

# How to read a research paper

## “You don’t have to be a scientist to think critically”

Introduction to Statistics by A/Prof Allan  
McRae

Terry Heiman-Patterson, MD  
Professor of Neurology, Director of the ALS Center of Hope  
Temple University Lewis Katz School of Medicine

# Overview

- General pointers to reading a research paper
- What are the sections of a research paper
- Step by Step Process

# Pointers

- Think Critically
  - Do not assume that authors are always correct
  - Ask questions
  - Are the investigators solving the right problem? Approaching it logically? Making reasonable assumptions?
- Read Creatively
  - What are the good ideas in the paper
  - Can the ideas be applied elsewhere?

# Pointers

- Take Notes
  - Include questions and criticisms
  - Underline key points
  - Mark data that is most important or most questionable
- After your read through try to summarize in a few sentences
  - Will help solidify the information and identify what you may want to re-read

# Pointers

- Consider looking at references and the background to compare the results to others in the field
  - What did this study contribute
- Remember it will be slow at first

# Sections of a Research Paper

- Abstract
- Introduction
- Methods
- Results
- Conclusions/Discussion
- References

# Sections of a Research Paper

- Abstract
  - Summary of the paper
  - Highlights the main question
  - Presents key results
  - Overview of the conclusions

# Sections of a Research Paper

- Introduction
  - Background to the question including previous work
  - Outlines the basis for the study and the particular question to be asked
- Methods
  - Design of the study
  - How the experiment will be carried out
- Results
  - What was found: the data from the experiments



# Sections of a Research Paper

- Conclusions
  - Interpretation of the results
  - Review of previous work and how the present results add to the field
  - Next steps
- References
  - Literature referred to by the investigators

# Step by Step

- When you read, look up words you don't understand
  - Google and Wikipedia are your friend!!
- Take notes
- Reread if you are unsure

# Step by Step

- Begin with the introduction
  - Presents supporting background –lays the groundwork
  - Identify the big question –what problem is the entire field trying to solve
  - Should lead directly to the specific question that is being asked
  - Are the investigators making logical arguments?
  - Make sure that you can summarize the background and what question the investigator is asking. Consider how it will add to the field

# Step by Step

- Read the methods
  - Identify the approach
  - Consider the design of the study-is it likely to give valid results? Answer the question?
  - Try making a diagram of the experiments or trial
  - In the case of clinical trials-
    - Study and control population
    - How was medication dosed
    - How was safety measured
    - How were treatment and control groups determined
    - How was efficacy measured
    - How were the results analyzed

# Step by Step

- Read the results
  - Pay attention to the figures and tables
  - Did the results answer the specific question
  - In clinical trials:
    - Were the control and treatment groups similar
    - What safety issues occurred
    - Did the intervention work?
    - Was there statistical significance?

# Step by Step

- Read the Conclusion/Discussion/Interpretation section
  - Does the investigator interpret the results?
    - Do you agree with the interpretation
    - Can you think of any other way to interpret the results?
  - Does the investigator outline any weaknesses?
  - Does the investigator put his/her results in the context of previous results?
  - How does the study add to the knowledge?
  - What are the logical next steps?

# Step by Step

- References
  - Consider reading references that review the topic
  - Refer to references to review the background
- Now read the abstract
  - Is it an accurate summary of the research?

# Final Comments

- Do not be afraid to jump in and read the literature-be an informed consumer
- Learn to be critical and creative
- Ask questions
- With practice it will become easier



# Critiquing the Literature: Stem Cell Transplantation into the Frontal Motor Cortex in Amyotrophic Lateral Sclerosis Patients

Terry Heiman-Patterson, MD  
Chief of Neuromuscular Disorders  
Director MDA/ALS Center of Hope  
Temple University Lewis Katz School of Medicine

# Small Group Exercise 2: Critique of a research paper: Answer these questions

- Describe the design of the trial. (Results and Methods)
  - How many people enrolled? (Results paragraph 1)
  - How long was the trial? (Results paragraph 1)
  - What was the placebo-control group? Was a sham surgery used? (Methods paragraph 3, surgery, and Results paragraph 1)
  - Were the investigators blind to treatment? (Methods paragraph 3)
  - How did they measure the safety and efficacy of the stem cell treatment? (Methods paragraph 3 and data analysis)
- What are the inclusion/exclusion criteria of this trial? (Methods-Study Subjects paragraph 2)
- Please describe how the treatment and comparative (control) group were chosen? Was the selection at *random*? (Methods-subjects-paragraph 3)
- Please review table 1 and compare the following measures between the Control and Treatment groups (Results paragraph 2, Table 1, and Figure 2):
  - Duration from ALS diagnosis to baseline visit
  - ALSFRS-R Score at Baseline visit
  - Are the treatment and control groups similar (Apples-Apples) or different (apples-oranges)? Why is this important?
- What is the percentage of people that died because of the transplantation surgery? (Results paragraph 3)

# Please Briefly Describe the Design of the Trial

- How many people enrolled? (*Results section*)
  - 32 screened and 23 enrolled (10 treated and 13 control)
- How long was the trial? (*Results section*)
  - 1 year
- Was placebo 'sugar pill or sham surgery' used? (*Methods/Surgery*)
  - No
- Was the study 'blinded'? (Did the investigators know who was in the treatment group and who was in the control group?) (*Methods/ Study subjects*)
  - The study was not blinded
- How did they measure the safety and efficacy of the stem cell treatment? (*Methods/data analysis*)
  - Safety: There were no clear plans to measure Safety. Safety data was not presented in the results section
  - Efficacy: Survival, ALSFRS-R, FVC, QOL

