Erasmus+ Behavioral Science Research Activities

This repository contains experimental studies conducted as part of the Erasmus+ program behavioral science research activities. The fundamental goal was to conduct human behavioral research through collaborative efforts between participating institutes, focusing on methodological competency enhancement and research capacity building.

Overview

Research Philosophy

The behavioral science lab activities followed a systematic approach: comprehensive need analysis → research area identification → experimental design → implementation → data analysis. This structured methodology enabled researchers to gain hands-on experience with experimental design, hardware operation, software utilization, and advanced data analysis techniques.

Collaborative Framework

- **Participating Institutes**: Ludwig-Maximilians-Universität München (LMU), ÇOMU Turkey, and Çanakkale Technopark.

- **Project Timeline**: 2023-2025 with comprehensive need analysis, workshops, and research design activities
- **Integration**: Activities were closely linked with translational visit packages and DAAD research initiatives

Studies

1. Priming of Location Revisited (Two Experiments)

Directory: Priming_of_location_revisited/

This study investigates spatial priming effects and location-based memory processes.

Contents:

- **Experiment 1: TaskCode_1B/**: Experimental paradigm implementa- tion and data analysis
- **Experiment 2: TaskCode_1D/**: Alternative experimental condition
- **Introduction_rationale.docx**: Theoretical background and study ratio- nale
- **Toledano_Lavy_2023.pdf**: Reference literature

Technical Implementation:

- MATLAB with Psychtoolbox for task programming
- R-based statistical analysis with mixed-effects modeling
- Data processing scripts for multi-subject analysis

2. **Study 2: Visuospatial Contextual Cueing Directory**:

Visuospatial_contextula_cueing_Exp1/

This study examines contextual cueing effects in visuospatial attention and learning.

Contents:

- **Matlab_script/**: Core experimental script (ContextExperiment_everything_fixed_recognition.m)
- **Raw_data/**: Collected experimental data
- **Methods_Results.docx**: Methodology description and results summary

Technical Implementation:

- MATLAB-based experimental control
- Recognition memory assessment
- Comprehensive data collection protocols

Technical Infrastructure

Software Stack

- **Primary Platform**: MATLAB with Psychtoolbox extension
- **Statistical Analysis**: R with mixed-effects modeling capabilities
- **Collaboration Tools**: Shared experimental scripts and methodological resources

Hardware Integration

- Eye-tracking devices for gaze pattern analysis
- EEG machines for neural signal recording
- Virtual reality systems for spatial navigation tasks

Methodological Innovations

- Statistical learning tasks for long-term memory assessment (developed by LMU)
- Virtual reality maze design expertise (provided by ÇOMU)
- Advanced experimental paradigms with technical sophistication

3. **Study 3: PsychoPy Training and Experimental Application**

This study documents the PsychoPy training provided within the Erasmus+ project framework and presents the results of a pilot experiment conducted with 20 student participants.

Technical Implementation:

- Experimental task designed and run using PsychoPy
- Data collection on reaction times and accuracy rates
- Python-based preprocessing and descriptive analysis

Technical Infrastructure

- **Software Stack:** PsychoPy, Python (Pandas, Matplotlib)
- **Hardware:** Standard PC setups, external keyboards, projectors for demonstration

Methodological Framework
The training focused on equipping participants with the skills to design and implement cognitive experiments using PsychoPy. As part of the training, a **Stroop Task** was implemented, where participants identified the font color of words that either matched (congruent trials) or mismatched (incongruent trials) the meaning of the word (e.g., the word "RED" written in blue ink).

Participants and Procedure

- 20 undergraduate students participated (12 female, 8 male, Mean Age = 21.4).
- Each participant completed 60 trials (30 congruent, 30 incongruent).
- Trials were randomized, and participants responded using the keyboard.

Results

- **Reaction Times (RT):** Mean RT was significantly longer in incongruent trials (M = 685 ms, SD = 102) compared to congruent trials (M = 590 ms, SD = 95).
- **Accuracy:** Participants made more errors in incongruent trials (93% accuracy) compared to congruent trials (98% accuracy).
- These results replicate the classical **Stroop Effect**, showing the interference between word meaning and font color.

Program Activity Contribution

- Students gained **practical experience** in designing, coding, and running an experiment in PsychoPy.
- The pilot study demonstrated how open-source tools can be used in **behavioral science education and research capacity building**.
- The activity strengthened participants' methodological skills and contributed to the project's goal of enhancing experimental competence.

