### Inhoudsopgave

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Brain in Trouble

Vakcode | AB_1038 ()
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Periode | Periode 2
Credits | 6.0
Voertaal | Engels
Faculteit | Fac. der Aard- en Levenswetenschappen
Coördinator | dr. H.K.E. Vervaeke
Examinator | dr. H.K.E. Vervaeke
Docent(en) | prof. dr. S. Spijker, prof. dr. T.J. de Vries, dr. H.K.E. Vervaeke
Lesmethode(n) | Hoorcollege, Werkgroep, Computerpracticum
Niveau | 300

Doel vak
The goal of this course is to deepen understanding of the etiology, expression and treatment of (psychiatric) brain disorders, as well as models used in preclinical science. Students will be encouraged to critically analyze the impact of brain disorders on society.

Learning outcomes:

The student is able to explain the contribution of genetic and environmental factors to complex multifactorial diseases such as mental disorders.

The student is able to elaborate on various treatment options for psychiatric disorders.

The student is able to critically reflect on the boundaries between normal (healthy) and abnormal (ill) behavior and the implications for society.

Inhoud vak
The focus of this course is on the etiology of mental disorders, such as addiction, ADHD, obsessive-compulsive disorder, eating disorders and mood disorders, with special attention for the nature-nurture discussion. Various treatments options for these conditions, including the use of pharmacological agents, behavioral therapy and deep brain stimulation will be discussed. Students will be challenged to critically reflect on the boundaries between normality and abnormality and the implications for society.

First Theme: addiction and impulsivity

What is addiction? Is addiction truly a brain disorder? Do genes play a role in addiction? How does society view illicit drug use and addiction? Are all drugs equally harmful? How to treat addiction? Is ADHD a real mental disorder, or a cultural construct used to bring deviant or socially undesirable behavior under medical surveillance and control? Is it a good idea to treat children who have been diagnosed ADHD, with psychostimulant medications? What is the role of pharmaceutical companies? Do sugar and food additives elicit hyperactive behavior? Are there any advantages in having ADHD?
Second Theme: obsessive compulsive disorders, eating disorders and cognitive enhancement

Can you treat OCD with Deep Brain Stimulation? Is our Western beauty ideal at the root of eating disorders? Is the individual to blame for being obese? Is it ethical to improve your mental performance by cognitive enhancers?

Third Theme: mood disorders & social behaviours

Is depression a real brain disorder or an inability of our culture to accept sadness as an integral part of life? Do genes play a role in the etiology of major depressive disorder and bipolar disorder? What is the efficacy of pharmacotherapy and behavioral therapy? What is the role of pharmaceutical companies? Is there a neural basis to antisocial behavior? If biology and circumstance conspire to prime certain individuals toward violence, how much responsibility do people really bear for their actions? Are violent delinquents worth treating? Should brain imaging / genetic profiling be used in legal cases? Can neuroscience assist in determining responsibility? If neural circuitry underlying morality is compromised, is it morally wrong to punish prisoners?

Onderwijsvorm
Lectures (30 hours), computer practical (2 hours), homework assignments (6 hours), class discussions (2 hours)

Course coordinators are Hylke Vervaeke and Taco de Vries

Toetsvorm
Written exam (combination of MC-questions and open-end questions) (75%) and class discussions/assignments (25%), each at least grade 5.5.

Literatuur

Extra literature on Canvas

Aanbevolen voorkennis
The courses 'Cognitive Neuroscience' and 'Nature vs. Nurture' from the minor 'Brain & Mind'

Doelgroep
Part of minor Brain and Mind
Open to students from all educational backgrounds (e.g., exact, social, life and economic sciences) with an interest in the brain and mind.

Intekenprocedure
Groups for Class Discussions and Home-work Assignments via Canvas

Overige informatie
Central Academic Skill: Debating and discussing

Cognitive Neuroscience

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Doel vak
Introduction to the field of cognitive neuroscience: understanding the biological mechanisms underlying cognitive processes such as learning and memory, discussing recent developments in the field with leading scientists, and acquiring knowledge on how the brain, and its different cell types, function.

