

**Brain Development-Psychology 450**  
**Mondays 11:30-12:50, Thursdays 1-2:20, Biosciences Room 2109**

**Professor: Dr. Beth Kelley**

**Office: Room 351 Humphrey**

**Office Hours: Mondays 9:30-10:30 and Thursdays 9:30-10:30**

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**Book: “Developmental Cognitive Neuroscience, Third Edition” by Mark Johnson**

### **Course Description**

This course is designed to be a relatively broad discussion of brain development, with a particular focus on issues such as the developmental course of brain development, how to most effectively measure brain development and the changes in brain functioning, how and when the brain may develop atypically, the role of plasticity and pruning in brain development, and how brain development is related to various aspects of cognitive development.

There are a lot of readings in this course (all of which are available in the book or online through Queen’s journal system), particularly at the beginning of the course. I highly suggest that you at least skim each reading before coming to class that you can participate in the discussion-you can always go back and read them over in more detail when writing the final exam. Of course, if you are submitting a question for that day’s readings, you will need to read them in more detail. Instead of me just re-iterating what you read in the readings, I will make a real attempt to make each class more of a discussion of these readings and how they relate to broader themes in developmental cognitive neuroscience.

The latter part of the course will be taken up by group presentations on atypically-developing brains.

### **Course Requirements**

1. *Questions on the readings-worth 20%.* Four times during the semester, you will be asked to submit discussion questions on the readings. These questions should be as substantive as possible and make a real attempt to tie the readings/lecture into other things you have learned in psychology and especially developmental psychology. Think big picture, critical thinking, theoretical type of questions. You might also try to think of other ways that the issues under discussion might be addressed, that is, what sort of experimental design might be more appropriate, but please be sure to offer up constructive criticism, i.e., don’t just talk about how the methodology in the paper sucks! I am happy to answer questions of clarification, but these will not count toward your mark. Each day’s question will be worth 5 marks toward your overall grade. These questions are due by 9 a.m. on the day of class so that I can organize them and print them off for the whole class. For the first few classes I will provide the discussion questions to give you an idea of what I am looking for.
2. *Attendance and participation-worth 10%.* You will be expected to attend every class and be engaged in the discussion. I know this is not always easy to do, but it is certainly not impossible! If you do need to be absent, please let me know the reason for your absence. In the past I have actually taken attendance and made check marks for people every time that they contributed to the discussion, but I found that this led to people just agreeing with what had already been said, just for the sake of getting a check mark. Thus, this mark will be more of a holistic one (though I will take attendance at the beginning, more so that I can get to know your names more than anything else). Thus, if you miss a couple of classes but contribute substantially to the discussion on the remaining days, your mark will remain a good one. I know that not everyone feels comfortable speaking up in class, so if you attend every class and only make the occasional substantial comment, your mark will also remain good. I will try to remain as fair as possible with this mark, and have attendance and participation weigh on it equally.

3. *Oral presentation-worth 35%*. Further on in the semester, topics will be presented by small groups on atypical brain development. You will be responsible for finding articles related to this topic, synthesizing the articles and presenting them as a group. You will also be responsible for trying to answer questions and lead the discussion on the topic, although I will certainly help in this regard. You will receive group marks for these presentations-if things are not going well in the group and someone is not pulling their weight, I would appreciate it if you would try to work it out amongst yourselves first, and if you cannot, I will mediate the discussion. Please come to me enough ahead of time so that we can make sure everything gets straightened out by the presentation date. Psychologists have to work together and learning to work together is an important part of the process. Those scheduled to present **MUST** be in class on the day of the presentation. Additionally, it is strongly encouraged that you come to me with ANY questions that you have about the topic itself. I strongly suggest that you start working on this presentation early in the semester as gathering all of this information and synthesizing it takes time.

Presentations should be roughly structured as follows:

1. What are the general symptoms of the disorder and what is its prevalence?
2. What are the major effects on brain development?
3. How are these effects on brain development related to cognitive development?
4. Are there any effective treatments to minimize the deleterious effects?

You will see that there are four topics here and there will be four of you in each group so you can certainly split things up by topic. However, I **STRONGLY** advise you to work closely on these presentations so that you're not repeating yourselves, you all know what each other are going to say, and you can share information more efficiently. Remember, you will get a group mark, so it behooves you to make sure that everyone's presentation in the group is the best that it can be.

4. *Final Exam-worth 35%*. The final exam will be a take-home exam which will be given to you when you come back after reading week. It will be an short essay-based exam that will cover the important themes running throughout the course. This exam will be due by 11:59 pm on Monday, April 21st without exception-if you do not have a doctor's note, 2% of the grade will be taken off each 24 hours that it is late. The paper can be e-mailed to me as a **Microsoft Word** attachment (preferable) or as a PDF.

### **Grading Summary**

**Questions and Comments-20%**

**Attendance and Participation 10%**

**Oral Presentation 35%**

**Final Exam 35% (due April 21<sup>st</sup> at 11:59 p.m.)**

## **CLASS SCHEDULE**

### **January 6**

Introduction to class, "getting to know you", go over syllabus, discuss expectations and grading

Gazzaniga, M.S. (2010). Neuroscience and the correct level of explanation for understanding mind. *Trends in Cognitive Sciences*, 14, 291-292.

### **January 9**

Textbook Chapter 1 "The Biology of Change"

Gottlieb, G. (2007). Probabilistic epigenesis. *Developmental Science*, 10, 1-11.

Stiles, J. (2009). On genes, brains, and behavior: Why should developmental psychologists care about brain development? *Child Development Perspectives*, 3, 196-202.

