Neuroplasticity: The Brain and Behavior
Semester: Spring 2017
Copenhagen
Credits: 3
Major Disciplines: Neuroscience, Pre-Medicine/Health Science, Psychology

Course Information and Purpose

1. Instructor
Claudia Carrara-Augustenborg, Ph.D.
Ph.D. in Cognitive Neuroscience from University of Copenhagen (Denmark) and M.Sc Psychology (Major in Clinical and Neuropsychology). Interests are focused on the neural mechanisms that mediate and modulate human consciousness, and on the functional and neural distinctions between conscious and unconscious processes. With DIS since 2013.
Email: cau@dis.dk

Psychology Program Director:
Carla Caetano, Ph.D.
Email: cca@dis.dk

DIS Contact:
Psychology Program Assistant:
Kate Giddens
Email: kg@dis.dk
Phone: +45 33 76 57 64

Guest Lecturers:
Hana Mala Rytter, Ph.D., Institute for Psychology, Copenhagen University
  Topic: Brain Injury Rehabilitation-- Evidence-based practice vs. practice-based evidence

Carla Caetano, Ph.D., PSY Program Director of DIS
  Topics: Rehabilitation treatment and challenges following acquired brain injury.

2. Course Description
Prerequisites: One semester of neuroscience, physiological psychology, or biological psychology at university level.

This course will focus on neuroplasticity from a predominantly behavioral perspective. Emphasis will be on:
  a) the neural development of the human brain and implications for psychological and social behavior
  b) the adult brain and neuroplasticity with respect to both learning and aging

Neuroplasticity: The Brain and Behavior | DIS – Study Abroad in Scandinavia | 1702571
Related Disciplines: Human Development
c) brain repair with focus on rehabilitation of the adult brain after acquired brain injury.

3. Course Learning Objectives
By the end of this course, students will be able to:

- Identify the principles of neuroplasticity from a behavioral perspective;
- Compare and contrast neuroplasticity across the lifespan;
- Evaluate the role of neuroplasticity in pathology;
- Appraise the aftermath of neuroplasticity in the context of neurodevelopmental disorder
- Evaluate brain plasticity embedded in the individual

The following topics will be covered during the course:

**Theme 1: Principles of Neuroplasticity**
- Foundations of neural development
- Principles of cerebral development
- Experiential influences on neuronal plasticity
- Plasticity of language network

**Theme 2: Learning and Aging**
- Learning principles: Neural and behavioral factors
- Memory
- Normal brain aging
- Brain aging and neurodegeneration
- Biocultural perspectives on brain plasticity

**Theme 3: Pathological factors and brain plasticity**
- Brain plasticity in early damage: Neurological, developmental and psychosocial dimensions
- Early Brain Insult: Neural and behavioral principles of rehabilitation
- Clinical perspectives on neuroplasticity: Depression, stress and schizophrenia
- Plasticity and atypical brain architectures
- Neuroprotection and Neuroplasticity

**Course Components**

1. **Required Textbook (available at DIS Library)**

2. **Required Articles and Other Media**
   - Additional articles can be found on Canvas. See Course Schedule below.

3. **Approach to Teaching**
   Lectures, class discussions, case studies, group presentations, critical analysis of research (individual/groups), field studies.
4. Field Studies
This course will be accompanied with field studies. Field studies connect DIS courses to organizations, companies, sites, and/or persons that are relevant to the course topic.

**Lions Kollegiet**
Date: **Wednesday, October 5**  
Time: **09:00-12.30**  
Location: Tuborgsvej 140, 2300 København

**Center for Rehabilitation after Brain Injury**  
Date: **Wednesday, November 30**  
Time: **13.00-17.00**  
Location: Amagerfælledevej, 56A, 2300 København

5. Expectations of the Students
Class attendance is mandatory. Students are expected to have done the reading for each class and to come with notes and questions for me and for the other students. This will give us material to generate conversation. It is also expected that during classes the students are able to discuss and to present topics and to respond questions providing references to our readings to support their points. Active participation during classes will constitute 15% of the grade. Finally, it is expected that students hand in their assignment on time (late papers will not be accepted) and that they contribute significantly to planned group activities.

