Lifespan Development:
Theory and Methods

Course Number: PSYC W3484
Term: Fall 2016
Points: 4
Meeting Time: Thursdays, 4:10 – 6PM
Location: Schermerhorn 405

Instructor Info
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Syllabus Contents

I. Course Description

This course will explore the theory and methods underlying lifespan development: the cognitive and neural changes that we undergo from even before birth until the end of life. Each week will focus on a different broad time period in the life of a person, and introduce a major research method used in the study of human development. Topics will range from prenatal development and epigenetics to late-life brain changes and neuroimaging.

The course is a seminar with a heavy emphasis on student participation and interaction. We will utilize a "flipped classroom" approach, wherein prior to each class students will view a pre-recorded lecture—usually about 20 to 30 minutes in length—about the topic for that week. In class we will focus on critically discussing the issues raised by the lecture and the readings for the week. A mix of student-led discussions and small-group exercises will be used to maximize student engagement.

II. Prerequisites

Science of Psychology (PSYC 1001), Mind, Brain, & Behavior (PSYC 1010), or an equivalent Introductory Psychology course is required, plus permission of the instructor. It is recommended, but not required, that you have a good grasp of general psychological research methods, attainable by taking a class in Experimental Methods (PSYC 1420, PSYC 1450 or PSYC 1455). In addition, Developing Brain (PSYC 2480) will provide a strong, directly relevant background in neural development and will be especially helpful, but is not required. If you have little psychology background but have taken biology or neuroscience courses, you may be able to take this course with the instructor's permission.

III. Role of PSYC W3484 in the Psychology Curriculum:

PSYC W3484 is a seminar designed especially for undergraduates majoring in Psychology or Neuroscience and Behavior, and for students participating in the Psychology Post-Baccalaureate Certificate Program. It will help address several gaps in the psychology curriculum, including a relative lack of lifespan developmental courses. PSYC W3484 will fulfill the following degree requirements:

- For the Neuroscience and Behavior joint major, it will fulfill the fifth Psychology requirement for "one advanced psychology seminar from a list approved by the Psychology Department advisor to the program."
- For the Psychology Post-Baccalaureate students and for Psychology majors who enter Columbia in Fall 2013 or later, it will fulfill the seminar requirement.
- For the Psychology major or concentration in the College and in the School of General Studies, for the Psychology minor in Engineering, and for the Psychology Post-Baccalaureate Certificate Program, this class will meet the Group II (Psychobiology & Neuroscience) distribution requirement.
- This class will meet one term of the social science requirement of G.S., provided that students obtain the necessary permissions and have taken the prerequisite psychology courses. Majors will have priority over students who are taking the course for social science credit.

IV. Required Materials

There is no required textbook for this course. All readings will be posted on CourseWorks and can be downloaded free of charge, or are located within the holdings of the Columbia Libraries. All lecture videos will be posted under the "Files and Resources" section of CourseWorks. (Direct links to these articles also will be available on the online version of this syllabus, posted on CourseWorks.)

V. Course Goals

This course will contribute to your progression in each of the 9 goals of Columbia's undergraduate psychology major:

1) **Knowledge Base:** You will be able to identify the major stages in human development, from birth until very old age and death, in terms of major cognitive and brain changes.
2) **Research Methods**: You will be able to describe and understand the major research techniques used to study cognitive and psychological change across the lifespan, as well as their limitations.
3) **Research Methods/Quantitative Literacy:** You will be capable of identifying and describing common statistical techniques employed across a variety of methods, and will be able to identify the common inferential errors associated with each of these techniques.
4) **Critical Thinking:** You will be able to think critically about the limitations of existing research methods, and to creatively combine the different methods into a synergistic

research project that can realistically address the limitations of studies carried out with one method alone.