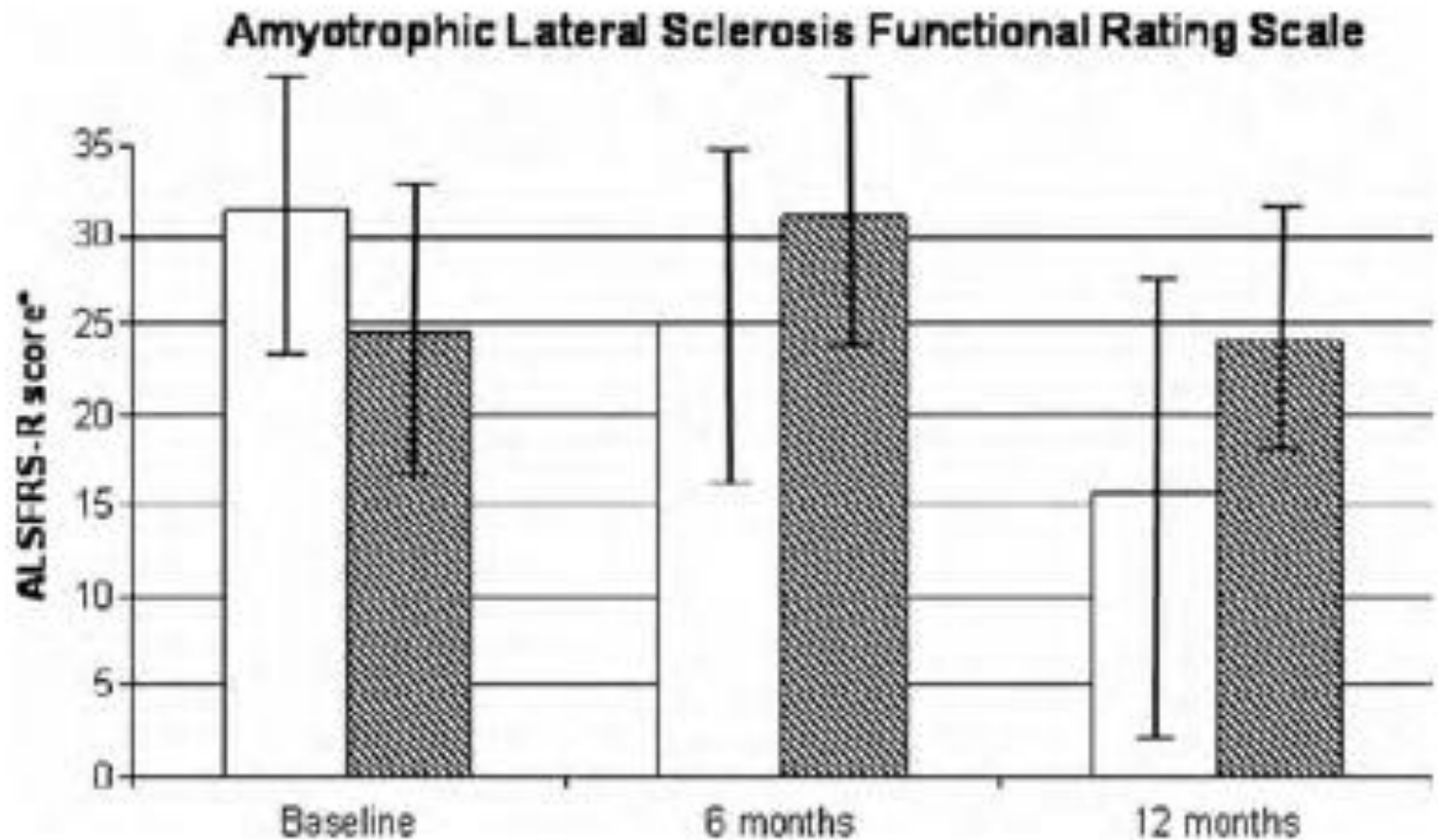
# What are the Inclusion/Exclusion Criteria of this Trial?

- The inclusion criteria for patients were:
  - (a) confirmed ALS according to the El Escorial clinical and neurophysiologic criteria;
  - (b) cervical and cranial magnetic resonance imaging (MRI) excluding structural damage to the brain and spinal cord;
  - (c) a functional respiratory test showing the occurrence of forced vital capacity (FVC) values; and
  - (d) an appropriate nutritional state (above 20%).
- The exclusion criteria were:
  - (a) severe bulbar involvement;
  - (b) an inadequate nutritional state;
  - (c) tracheostomy or gastrostomy;
  - (d) the presence of systemic disorders
  - (e) evidence of cervical spondylotic myelopathy or structural abnormalities by MRI.

# How were the treatment and comparative (control) group chosen?

- Selection was done by the site investigator and was not at random.
- Controls were self selected by refusing treatment

# Compare Measures between the Control and Treatment Groups (Table 1)



# What Percentage of People Died because of the Transplantation Surgery?

- 1 out of 10 → 10% (Results)

# How can the Study Design be Improved?

- Placebo controlled
- Blinding
- Random assignment of treatment
- Collection of safety measures (safety labs, adverse events)
- Information about trial conduct that may affect trial integrity, major protocol deviations?



# Final Lessons

- Read Carefully-Do not take everything at face value
- Be Informed
- Educate others

Thanks for being a Research  
Ambassador!!!