Psy 495H1

SEX AND THE BRAIN

Fall 2015

Dr. G. Einstein
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OFFICE HOURS:
Starting September 28, Mondays 3:30-5PM
and by appointment

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Course Description

This course explores the scientific literature underlying the concept that female/male, gay/straight, and transgendered behaviors are based on brain differences. Original scientific papers will be read in close detail for design and interpretation of the experiments. The goal is to gain an understanding of the science underlying sex/gender differences, popular conceptions of sex, and the identification of the sexual brain. Topics include:

- Sexual differentiation
- Estrogens and androgens
- Connection of the brain with the rest of the body (HPG Axis)
- Relationship between brain and sexual behaviors
- Sex differences and cognition
- Sex and sexuality/gender identification

Learning Outcomes

By the end of this course, students will be able to:

a. Read and understand original research papers in the field of Hormones and Behaviour;
b. Articulate the purpose, methods, and interpretation of experiments as conveyed in original research papers;
c. Employ their understanding of sexual differentiation to understanding sex differences in brain and behavior;
d. Identify central nervous system (hypothalamic, cortical, and spinal cord) differences between males, females, gay, straight, transgendered and sexes in between;
e. Be familiar with ways in which science is knowledge-in-the-making
f. Take a position on whether sex differences in brain and behavior make a difference

Classroom Interactions

This is a classroom in which we aim to engage with each other in respectful and thoughtful conversations about the relationship between brain, behaviour, and sex differences. Attendance is mandatory. Because a significant part of the course will be classroom discussion, a major assignment is keeping up with readings, participating in dialogue an informed way, and providing thoughtful feedback to other students. You should come to class not only having done the assigned reading, but also having thought about it and having prepared some points/questions for discussion. Your responses to other students should not be negative. As an engaged learner, your job is to enter into conversations about what was read/heard, and your responses to the ideas presented. You are asked to structure your responses with the following in mind:

- Identifying the ideas that engage you

As you read texts or listen to the lectures, presentations, and discussions which ideas caught your attention or captured your imagination? Which ones stuck a chord for you?

1. Describing the intentions of the writers or speakers

What values and principles regarding people, their health and well-being, and the world more generally do these ideas evoke? What do the ideas suggest to you about the writers' or speakers' purposes and commitments?

2. Situating your responses

What is it about your own life experiences or interests that account for why these ideas caught your attention? Do you have a sense of which aspects of you own experiences resonated with these ideas?

3. Identifying gaps and spaces

What are some gaps and spaces that you notice in each reading? What areas do you think need further exploration in this topic area? What remains confusing, unclear, or underdeveloped? What suggestions in the form of other authors and ideas can you offer to help the analysis along?

4. Recognising the growth of your ideas throughout the course

How have you been moved by engaging with these ideas? Where have these ideas taken you? How have you shifted as a result of listening to and participating in the development of these ideas?

Accessibility Information

The University provides academic accommodations for students with disabilities in accordance with the terms of the Ontario Human Rights Code. This occurs through a collaborative process that acknowledges a collective obligation to develop an accessible learning environment that both meets the needs of students and preserves the essential academic requirements of the University's courses and programs.

Students with diverse learning styles and needs are welcome in this course. Please feel free to approach us or Accessibility Services so we can assist you in achieving academic success in this course.

ACCESSIBILITY SERVICES:
Phone: (416) 978 8060
Email: accessibility.services@utoronto.ca ; Website: www.accessibility.utoronto.ca