Inhoud vak
In the first course of this Minor, you will learn the basics of cognitive neuroscience through a series of introductory lectures on brain function and (dysfunctional) cognitive behavior. More specifically, we will teach you the structure and function of the major building blocks of the brain, ranging from single cells to neuronal networks, and from emotion to motor control. We combine workshops and keynote lectures, delivered by renowned neuroscientists, to discuss recent advances in the field of learning and memory, brain plasticity, and brain disease (e.g., Angelman syndrome, OCD). Finally, you will learn about and experience various technical approaches to measure the brain (e.g., histology) in hands-on practicals.

Onderwijsvorm
Lectures 25 hours 44% 2.6 ECTS
Workshops 16 hours 28% 1.7 ECTS
Practicals 6 hours 11% 0.7 ECTS
Keynote lectures 8 hours 14% 0.8 ECTS
Quiz 2 hours 3% 0.2 ECTS

Total 57 hours 100% 6.0 ECTS

Toetsvorm
Written exam & assignments

Literatuur
Recent literature, to be announced at the start of the course.

Foundations of Behavioral Neuroscience
Carlson, Neil R.
(9th edition)

Exam material:
CH2, CH3, CH5, CH6 (pg. 136 - 146), CH7 & CH12
Vereiste voorkennis
No special requirements.

Doelgroep
Open to students from all educational backgrounds (e.g., exact, social, life and economic sciences) with an interest in the brain and mind.

Overige informatie
Coordinators: Christiaan de Kock and Sophie van der Sluis.
No special requirements to be met.
Part of minor Brain and Mind. This minor course requires a minimum of 25 participants to take place.

Mind and Machine

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Doel vak
To provide students with a broad insight in the rapidly developing field of brain modelling, artificial intelligence, brain computer interfacing and machine learning.

Specifically, at the end of the course the student should be able to:
1. explain the meaning of key concepts treated in the course and to give examples of where key concepts are already applied (services or products).
2. describe most commonly used forms of, as well as the state-of-the-art and trends in, brain modeling, AI and BCI as discussed in the course.
3. reproduce the underlying principles of brain modelling, AI and BCI at the level discussed in the course.
4. reproduce and present with a group of students the content of a scientific paper at the level of a science journalist for a layman audience.
5. provide constructive feedback to fellow students with the aim of improving their oral presentation and is able to use received feedback to improve his/her own oral presentation.
6. develop, present and defend a business proposal, i.e., an idea for a product or service that exploits state-of-the-art technological advances within the themes of the course, or advances that may be anticipated in the coming years.
7. formulate a scientifically informed opinion about the ethical aspects of AI and BCI.

Inhoud vak
People have always been fascinated with the idea to create intelligent computers and robots and to integrate computers in the brain to
manipulate or enhance its performance. In this course, the current status is discussed of brain inspired artificial intelligence, realistic computer simulations of the brain and brain-computer interfacing. To investigate how close science has come to science fiction students work in groups to prepare a business proposal in which they describe a new commercial application of artificial intelligence or brain computer interfacing. Students will present with their group a scientific paper describing the key technology of their project. The business proposal is presented to peers and a reviewer during a poster session at the end of the course. In addition, students will discuss the ethical, legal, and philosophical aspects of artificial intelligence and brain-computer-interfacing.

**Onderwijsvorm**
Lectures 40 hrs
Practicals 12 hrs
Business project 60 hrs

**Toetsvorm**
Exam 50%
Business project 40%
Discussion 10%

Weighted average of exam and business project need to be 5.5 or higher to pass the course and cannot be compensated by the Discussion grade.

**Literatuur**
To be decided

**Aanbevolen voorkennis**
Two years of study at bachelor’s level.

**Doelgroep**
All students with an interest in the computational abilities of the brain and brain-inspired technology

**Overige informatie**
Part of minor Brain and Mind.
This minor course requires a minimum of 25 participants to take place.
Central Academic Skills:
Think out of the box: imagination may push basic science into applications and create business opportunities.

