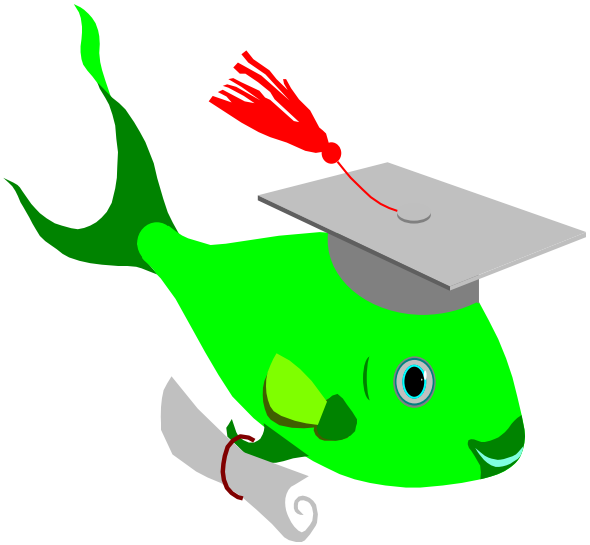
Research Essentials:
Making Sense of What you Read

Einas Al-Eisa, MSc, PhD



CME

EBM

Professional development

Career paths
Specialization

Research

Objectives

- Learn the basics??
- Learn to synthesize published information??
- Start your own project??
- Argue with physicians in rounds??
- **Be a better clinician** √

Interactive Sessions

For **active** learners

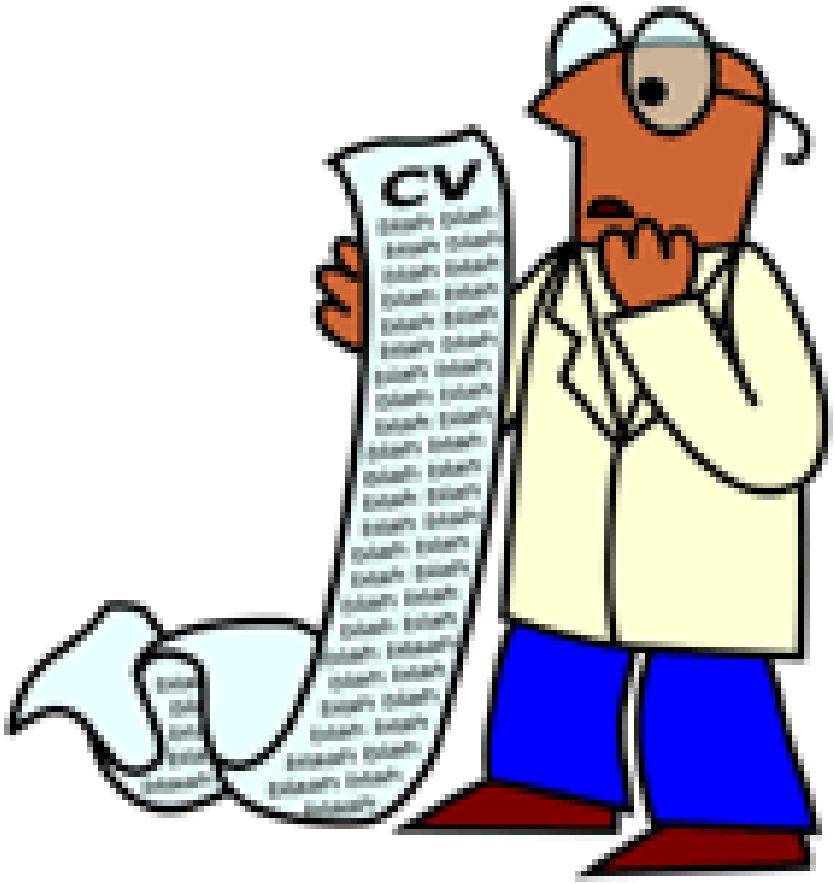
Outline

- Definition of research
- Why research?
- Evidence-based medicine
- Who should research
- Barriers of research
- Developing answerable research problem

Definition of Research

- “The process by which we determine whether what we do as physical therapists makes a difference in the lives of the people we serve” (Domholdt, 2000)

Why research?



