

**PSY 3393  
Experimental Projects  
Spring 2008**

**Dr. Peter Assmann**

**Instructor:** Dr. Peter Assmann  
**Office:** GR 4.126  
**Office hours:** Tues 11:00 am -12:00 noon  
**Tel:** 972-883-2435  
**Email:** [assmann@utdallas.edu](mailto:assmann@utdallas.edu)

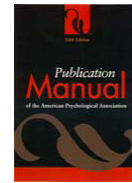
**TA:** Crystal Holloway  
**Office:** GR 4.304  
**Office hours:** Thu 11:30-12:30 pm  
**Email:** [cmh046000@utdallas.edu](mailto:cmh046000@utdallas.edu)

The course syllabus, project descriptions, class notes and additional course materials will be available at the following web address:

<http://www.utdallas.edu/~assmann/PSY3393/>

**Required text:**

American Psychological Association (2001).  
*Publication Manual of the American Psychological Association. 5th edition.*  
APA: Washington, DC.



**Important Deadlines**

**Jan 24:** Submit draft of Intro section for Project 1  
**Jan 31:** Submit draft of Methods section  
**Feb 19:** Project 1 due  
**Feb 26:** Oral presentations of Project 2 topic  
**Feb 28:** Oral presentations of Project 2 topic  
**Mar 20:** Submit draft of Intro section for Project 2  
**Apr 3:** Submit draft of Methods section  
**Apr 22/24:** PowerPoint oral presentations  
**Apr 24:** Project 2 due

**Assignment: journal article report**

- Find an article on a topic of special interest to you from any *peer-reviewed journal* in Psychology, Neuroscience or Cognitive Science.
- Sign up for a date to present your article.
- Submit the reference (authors, title, journal name, volume number and page ranges) for approval in the preceding class.
- Presentations should be about 5 minutes in length.

## Peer review

- What is a *peer-reviewed journal*?
- Peer reviewed (sometimes called refereed) journals have articles that are reviewed by a panel of peers, researchers or scholars with expertise in the topic of the article. Peer review ensures that the research meets established standards for the field. Non-refereed journals may also meet those standards, but there is no peer certification.

## Peer review

- How can I tell if a journal is peer-reviewed?
- Some databases provide a checkbox to return *only* peer-reviewed articles.
- A good place to start:  
<http://www.utdallas.edu/library/resources/databases/brain.htm>

## Peer review

- Google search (<http://www.google.com>) lists web publications that may or may not be peer-reviewed.
- Google Scholar (<http://scholar.google.com>) provides mainly peer-reviewed articles.

## Project 1 assignment

### Stroop effect

- *Collect data from about five subjects, apply the appropriate statistical analysis & write your report in APA format.*

## Stroop effect

- Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 28, 643-662.
- MacLeod, C.M. (1991). Half a century of research on the Stroop effect: An integrative review. *Psychological Bulletin*, 109, 523-553.

<http://psychclassics.yorku.ca/Stroop/>  
<http://www.apa.org/science/stroop.html>  
<http://www.ncbi.nlm.nih.gov/PubMed/>

red	yellow
blue	green
yellow	red
green	blue

## Stroop effect

- *Start a literature search*
  - Keep a list of references and make notes
  - Make a list of questions
- *Read description of experimental procedure*
  - Study different techniques and make notes on procedure

## Some useful online materials

### PubMed (Medline search)

<http://www.ncbi.nlm.nih.gov/PubMed/>

### Univ of Wisconsin Handbook: Scientific reports

[http://www.wisc.edu/writing/Handbook/Science Report.html](http://www.wisc.edu/writing/Handbook/ScienceReport.html)

### UTD online journals (McDermott Library)

<http://www.utdallas.edu/library/resources/journ>

## Some useful online materials

### Web of Science

- Access through library databases
- Choose Products & Features => Web of Science
- Quick search => enter your topic (e.g. Stroop)

### APA web page on Stroop effect

<http://www.apa.org/science/stroop.html>

### CogLab Stroop effect

<http://coglab.wadsworth.com/experiments/Stroop/index.html>

*Note: do not use this web page to collect your experimental data!*

## Variables in experimental research

- **Dependent variable** – behavioral outcome measure
- **Independent variables** – factor or variable *selected* or *manipulated* by the experimenter in order to observe its effects on behavior

## Replication

- Repeating an experiment using the same method and procedures, but with different participants, should produce same statistical outcome.
  - Possibility of type I error
  - Effect of sample size

## Experimental designs

- **Between-subjects design:** different groups of subjects are randomly assigned to the levels of the independent variable
- **Within-subjects design:** each subject is exposed to every level of the independent variable

## Experimental designs

- **Between-subjects design:** different groups of subjects are randomly assigned to the levels of the independent variable
- **Within-subjects design:** each subject is exposed to every level of the independent variable

### Between- or within-subjects design

- The experiment was completed by 40 children ranging in age from 5 to 7 years. Participants were assigned to one of four conditions varying in level of difficulty.