DATES, TOPICS & READINGS

Date		Topic	Reading/questions
Sep	15	Introduction to the course	What is sex? Is it a binary? The field of Hormones and Behaviour. Where is the field now?
	17	How to read a scientific paper	1. Frank A. Beach (1941) Female mating behavior shown by male rats after administration of testosterone propionate. Endocrinology 29:409–412. 2. Sinclair et al. (1990) A gene from the human sex determining region encodes a protein with homology to a conserved DNA-binding motif. Nature 346:240–244.
	22	Sex difference in the brain: A matter of wiring... —Dr. Annie Duschene	1. Ingalhalikar, M., Smith, A., Parker, D., Satterthwaite, T. D., Elliott, M. A., Ruparel, K., … Verma, R. (2014). Sex differences in the structural connectome of the human brain. Proceedings of the National Academy of Sciences of the United States of America, 111(2), 823–8. 2. The hardwired difference between male and female brains could explain why men are 'better at map reading' the Independent Today
	24	Sex difference in the brain: What can be learned from Ingalhalika et al.	Commentary on the Ingalhalikar paper and discussion
	29	Sexual Differentiation	1. David C. Page, Laura G. Brown, and Albert de la Chapelle (1987) Exchange of terminal portions of X- and Y- chromosomal short arms in human XX males. Nature 328:437–440. 2. Neil J. MacLusky and Frederick Naftolin (1981) Sexual differentiation of the central nervous system. Science 211:1294–1302.
Oct	1	Organization & Activation	1. Phoenix et al. (1959) Organizing action of prenatally administered testosterone propionate on the tissues mediating mating behavior in the female guinea pig. Endocrinology 65:369–382.
	6	The HPG Axis	1. G. W. Harris (1937) The induction of ovulation in the rabbit, by electrical stimulation of the hypothalmohypophysial mechanism. Proceedings of the Royal Society of London B 612:374–394.
	8	Estrogens	1. C. Dominique Toran-Allerand (1976) Sex steroids and the development of the newborn mouse hypothalamus and preoptic area in vitro: Implications for sexual differentiation. Brain Research 106:407–412. 2. Catherine S. Woolley and Bruce S. McEwen (1992) Estradiol mediates fluctuation in hippocampal synapse density during the estrous

			cycle in the adult rat. Journal of Neuroscience 12:2549–2554.
	13	Steroid receptors & brain development	1. Madhabananda Sar and Walter E. Stumpf (1977) Distribution of androgen target cells in rat forebrain and pituitary after [3H]-dihydrotestosterone administration. Journal of Steroid Biochemistry 8:1131–1135. 2. Shughrue et al., (1990) Developmental changes in estrogen receptors in mouse cerebral cortex between birth and postweaning: Studied by autoradiography with 11b-methoxy-16a [125I]iodoestradiol. Endocrinology 126:1112–1124. 409
	15	Sex Differences I. The songbird	1. Fernando Nottebohm and Arthur P. Arnold (1976) Sexual dimorphism in vocal control areas of the songbird brain. Science 194:211–213. 247 2. Fernando Nottebohm (1980) Testosterone triggers growth of brain vocal control nuclei in adult female canaries. Brain Research 189:429–436. 3. Eliot A. Brenowitz (1991) Altered perception of species specific song by female birds after lesions of a forebrain nucleus. Science 251:303–305. (OPTIONAL)
	20	Sex Differences II. The rat spinal cord	1. S. Marc Breedlove and Arthur P. Arnold (1983) Hormonal control of a developing neuromuscular system. I. Complete demasculinization of the male rat spinal nucleus of the bulbocavernosus using the anti-androgen flutamide. Journal of Neuroscience 3:417–423. 2. Nancy G. Forger and S. Marc Breedlove (1986) Sexual dimorphism in human and canine spinal cord: Role of early androgen. Proceedings of the National Academy of Sciences USA 83: 7527–7531.
	22	Sex Differences III. Circuits for the ovarian cycle	1. G. Raisman and P. M. Field (1973) Sexual dimorphism in the neuropil of the preoptic area of the rat and its dependence on neonatal androgen. Brain Research 54:1–29. FAMILIARIZE YOURSELF WITH THE MAIN POINTS, WE WILL GO OVER DETAILS IN CLASS
	27	Sex Differences IVa. A mammalian sexually dimorphic nucleus	1. Gorski et al., (1978) Evidence for a morphological sex difference within the medial preoptic area of the rat brain. Brain Research 148:333–346. 2. D. F. Swaab and E. Fliers (1985) A sexually dimorphic nucleus in the human brain. Science 228: 112–115.
	29	Midterm	
Nov	3	Sex Differences IVb. The function of the sexually dimorphic nucleus	1. Gary W. Arendash and Roger A. Gorski (1983) Effects of discrete lesions of the sexually dimorphic nucleus of the preoptic area or other medial preoptic regions on the sexual behavior of

