

KINE 601

Reading Research Publications in Kinesiology

should be titled:

**Reading and Understanding Research
Publications in Kinesiology**

Introductions

- **Instructor: J.S. Green, Ed.D., Ph.D., FACSM**
 - Former high school football, basketball coach - math teacher
 - **Ed.D.** - Okla. State, 1984: Health and Physical Education
 - GA: rock climbing, life guarding, weight lifting
 - Rose State College, 1985-88, Aquatics administrator / instructor
 - trained SCUBA instructors, taught SCUBA, lifeguarding, personal health
 - Texas A&M, 1989, exercise physiologist, *FITLIFE* program coordinator
 - assistant lecturer - taught applied & clinical exercise physiology
 - **Ph.D.** - Texas A&M, 1996 - Physiology / Statistics & Research Design
 - assistant lecturer r 15 years later r full clinical professor
 - teach applied & clinical exercise physiology, statistics & research
- **Students: Name, Hometown, Major area of study, Advisor ?**
 - What is your definition of **RESEARCH** ?
 - Can anything be **PROVEN** using **RESEARCH** ?
 - If **RESEARCH** could definitively answer one question, what should that question be ?

Science and associated assumptions

- "The goal of science is to explain, predict, and / or control phenomena. This goal is based on the assumption that all behaviors and events are orderly and that they are effects which have discoverable causes" - *L. R. Gray, Research Scientist, 1976*
- Have all events throughout history had a “cause” ?
- Will science eventually be able to identify all “causes” ?

What is Research ?

- **Webster Dictionary:**
 1. Careful or diligent search
 2. Studious inquiry or examination
 - investigation or experimentation aimed at the discovery and interpretation of facts, or practical application of such new or revised theories or laws.
- The process by which knowledge is acquired
- First response from Google search: “research”
<http://www.itools.com/>
- First response from Yahoo! search: “research”
<http://www.forrester.com/my/1,,1-0,FF.html>

What is Research ?

- My opinion: research is simply the cyclic search for **TRUTH** in a potentially infinite number of disciplines or topic areas.
- The problem: can we ever really know the **TRUTH** ?

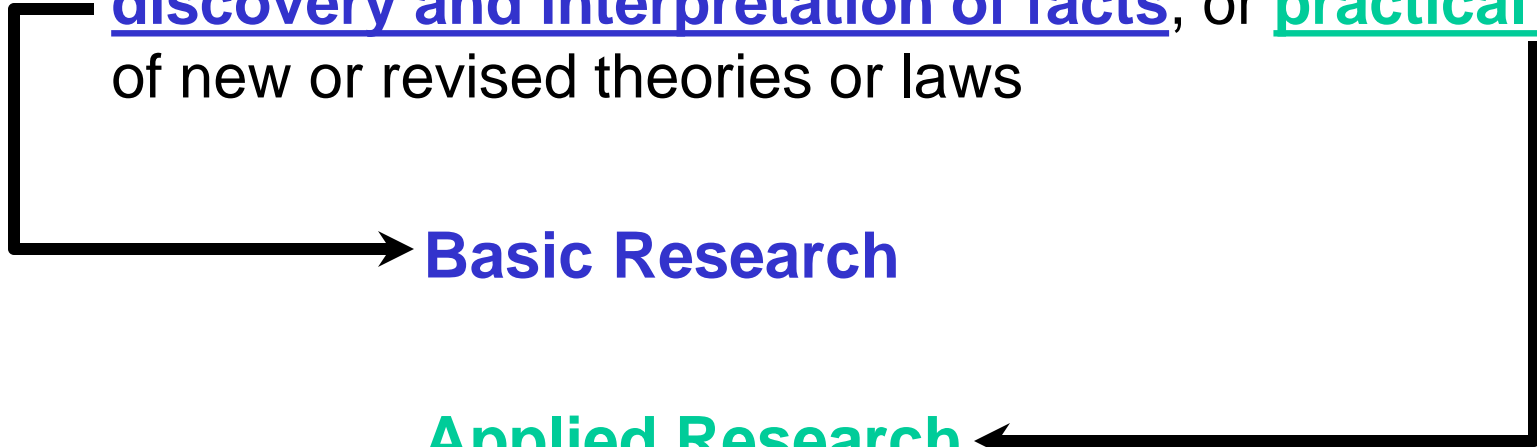
The **Post-modernist** purpoptrt that truth is not something lying outside of human collective decisions. Or, to put it another way, to the extent that there is an objective reality it is nothing more nor less than what we *say* it is. **We human beings are, then, the ultimate arbiters of what is true.** **Consensus is truth.** The 'subjective' and the 'objective' are rolled into one inseparable compound

