Genetics of Compulsive Behavior (01:447:460)

Fall Semester 2023

- Class meets from 3:50 PM to 5:10 PM, on Mondays and Wednesdays, in Hill Center Room 009.
- Class begins on the first Wednesday of the Fall Semester, September 6, 2023, and ends on the last day of class, Wednesday, December 13, 2023.

Credits: 3

Prerequisites: Genetics 01:447:380 or Genetic Analysis I 01:447:384, and General Biology Lab 01:119:117 or 01:119:102

COURSE DESCRIPTION

Compulsive urge can be channeled toward productive endeavors such as a strong drive to succeed in competitions, schooling, and career. On the other hand, improper handling of compulsive urge may lead to problematic behaviors such as alcoholism, drug use, gambling, and other undesirable behaviors. There are also conditions that are medically defined as disorders, with certain types of compulsive behaviors as part of the diagnostic symptoms, such as OCD and ADD/ADHD. There is evidence that genetics contribute to compulsive behavior in humans, and research in animal models has begun to uncover the molecular factors that underlie the genetic basis of compulsive behavior.

Primary research literature will be used as the main material for this course, selected to cover a range of the study of compulsive behavior genetics. The course will involve extensive reading and discussion, and will examine scientific literature relating to the genetics of compulsive behavior. Each cycle will begin with assigned primary literature on the genetic research of a specific compulsive behavior, with student presentations and class discussion. Each student will then write an essay, summarizing the salient features of the research paper, and presenting her/his own analysis and critique. A peer-review component is also incorporated, with randomized roster assignment to peer-review classmates' writings, conducted in a two-way anonymous fashion (neither the peer reviewers nor the reviewees know each other's names), to promote objective peer reviewing. Typically six to eight rounds of literature review and essay writing will be conducted during the course, covering scientific research on major types of compulsive behavior. The course focus will be on developing skills in critical thinking and effective writing, as well as critical evaluation of written materials.

SAS CORE CURRICULUM GOAL:
WCD – Student is able to communicate effectively in modes appropriate to a discipline or area of inquiry; evaluate and critically assess sources and use the conventions of attribution and citation correctly; and analyze and synthesize information and ideas from multiple sources to generate new insights.

DEPARTMENTAL LEARNING GOALS – URL:
https://genetics.rutgers.edu/academics/undergraduate/learning-goals

DEPARTMENTAL LEARNING GOALS – FULFILLED BY THIS COURSE:

- Knowledge specific goals: Know the terms, concepts and theories in genetics.
- Integrate the material from multiple sources and research. That is, to think holistically and to see the whole as well as the parts.
- Use genetic information and ideas to critically analyze published research articles in genetics.

SCIENTIFIC WRITING SKILLS DEVELOPED IN THIS COURSE:

- Communicate complex ideas effectively, in standard written English, to a general audience;
- Communicate effectively in modes appropriate to genetics as a discipline: in-class presentation, questions and answers with course instructor and fellow students in the course;
- Evaluate and critically assess sources and use the conventions of attribution and citation correctly: written summary of assigned reading as part of the written essays;
- Analyze and synthesize information and ideas from multiple sources to generate new insights: written essays based on assigned reading, with emphasis on generating one's own synthesis of the research topics.
- Improve writing skills through multiple rounds of essay writing, by responding effectively to editorial feedback from the instructor and peers.

Exams, Assignments, and Grading Policy

- Research literature will be assigned for reading and essay writing;
- During the class, most time will be devoted to discussion of assigned reading and evaluation of student's writing;
- 20% class discussion participation;
- 80% written essay, peer review, and on-time submission of writing assignments.

Course Materials: Research literature and journal articles assigned by the instructor.

Rutgers University takes academic integrity very seriously. By enrolling in this course, you assume responsibility for familiarizing yourself with the Academic Integrity Policy and the possible penalties (including suspension and expulsion) for violating the policy. As per the policy, all suspected violations will be reported to the Office of Student Conduct. Academic dishonesty includes (but is not limited to):

– cheating
– plagiarism
– aiding others in committing a violation or allowing others to use your work
– failure to cite sources correctly
– fabrication
– using another person's ideas or words without attribution
– re-using a previous assignment
– unauthorized collaboration
– sabotaging another student's work

Please review the Academic Integrity Policy at:
https://nbprovost.rutgers.edu/academic-integrity-students

Course Closed?
There is no wait list for this course, and Department of Genetics no longer issues Special Permission Numbers. Please continue to monitor Web-Reg for openings.

