Child and Adolescent Brain Development: Applications from Neuroscience to Practice

Class code: CAMS-UA 9141 – 001

Instructor Details:
Suraj Samtani
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Office hours: Wednesday 3-3:30pm OR Consultation by Appointment
Please allow at least 24 hours for your instructor to respond to your emails.

Class Details:
Spring 2015

Child and Adolescent Brain Development: Applications from Neuroscience to Practice

Wednesday 12:00 – 3:00pm
February 4 to May 13
Room 202
NYU Sydney Academic Centre

Prerequisites: None

Class Description:
The course is broken up into three sections;

Section I: Foundations: Knowledge versus the Unknown
In this section, students will be involved in lectures and discussions aimed at developing their knowledge about the functional anatomy of the human brain and the current appreciation that neuroscientists have developed about how the human brain has developed in utero, from infancy through early childhood and into adolescent development. The course focuses on the models that have been proposed in the past for explaining the relationship to brain areas and human behaviour (phrenology and specific localization of cognitive functioning) and contrast those models with the current base of knowledge. Awareness that there is more about brain development that has not been learned and remains unknown will be discussed.

Section II: Observation: Nature versus Nurture
In this section, students will be involved in lectures and discussions aimed at developing their knowledge about the functions that are essential during the development of infancy and early childhood. Students will develop their appreciation for observational methods of examining the behaviour of very young children and will review empirical studies of children’s
intellectual development, in the perception and orientation toward human faces, in language development, and in motor development. The studies that will be examined will help students to consider the role of genetics and the impact that environmental influences have on the brain development of children.

Section III: Assessment: Normalcy versus Disorder
In this section, students will be involved in lectures and discussions aimed at developing their knowledge about the neurocognitive functions that are essential during middle and late childhood. Students will be introduced to the method of assessment used by neuropsychologists. Students will develop their appreciation for assessment methods in which the behaviours of children can be compared to their peer group on standardised instruments. We will review how assessment can be used to differentiate normal or typical development from disorders in cognitive functioning such as in learning to read, in attentional disorders, in anxiety disorders, and in those errors children make in remembering factual and autobiographical information.

Desired Outcomes
Students will learn key aspects of:
1. the anatomy of the human brain;
2. the development of the human brain across the lifespan; and
3. how scientists observe, assess and intervene in the development of neurocognitive processes in childhood and adolescence.

Students will develop:
1. An appreciation of the complexity of the human brain, the limits and advantages of our current knowledge; and
2. An awareness that a neurocognitive perspective has explained a considerable array of human behaviour, including aspects of emotional functioning and personality.

Students will be able to:
1. Generate ideas about how development of the brain parallels other developmental changes seen through childhood and adolescence; and
2. Critically evaluate the common, albeit unscientific assumptions, that are made about the development of children’s brain functioning and provide alternate theoretically and empirically supported explanations about child and adolescent behaviour based on neurocognitive models.

Assessment Components

Exam 1 (15%): Session 6 (Wed 11 Mar) 1 hour 15 minutes
Students will answer multiple choice and short answer questions about neuroanatomy, brain development, and past and current models of the connection between brain functions and human behaviour.

Exam 2 (20%): Session 10 (Wed 15 Apr) 1 hour 15 minutes
Students will answer multiple choice and short answer essay questions about infant
development, prematurity, intelligence, visual perception, language development, and motor functioning.

Exam 3 (20%): Exam Week (Tues 19 May) 12.00-2.00PM
Students will answer multiple choice questions and short answer essay questions about the neuropsychological evaluation, reading, dyslexia, attentional disorder, memory and learning disorders and brain based connections for emotional dysfunction.

Class Participation (10%) – ongoing throughout semester
Students will be given a grade for participation based upon attention during class, responsiveness and thoughts about comments made by other students, and a demonstration that they have read the material.

Research Topic Paper (35%): Session 14 (Wed 13 May) – 4 pages
A half page write up of your topic is due in Session 11 (Wed 22 April)
Students will write a research paper on a topic using outside APA approved journal references (minimum of 5 references required). This write-up does not need to be in APA format, but must include at least three references from outside of class.

The paper should serve to briefly define the relevant terms, briefly review the literature on brain development (using articles outside of those assigned for class), and highlight one specific area that you were interested in exploring further related to either development or intervention.

*Failure to submit or fulfill any required course component will result in failure of the class.*

**Assessment Expectations**

**Grade A:** Excellent performance showing a thorough knowledge and understanding of the topics of the course; all work includes clear, logical explanations, insight, and original thought and reasoning.

**Grade B:** Good performance with general knowledge and understanding of the topics; all work includes general analysis and coherent explanations showing some independent reasoning, reading and research.

**Grade C:** Satisfactory performance with some broad explanation and reasoning; the work will typically demonstrate an understanding of the course on a basic level.

**Grade D:** Passable performance showing a general and superficial understanding of the course’s topics; work lacks satisfactory insight, analysis or reasoned explanations.

**Grade F:** Unsatisfactory performance in all assessed criteria. Work is unfinished or unsubmitted.
A grading rubric will be provided and distributed in class.