Two Basic Types of Research:

- Research is investigation or experimentation aimed at the discovery and interpretation of facts, or practical application of new or revised theories or laws

Basic Research

Applied Research



Key Terms

- **Variable**
 - concept or construct that can have more than one value
- **Dependent Variable** - outcome measure
 - the characteristic being measured
 - variable upon which values statistical tests are performed
 - variable that "depends" on the action of the independent variable
 - the "effect" variable in a cause-effect study
- **Independent Variable** - the "treatment" variable
 - the variable being investigated
 - variable manipulated by researcher
 - the "cause" variable in a cause-effect study

Identifying Independent and Dependent Variables

1. A physiologist wishes to determine if oat bran consumption affects cholesterol levels in humans. What are the independent and dependent variables in the study?
2. A researcher wishes to determine if participation in an exercise program reduces the risk of heart disease. List some possible independent and dependent variables that might be included in such a study.
3. "All skinfold-thickness and circumference measures, waist-to-hip ratio, body mass index, fat mass, percent body fat, CT scan measurements of total, subcutaneous, and visceral abdominal fat decreased with training, whereas total body density and fat free mass increased. These changes were significant but small. There were several differences in training response by sex and race, but not by age." *Wilmore et al., Am J Clin Nutr, 1999, 70: 346-52*

Key Terms

- **Hypothesis** - speculation, educated guess
 - formulated on the basis of theory and previous research findings
 - postulates how two or more variables are related to one another
- **Research / Alternative / Working Hypothesis** – original speculation as to what will happen
 - often unidirectional, based on previous research findings
 - hypothesis accepted as true if the null hypothesis is rejected
- **Null Hypothesis** - hypothesis for statistical testing
 - usually stated in negative form

note: many / most studies published in the medical literature do not state a null hypothesis....it is inferred to exist. In fact, most studies do not formalize any type of hypothesis...they only state the "purpose of the investigation is to...". This simply does away with some of the "formality" of research methodology.

Hypothesis Formulation Examples

A researcher wishes to determine if there is a rise in plasma (circulating) norepinephrine levels when ropes course participants move from the "low elements" to the "high elements"

Null: There will be no significant difference in plasma epinephrine levels in subjects participating in ropes course training when moving from the low to high elements.

Research / Alternative / Working: There will be an increase in plasma epinephrine levels in subjects participating in ropes course training when moving from the low to high elements.

Informal Style: The purpose of this investigation is to determine if there is an increase in plasma norepinephrine levels in ropes course participants when they move from the low elements to the high elements.

Types of Research

Empirical

Ethnographic

Historical

Descriptive

Meta Analysis

Case Study

Questionnaire

Analytical

Experimental

Causal Comparative

Types of Research

- **Empirical Research** (leaning toward the "quantitative")
 - research based on "quantifiable observation" (data gathering)
 - analyzes quantifiable dependent variables
 - draws generalized conclusions from specific observations
 - "final product" involves both inductive and deductive reasoning
 - inductive reasoning to formulate hypotheses ("specific" to "general")
 - "eating oat bran d my cholesterol r maybe eating oat bran d cholesterol"
 - deductive reasoning to apply research findings ("general" to "specific")
 - "We know oat bran d cholesterol r everybody should eat more oat bran"
 - uses the concept of "inference" ("generalizability" of research results)
 - associated with the "scientific method"
 1. Identification of problems, questions
 2. Formulation of hypothesis (es)
 3. Collection, organization, and analysis of data (hypothesis testing)
 4. Formulation of conclusions

Types of Research

- **Ethnographic** (leaning toward the "qualitative")
 - sometimes called "naturalistic inquiry"
 - research based on "interpretive observation" (note taking)
 - developing inductive theories based on long term observation
 - "here is what we saw and here is what we think it means"
 - used mostly for "case studies" of "cultural" phenomenon
- While empirical research "breaks down" reality into quantifiable (measurable) variables, ethnographic research makes holistic observations of the total context in which reality occurs
- some application in health & kinesiology research
- no application in exercise physiology research

Types of Empirical Research

- **Historical** - interpretation of the past
 - determining the meaning, causes, or effects of past phenomenon
 - determining the relevance of past phenomenon to the future

Examples:

- How did the research conducted at the Harvard fatigue laboratory (1927 – 1947, Director: Dr. D.B Dill) influence the topics in exercise physiology that we study today.
- How did the implementation of the “shot clock” change the scoring average in the NBA?