Why research?

1. To establish a **body of knowledge** for physical therapy
   - For the survival of a profession
   - Stop borrowing from other disciplines!!

Why research?

2. To determine the **efficacy** of physical therapy treatments

   – Research should <u>not</u> be undertaken to show that what we do works (***Bias*** *error*)

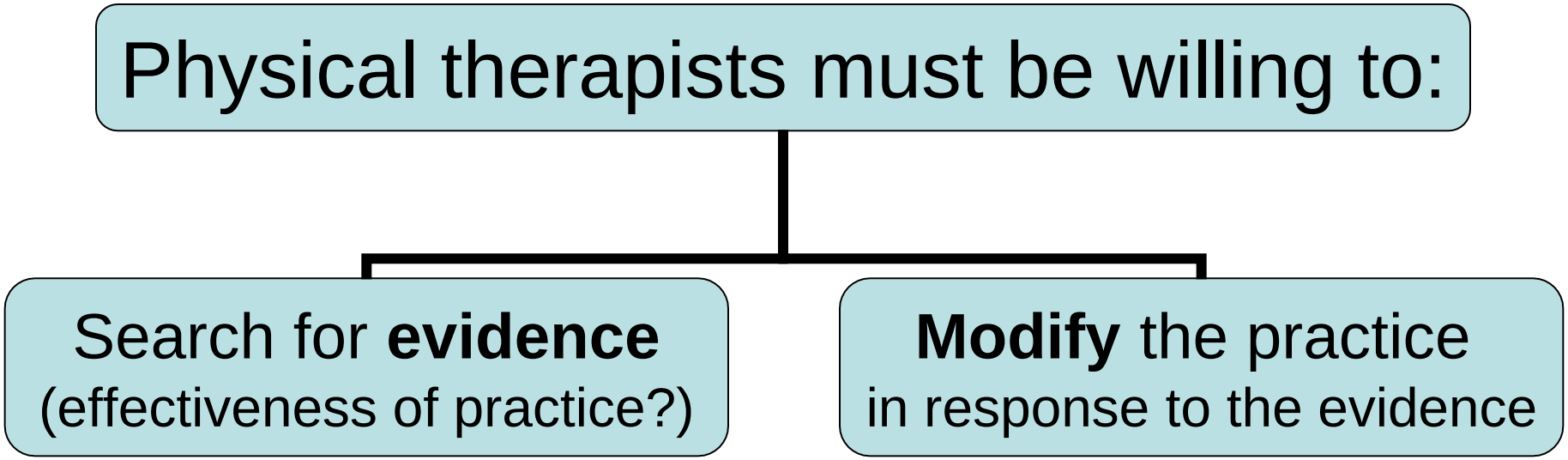
   ➢ We should study **whether** what we do works

Why research?

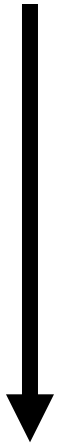
3. Improve **patient care**

   - Helping clinicians make decisions about the use of **existing practices**

   - Test **new procedures**


Physical therapists must be willing to:
Search for **evidence**
(effectiveness of practice?)
Modify the practice
in response to the evidence

Knowledge of research design & data analysis



evaluate existing evidence & produce new evidence

EBM???