5) **Values in Psychology:** You will understand the trade-off between highly invasive research methods and less-informative but sometimes more ethical observational studies. More generally, you will develop an appreciation for psychology as both a "nomothetic" and "idiographic" science.
6) **Application of Psychology:** You will be able to describe how basic psychological and neuroscientific findings can be translated into clinical practice, as well as how these findings may be relevant for policy implications.
7) **Communication Skills – Written:** You will be expected to demonstrate superior written communication skills culminating in a final research paper of near-publishable quality. I will work with you throughout this process including accepting revisable drafts. Your discussion board posts will also help you sharpen your written communication by requiring you to raise substantive critiques and comments of the papers and methods we will be investigating,
8) **Communication Skills – Oral:** You will sharpen your oral communication skills by engaging in frequent in-class discussion, both on a class-wide basis and within small group exercises requiring you to creatively engage with the course topics in different ways each week. You will also hone your presentation skills by guiding a discussion of the assigned readings using visual aids.
9) **Information and Technological Literacy:** You will engage with the educational technology available through the class CourseWorks site, as well as be required to conduct scientific literature searches on your own using appropriate databases and search filters.

VI. Course Requirements and Grading Policy
Grades will be based on:

1) Attendance and In-Class Exercises (25%): This course is a seminar, and is designed to facilitate communication between you and the instructor, and between you and your fellow students. To ensure that everyone is getting the maximum engagement with the material, participation will be an extremely important component of your grade. You are expected to make substantial contributions to the in-class discussions. (Note: If you are shy, or are hesitant to speak in class for whatever reason, please come and talk to me so we can discuss your situation.) Attendance is required. However if you miss a class with a legitimate excuse (e.g. a documented illness or personal emergency), you can make up the class by completing additional written assignments based on the readings (in addition to the discussion questions detailed below).

2) Discussion Board (25%): In addition to our in-class discussions, we will utilize the CourseWorks discussion board. Each video lecture posted will raise a discussion question that you must respond to by the start of the corresponding class. You are expected to post a substantive reaction of at least 400 words to this prompt. Late posts will not receive credit (unless a documented excuse is provided). The purpose of writing

these posts is both to guide your critical thinking as you read and synthesize the research articles and relate these to the lectures, and to keep you in the habit of writing about complex scientific topics throughout the entire course. (It is also meant to show that you have watched the lecture video.) Sometimes these questions will be based on the lecture, sometimes based on the readings, and typically they will require you to synthesize information found in both these sources; therefore, your strategy for answering these questions should be to watch the lecture and read the articles first, then to formulate a response. I also strongly encourage you to read the articles before the lectures are posted, note any questions or methods you did not completely understand, then to go back and re-read the articles after watching the lecture. Scientific articles are often difficult and require more than one reading to fully understand—make sure you factor this when planning your schedule.

There are many ways to create a "good post"—a careful critique of an article's conclusions based on flaws in its methodology, a synthesis of distinct theories from different articles throughout the semester backed by logical argument, a suggestion for new research approaches that would answer some open question in the field of lifespan psychology, etc. In general, your post should be based on critical thinking rather than feelings or opinion, and should provide evidence that you substantially engaged with the readings. Posts that meet these guidelines will receive full credit. If your posts are not meeting the criteria above, I will let you know and give you feedback to improve your posts. If your posts still don't improve after receiving feedback, you will begin to lose credit on these. Likewise, not doing a post will result in a lower discussion board grade (by 10% of your overall discussion board grade per post) as well.

3) Presentation (25%): You will be required to lead one class discussion, which should be accompanied by a visual presentation (e.g. a PowerPoint). On the first day of class, you will rank the course topics by your degree of interest, and I will do my best to assign you to a topic which you have expressed interest in. The presentation should cover the assigned readings in their entirety, and you should plan to incorporate discussion *throughout* the presentation. You should plan for this very early, as you will need to prepare a PowerPoint presentation as well as several discussion questions for your fellow students; all of these materials must be sent to me no later than one week before your presentation. After this, you should arrange to meet with me at least one week prior to your scheduled presentation (this will give you time to make any course corrections that need to be made). You will be graded based on not just the quality of the PowerPoint but the quality of the overall presentation and discussion. You will be informed of the schedule for presentations no later than the 2nd class.

