct 14 - Del Cul A, Dehaene S, Reyes P, Bravo E, Slachevsky A. Causal role of prefrontal
cortex in the threshold for access to consciousness. Brain. 2009 Sep;132(Pt 9):2531-40.

(The best 2 of the above 5 will count towards 10% of your final grade, the best 2 of the below 4
will count towards 10% of your final grade)

Oct 21 Sergent C, Dehaene S. Is consciousness a gradual phenomenon? Evidence for an all-
or-none bifurcation during the attentional blink. Psychol Sci. 2004 Nov;15(11):720-8.

Oct 28 de Gardelle V, Sackur J, Kouider S. Perceptual illusions in brief visual presentations.

Conscious Cogn. 2009;18(3):569-77.

Nov 18 O'Craven KM, Downing PE, Kanwisher N. fMRI evidence for objects as the units of attentional selection. Nature. 1999 Oct 7;401(6753):584-7

Nov 25 Rees G, Wojciulik E, Clarke K, Husain M, Frith C, Driver J. Unconscious activation of visual cortex in the damaged right hemisphere of a parietal patient with extinction. Brain. 2000 Aug;123 (Pt 8):1624-33.

Main Readings

* = important reading, usually an overview / review article

For each topic, lecture notes will be posted online to assist review

Sep 9, 11 - early vs late selection debate / inattentional blindness / TMS basics

*Driver J.

A selective review of selective attention research from the past century.
Br J Psychol. 2001 Feb;92 Part 1:53-78. (only pages 53-59)

* Simons DJ. Attentional capture and inattentional blindness.
Trends Cogn Sci. 2000 Apr;4(4):147-155.

Strayer DL, Johnston WA. Driven to distraction: dual-Task studies of simulated driving and conversing on a cellular telephone.
Psychol Sci. 2001 Nov;12(6):462-6.

Koivisto M, Revonsuo A. How meaning shapes seeing.
Psychol Sci. 2007 Oct;18(10):845-9.

Sep 16, 18 - change blindness / load theory

*Simons DJ, Rensink RA.

Change blindness: past, present, and future.
Trends Cogn Sci. 2005 Jan;9(1):16-20

*Lavie N. Distracted and confused?: selective attention under load.
Trends Cogn Sci. 2005 Feb;9(2):75-82.

Simons DJ, Nevarez G, Boot WR.
Visual sensing IS seeing: why "mindsight," in hindsight, is blind.
Psychol Sci. 2005 Jul;16(7):520-4.

Silverman ME, Mack A.
Change blindness and priming: When it does and does not occur.

Conscious Cogn. 2006 Jun;15(2):409-22.

Sep 23, 25 - neuronal consequences of attention

*Treue S. Neural correlates of attention in primate visual cortex.
Trends Neurosci. 2001 May;24(5):295-300.

*Reynolds JH, Desimone R.

The role of neural mechanisms of attention in solving the binding problem.
Neuron. 1999 Sep;24(1):19-29, 111-25.

Kastner S, Ungerleider LG. The neural basis of biased competition in human visual cortex.
Neuropsychologia. 2001;39(12):1263-76.

Oct 7, 9 - psychophysics & SDT

Heeger D

***Introductory notes on signal detection theory

<http://www.cns.nyu.edu/~david/sdt/sdt.html>

Gorea A. & Sagi D. (2005).

Decision and Attention

In L. Itti, G. Rees & J. Tsotsos (Eds), Neurobiology of Attention, Academic Press / Elsevier (pp 152-159)

Gorea A, Caetta F, Sagi D.

Criteria interactions across visual attributes.

Vision Res. 2005 Sep;45(19):2523-32.

Oct 14, 16 - theories and functions of consciousness

* Lau H, Rosenthal D. Empirical support for higher-order theories of conscious awareness.
Trends Cogn Sci. 2011 Aug;15(8):365-73.

* Lau H (2010) Theoretical motivations for investigating the neural correlates of consciousness
Wiley Interdisciplinary Reviews (WIREs) Cognitive Science DOI: 10.1002/wcs.93

Oct 21, 23 - attentional blink / guest lecture by Dr Martijn Wokke (University of Amsterdam)

* Hommel B, Kessler K, Schmitz F, Gross J, Akyurek E, Shapiro K, Schnitzler A.

How the brain blinks: towards a neurocognitive model of the attentional blink.

Psychol Res. 2006 Nov;70(6):425-35.

Wokke ME, Vandenbroucke AR, Scholte HS, Lamme VA. Confuse your illusion: feedback to early visual cortex contributes to perceptual completion. Psychol Sci. 2013 Jan 1;24(1):63-71.

Wokke ME, Sligte IG, Steven Scholte H, Lamme VA. Two critical periods in early visual cortex during figure-ground segregation. Brain Behav. 2012 Nov;2(6):763-77.

Oct 28, 30 - Prospective vs Retrospective attention

* Readout from iconic memory and selective spatial attention involve similar neural processes. Ruff CC, Kristjánsson A, Driver J. Psychol Sci. 2007

* Landman R, Spekreijse H, Lamme VA. Large capacity storage of integrated objects before change blindness. Vision Res. 2003 Jan;43(2):149-64.

Raz A, Buhle J. Typologies of attentional networks. Nat Rev Neurosci. 2006 May;7(5):367-79.

Nov 18, 20 feature integration theory / guest lecture by Dr Ai Koizumi (Columbia)

* Wolfe JM. Moving towards solutions to some enduring controversies in visual search. Trends Cogn Sci. 2003 Feb;7(2):70-76.

* Treisman A. The binding problem. Curr Opin Neurobiol. 1996 Apr;6(2):171-8.

Nov 25, 27 - neglect & extinction

Milner AD, McIntosh RD. The neurological basis of visual neglect. Curr Opin Neurol. 2005 Dec;18(6):748-53.

*Corbetta M, Shulman GL.

Control of goal-directed and stimulus-driven attention in the brain. Nat Rev Neurosci. 2002 Mar;3(3):201-15.

IV. Academic Integrity

"The intellectual venture in which we are all engaged requires of faculty and students alike the highest level of personal and academic integrity. As members of an academic community, each one of us bears the responsibility to participate in scholarly discourse and research in a manner characterized by intellectual honesty and scholarly integrity. . . . In practical terms, this means that, as students, you must be responsible for the full citations of others' ideas in all of your research papers and projects; you must be scrupulously honest when taking your examinations; you must always submit your own work and not that of another student, scholar, or internet agent."

From the Faculty Statement on Academic Integrity - www.college.columbia.edu/academics/integrity-statement.

Students are expected to do their own work on all tests and assignments for this class and act in accordance with the Faculty Statement on Academic Integrity and Honor Code established by the students of Columbia College and the School of General Studies. Because any academic integrity violation undermines our intellectual community, students found to have cheated, plagiarized, or committed any other act of academic dishonesty can expect to receive a zero for the work in question and may fail the class. Students will also be referred to the Dean's Disciplinary Process, described here:

www.college.columbia.edu/academics/disciplinaryprocess

It is students' responsibility to ensure their work maintains expected standards. Should you have any questions or concerns regarding these expectations, please:

- Talk with your TA
- Ask the instructor
- Refer to the Columbia University Undergraduate Guide to Academic Integrity:
www.college.columbia.edu/academics/academicintegrity