Evidence-based Medicine

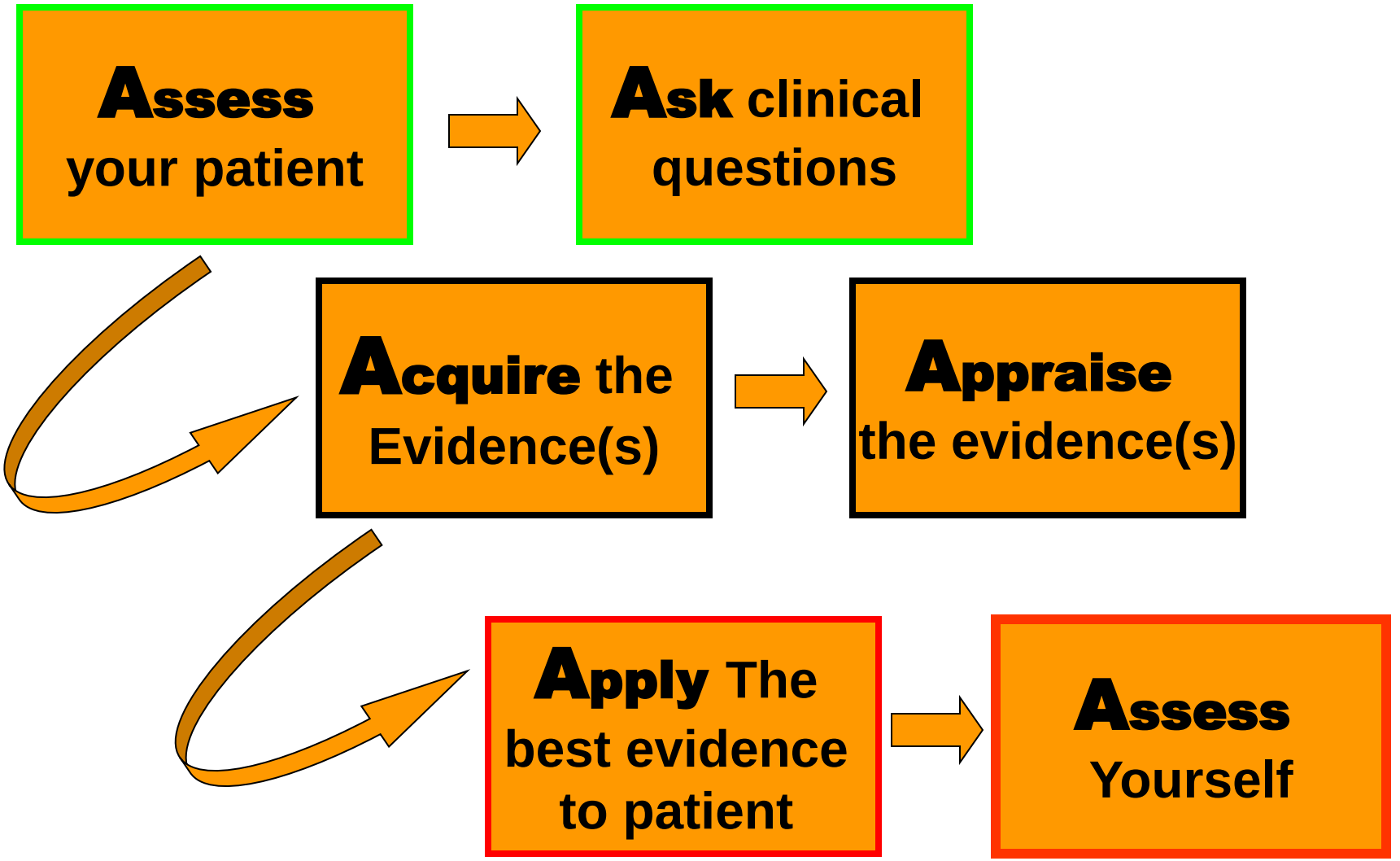
Evidence-based Medicine

Integrating the:

- ✓best research evidence with
- ✓clinical expertise
- ✓patient values

(Brinkley et al., 1999)

Haven’t all concerned physicians been doing this EBM for ages... ?


Assess your patient
Ask clinical questions
Acquire the Evidence(s)
Appraise the evidence(s)
Apply The best evidence to patient
Assess Yourself

5 Steps to Evidence-based practice

1. Define the **question**

2. **Collect the best evidence** related to the question

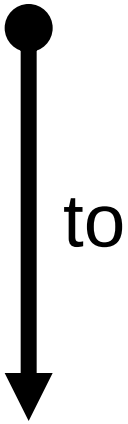
3. **Critically appraise** the evidence

5 Steps to Evidence-based practice

4. **Integrate** the evidence with clinical expertise & patient factors to make a decision