4) Research Proposal Paper (25%): One the last day of class you will be expected to submit a research proposal paper, related to the theories and methods of lifespan psychology. We will discuss the requirements for this paper extensively later in the semester, but in essence the purpose of this paper is to suggest a research study that uses a novel combination of research methods to mitigate some of the limitations

inherent to the studies we will have discussed. The proposal paper should be approximately 12-15 double-spaced pages, and should include a brief literature review, a description of at least two methods to be included, and description of proposed study procedures and their expected results, and a section on the limitations of the proposed research (including statistical, ethical, or feasibility limitations). We will discuss appropriate writing strategies as well as the basics of APA formatting in class, and early drafts are encouraged for you to receive feedback from me. A paragraph description of your topic will be due no later than the fifth class (9/29) which will constitute 5% of the total paper grade, and a bibliography and structured outline (for which you will receive a rubric) will be due no later than the tenth class (11/17) which will constitute an additional 5% of the total paper grade. These materials will be evaluated promptly and returned to you so that you can have extensive feedback about your paper plans before you begin writing. The remaining 90% of the paper grade will be evaluated based on the final composition. For the paper, you will not simply summarize information, but will be thinking critically and creatively about the methodological decisions that go into conducting research. More details about the paper will be given later in the class.

VII. Policy on Academic Integrity
(From the Faculty Statement on 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.

Scholarship, by its very nature, is an iterative process, with ideas and insights building one upon the other. Collaborative scholarship requires the study of other scholars' work, the free discussion of such work, and the explicit acknowledgement of those ideas in any work that inform our own. This exchange of ideas relies upon a mutual trust that sources, opinions, facts, and insights will be properly noted and carefully credited.

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.

Any breach of this intellectual responsibility is a breach of faith with the rest of our academic community. It undermines our shared intellectual culture, and it cannot be tolerated. Students failing to meet these responsibilities should anticipate being asked to leave Columbia.

For more information on academic integrity at Columbia, students may refer to the *Columbia University Undergraduate Guide to Academic Integrity*: http://www.college.columbia.edu/academics/academicintegrity

VIII. External Resources Available

Columbia has a wealth of resources available to you as a student for getting the most out of your academic experience:

1) If you are having trouble with any aspect of your written assignments, I would encourage you to utilize the Writing Center at Columbia: http://www.college.columbia.edu/core/uwp/writing-center. They can help you with any step of the writing process, from outlining and planning to drafting and revising.

2) If you are having trouble with APA formatting specifically, try consulting the OWL at Purdue: https://owl.english.purdue.edu/owl/resource/560/01/. They have a very useful guide to APA formatting.

3) If you are a student with a disability I encourage you to register with the Office of Disability services: Disability Services at 212-854-2388 and disability@columbia.edu. They can help you with issues like assistive technologies or note-taking accommodations, among other things. Also please see me early in the semester with your DS-certified "Accommodation Letter" to discuss your needed accommodations.

4) If you are feeling overwhelmed or are having some other feelings of distress, I would encourage you to seek out the Office of Counseling and Psychological Services: https://health.columbia.edu/counseling-and-psychological-services. They can help you with issues ranging from urgent mental health concerns to short-term individual counseling, or referrals for an appropriate long-term therapist.

IX. Schedule

The schedule below specifies both the dates when the lectures are posted and the date of the corresponding in-class discussion. All lectures will be posted by noon on the date given. Readings for each week are listed next to the lecture posting dates, but these will all be available on CourseWorks by the start of the term. Note that readings marked with *** indicate supplemental readings— we will be discussing these in class based largely on the coverage of the student presenters and so you are strongly encouraged to read these if you can, but they will not be strictly required. Due dates for important course assignments are also posted here.