			male rats. Brain Research Bulletin 10:147–154. 2. Y. Oomura, H. Yoshimatsu, and S. Aou (1983) Medial preoptic and hypothalamic neuronal activity during sexual behavior of the male monkey. Brain Research 266:340–343.
	5	Sex Differences in Cognition I. Hemispheric lateralization	1. Christine de Lacoste-Utamsing and Ralph L. Holloway (1982) Sexual dimorphism in the human corpus callosum. Science 216:1431–1432. 2. Oppenheim et al., (1987) No sex-related differences in human corpus callosum based on magnetic resonance imagery. Annals of Neurology 21:604–606. 3. Allen et al., (1991) Sex differences in the corpus callosum of the living human being. Journal of Neuroscience 11:933–942. READ INTRODUCTION AND FIGURES
	10	Fall Break	
	12	Sex Differences in Cognition II. Autism	1. Lai, M-C. et al. (2015). Sex/gender differences and autism: setting the scene for future research. *Journal of the American Academy of Child & Adolescent Psychiatry*, 54(1), 11-24. 2. Halladay et al. (2015). Sex and gender differences in autism spectrum disorder: summarizing evidence gaps and identifying emerging areas of priority. *Mol Autism*, 6, 36.
	17	Sex Differences in Cognition III. Language	1. S. F. Witelson et al., (1995) Women have greater density of neurons in posterior temporal cortex. Journal of Neuroscience 15:3418–3428. 577. 2. Shaywitz et al. (1995) Sex differences in the functional organization of the brain for language. Nature 373: 607–609
	19	Sex Differences in Cognition IV. The role of testosterone	
	24	Sex Differences in Mood, Pain, & Memory	1. Hassan et al., (2014) Ovarian hormones and chronic pain: A comprehensive review. Pain 155(12)120: 2448-2460. 2. Schwartz et al., (2012) The role of ovarian steroids in mood. Hormones and Behavior, 62,448–454. READ ONLY 1 PAPER
	26	Brain differences and gender ID, I. Transsexuality	1. Luders E, Sánchez FJ, Gaser C et al. Regional gray matter variation in male-to-female transsexualism. Neuroimage 2009: 46; 904-7. 2. Hahn A, Kranz GS, Küblböck M et al. Structural connectivity networks of transgender people. Cereb Cor 2014: Epub; doi:10.1093/cercor/bhu194 3. Van Goozen SHM, Slabbekoorn D, Gooren LJG et al. Organizing and activating effects of sex hormones in homosexual transsexuals. Behav

			Neurosci 2002: 116; 982-8.
Dec	1	Brain differences and gender ID, II. Male & female	1. Deeb et al. (2005) Correlation between genotype, phenotype, and sex of rearing in 111 patients with partial androgen insensitivity syndrome. Clinical Endocrinology 63:56–62. 2. Tom Mazur (2005) Gender dysphoria and gender change in androgen insensitivity or micropenis. Archives of Sexual Behavior 34: 411–421. READ ONLY 1 PAPER
	3	Brain differences and gender ID, III. Gay & straight	1. D. F. Swaab and M. A. Hofman (1990) An enlarged suprachiasmatic nucleus in homosexual men. Brain Research 537: 141–148. 2. Simon LeVay (1991) A difference in hypothalamic structure between heterosexual and homosexual men. Science 253: 1034–1037. 3. Savic et al. (2005) Brain response to putative pheromones in homosexual men. Proceedings of the National Academy of Sciences USA 102:7356–7361. (OPTIONAL)
	8	Elevator Speech	Students describe their experiment in 60 seconds

Text

Text: Einstein, G (ed) (2007) *Sex and the Brain*. MIT Press.

Ancillary Readings

Bailey, Michael (2003) *The Man Who Would be Queen: The Science of Gender Bending and Transsexualism*. Joseph Henry Press.
Baron-Cohen, Simon (2003) *The Essential Difference: Men, Women, and the Extreme Male Brain*. Basic Books.
Baron-Cohen, Simon (2005) *Prenatal Testosterone in Mind*. MIT Press.
Brizendine, Louann (2006) *The Female Brain*. Broadway Books.
Colapinto, John (2000) As Nature Made Him: The Boy Who was Raised as a Girl. Harper Collins.
Fausto-Sterling, Anne (1992) *Myths of Gender*. Basic Books
Fausto-Sterling, Anne (2000) *Sexing the Body*. Basic Books
Fine, Cordelia (2010) Delusions of Gender: How Our Minds, Society, and Neurosexism Create Difference. WW Norton & Co
Jordan-Young, Rebecca (2011) Brian Storms: The flaws in the science of sex differences. Harvard University Press
Laqueur, Thomas (1990) *Making Sex: Body and Gender from the Greeks to Freud*. Harvard University Press.
LeVay, Simon (1994) *The Sexual Brain*. Bradford Books.
Pinker, Susan (2009) *The Sexual Paradox: Men, Women, and the Real Gender Gap*. Vintage Canada.
Stein, Edward (1999) *The Mismeasure of Desire: The Science, Theory, and Ethics of Sexual Orientation*. Oxford University Press.