5. **Evaluate** the process so it can be improved next time

Knowledge of research design and data analysis is a prerequisite



evaluate existing evidence and produce new evidence

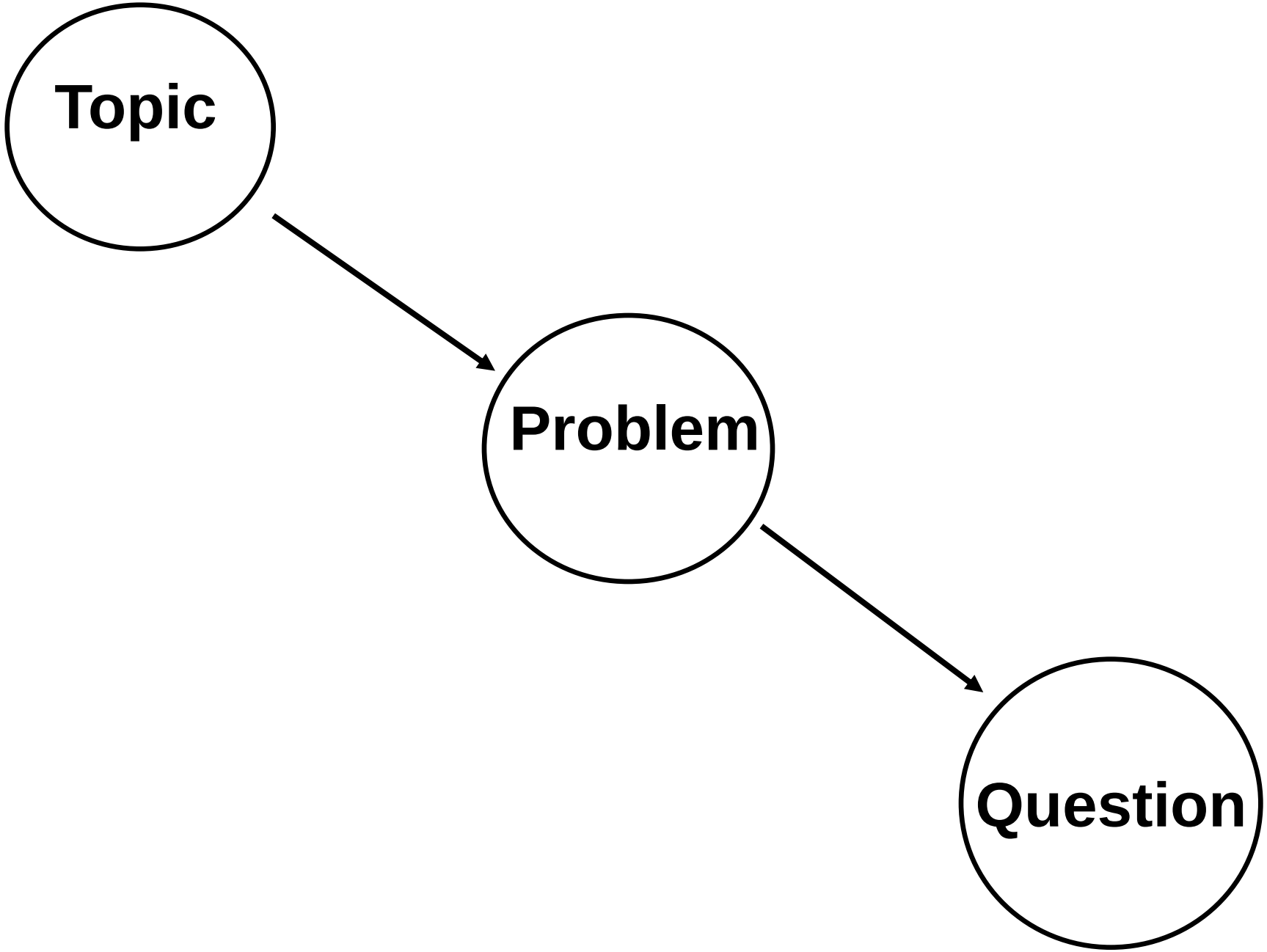
EBM Step 1

- Formulate a clinically relevant and “searchable” question

Developing answerable research **problem**

"The challenge in searching for a research question is not a shortage of uncertainties in the universe; it is the difficulty in finding an **important** one that can be transformed into a **feasible** and valid **study plan**"

(Cummings et al., 1988)


Topic
Problem
Question

Example

- **Topic**: Low Back Pain (LBP)
- **Problem**: the popular use of back support to prevent LBP

Questions:

– Do back support increase **intra-abdominal pressure**?