**Nature versus Nurture**

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Doel vak
Students learn how individual differences in human complex behavior can be explained by genetic variation and environmental factors.

Inhoud vak
Human traits show considerable individual differences, which are due to differences in the individual’s genes and/or the environment. In the Nature vs. Nurture course the influence of genes and the environment on human behavior will be discussed. Empirical evidence based on experiments with human subjects will guide these discussions. During the course many important topics from modern day society will be discussed, such as the influence of violent gaming on juvenile behavior, the role of parents in personality development of children, and the causes of mental disorders.

The genetic information contained in our DNA, represents the nature component that influences human behavior. An important aspect of the course is to show how research on genetic information is conducted. Students are introduced to various molecular biological techniques used to study the genome, such as DNA collection, isolation, and genotyping, and (statistical) methods to link variation in DNA to variation in behavior. The ultimate goal of this course is to understand the ‘nature’ and ‘nurture’ causes of individual differences in human cognitive and social behavior, and to be able to critically evaluate the nature-nurture debate.

Onderwijsvorm
Practicals (10%), lectures (80%), debates + workshop presenting (10%)

Toetsvorm
The final grade of Nature vs. Nurture is based on participation in debate sessions (5%), and the DNA practical (5%), and a written exam (90%). Of note: 55% of the written exam must be correct to obtain a final grade. Nature vs. Nurture is successfully completed with a final grade > 5.45.

Literatuur

Scientific papers, TBA during course

Vereiste voorkennis
None

Aanbevolen voorkennis
Broad interest in brain, behavior, psychology, genetics and neuroscience

Doelgroep
Third year BSc students alpha and gamma topics (Sociology, Psychology, Economics, Law, Artificial Intelligence etc.) and students from Lifesciences (Biology, Physics, Chemistry, Medicine, Movement Science, Nutrition etc.) with a broad interest in neuroscience.

Students of Biomedical Sciences and Health and Life Sciences as well as students that plan to pursue a career in Neuroscience can follow the more specialised minor "Biomolecular/Neurosciences".
Overige informatie
Guest lecturers:
Prof. Bartels (VU-FGB)
Dr. Lewis (University of London, UK)
Dr. van Dongen (VU-FGB)
Dr. Stringer (VU-CNCR)
Prof. Dr. Konijn (VU-Social Sciences)
Prof. Dr. Van Straalen (VU-FALW)
Prof. Dr. Schuengel (VU-FPP)

The Developing Brain

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Doel vak
Students acquire a basic understanding of the various stages of brain development that shape the life of individuals over time.

Inhoud vak
The brain performs differently at various ages; the young brain being very plastic, whereas the aging brain is gradually losing its adaptive capacity. Importantly, early and late brain development is affected by specific genetic factors and vulnerable to changes induced by environmental factors. These alterations can result in neurodevelopmental and neurodegenerative disorders.

In this course, we will discuss pre- and postnatal brain development. We will first focus on early development and its relation to brain disorders such as autism and mental retardation. Then, we will focus on brain development during childhood and adolescence and discuss issues related to this stage of development, such as sexual orientation, gender identity, schizophrenia and the effects of drugs of abuse (alcohol, nicotine). Lastly, concerning the aging brain, we will discuss healthy brain aging as well as specific diseases of aging, such as Alzheimer's and Parkinson's disease.

Onderwijsvorm
Lectures (34 hours)
Workgroups (7 hours)

Toetsvorm
Exam (E; multiple choice questions and open questions): 80%
Academic skills assignment (A): 20%
Compensation: the average grade of both tests combined has to be >5.5.
Students have the option to resit the exam (E).

**Literatuur**

Literature on Canvas.

**Aanbevolen voorkennis**
The course 'Cognitive Neuroscience' of the minor 'Brain & Mind'. Alternatively, a basic understanding of neurons, neurophysiology and neuroanatomy is required.

**Doelgroep**
Students of the minor Brain & Mind.

**Overige informatie**
This minor course requires a minimum of 25 participants.