Written work due in class must be submitted to your instructor during class time.

Late work should be submitted in person to the Academics Coordinator during regular office hours (9:00am-5:00pm, Monday-Friday). In the absence of the Academics Coordinator, another member of the administrative staff can accept the work in person. The NYUS staff will mark down the date and time of submission in the presence of the student. Students must also submit an electronic copy of late written work to Turn-It-In within 24 hours.

Work submitted after the submission time without an agreed extension receives a penalty of 2 points on the 100-point scale (for the assignment) for each day the work is late.

Written work submitted beyond five (5) weekdays after the submission date without an agreed extension fails and is given a zero.

The academic standards of New York University apply to all coursework at NYU Sydney. NYU Sydney policies are in accordance with New York University’s plagiarism policy. The presentation of another person’s words, ideas, judgment, images or data as though they were your own, whether intentionally or unintentionally, constitutes an act of plagiarism.

Penalties for confirmed cases of plagiarism are severe and are dealt with by the Director, NYU Sydney, not your instructor. Your home school will be notified and you will be dealt with according to the standards of that school. The codes of conduct and academic standards for NYU’s various schools and colleges are outlined in the respective school’s academic resources.

Study abroad at Global Academic Centres is an academically intensive and immersive experience, in which students from a wide range of backgrounds exchange ideas in discussion-based seminars. Learning in such an environment depends on the active participation of all students. And since classes typically meet once or twice a week, even a single absence can cause a student to miss a significant portion of a course. To ensure the integrity of this academic experience, class attendance at the centres is mandatory, and unexcused absences will be penalised with a two percent deduction from the student’s final course grade for every week of classes missed.

The class roster will be marked in the first five minutes of class and anyone who arrives after this time will be considered absent. Students are responsible for making up any work missed due to absence. Repeated absences will result in harsher penalties, including failure.

This is a seminar subject and requires the active participation of all students. It also requires
**Expectations**

engaged discussion, including listening to and respecting other points of view. Your behaviour in class should respect your classmates’ desire to learn. It is important for you to focus your full attention on the class, for the entire class period.

- Arrive to class on time.
- Once you are in class, you are expected to stay until class ends. Leaving to make or take phone calls, to meet with classmates, or to go to an interview, is not acceptable behaviour.
- Phones, digital music players, and any other communications or sound devices are not to be used during class. That means no phone calls, no texting, no social media, no email, and no internet browsing at any time during class.
- Laptop computers and tablets are not to be used during class except in rare instances for specific class-related activity expressly approved by your instructor.
- The only material you should be reading in class is material assigned for that class. Reading anything else, such as newspapers or magazines, or doing work from another class, is not acceptable.
- Class may not be recorded in any fashion – audio, video, or otherwise – without permission in writing from the instructor.

**Required Texts**


Other selected readings are posted on NYU Classes.

**SECTION I: FOUNDATIONS: KNOWLEDGE VERSES THE UNKNOWN**

**Session 1   Introduction and Cognitive Models: The History**

**Wednesday 4 February**

Introduction to the Course Dialectics: Knowledge versus the Unknown, Nature versus Nurture, Normalcy versus Disorder, and Complacency versus Action. These are chosen to help students develop a mindset about important questions in the field such that they develop a broader base of information to manage the tensions between the two poles of each dialectic, but do not conclude that these issues have been definitively resolved.

**Cognitive Models: The History**

- Explanation of past models of brain functioning (phrenology and specific localization of cognitive functioning).
• Description of Functional Brain Areas or Units and Computational Models of Brain Functioning

Required Reading:

Recommended Reading:

Session 2
Wednesday 11 February

Functional Neuroanatomy: From Autopsy to Neuroimaging
• Review of directional terms: dorsal, ventral, caudal, rostral, posterior, anterior, sagittal, coronal and horizontal slices.
• Review of subcortical structures and functional properties of those areas.
• Review of cortical structures and preview of functional properties attributed to those areas including: occipital, parietal, temporal and frontal lobes as well as more detailed examination of prefrontal cortex.
• Review of the ventricular system and the vascular system.
• Review of the use of autopsy, CT scans, MRI and fMRI technology, and newer technologies like Diffusion MRI.
• Identification of Gray and White Matter

Required Reading:

The Developing Brain I
• Review of cell migration, pruning, and arborization in animal and human models.
• Review the growth and development of the grey and white matter during early childhood and the functional implications of those brain changes.

Required Reading:

Session 3
Wednesday 18 February

The Developing Brain II
• Review of cell migration, pruning, and arborization in humans during late childhood, adolescence and adulthood.
• The growth and development of the grey and white matter during later childhood and adolescence and the functional implications of those brain changes.
• Discuss how these research findings can be understood in the context of those behaviours that children and teens are expected to engage in (i.e., a developmental perspective).
• Discuss concept of plasticity and how it applies to childhood, adolescence and adulthood.
• Examine cases of traumatic brain injury in these different stages to highlight differences in plasticity of brain functioning.