– How well do different back supports **unload** the spine?

– Do back support preserve the **endurance** of the back extensor muscles?

A good research problem is:

- **Feasible** (subjects, equipment, time, technical support, money)
- **Interesting** (to the investigator)
- **Novel** (challenge the old)
- **Can be studied ethically** (with no negative impact on the subjects)
- **Relevant** (who cares?)

EBM Step 2
Find the Evidence

But Too many articles retrieved…

How do you find the best evidence?

EBM Step 3
Critical Appraisal

- Are the results of the study likely to be true?
- Are the results likely to be free of systematic bias?

Rx	***Dx***	***Review***
Intervention RCT	***Diagnostic***	***Systematic Meta-analysis***

EBM Step 4
Integrate evidence & practice

If the **methods** are **valid**:

- What are the **results**?
- Magnitude of results?

  - Study design
  - Conflicting results

Conflicting Results--

Guideline 1

Article 1

Guideline 2

Article 2

CME

Textbook

Expert

What's the truth?

EBM will NOT tell you what to do!

What will determine what you do:

The integration of

- individual clinical expertise

with the:

- best available external clinical evidence from systematic research

Who should research?

Members of the profession that:

- Have interest in a particular area
- Are motivated & willing to devote effort & time
- Possess considerable knowledge of the area being investigated
- Are familiar with the procedures of conducting research & analyzing the results
  - Clinical researcher = practitioner & investigator

Barriers of research

- Unfamiliarity with research
- Unfamiliarity with statistics
- Lack of funding
- Lack of equipment & facilities
- Lack of time
- Lack of administrative support

RHS 481 Suggested Topics

- Adherence / Compliance
- Physical activity
- Health & Wellness Promotion
- Low back pain

RHS 481 Suggested Topics

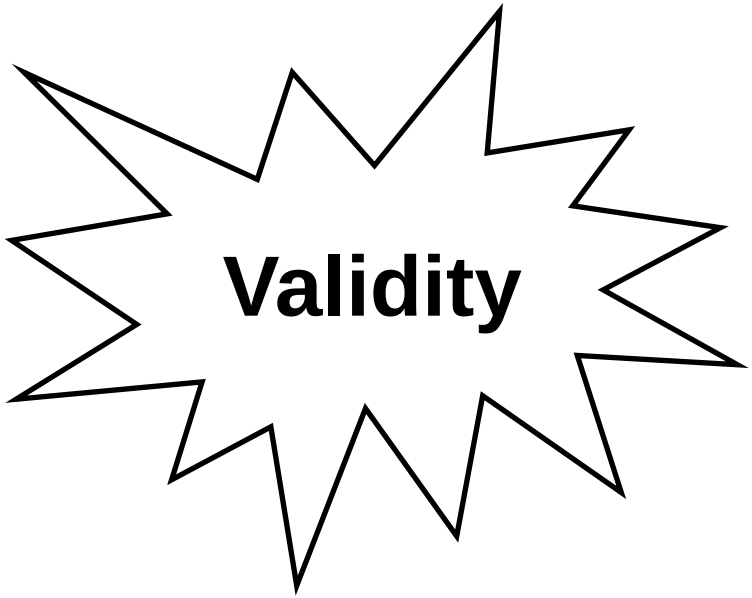
- EMG of transverse abdominus and multifidus during Pilates exercises on and off Swiss ball

THINK BIG !

start small

ACT NOW

Fundamental concepts



Reliability

- **Reliability** (consistency) = the degree to which test scores are free from error