### **January 13**

Textbook Ch 2-“Methods and Populations”

Byars, A.W., Holland, S.K., Strawsburg, R.H., Bommer, W., Dunn, R.S., Schmithorst, V.J., & Plante, E. (2002). Practical aspects of conducting large-scale functioning magnetic resonance imaging studies in children. *Journal of Child Neurology, 17*, 885-890.

Vul, E., Harris, C., Winkielman, P., & Pashler, H. (2009). Puzzlingly high correlations in fMRI studies of emotion, personality, and social cognition. *Perspectives on Psychological Science, 4*, 274-290.

### **January 16**

Poldrack, R. A. (2010). Interpreting developmental changes in neuroimaging signals. *Human Brain Mapping, 31*, 872-878.

Karmiloff-Smith, A. (2010). Neuroimaging of the developing brain: Taking “developing” seriously. *Human Brain Mapping, 31*, 934-941.

### **January 20**

Peterson, B.S. (2003). Conceptual, methodological, and statistical challenges in brain imaging studies of developmentally-based psychopathologies. *Development and Psychopathology, 15*, 811-832.

### **January 23**

Dong, W. K., & Greenough, W. T. (2004). Plasticity of nonneuronal brain tissue: Roles in developmental disorders. *Mental Retardation and Developmental Disabilities Research Reviews, 10*, 85-90.

Shaw, P., Gogtay, N., & Rapoport, J. (2010). Childhood psychiatric disorders as anomalies in neurodevelopmental trajectories. *Human Brain Mapping, 31*, 917-925.

### **January 27**

Textbook Chapters 3& 4- “From Gene to Brain” and “Building a Brain”

Mercado, E. (2009). Cognitive plasticity and cortical modules. *Current Directions in Psychological Science, 18*, 153-158.

### **January 30**

Abraham, W. C. (2008). Metaplasticity: Tuning synapses and networks for plasticity. *Nature Reviews Neuroscience, 9*, 387-399.

Casey, B. J., Galvan, A., & Hare, T. A. (2005). Changes in cerebral functional organization during cognitive development. *Current Opinion in Neurobiology, 15*, 239-244.

Thomas, M. S. C., & Johnson, M. H. (2008). New advances in understanding sensitive periods in brain development. *Current Directions in Psychological Science, 17*, 1-5.

### **February 3**

Leuner, B., Glasper, E. R., & Gould, E. (2010). Parenting and plasticity. *Trends in Neurosciences, 33*, 465-473

Stevens, M. C. (2009) The developmental cognitive neuroscience of functional connectivity. *Brain and Cognition, 70*, 1-12.

Fox, S. E., Levitt, P., & Nelson, C. A. (2010). How the timing and quality of early experiences influence the development of brain architecture. *Child Development, 81*, 28-40.

### **February 6**

Textbook Ch. 5 “Vision, Orienting and Attention”

Richards, J. E., Reynolds, G. D., & Courage, M. L. (2010). The neural bases of infant attention. *Current Directions in Psychological Science, 19*, 41-46.

### **February 10**

Textbook Ch. 6 “Perceiving and Acting on the Physical World”

Grill-Spector, K., & Sayres, R. (2008). Object recognition: Insights from advances in fMRI methods. *Current Directions in Psychological Science, 17*, 73-79.

### **February 13**

Textbook Ch 7-“Perceiving and Acting on the Social World”

Blakemore, S.-J., & Frith, U. (2004). How does the brain deal with the social world? *NeuroReport, 15*, 119-128.

### **February 24**

Somerville, L. H., Jones, R. M., Ruberry, E. J., Dyke, J. P., Glover, G., & Casey, B. J.(2013). The medial prefrontal cortex and the emergence of self-conscious emotion in adolescence. *Psychological Science, 24*, 1554-1562.

Shaw, D. J., Grosbras, M.-H., Leonard, G., Pike, G. B., & Paus, T. (2011). Development of functional connectivity during adolescence: A longitudinal study using an action-observation paradigm. *Journal of Cognitive Neuroscience, 23*, 3713-3724.

### **February 27**

Textbook Ch. 8 “Learning and Long-Term Memory”

Bauer, P. J. (2008). Toward a neuro-developmental account of the development of declarative memory. *Developmental Psychobiology, 50*, 19-31.

### **March 3**

Textbook Ch. 9 “Language”

Kuhl, P., & Rivera-Gaxiola, M. (2008). Neural substrates of language acquisition. *Annual Review of Neuroscience, 3*, 511-534.

### **March 6**

Textbook Ch. 10 “Prefrontal Cortex, Working Memory and Decision Making”

Bunge, S. A., & Wright, S. B. (2007). Neurodevelopmental changes in working memory and cognitive control. *Current Opinion in Neurobiology, 17*, 343-350.

Thompson-Schill, S. L., Ramscar, M., & Chrysikou, E. G. (2009). Cognition without control: When a little frontal lobe goes a long way. *Current Directions in Psychological Science*, 18, 259-263.

**March 10**

Textbook Chs. 11 & 12-“ Cerebral Lateralization” and “Interactive Specialization”

Hopkins, W. D., & Cantalupo, C. (2008). Theoretical speculations on the evolutionary origins of hemispheric specialization. *Current Directions in Psychological Science*, 17, 233-237.

**March 13**

Presentation group 1-The effects of premature birth on brain development

**March 17**

Presentation group 2-Brain development in children with Dyslexia

**March 20**

Presentation group 3-Brain development in children with Fetal Alcohol Spectrum Disorders

**March 24**

Presentation group 4-The effects of cancer on brain development

**March 27**

Presentation group 5-Brain Development in children with Fragile X syndrome

**March 31**

Presentation group 6-The effects of epilepsy on brain development

**April 3**

Textbook Ch. 13 “Toward an Integrated Developmental Cognitive Neuroscience”  
Wrap-up, bake-off, and discussion of final exam