Required Reading:

Session 4

Wednesday 25 February

Sensitive/Critical Periods and Neuroplasticity
• Review concept of sensitive and critical periods for the development of specific neurocognitive functions.
• Examine clinical cases of language development and fine motor functioning

Required Reading:

Session 5

Wednesday 4 March

Prematurity
• Review prenatal Development including definitions of low birth weight (“LBW”) and Preterm Birth
• Discuss prevalence and introduce interventions for preterm and low birth weight infants
• Students will learn about causes and effects on the brain and specific outcomes neuropsychological Outcomes

Required Reading:
Prenatal Development Infancy and Early Childhood Intellect: Genes and the Role of the Environment

- Developmental Milestones of Infants and Early Children

Required Reading:

SECTION II: OBSERVATION, NATURE VERSUS NURTURE

Session 6
Wednesday 11 March

EXAM 1 (15%)

Intelligence
- Review the History of Intelligence Tests for Children
- Students will learn types of Intelligence and Models of Multiple Intelligences
- Discuss the genetic and environmental Impacts on Intelligence as well as the applications of the IQ Test
- Students will review and re-learn the occipital, parietal and temporal lobe and important subcortical areas

Required Reading:

SPRING BREAK 16 – 20 March

Session 7
Wednesday 25 March

Facial Perception and Object Perception
- Students will observe and learn the orientation of Babies to Human Faces
- Review of Empirical Studies of Facial Perception and Implications of Brain Areas Involved
- Discuss Ideas of Attachment and Autism

Required Reading:

Reminder: Please read the book *Meaningful Differences* for Session 8.

**Session 8**
**Wednesday 1 April**

**Language Development: The Role of the Environment**
- Re-Learning the Temporal, Parietal and Frontal Cortical Areas
- A system for understanding different language based skills and functions
- Small Group Discussion of Reading: Meaningful Differences

**Required Reading:**

**Session 9**
**Wednesday 8 April**

**Motor Development**
- Re-Learning the Frontal Lobe, Subcortical Areas and the Cerebellum
- Learning system for understanding different motor based skills and functions

**Required Reading:**

**SECTION III: ASSESSMENT: NORMALCY VERSES DISORDER**

**Session 10**
**Wednesday 15 April**

**EXAM 2 (20%)**

**The Neuropsychological Evaluation**
- How to think about Assessment of Cognitive Functions and Guidelines for Cognitive Development According to Child Age
• Introduction to the Psychoeducational Evaluation and the Neuropsychological Evaluation The Neuropsychological Method and the Application to Children
• Areas of Cognitive Functioning: Intelligence, Language, Memory, Attention, Executive Functions, Visual Perception, Visual Motor Integration, Gross and Fine Motor Functioning, Tactile Perception, Academic Achievement, Social-Emotional Functioning
• Case Examples of Differential Diagnosis

Required Reading:

Reminder: Please read the book Proust and the squid: The story and science of the reading brain for next week’s session

Session 11
Wednesday 22 April

The Reading System
• How the Brain Learns to Read
• Phonological Awareness and Reading Fluency: Automaticity and problems with Retrieval

Required Reading:

Developmental Dyslexia and Learning Disorders
• Developmental Dyslexia Common Myths, Gender Differences and Cultural Differences, Dyslexia as a Brain Based Language Based Learning Disorder, Remediation of Dyslexia, Other Language Based Learning Disorders Typically Seen in Childhood
• Review of Cases—The Neuropsychological Perspective

Required Reading:

Recommended Reading:

Half-page write up of your Paper Topic due.

Session 12
Wednesday 29 April
Attentional Disorders

- Attentional and Executive Functions Important in Childhood
- The four neurocircuits involved in Attention
- Four Models of ADHD
- Changes in the Behavioral Phenotype Across the Lifespan

Required Reading:

Recommended Reading:

Session 13
Wednesday 6 May

Problems with Memory

- Different Types of Memory: Declarative, Procedural, Episodic.
- Memory Functions Important in Childhood How Memories are Made and Stored- The Role of the Hippocampus
- Unusual Experiences in Memory Function-Retrieval Problems, Problems with Source Memory, False Memories, Trauma, Suggestibility

Required Reading:

Session 14
Wednesday 13 May

Emotions: Fear and Anxiety Disorders

- The Processing of Emotional Experiences
- Some Models of Emotional Experience-The Somatic Marker Hypothesis
- How Emotional Experiences Occur and are Understood-The Role of the Amygdala

Required Reading:

**The Future: Neuroimaging and Experimental Evidence & Wrap Up**

*Research Paper Due (35%)*

*EXAM 3 (20%): Tues 19 May 12.00-2.00PM*

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**Your Instructor**

Suraj Samtani is a Clinical Psychologist (Registrar) and a PhD Candidate at the University of New South Wales. His primary research interests are rumination and worry, and developing better assessments and treatments for these cognitive processes across disorders.

He has taught various subjects at UNSW including neuropsychological assessment and psychopathology, social and developmental psychology, and introduction to psychology. He has worked as a clinician with acute psychosis, traumatic brain injury and personality disorder populations, conducting neuropsychological assessments and delivering treatment. His clinical experience also includes working with children and adolescents with learning difficulties, anxiety, depression, and autism spectrum disorder.