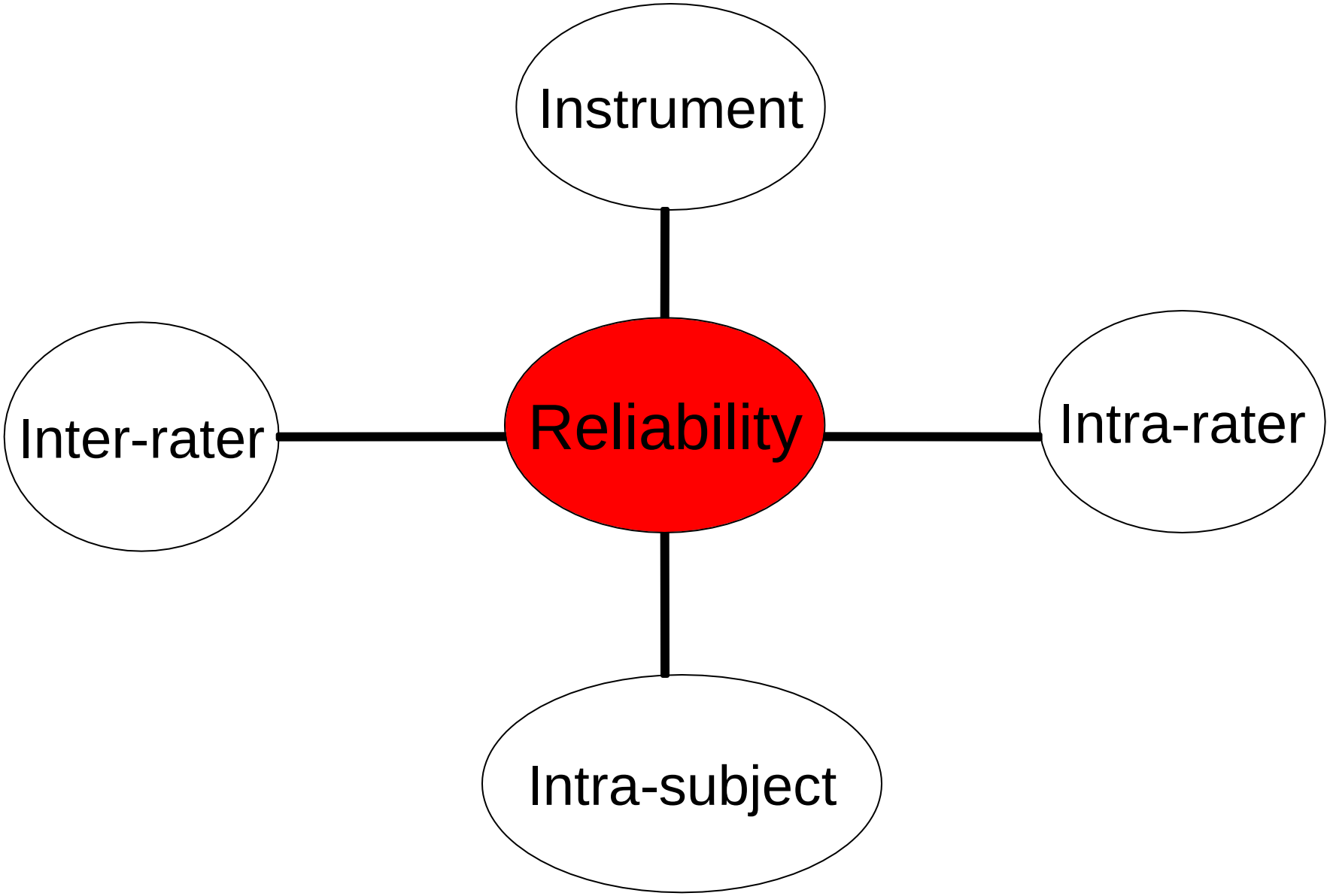
  - ***Instrument reliability*** = measurement error

  - ***Intra-rater reliability*** = consistency with which one rater assigns scores to the same thing on two occasions

