psy110 - Research methods

Module label: Research methods  
Module code: psy110  
Credit points: 12.0 KP  
Workload: 360 h  
Used in course of study: Master's Programme Neurocognitive Psychology > Master module  
Contact person: Andrea Hildebrandt

Entry requirements: Enrolment in Master's programme Neurocognitive Psychology.

Skills to be acquired in this module:

Goals of module:
Students will acquire basic knowledge in planning empirical investigations, setting up computer controlled experiments, managing and understanding quantitative data and conducting a wide variety of multivariate statistical analyses. They will learn how to use the statistical methodology in terms of good scientific practice and how to interpret, evaluate and synthesize empirical results from the perspective of statistical modeling and statistical learning in basic and applied research context. The courses in this module will additionally point out statistical misconceptions and help students to overcome them.

Competencies:
++ interdisciplinary knowledge & thinking  
++ statistics & scientific programming  
++ data presentation & discussion  
+ independent research  
+ scientific literature  
++ ethics / good scientific practice / professional behavior  
++ critical & analytical thinking  
++ scientific communication skills  
+ group work

Module contents:

Part 1: Multivariate Statistics I (lecture)
- Graphical representation of data  
- Basic concepts of probability  
- Frequentist and Bayesian statistical inference  
- The Generalized Linear Modeling framework (Simple, multiple and moderated linear regression, Analyses of variance as a specific case of the General Linear Model, Logistic regression)  
- Multilevel regression  
- Path modeling  
- Factor analysis (exploratory & confirmatory)  
- Structural equation modeling

Part 2: Computer-controlled experimentation (seminar)
- Computer hardware basics  
- Scripting and programming in Presentation  
- Combining stimulus delivery with EEG  
- Temporal precision

Part 3: Multivariate Statistics II (lecture)
- Supervised and unsupervised statistical learning and prediction  
- Regularized regression and non-linear models  
- Resampling methods  
- Tree-based methods and Support Vector Machines  
- Principal components and clustering

Part 4: Evaluation research (seminar)
- Paradigms and methods in applied evaluation research (quantitative, mixed-methods)  
- Types of studies and designs in evaluation research (experimental, quasi-experimental, (multiple) time series, etc.)
- Specific statistical tools (e.g., Propensity score matching)
- Research synthesis and meta-analysis

Reader's advisory
Links
Language of instruction English
Duration (semesters) 2 Semester
Module frequency The module will be offered every winter term.
Module capacity unlimited
Modullevel MM (Mastermodul / Master module)
Modulart Pflicht / Mandatory
Lern-/Lehrform / Type of program Parts 1 and 3: lectures; Parts 2 and 4: seminars; additional tutorials are offered.
Vorkenntnisse / Previous knowledge basic statistics; otherwise please attend Introductory Course Statistics

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<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tbody>
<tr>
<td>Final exam of module</td>
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<td>The module will be tested with an oral exam (20 min). Bonus for creating a script for the presentation on experimental stimuli in part 2.</td>
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<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
<td>part 1: 8 semester hours per week in the second half of the winter term, part 3: 2 semester hours per week in summer term</td>
<td>6.00</td>
<td>SuSe and WiSe</td>
<td>84 h</td>
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<td>Seminar</td>
<td>Part 2: 2 semester hours per week in the winter term. Part 4: 2 semester hours per week in summer term</td>
<td>4.00</td>
<td>SuSe and WiSe</td>
<td>56 h</td>
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<tr>
<td>Tutorial</td>
<td>winter term: 2 hours/week (statistics) summer term: 2 x 2 hours/week (statistics and R)</td>
<td>0.00</td>
<td>SuSe and WiSe</td>
<td>0 h</td>
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Total time of attendance for the module 140 h