### Between- or within-subjects design

- Speech recognition performance was assessed in 12 normal-hearing and 12 hearing-impaired listeners in three conditions with background noise and in quiet.

Prevor MB, Diamond A.  
*Color-object interference in young children:  
A Stroop effect in children.*  
Cogn Dev. 2005 Jun;20(2):256-278.

The Stroop color-word task cannot be administered to children who are unable to read. However, our color-object Stroop task can. One hundred and sixty-eight children of 3(1/2)-6(1/2) years (50% female; 24 children at each 6-month interval) were shown line drawings of familiar objects in a color that was congruent (e.g., an orange carrot), incongruent (e.g., a green carrot), or neutral (for objects having no canonical color [e.g., a red book]), and abstract shapes, each drawn in one of six colors.

Prevor MB, Diamond A.  
*Color-object interference in young children:  
A Stroop effect in children.*  
Cogn Dev. 2005 Jun;20(2):256-278.

Half the children were asked to name the color in which each object was drawn, and half were to name each object. Children's predominant tendency was to say what the object was; when instructed to do otherwise they were slower and less accurate. Children were faster and more accurate at naming the color of a stimulus when the form could not be named (abstract shape) than when it could, even if in its canonical color.

Prevor MB, Diamond A.  
*Color-object interference in young children:  
A Stroop effect in children.*  
Cogn Dev. 2005 Jun;20(2):256-278.

The heightened interference to color-naming versus object-naming was not due to lack of familiarity with color names or group differences: Children in the color condition were as fast and accurate at naming the colors of abstract shapes as were children in the form condition at naming familiar objects.

### Error variance

- Variability in scores due to factors *other than* the independent variable (background noise, extraneous uncontrolled factors)
  - *Subject differences*
  - *Differences in testing conditions*
  - *Ineffectiveness of the independent variable*
  - *Lack of sensitivity of the dependent variable*
  - *Small sample size*

## Statistical Decisions

Decision	$H_0$ is true	$H_0$ is false
Reject $H_0$	Type I error $p = \alpha$	Correct decision $p = 1 - \beta$ (power)
Do not reject $H_0$	Correct decision $p = 1 - \alpha$	Type II error $p = \beta$

$H_0$ : null hypothesis (no significant effect)

$H_1$ : alternate (research) hypothesis (significant effect)

## Writing research reports

- (1) select a research topic or question to be answered
- (2) develop a hypothesis and a research design to test your hypothesis
- (3) collect data and analyze it
- (4) report research results

## Sections of an APA paper

1. Title
2. Abstract
3. Introduction
4. Method
5. Results
6. Discussion
7. References

## Writing the Abstract

- The abstract is a brief, comprehensive summary of the complete study.
  - **Aims and objectives:** what did the study investigate, and why is the topic interesting?
  - **Methods:** how was the study conducted?
  - **Results:** what did you find out?
  - **Significance:** why are these findings important?

## Writing the Abstract

- The abstract contains key elements from each of the main sections of the paper.
  - Do not cite other studies in the abstract
  - Do not include information unless it appears elsewhere in the paper (must be *paraphrased*)
  - Do not exceed the recommended length
  - Single (double spaced) paragraph in block format
  - Often easiest to write the Abstract last.

## Introduction draft

- Homework assignment: Write up the **Introduction** section for your project.
- Date due: **Jan 24**

## Writing the Introduction

- What problem does your study address?
  - Describe the problem under investigation
  - Summarize relevant background material
  - Provide a review of previous research
  - Introduce concepts and define key terms

## Writing the Introduction

- Why is it important?
  - Tell readers why you have chosen this topic.
  - Explain the problem or unanswered questions
  - State what is unique or novel about your study
  - Provide the background: explain how and why your study extends earlier work, investigates an untested population, or applies a new technique.

## Writing the Introduction

- How do you propose to address the problem?
  - Outline your research strategy
  - State the research hypotheses
  - Describe your experimental design
  - Explain the advantages of doing it this way

## Writing the Introduction

- Build a case for the approach you've chosen.
  - Discuss practical implications.
  - Discuss theoretical significance.
  - Develop clear links between past research and the present study, and between your research question and research design.
  - In your review of the literature, select previous studies that relate directly to your study.