Reliability

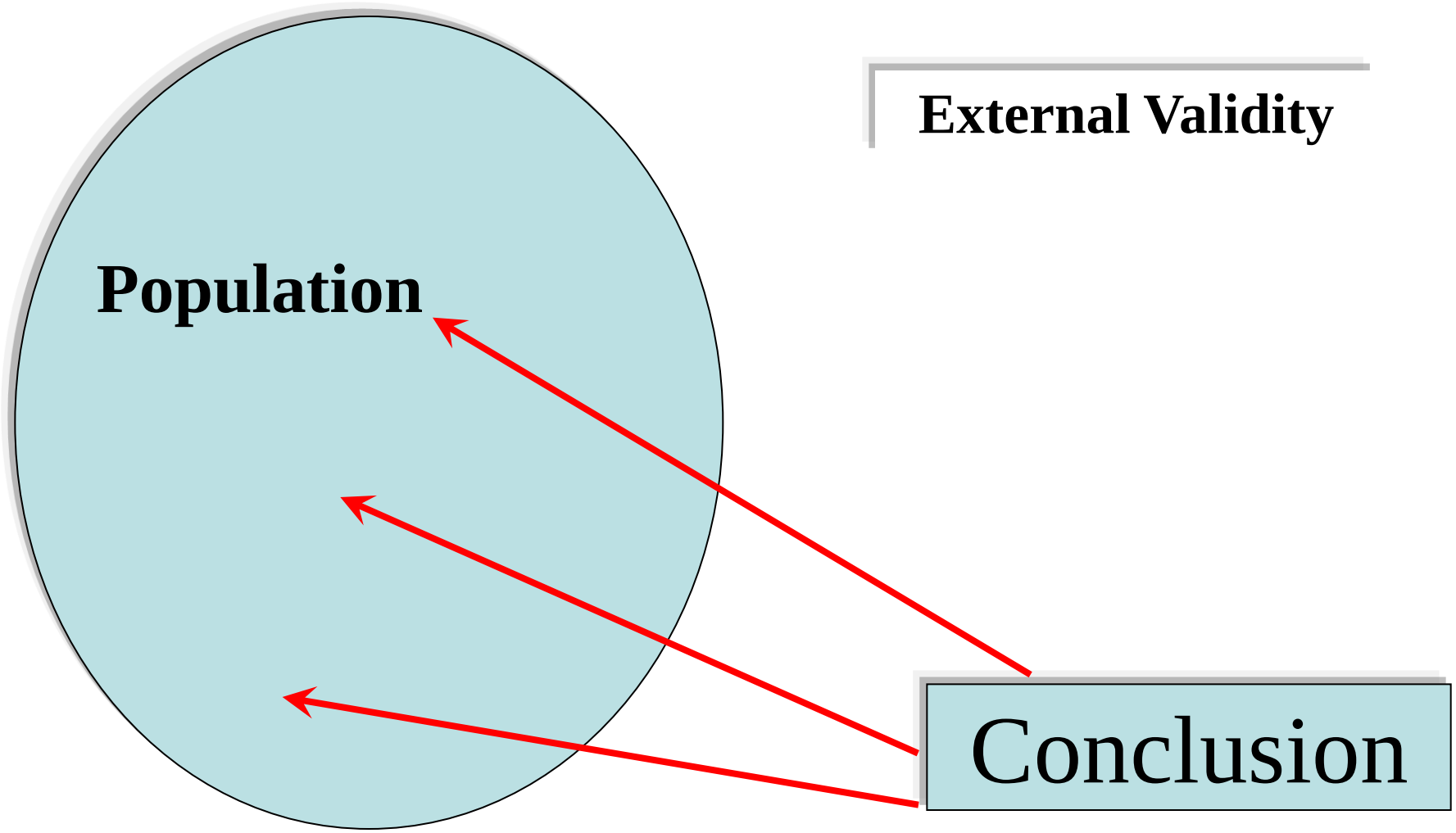
- ***Inter-rater reliability*** = consistency among different raters in assigning scores to the same thing

- ***Intra-subject reliability*** = related to change in subject performance from time to time


Instrument
Inter-rater
Reliability
Intra-rater
Intra-subject

Research validity

- The extent to which the conclusions of the research are believable and useful


External Validity
Population
Conclusion

Types of validity

Internal validity:

- The extent to which the results demonstrate that a causal relationship exists between the independent and dependent variables

- Is the research designed so that there are only few alternative explanations for changes in the dependent variable other than the effect of the independent variable?

Types of validity

Internal validity:

- To increase internal validity ⟶ maximize the control over all aspects of the study

- Example: eliminating ***confounding*** (extraneous) variables through *control* of the experimental setting to eliminate their effects on the dependent variable

- Should be planned as early as the proposal

Types of validity

Construct validity:

- Concerned with the meaning of variables within the study

- Are the research constructs defined so that the research can be placed in the framework of other research within the field?