To be eligible for a passing grade in this class, the students must complete all of the assigned work.

### Assignments and Evaluation
The final grade for this course will be based on two tests, a research paper, two group presentations and participation.

<table>
<thead>
<tr>
<th>Methods of Evaluation</th>
<th>How Evaluated</th>
<th>Due Date</th>
<th>Percentage of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation (incl. group-presentation questions) and Attendance</td>
<td>Individual</td>
<td>Throughout the course</td>
<td>15%</td>
</tr>
<tr>
<td>Group Presentation</td>
<td>Individual</td>
<td>See course schedule</td>
<td>20%</td>
</tr>
<tr>
<td>Midterm</td>
<td>Individual</td>
<td>October 7th</td>
<td>20%</td>
</tr>
<tr>
<td>Research Paper</td>
<td>Individual</td>
<td>November 18th</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>Individual</td>
<td>TBA</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Participation (incl. group-presentation questions) and Attendance (15%):
Since class participation is a major component of the course, you will need to be present and participating to receive full credit.
Class participation includes, but it is not limited to: (see also evaluation criteria on Canvas)
- critically evaluating the model/hypotheses suggested in readings
- asking relevant questions that show understanding of the material – with tentative considerations/conclusions
- being prepared for class and be ready to answer questions when asked
- discussing implications as regards practical application and/or future research considerations
- contributing to class activities

Group Presentation (20%):
Groups of approx. 2-4 students will be presenting a topic in class (ca. 15 min.), after which there will be ca. 15 min. discussion with the rest of the class, answering prepared questions (see Group-presentation Questions below)
Contents should include (but not be limited to):
- Introduction of the key issues of the topic
- Method employed to investigate it
- Identification and discussion of key findings/knowledge
- Critique of methods and potentially of the findings
- Examples/Applied cases

Group-presentation Questions:
Students not presenting should demonstrate their participation by preparing discussion questions with focus on the presented topic; the questions should be based on the students own reflective considerations, can be open-ended or can be in form of thought-provoking comments, e.g. (with reference to the due reading), “It is mentioned in the text that a child adjusting to a developmental disorder and a child adjusting to an acquired brain injury have very different experiences. What might underlie the lack of a sense of “normality” in a child with a developmental disorder and the feeling of loss of “normality” in a child with an acquired brain injury?”; “The authors of this paper made no mention of clinical testing following the first stroke. Why might this be a source of dubiousness for the overall conclusions drawn in the paper?”

Midterm (20%):
*Date: October 7th*
Short-questions + 2 short essays (selected among 6 available topics)

Research Paper (20%):
*Due: November 18th*
Assessment and evaluation of 2-3 case studies in the context of brain damage and rehabilitation.

Final Exam (25%):
*Date: TBA*
Short questions + 3 short essays (selected among 6 available topics)

In addition to the academic content of the written assignments(s), focus will also be placed on the structure, use of appropriate academic language, and writing skills.
Disability and resource statement: Any student who has a need for accommodation based on the impact of a disability should contact Sean Green (sgr@dis.dk) to coordinate this. In order to receive accommodations, students should inform the instructor of approved DIS accommodations within the first two weeks of classes.

Policies

Attendance:
You are expected to attend all DIS classes when scheduled. If you miss a class for any reason please contact the faculty no later than the day of the missed class. If you miss multiple classes the Director of Teaching and Learning, and the Director of Student Affairs will be notified and they will follow-up with you to make sure that all is well. Absences will jeopardize your grade and your standing at DIS. Allowances will be made in cases of illness, but in the case of multiple absences you will need to provide a doctor’s note.

Academic Honesty, Plagiarism, and Violating the Rules of an Assignment:
DIS expects that students abide by the highest standards of intellectual honesty in all academic work. DIS assumes that all students do their own work and credit all work or thought taken from others. Academic dishonesty will result in a final course grade of “F” and can result in dismissal. The students’ home universities will be notified. DIS reserves the right to request that written student assignments be turned in electronic form for submission to plagiarism detection software. See the Academic Handbook for more information, or ask your instructor if you have questions.