Faculty course instructor:
Dr. Lei Yu
Office: Smithers Hall, Room 107
Office hours: Tuesdays 4:20 PM – 5:20 PM, before the class.
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Genetics of Compulsive Behavior - Content Areas

1) Overview: Compulsive Behaviors
   a) What are compulsive behaviors
   b) The good, the bad, and the ugly
   c) How the research on compulsive behaviors has evolved
2) Classification of Compulsive Behaviors
   a) The impulsivity – compulsivity continuum: impulse control disorders
   b) Movement-related
      i) ADHD / ADD
      ii) Tourette's syndrome
      iii) Motor control disinhibition
      iv) Intolerance to delayed gratification / sensitive to reward
   c) Eating-related
      i) Anorexia nervosa
      ii) Bulimia nervosa (& orthorexia nervosa)
      iii) Food addiction: binge eating & compulsive over-eating
   d) Drug-related
      i) Alcohol dependence and alcoholism
      ii) Psychostimulants: cocaine, amphetamine, methamphetamine
      iii) Opioids: morphine, heroin, prescription pain medicine addiction
      iv) Hallucinogens
      v) Barbiturates
      vi) Nicotine & smoking
   e) Non-drug addictions
      i) Pathological gambling
      ii) Trichotillomania
      iii) Kleptomania, pyromania
      iv) Compulsive shopping
      v) Compulsive hoarding
      vi) Sex addition
      vii) Video game/internet addiction
   f) Behavioral stereotypy
      i) Motor stereotypy
      ii) Inappropriate persistence, persistent responding
   g) Overlap with other psychiatric disorders
      i) Autism
      ii) OCD
      iii) Comorbidity with psychiatric disorders

3) Neurobiological Basis of Compulsive Behaviors
    a) Focus on the brain
        i) Neuroanatomical sites involved in compulsivity
        ii) Neurotransmitter systems involved in reward
        iii) Brain lesion studies: human clinical cases and animal models
    b) Distinction of cognitive functions involved in compulsivity
        i) Psychological tests to quantify behavioral compulsiveness
        ii) Neurophysiological measurements for physiological responses during psychological tests
        iii) Human brain imaging studies: with and without drugs
        iv) Voluntary vs. involuntary
        v) Craving vs. intension
4) Genetics of Compulsive Behaviors
    a) General approaches to study genetics of compulsive behaviors
        i) Genetic studies in human populations: “guilt by association”
        ii) Gene-based studies in animal models: cause-effect analysis
    b) Animal models for compulsive behaviors
        i) Validity vs. inadequacy of animal models
        ii) Spontaneous animal models: “OCD” mice as an example
        iii) “Designer mouse” type of models: targeted gene editing
    c) Neurochemical systems and their genes involved in compulsive behaviors
        i) Norepinephrine (NE): arousal/excitation control
        ii) Serotonin (5-HT): behavior initiation/cessation control, mood regulation
        iii) Dopamine (DA): reward, reinforcement control
        iv) Opioids: pleasure/sense of doom control
    d) Genes for neurotransmitter/neuropeptide synthesis and metabolism
    e) Genes for neurotransmitter/neuropeptide receptors
5) Gene vs. Behavior
    a) Nature vs. nurture debate: innate or acquired? Born to be or environmental?
    b) Trait vs. state: key issue in genetic research

Science Writing: Focusing on Discipline-Appropriate Writing

Overview of Instruction Structure:

- This course focuses on discipline-appropriate primary research literature reading and essay writing, using published journal articles assigned by the instructor as the major source of material.
- The emphasis is on developing skills in critical thinking and effective writing, as well as critical evaluation of written materials in the form of peer review.
- Various topics on the genetics of compulsive behavior serve as discipline-specific subject areas, with source materials consisting of a primary research publication as each essay's focus, and a number of review articles for topic-specific background information.
- Each essay-writing cycle lasts about two weeks (possibly longer for the first essay) in the beginning of the semester, and may become shorter as the semester progresses and the students become more familiar with the writing process. The course consists of a total of six to eight essay-writing cycles, depending on the varying time it takes to understand the technical complexity of the primary research publications.
- Learning about science writing is integral to the course, front and center to each essay-writing cycle. Writing topics (listed below) are discussed throughout the course, in the form of embedded mini lessons during in-class discussions, using issues gleaned from student writing as examples.

Writing Mini Lesson Topics:

- Brainstorming for Central Ideas in Essay Planning
- Re-reading of Research Paper to Develop Central Ideas
- Prewriting Planning
- Purpose and Audience for Essay Writing
- Evidence-Based Reasoning
- Relevant vs. Irrelevant Details in Support of Central Ideas
- Proper Quotation/Citation in Science Writing vs. Plagiarism
- Passive vs. Active Voice in Science Writing
- Writing an Introductory Paragraph of the Essay
- Writing the Conclusion
- Writing a Rough Draft for an Essay
- Revising a Draft
- Complete Sentences vs. Fragments
- Run-On Sentences
- Paragraph Structure
- Closing Sentences and Clinchers
- Word Choice and Diversity
- Variety of Sentences
- Capitalization, Punctuation, Spelling
- Using Online Tools to Assist Writing
- Peer-Review Feedback Writing & Reflections on Peer-Review Feedback