Week 1	
9/4	**Lecture Posted:** Evolutionary Methods **Readings:** • Del Giudice, M. (2014). Early stress and human behavioral development:

	emerging evolutionary perspectives. *Journal of developmental origins of health and disease*, *5*(04), 270-280. • Miller, J. A., Ding, S. L., Sunkin, S. M., Smith, K. A., Ng, L., Szafer, A., ... & Arnold, J. M. (2014). Transcriptional landscape of the prenatal human brain. *Nature*, *508*(7495), 199-206. • Raznahan, A., Greenstein, D., Lee, N. R., Clasen, L. S., & Giedd, J. N. (2012). Prenatal growth in humans and postnatal brain maturation into late adolescence. *Proceedings of the National Academy of Sciences*, *109*(28), 11366-11371.
9/8	**Class:** Prenatal Development
Week 2	
9/11	**Lecture Posted:** Animal Research **Readings:** • Braun, K., & Champagne, F. A. (2014). Paternal influences on offspring development: behavioural and epigenetic pathways. *Journal of neuroendocrinology*, *26*(10), 697-706. • Bohacek, J., Gapp, K., Saab, B. J., & Mansuy, I. M. (2013). Transgenerational epigenetic effects on brain functions. *Biological psychiatry*, *73*(4), 313-320. • Freund, J., Brandmaier, A. M., Lewejohann, L., Kirste, I., Kritzler, M., Krüger, A., ... & Kempermann, G. (2013). Emergence of individuality in genetically identical mice. *Science*, *340*(6133), 756-759. • ***Freund, J., Brandmaier, A. M., Lewejohann, L., Kirste, I., Kritzler, M., Krüger, A., ... & Kempermann, G. (2015). Association between exploratory activity and social individuality in genetically identical mice living in the same enriched environment. *Neuroscience*, *309*, 140-152.
9/15	**Class:** Infanthood and Parental Influence
Week 3	
9/18	**Lecture Posted:** Cognitive-Experimental Studies **Readings:** • Ramscar, M., Dye, M., & Klein, J. (2013). Children value informativity over logic in word learning. *Psychological science*, *24*(6), 1017-1023. • Weisleder, A., & Fernald, A. (2013). Talking to children matters early language experience strengthens processing and builds vocabulary.*Psychological science*, *24*(11), 2143-2152. • Piazza, M., Pica, P., Izard, V., Spelke, E. S., & Dehaene, S. (2013). Education enhances the acuity of the nonverbal approximate number system. *Psychological science*, *24*(6), 1037-1043.
9/22	**Class:** Childhood Conceptual Development and Language Acquisition
Week 4	
9/25	**Lecture Posted:** Neuroendocrinology and Biomarkers **Readings:** • Pattwell, S. S., Lee, F. S., & Casey, B. J. (2013). Fear learning and memory across adolescent development: Hormones and Behavior Special Issue: Puberty and Adolescence. *Hormones and behavior*, *64*(2), 380-389. • Vetter-O'Hagen, C. S., & Spear, L. P. (2012). Hormonal and physical markers