Types of validity

Construct (criterion) validity:

- ***Labeled*** versus ***implemented*** construct

- Example: using active range of motion as a dependent measure of shoulder function. Labeled construct is “function”, and implemented construct is “range of motion”

Types of validity

External validity:

- To whom, in what settings, and at what times can the results be ***generalized***?

- To whom can the results of this research be ***applied***?

Types of validity

External validity:

- Requires thoughtful consideration of the population to whom the results of the study can be applied

Types of validity

Statistical conclusion validity:

- Are statistical tests used correctly to analyze the data?

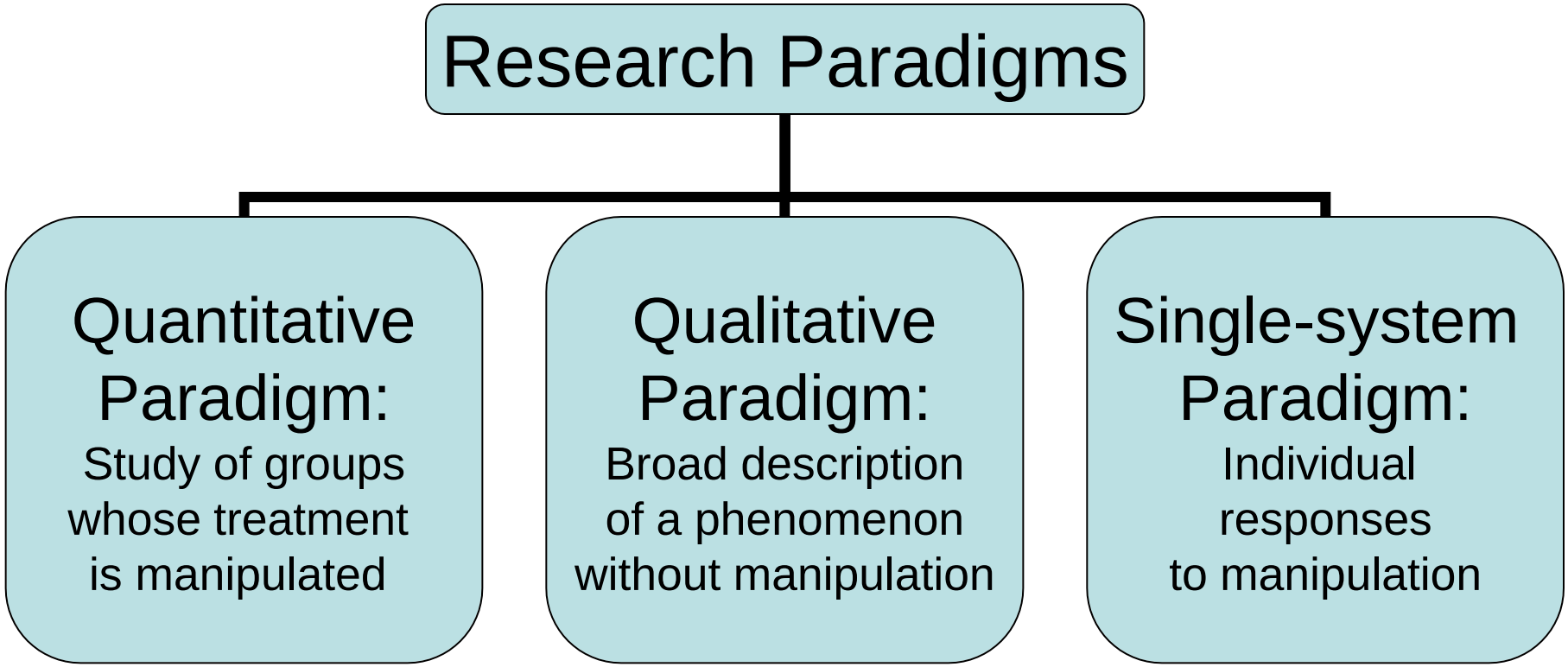
Validity Example

- To achieve a high level of *internal validity*, researchers standardize the experimental treatment to control confounding variables.

- Such standardization compromises *external validity* because the results can be applied only to settings in which the treatment can be controlled.

THINK BIG !

start small

ACT NOW

Methods of obtaining knowledge