## Writing the Introduction

- Review the literature.
  - Start out with broad, general considerations, define your terms and gradually become more specific.
  - Review the *relevant* literature. No need to include *every* study on the subject.
  - Make the connection to the present study.

## Writing the Introduction

- Set up clear research hypotheses.
  - From your research question, formulate research hypotheses and explain their rationale.
  - End the Introduction with an explicit statement of the purpose of the study.

## Stroop effect

- Stroop (1935)
  - In **Experiment 1** the color words (red, blue, green, brown, purple) were printed in different colors of ink. In the mismatch condition, the color of the ink did not match the word (e.g. red written in blue ink). In the control condition, each word was printed in black ink. Subjects were asked *to read the words, not name the color of the ink*.
  - No significant differences were found.

## Stroop effect

- Stroop (1935)
  - In Stroop's original **Experiment 2**, the color words (red, blue, green, brown, purple) were again mismatched, but now in the control condition, the stimuli were colored rectangles rather than words. Subjects were asked to name the color of the ink.
  - Large differences between the conditions were found.

## Stroop effect

- Why does the Stroop effect occur?
- Most explanations rely on some form of semantic interference.
  - Klein (1964) compared six conditions: non-words (**sifde**), rare words (**abjure**), common words (**sit**), color-related words (**lemon**), color words not included in the color set (**lilac**), and color words in mismatched colors (**red** in blue ink, **blue** in red ink, etc). Greater interference was found when the words were more color-related.

## Methods draft

- Write up the **Methods** section for your project.
- Date due: **Jan 30**
- The **Methods** section describes in detail how you performed the study. It must provide *all* and *only* the information another researcher would need to replicate the study.

## Methods

- Why is the **Methods** section included?
  - Enables readers to evaluate the appropriateness of the methods used in the study
  - Addresses *reliability* of the results
  - Addresses *validity* of the results
  - Provides a basis for *replication*

## Homework assignment

- The **Methods** section is typically divided into four *subsections* (see APA manual, pp. 17-20)
  - Participants
  - Apparatus
  - Design
  - Procedure

## Participants

- Defines the sample of subjects tested
- Criteria for inclusion or exclusion
- Demographic variables (age, sex, race/ethnicity, SEC, disability status, etc. as appropriate)
- Number and basis for assignment of subjects to conditions; failure to complete experiment (how many, reasons)

## Apparatus

- Apparatus and materials used
- Standard lab equipment need not be included (and this section may be omitted)
- Specialized equipment must include model and supplier information
- Detailed description may be included in an appendix

## Design

- Include a Design subsection in the Method if the design of the study is complex, or if the stimuli / conditions need a detailed description.

## Research Design

- The basic Stroop effect uses a **two-group experimental design**.
  - experimental group
  - control group
- Use a statistical test (*t*-test) to see if the mean scores for these two groups differ.

## Two-group experiments

- **Manipulated** (independent) variable: (two levels of a single independent variable)
  - *matched vs. mismatched* ink color
- **Measured** (dependent) variable:
  - reaction time for naming color words

## Order effects

- In a **repeated measures** design, each subject is tested more than once.
- **Order effects** (caused by differences in amount of practice or learning, or fatigue if the experiment takes a long time) can contaminate the results.
- Order can be a **confounding** variable: differences between conditions can be due to **order** rather than the manipulated variable.



## Possible solutions

- Avoid repeated measures design (use *different* subjects in each condition; random assignment).
  - BUT: you need twice as many subjects.
- **Alternative #1:** Test subjects repeatedly, using all possible orders of conditions, and combine (pool) the data across orders.
- **Alternative #2:** Test subjects repeatedly, using all possible orders of conditions, and test to see if order has a significant effect.
  - Randomized vs. blocked presentation of conditions

## Counterbalancing

- With a repeated measures design, in some situations you can control for order effects by **counterbalancing** the conditions.
- For example, in the Stroop experiment you might start with the matched condition for half of the participants, followed by the mismatched condition; the other half of the participants complete the conditions in the reverse order. The data are then combined across the two orders.

## Procedure

- Each step in carrying out the experiment must be included.
- Instructions, practice sessions, formation of groups, specific experimental manipulations
- Randomization, counterbalancing, controls
- Summarize or paraphrase instructions
- What you did, how you did it; everything needed for replication

## Statistical analysis of results

- **One** independent variable, **two** conditions (or *groups*, or *levels*): Use a **t-test**.
  - Same subjects tested twice: Use a **t-test** for **correlated means**
  - Different subjects in each condition: **t-test** for **independent means**
- **One** independent variable, **more than two** conditions: Use a one-way analysis of variance (**ANOVA**). If significant, apply a *post-hoc* test to see which means differ.