All of these books have been placed on Reserve at Gerstein Library

MARKING SCHEME and ASSIGMENTS

MARKING SCHEME:

Assignment	Percentage	Due Date
1. One 10 minute presentation summarizing an assigned paper in class with debate	25%	The day for which you signed up classes from Sep 29 — Dec 3
Class participation/Handing in, in class, a paragraph summary of the papers saying what their relation to each other is	15%	Starting with reading for Sep 29 Not due on day you are presenting a reading. You can not turn in 1.
3. Midterm	25%	Oct 29
4. Writing Project	30%	Note: *Turning in the assignment in sections not mandatory but if you want feedback, they must be turned in on dates below.*
a. Proposal for an experiment	5%	Nov 5 – due in class
b. Background and significance with references supporting that the experiment needs doing	10%	Nov 19 – due in class
c. Full Write up of proposed experiment with references	15%	Dec 8 – due in class
5. Elevator Speech	5%	Dec 8 – delivered in class

ASSIGNMENTS:

1. 10 MINUTE PRESENTATION SUMMARIZING AN ASSIGNED PAPER IN CLASS WITH DEBATE

Sign up to be responsible to summarize in 10 minutes one of the readings starting Sept 29. Two students will present either the same paper or two different papers depending on the class.

Grade will be based on the following:

a. demonstrated understanding of the gist of the paper
b. highlighting what is important or controversial about the paper
c. relating it to the theme of the course (sex differences)
d. discussion and debate that ensues as to whether or not
e. this is a good demonstration of sex differences or important to the field
f. you and the other presenter see the same importance to the paper (obviously you don't have to, you just need to stir discussion!)

2. CLASS PARTICIPATION

Class participation is important to enhancing your understanding of the material read as well as for creating familiarity with asking questions of scientific texts. It is also important to read and think about the papers that will be presented in class.

Class participation will be graded based on:

a. Handing in, in class, a paragraph summary of the papers saying what their relation to each other is
b. This assignment starts with the reading for Sept 29
c. Name and date must be on the paper handed in
d. To receive full marks, 15/17 must be handed in.
e. Can miss one assignment without penalty and no assignment due the day of your presentation.

3. MIDTERM

The purpose of the Midterm is to gauge your understanding of key knowledge and concepts in *Hormones and Behaviour* covered by the course material up to that point.

It will consist of T/F, multiple choice and short answer questions. There may be an essay question testing your ability to synthesize the material as well. No notes are allowed.

The details of this test will be discussed in class at least a week prior to the test.

4. WRITING PROJECT

All 4th year courses in Psychology are required to have a significant writing project. The purpose of this project is to take what you are learning about the issues around studying sex differences and the paradigms for studying them and to use that knowledge to create a proposed experiment to test a sex difference of your choosing.

Identify a brain phenomenon – anatomy, functional, behavioural — Design an experiment to test whether or not there are sex differences

a. Animal model
b. Healthy humans
c. Clinical population

It is divided into 3 parts to help you organize your efforts and to provide feedback as you engage in the project. Note: *Turning in the assignment in sections not mandatory but if you want feedback, they must be turned in on dates below.*

a. Proposal: 250-*500 words* — Propose an experiment to determine a sex difference
i. describe the sex difference you're interested in testing
ii. say what you think you will find (you might hypothesize not finding a sex difference that's okay)
iii. say why you think it's important

b. Background and significance: 1000 words max
i. present a sound argument as to why the experiment needs doing
1. cite at least 10 sources
2. provide those citations in the form of a bibliography
ii. provide the evidence with references supporting that the experiment needs doing
iii. use the kinds of arguments and form of argumentation used in the Introductions of many of your readings

c. Full write up: 1500 - 2000 words

The full write up will consist of:

i. your proposal (expanded and modified based on the feedback you received)
ii. the background and significance (expanded and modified based on the feedback you received)
iii. the experimental design
iv. what you hypothesize you will find

Write up each of these sections using APA format. The full paper should be double-spaced and use 12 point font with 1" margins.

Each part of this project – Parts 1, 2, and 3 – must be turned in with an Academic Integrity Statement signed by you (see below). Any aspect of this assignment will be considered late until accompanied by the academic integrity statement with boxes checked and signed.

All written assignments should be typewritten and double spaced.