Policy on Late Papers:
Late papers will not be accepted.

Policy for students who arrive late to class:
Students arriving over 15 minutes after the beginning of class will not be allowed to participate. One exception throughout the course will be given to students who arrive within 15 minutes after the beginning of class.

Use of laptops or phones in class
To establish a positive learning environment, it is important that everyone is present in body and mind, and not distracted by technology or other disruptive behaviors. Therefore, students are not allowed to use laptops/Tablets/iPads in the classroom unless agreed upon for specified tasks such as article reading and/or for discussion purposes and/or note-taking. Cellular phones must be switched off during class. Disregard of these rule will have a very negative impact on the student participation grade.

Expectations and Code of Conduct:
- Reading must be done prior to the class session
- Since class participation is a major component of the course, you will need to be present and participating to receive full credit. Your grade will be negatively affected by unexcused absences and lack of participation.
- Classroom etiquette includes being respectful of one another’s opinions, listen to others and enter a dialogue in a constructive manner.
### Course Schedule

**Topic: Foundations of neural development**
- General presentations, course introduction and social activity

*No required readings for today.*

#### Theme 1: Principles of Neuroplasticity

**Topic: Developmental principles of neuronal plasticity I**
- Early developmental stages

**Required Readings**
- Canvas:

**Topic: Developmental principles of neuronal plasticity II**
- Influences on brain development and on specialization of the cerebral cortex
- Critical periods

**Required Readings**
- Canvas:

**Topic: Experiential factors on neuronal plasticity I**
- Biocultural Co-Construction of Lifespan Development

**Required Readings**
- Textbook:

**Topic: Experiential factors on neuronal plasticity II**
- Emotional and cultural variables on neuronal plasticity

**GROUP 1 PRESENTATION**

**Required Readings**
- Textbook:
### Core Course Week
No Class

### Theme 2: Learning and Aging

#### Topic: Plasticity of language network
- Language Acquisition: Biological vs. Cultural Implications
- Language dysfunction

**GROUP 2 PRESENTATION**

**Required Readings**

- Textbook:

#### Topic: Principles of Learning and Memory
- Neuroplasticity and Memory mechanisms
- Synaptic plasticity of hippocampal structures

**GROUP 3 PRESENTATION**

**Required Readings**

- Canvas:

#### Topic: Principles of Learning and Memory
- Neuroplasticity and Learning mechanisms

**GROUP 4 PRESENTATION**

**Required Readings**

- Canvas:
<table>
<thead>
<tr>
<th>Topic: Neuroplasticity and Cognition</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Biological and Self-Initiated Factors on brain plasticity and cognition</td>
</tr>
</tbody>
</table>

**GROUP 5 PRESENTATION**

**Required Readings**

**Textbook:**

  **Midterm Evaluations In Class Today!**
  **Remember to bring your laptop to class!**

<table>
<thead>
<tr>
<th>Topic: Neuroplasticity in aging</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Aging processes and hypotheses</td>
</tr>
<tr>
<td>- Midterm test: Q/A</td>
</tr>
</tbody>
</table>

**GROUP 6 PRESENTATION**

**Required Readings**

**Textbook:**

**FIELD STUDY**

Lions Kollegium

**Date:**

**Time:** 9:00 -12:00

**Location:** Tuborgsvej 140, 2300 København (meeting place TBA)

**Topic:** Brain Rehabilitation

<table>
<thead>
<tr>
<th>Midterm Test</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Travel Break</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Class</td>
</tr>
<tr>
<td>Topic: The aging brain</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>• Influences of work and occupation on brain plasticity</td>
</tr>
<tr>
<td>• Case analysis: Tyrone</td>
</tr>
</tbody>
</table>