Types of Empirical Research

- **Descriptive** - describing what is
 - describing an event and deriving meaning from it
 - used to determine "status quo" (current status) of reality
 - much Health & Kinesiology research falls under this heading
 - **types of descriptive research**
 - **Case study** - investigation of individual, group, or institution
 - **Questionnaire** - gathering data from survey instruments
 - **Analytical** - analyzing data to infer meaning or describe relationships (correlational research)
 - **Experimental** - conducting experiments in a controlled setting in which the independent variable is manipulated by the researcher in order to test hypotheses of cause-effect relationships
 - **Causal-comparative** - same as experimental except the researcher does not manipulate the independent variable (it has already "occurred")
 - **Examples:**
 - determining the difference in reaction times of males and females
 - quantifying EMG activity in the sartorius muscle of a paralyzed person
 - quantifying cardiac function in postmenopausal women who are already taking versus those not taking supplemental estrogen

Types of Empirical Research

- **Meta Analysis** - analysis of cumulative studies
 - uses results of other studies as data points in an inferential analysis
 - dependent variable in meta analysis is "effect size"
 - effect size: $\text{post-treatment score} - \text{pre-treatment score} / \text{variation}$
 - literature search must be exhaustive
 - file drawer problem
 - one of the best methods to generate true knowledge
 - individual studies by themselves can not infer undisputed fact
 - studies have flaws or extraneous variation that may affect results which precludes the inference of totally generalizable fact from just one study, no matter how well the study is done.

Types of Research Designs

true experimental designs

- pretest posttest control group
R -> O -> X -> O
R -> O -> C -> O
- posttest only control group
R -> X -> O
R -> C -> O
- solomon 4-group
R -> O -> X -> O
R -> O -> C -> O
R -----> X -> O
R -----> C -> O

Types of Literature & Data sources

- **Primary sources** - firsthand knowledge, experimental results
 - data which lie closest to the source of the phenomenon
 - results of "experimental" studies
 - eyewitness reports / interviews
 - original "documents"
- **Secondary sources** - secondhand knowledge
 - summaries / reviews of primary data
 - review articles (not to be cited in a subsequent literature review)
 - philosophical viewpoints on a particular subject

Ethics in Research

"As to diseases, make a habit of two things--to help, or at least *do no harm*."

--- Hypocrites, *The Epidemics* ---

- **Ethics Principles** - Human Subjects - Belmont Report, 1979

- Developed from Nuremberg code of 1947

- **Respect for Persons**

- individuals should be treated as autonomous agents
 - capable of making their own decisions regarding pro's & con's of research
 - persons with diminished autonomy are entitled to protection.

- **Beneficence**

- risks should be minimized and proportionate to anticipated benefits

- **Justice**

- both benefits and risks of research should be distributed fairly
 - selection of subjects should be both representative and fair

- **Additional resources:** National Institutes of Health

- <http://ohsr.od.nih.gov/guidelines/guidelines.html>

Ethics in Research

Implications of the Belmont Report

- Informed consent must be give by all subjects
 - informed consent must be obtained and confidentiality must be protected
 - IC must contain information, comprehension, voluntariness
 - research protocol explained to subjects in comprehensible "lay terms"
 - participation must be truly voluntary - no coercion or undue influence
- Systematic assessment of Risk vs. Benefits
 - Brutal or Inhuman treatment of humans NEVER justified
 - Risks should be maximally reduced (can animals be used?)
 - When risk is significant, panels should carefully examine risks vs benefits
 - Overwhelming voluntariness should also be considered
- Selection of Subjects
 - Selection Injustice:
 - Selecting the disadvantaged, institutionalized, racial minorities
 - Who receives the benefits ? Does it balance with who bears the burdens?

Texas A&M Review Boards for Research

- **Institutional Review Boards (IRB's) at Texas A&M**

- must approve all research involving human subjects

<http://researchcompliance.tamu.edu/irb2.php>

- research on animals must also pass A&M Animal Use Protocol board

<http://animal.tamu.edu/animaluse.html>

Most research agencies and institutions require a 1 hour computerized tutorial over ethics in research by the NIH

<http://www.nih.gov/sigs/bioethics/casestudies.html>

Ethics in Research

- Other ethical concerns:
 - data fabrication - making up data
 - falsification of data - changing or misrepresenting data / analyses
 - statistics - you can manipulate data to say anything you wish
 - “ I can get you any results you like....what’s it worth to ya....because there is no wrong....there is no right....just data to be manipulated.” The devil’s 2nd monologue in Don Henley’s song [The Garden of Alah – 1996](#)
 - not reporting undesirable or “non-significant” results
 - does non-significance make the research project of no value ??????
 - copying research questions / ideas from colleagues
 - misuse of grant funding, university funding, or university facilities
 - recent conviction of computer science professor here at A&M
 - tampering with experiments or instrumentation
 - plagiarism
 - the non-reporting of misconduct
 - publishing similar manuscripts using the same data