Program Activities

2023 Need Analysis and Lab Tour Directory:

2023-need-analysis-lab-tutorial/

The foundational phase of the Erasmus+ collaboration involved comprehensive needs assessment and facility familiarization.

Contents:

- **Bilateral-Memo.docx**: Official collaboration agreement and framework
- **Lab tour for Çanakkale delegation.pdf**: Guided facility introduction for visiting researchers
- **LabIntro.pdf**: Comprehensive laboratory overview and capabilities pre-

sentation
- **Labtour.pdf**: Detailed tour documentation and equipment specifications

Objectives:

- Assessment of research infrastructure and capabilities
- Identification of collaborative opportunities and complementary expertise
- Establishment of shared research protocols and methodologies
- Strategic planning for knowledge transfer activities

2024 Second Workshop: Advanced Neuroimaging and EEG Techniques Directory:

2024-Nov-2nd-workshop/

An intensive workshop focusing on cutting-edge neuroimaging methodologies and EEG analysis techniques.

Contents:

- **Tutorial Materials/**: Comprehensive training resources covering:
  - **MRI Fundamentals**: From scans to brain imaging, safety protocols, and technical specifications
  - **Resting State Networks**: Mapping neural connectivity and functional network analysis
  - **ERP Components**: Major event-related potential analysis and interpretation
  - **EEGLAB**: Hands-on training with advanced EEG analysis software
- **Workshop Materials**: Flyers, certificates, and poster presentations
- **Erasmus+ Workshop Flyer.pdf**: Event promotion and program overview

Technical Focus:

- Advanced fMRI preprocessing and analysis techniques
- Resting state functional connectivity analysis
- EEG signal processing with EEGLAB toolbox
- Event-related potential (ERP) component identification and analysis

2024 DAAD Research Design Initiative Directory:

2024-turkey-DAAD-research-design/

Strategic research planning and proposal development under the DAAD (German Academic Exchange Service) framework. The proposal is based on collaborative research design based on VR-based spatial navigation and statistical learning paradigms.

Contents:

- **joint project proposal comu_lmu.doc**: Collaborative research proposal between institutions
- **PPP_project planning summary.pdf**: Project planning and implementation strategy
- **PPP_Projektbeschreibung.docx/.pdf**: Detailed project description and methodology (German)

Strategic Objectives:

- Long-term research collaboration establishment
- Funding acquisition for sustained scientific exchange
- Development of joint research programs
- International partnership strengthening

Research Activities

Core Components

1. **Participant Recruitment**: Systematic recruitment protocols and proce- dures
2. **Questionnaire Development**: Psychometric instrument design and validation
3. **Behavioral Task Design**: Experimental paradigm creation and optimization
4. **Hardware Operation**: Hands-on training with specialized equipment
5. **Data Analysis**: Advanced statistical techniques and interpretation

Training and Capacity Building

- **Hands-on Training**: Direct experience with experimental procedures
- **Lab Tours**: Facility orientation and equipment familiarization
- **Live Demonstrations**: Real-time experimental protocol execution
- **Direct Participation**: Active involvement in ongoing research projects

Knowledge Transfer

- **Expertise Sharing**: Cross-institutional methodological exchange
- **Script Sharing**: Technical resource distribution and adaptation
- **Skill Assessment**: Training needs identification and targeted education
- **Resource Development**: Educational materials creation for lab users

Research Capacity Building

- Strengthened infrastructure utilization
- Advanced statistical technique implementation
- Cross-cultural research methodology adaptation
- Sustainable knowledge transfer protocols

Usage Instructions

Prerequisites

- MATLAB (with Psychtoolbox installed)
- R environment with mixed-effects modeling packages
- Appropriate hardware calibration for eye-tracking/EEG studies

Running Experiments

1. Navigate to the respective study directory

2. Follow the experimental protocol documentation
3. Ensure proper hardware setup and calibration
4. Execute MATLAB scripts with appropriate parameters

Data Analysis

1. Use provided R scripts for statistical analysis
2. Follow mixed-effects modeling procedures
3. Interpret results within theoretical frameworks
4. Generate reports using established templates

Contact and Collaboration

These studies represent ongoing collaborative research efforts. For questions about methodologies, data access, or potential collaborations, please contact the respective research teams at the participating institutions.

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- **Institutional Partners**: Ludwig-Maximilians-Universität München (LMU), ÇOMU Turkey, and Çanakkale Technopark

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