**Required Readings**

**Textbook:**

**Theme 3: Pathological Factors and Brain Plasticity**

<table>
<thead>
<tr>
<th>Topic: The Plastic Fantastic Brain</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Documentary on brain plasticity</td>
</tr>
<tr>
<td>• Hemispherectomy</td>
</tr>
<tr>
<td>• Sensory substitution</td>
</tr>
</tbody>
</table>

**Required Readings**

**Canvas:**

**Topic: Brain damage and Rehabilitation**

| Case analysis: Jarrod |

**Required Readings**

**Canvas:**
- "Brain is also a Dependent Variable: Biocultural Construction of Developmental Plasticity Across the Life Span", Shu-Chen Li, 2008. Research in Human Development, Special issue: Lifespan psychology – The legacy of Paul Baltes, Volume 5, Issue 2, pp. 80-93.

**Topic: Rehabilitation - Evidence-based practice vs. practice-based evidence**

**Guest lecturer: Hana Mala Rytter**

**Topic: Brain Injury Rehabilitation**

**Required Readings**

**Canvas:**
### Travel Break

**No Class**

<table>
<thead>
<tr>
<th>Topic: Brain plasticity in early damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovery from Early Brain Insult: Plasticity, Early Vulnerability and their Neural Bases</td>
</tr>
<tr>
<td>Case analysis</td>
</tr>
</tbody>
</table>

**Required Readings**

**Canvas:**


<table>
<thead>
<tr>
<th>Topic: Cognitive plasticity in childhood and adulthood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principles of Cognitive Rehabilitation</td>
</tr>
<tr>
<td>Case analyses (2 patients)</td>
</tr>
</tbody>
</table>

**Required Readings**

**Canvas:**


<table>
<thead>
<tr>
<th>Topic: Rehabilitation treatment and challenges following acquired brain injury</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Guest lecturer:</strong> Dr. Carla Caetano</td>
</tr>
<tr>
<td><strong>Topics:</strong> Rehabilitation treatment</td>
</tr>
</tbody>
</table>

**Required Readings**

- TBA

<table>
<thead>
<tr>
<th>Topic: Brain Insult in Adulthood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class project: Shaping a treatment program</td>
</tr>
</tbody>
</table>

**RESEARCH PAPER IS DUE**

**Required Readings**

**Canvas:**

### Topic: Brain Insult in Adulthood
- Presentation of class project
- Constraint-Induced Therapy for Functional Recovery After Brain Injury
- The sick brain

**Required Readings**

**Canvas:**

### Travel Break
- No Class

### Topic: Clinical perspectives
- Stress and neuroplasticity
- Schizophrenia: Neuroplasticity-based interventions

**Required Readings**

**Canvas:**

### FIELD STUDY
- Center for Rehabilitation after Brain Injury
- **Date:**
- **Time:** 13:00-15:30
- **Meeting Place:** Islandsbrygge Metro Station

**Topic: Brain Rehabilitation**

**Topic: Clinical perspectives**
- Plastic changes following stroke and focal damage
- Use of Estrogens as Neuroprotectants in Alzheimer’s Disease

**Required Readings**

**Canvas:**
- "Homeostatic structural plasticity can account for topology changes following deafferentation and focal stroke" Butz et al. (2014). In Front. Neuroanat. 1-20.
<table>
<thead>
<tr>
<th>Topic: Course Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Open discussion with regard to topics covered during the course</td>
</tr>
<tr>
<td>• Clarification of eventual matters with regard to final</td>
</tr>
</tbody>
</table>

No required readings for today.

<table>
<thead>
<tr>
<th>Finals Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam</td>
</tr>
<tr>
<td>Date:</td>
</tr>
<tr>
<td>Time:</td>
</tr>
<tr>
<td>Location:</td>
</tr>
</tbody>
</table>

Readings for the Course

**Selected Book Chapters**


**Journal articles**


Shu-Chen Li, (2008). Brain is also a Dependent Variable: Biocultural Coconstruction of Developmental Plasticity Across the Life Span, in *Research in Human Development*, Special issue: Lifespan psychology – The legacy of Paul Baltes, Volume 5, Issue 2, pp. 80-93