	of puberty and their relationship to adolescent-typical novelty-directed behavior. *Developmental psychobiology*, *54*(5), 523-535 • Noble, K. G., Houston, S. M., Brito, N. H., Bartsch, H., Kan, E., Kuperman, J. M., ... & Schork, N. J. (2015). Family income, parental education and brain structure in children and adolescents. *Nature neuroscience*, *18*(5), 773-778. • ***Padmanabhan, A., & Luna, B. (2014). Developmental imaging genetics: linking dopamine function to adolescent behavior. *Brain and cognition*, *89*, 27-38.
9/29	**Class:** Adolescence and Pubertal Development **DUE:** Paper Topic Paragraph
Week 5	
10/2	**Lecture Posted:** Decision-Making Research **Readings:** • Vohs, K. D., Baumeister, R. F., Schmeichel, B. J., Twenge, J. M., Nelson, N. M., & Tice, D. M. (2014). Making choices impairs subsequent self-control: a limited-resource account of decision making, self-regulation, and active initiative. • Smith, D. G., Xiao, L., & Bechara, A. (2012). Decision making in children and adolescents: impaired Iowa Gambling Task performance in early adolescence. *Developmental psychology*, *48*(4), 1180. • Domenech, P., & Koechlin, E. (2015). Executive control and decision-making in the prefrontal cortex. *Current opinion in behavioral sciences*, *1*, 101-106. • ***Del Missier, F., Mäntylä, T., & Bruin, W. B. (2012). Decision-making competence, executive functioning, and general cognitive abilities. *Journal of Behavioral Decision Making*, *25*(4), 331-351.
10/6	**Class:** Early Adulthood and Executive Functioning
Week 6	
10/9	**Lecture Posted:** Survey Research **Readings:** • Wängqvist, M., Lamb, M. E., Frisén, A., & Hwang, C. P. (2015). Child and adolescent predictors of personality in early adulthood. *Child development*,*86*(4), 1253-1261. • Damian, R. I., Su, R., Shanahan, M., Trautwein, U., & Roberts, B. W. (2015). Can personality traits and intelligence compensate for background disadvantage? Predicting status attainment in adulthood. *Journal of personality and social psychology*, *109*(3), 473. • Kokko, K., Tolvanen, A., & Pulkkinen, L. (2013). Associations between personality traits and psychological well-being across time in middle adulthood. *Journal of Research in Personality*, *47*(6), 748-756. • ***Hutteman, R., Hennecke, M., Orth, U., Reitz, A. K., & Specht, J. (2014). Developmental tasks as a framework to study personality development in adulthood and old age. *European Journal of Personality*, *28*(3), 267-278.
10/13	**Class:** Adult Personality
Week 7	
10/23	**Lecture Posted:** Psychometrics

10/27	**Class:** Adult Intelligence **Readings:** • Troche, S. J., Wagner, F. L., Voelke, A. E., Roebers, C. M., & Rammsayer, T. H. (2014). Individual differences in working memory capacity explain the relationship between general discrimination ability and psychometric intelligence. *Intelligence*, *44*, 40-50. • Menary, K., Collins, P. F., Porter, J. N., Muetzel, R., Olson, E. A., Kumar, V., ... & Luciana, M. (2013). Associations between cortical thickness and general intelligence in children, adolescents and young adults. *Intelligence*,*41*(5), 597-606. • Euler, M. J., Weisend, M. P., Jung, R. E., Thoma, R. J., & Yeo, R. A. (2015). Reliable activation to novel stimuli predicts higher fluid intelligence.*NeuroImage*, *114*, 311-319. • ***Conway, A. R., & Kovacs, K. (2015). New and emerging models of human intelligence. *Wiley Interdisciplinary Reviews: Cognitive Science*, *6*(5), 419-426.
Week 8	
10/30	**Lecture Posted:** GWAS and Genetic Studies **Readings:** • Clauss, J. A., Avery, S. N., & Blackford, J. U. (2015). The nature of individual differences in inhibited temperament and risk for psychiatric disease: a review and meta-analysis. *Progress in neurobiology*, *127*, 23-45. • Gu, J., & Kanai, R. (2014). What contributes to individual differences in brain structure?. *Frontiers in human neuroscience*, *8*(262), 1-6. • Chabris, C. F., Hebert, B. M., Benjamin, D. J., Beauchamp, J., Cesarini, D., van der Loos, M., ... & Freese, J. (2012). Most reported genetic associations with general intelligence are probably false positives. *Psychological science*, 0956797611435528. • ***Plomin, R., & Deary, I. J. (2015). Genetics and intelligence differences: five special findings. *Molecular psychiatry*, *20*(1), 98-108.
11/3	**Class:** Interindividual Differences
Week 9	
11/6	**Lecture Posted:** Epidemiology and Longitudinal Studies **Readings:** • Wilson, R. S., Boyle, P. A., Yu, L., Barnes, L. L., Schneider, J. A., & Bennett, D. A. (2013). Life-span cognitive activity, neuropathologic burden, and cognitive aging. *Neurology*, *81*(4), 314-321. • Salthouse, T. A. (2014). Why are there different age relations in cross-sectional and longitudinal comparisons of cognitive functioning?. *Current directions in psychological science*, *23*(4), 252-256. • Nyberg, L., Lövdén, M., Riklund, K., Lindenberger, U., & Bäckman, L. (2012). Memory aging and brain maintenance. *Trends in cognitive sciences*,*16*(5), 292-305.
11/10	**Class**: ”Healthy” Aging
Week 10	