5. ELEVATOR SPEECH

The purpose of the Elevator Speech assignment is to help you learn to take what you know and express it succinctly. Each person will have 60 seconds – yes, 60 seconds (I will be timing) – in class to

i. describe your experiment,
ii. what you propose,
iii. why you are proposing it,
iv. what you expect to find (your hypothesis),
v. how the experiment is relevant to the field of hormones and behavior.

If your speech goes over 60 seconds, you will not receive credit for the assignment. So get your timers out and practice!

EMAIL POLICY:

• if you have questions that are about course mechanics i.e., when an assignment due, details of the assignment, etc. please ask April Au, our TA.

• if you have a question that pertains only to you (personal, course or academic), send it to me at my email. I will endeavor to get to it as soon as I can.

All written assignments are due in hard copy in class on the day they are due.

Late Policy: No late work will be made unless you have a doctor-validated illness or validated family emergency.

Any written work not turned in in class will be assessed a late penalty of 2% per day starting after class on the due date.

Late assignments are to be turned in on the 4th floor of Sidney Smith Hall, in room 4027 (the fax/photocopy room) to there to the cabinet with slots on it or to the Psychology Department Office (if there is no slot in 4027).

Both places are open between the hours of 9AM and 4 PM.

Make Up Test Policy: No test make-ups without a doctor-validated illness or validated family emergency.

ACADEMIC INTEGRITY:

Academic integrity is fundamental to learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the U of T degree that you earn will be valued as a true indication of your individual academic achievement, and will continue to receive the respect and recognition it deserves.

Familiarize yourself with the University of Toronto's *Code of Behaviour on Academic Matters* (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm). It is the rule book for academic behaviour at the U of T, and you are expected to know the rules. Potential offences include, but are not limited to:

In papers and assignments:

- Using someone else's ideas or words without appropriate acknowledgement.
- Copying material word-for-word from a source (including lecture and study group notes) and not placing the words within quotation marks.
- Submitting your own work in more than one course without the permission of the instructor.
- Making up sources or facts.
- Including references to sources that you did not use.
- Lending your work to a classmate who submits it as his/her own without your permission.
- Obtaining or providing unauthorized assistance on any assignment including:
    - working in groups on assignments that are supposed to be individual work;
    - having someone rewrite or add material to your work while "editing".

On tests and exams:

- Using or possessing any unauthorized aid, including a cell phone.
- Looking at someone else's answers
- Letting someone else look at your answers.
- Misrepresenting your identity.
- Submitting an altered test for re-grading.

Misrepresentation:

- Falsifying or altering any documentation required by the University, including doctor's notes.
- Falsifying institutional documents or grades.

To remind you of these expectations, and help you avoid accidental offences, I will ask you to include a signed Academic Integrity Checklist with every assignment. If you do not include the statement, your work will not be graded.

The University of Toronto treats cases of academic misconduct very seriously. All suspected cases of academic dishonesty will be investigated following the procedures outlined in the *Code*. The consequences for academic misconduct can be severe, including a failure in the course and a notation on your transcript. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact me. If you have questions about appropriate research and citation methods, seek out additional information from me, or from other available campus resources like the U of T Writing Website. If you are experiencing personal challenges that are having an impact on your academic work, please speak to me or seek the advice of your college registrar.

Academic Integrity Checklist
Psy495HS
Professor Gillian Einstein

I, _____, affirm that this assignment represents entirely my own efforts.

I confirm that:

- ☐ I have acknowledged the use of another's ideas with accurate citations.
- ☐ If I used the words of another (e.g., author, instructor, information source), I have acknowledged this with quotation marks (or appropriate indentation) and proper citation.
- ☐ When paraphrasing the work of others, I put the idea into my own words and did not just change a few words or rearrange the sentence structure
- ☐ I have checked my work against my notes to be sure I have correctly referenced all direct quotes or borrowed ideas.
- ☐ My bibliography includes only the sources used to complete this assignment.
- ☐ This is the first time I have submitted this assignment (in whole or in part) for credit.
- ☐ Any proofreading by another was limited to indicating areas of concern which I then corrected myself.
- ☐ This is the final version of my assignment and not a draft.
- ☐ I have kept my work to myself and did not share answers/content with others, unless otherwise directed by my instructor.
- ☐ I understand the consequences of violating the University's academic integrity policies as outlined in the *Code of Behaviour on Academic Matters*.

By signing this form I agree that the statements above are true.

If I do not agree with the statements above, I will not submit my assignment and will consult the course instructor immediately.

Student name: _____ Signature: _____

Date: _____