11/13	**Lecture Posted:** Neuroimaging **Readings:** • Smith, S. M., Beckmann, C. F., Andersson, J., Auerbach, E. J., Bijsterbosch, J., Douaud, G., ... & Kelly, M. (2013). Resting-state fMRI in the human connectome project. *Neuroimage*, *80*, 144-168. • Fjell, A. M., McEvoy, L., Holland, D., Dale, A. M., Walhovd, K. B., & Alzheimer's Disease Neuroimaging Initiative. (2013). Brain changes in older adults at very low risk for Alzheimer's disease. *The Journal of Neuroscience*,*33*(19), 8237-8242. • Daselaar, S. M., Iyengar, V., Davis, S. W., Eklund, K., Hayes, S. M., & Cabeza, R. E. (2015). Less wiring, more firing: low-performing older adults compensate for impaired white matter with greater neural activity. *Cerebral Cortex*, *25*(4), 983-990. • ***Lövdén, M., Wenger, E., Mårtensson, J., Lindenberger, U., & Bäckman, L. (2013). Structural brain plasticity in adult learning and development.*Neuroscience & Biobehavioral Reviews*, *37*(9), 2296-2310.
11/17	**Class:** Structural and Functional Brain Changes **DUE:** Paper Outline and Bibliography
Week 11	
11/24	**NO CLASS -- THANKSGIVING**
Week 12	
11/27	**Lecture Posted:** Neuropsychology
12/1	**Class:** Dementia **Readings:** • Duff, K. (2012). Evidence-based indicators of neuropsychological change in the individual patient: relevant concepts and methods. *Archives of Clinical Neuropsychology*, *27*(3), 248-261. • Vos, S. J., Xiong, C., Visser, P. J., Jasielec, M. S., Hassenstab, J., Grant, E. A., ... & Fagan, A. M. (2013). Preclinical Alzheimer's disease and its outcome: a longitudinal cohort study. *The Lancet Neurology*, *12*(10), 957-965. • Monsell, S. E., Mock, C., Hassenstab, J., Roe, C. M., Cairns, N. J., Morris, J. C., & Kukull, W. (2014). Neuropsychological changes in asymptomatic persons with Alzheimer disease neuropathology. *Neurology*, *83*(5), 434-440. • ***Barulli, D., & Stern, Y. (2013). Efficiency, capacity, compensation, maintenance, plasticity: emerging concepts in cognitive reserve. *Trends in cognitive sciences*, *17*(10), 502-509.
Week 13	
12/4	**Lecture Posted:** Interventional Studies **Readings:** • Voss, M. W., Heo, S., Prakash, R. S., Erickson, K. I., Alves, H., Chaddock, L., ... & Gothe, N. (2013). The influence of aerobic fitness on cerebral white matter integrity and cognitive function in older adults: Results of a one-year exercise intervention. *Human brain mapping*, *34*(11), 2972-2985. Shute, V. J., Ventura, M., & Ke, F. (2015). The power of play: The effects of Portal 2 and Lumosity on cognitive and noncognitive skills. *Computers &*

	Education, *80*, 58-67. • Kühn, S., Gleich, T., Lorenz, R. C., Lindenberger, U., & Gallinat, J. (2014). Playing Super Mario induces structural brain plasticity: gray matter changes resulting from training with a commercial video game. *Molecular psychiatry*,*19*(2), 265-271. • Hayes, T. R., Petrov, A. A., & Sederberg, P. B. (2015). Do we really become smarter when our fluid-intelligence test scores improve?. *Intelligence*, *48*, 1-14. • ***Purcell, R. H., & Rommelfanger, K. S. (2015). Internet-Based Brain Training Games, Citizen Scientists, and Big Data: Ethical Issues in Unprecedented Virtual Territories. *Neuron*, *86*(2), 356-359.
12/8	**Class:** Cognitive Training **DUE:** Research Proposal Paper