Chapter 3
Research Method

EDHE6530

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Overview

- Review our progress

- Chapter 3 Research Methods

- Break

- How to review journal articles?

- A quick review of quantitative research methods

A Quick Review

Chapter One

- Introduction/problem statement
- Purpose of the study
- Conceptual framework or theoretical orientation
- Research questions and hypotheses
- Definition of terms
- Significance of the study
- Limitations, delimitations, & assumptions

Key to a good literature review

- Always keep your research questions in mind
- Critically analyze the literature
- Integrate instead of summarize
- Use primary sources
- Distinguish between assertion and evidence

Other tips

- Don't ignore studies that differ from majority or personal bias
- Read most recent ones first, oldest last
- Read important landmark works
- Use data-based, empirical studies
- Opinion pieces and descriptive research helpful in introduction – set stage
- Not a literary production- be clear and concise

Basic Research

- Theory Driven

- Discovery of knowledge

Applied Research

- **IMMEDIATE** practical problem
- **ACTUAL** problems in the field
- **Limited generalizability**

Research vs. Assessment

Research

- Generate knowledge that can be applied broadly
- Audience is not location-bounded
- Sample based

Assessment

- Evaluate the progress or results of a initiative or program
- Internally focused
- To improve the project or process
- Population based

Quantitative vs. Qualitative

- Epistemology
- Treatment of Theory
- Role of the researcher(s)
- Data collection and analysis
- Quality controls
- Report of findings
- Types of studies
- How to choose between the two methods

Quantitative Methods

- Experimental Design

- Casual-Comparative Design
  - Survey Research
  - Secondary Data Research

- Descriptive Design

Qualitative Methods

- Ethnography

- Case Study

- Grounded Theory

- Narrative Inquiry
  - Content Analysis

Ideological Approaches

- Researcher's role
  - Interpreting the phenomenon through a particular perspective
  - Identifying marginalized or endangered people in society
  - To advocate
- Challenging traditional views and usually controversial

Mixed-Method

- Philosophically torn between positivist and Phenomenology

- Pragmatism comes to save the day

- Focusing on "solving the problems" instead of philosophical arguments

- Mixed-method is **NOT** half quantitative and half qualitative

Discuss Your Research Questions and Possible Method Selections

Chapter 3
Research Methods

Purpose of the method chapter

- Make your research transparent
- Make it possible to other researchers to replicate your study
- Make it possible for other researchers to judge the quality of your study

Did you remember?

Always keep your research questions in mind

Four questions are addressed

- Who participated in the study?

- Types of materials needed?

- What data were collected and how?

- How did you analyze the data?

Participants/Sample

- How were they selected?
    - Random selection
    - Volunteers
    - Paid
- From where are participants
    - Geographic region
    - Institutional affiliation

Participants/Sample

- Demographic characteristics
  - Age/age range
  - Gender
  - Ethnicity
- Other information for replication

Example of Participants

A total of 50 participants will be selected from a population of 157 students enrolled in an Algebra I course at a large urban high school in Houston, TX. The population is tricultural, composed primarily of Caucasian non-Hispanic, African American, and Hispanic students from a variety of Latin American backgrounds. Moreover, 100% of students at this school are enrolled in the free or reduced price lunch program. Participants, comprised

Example of Participants

of 54% female and 46% male, will be selected randomly through use of random numbers table (Ary, Jacobs, & Razavieh, 1996).

Instrumentation

- Describes "things" used
- Sources of data
  - Test, questionnaire, interview...etc.
  - Archival sources
- Why instruments selected
- Quality of your instrument
  - Validity
  - Reliability

Instrumentation

- Who and how administered?
  - How many items
  - How long to complete
  - How scored
  - Special condition
- If new instrument developed
  - Why
  - Field test?
  - Include in entirety as table or appendix

Example of Instrumentation

The Stanford Achievement Test (SAT): Arithmetic Test (Level 7.0 – 9.9) will be utilized as the data gathering instrument. Split-half reliability coefficients are reported to range from .86 to .93 (Davies, 1994) and reviewers (Locus, 1995; Smythe, 1994) are in agreement concerning its high content validity. The SAT Arithmetic test is comprised of 45 multiple-choice items and requires approximately 35 minutes to complete.

What is missing from the example?

- Why instruments selected

- How scored (what is the score range and distribution?)

Procedures

- What did researchers/participants do? When? In what order were activities conducted?

- If intervention or treatment given, describe in detail

- Write in cookbook manner; step-by-step process

- Remember – enough details for replication

Example of Procedures

In the fall of 1997, prior to the assignment of students to classes, a list of all students scheduled to enroll in General Math I in the fall (approximately 150) will be obtained from the principle of the school. Using this list, 50 students will be randomly selected through use of a random numbers table to participate in the study. These 50 students will then be randomly assigned to one of two General Math I classes, one class to receive

Example of Procedures

programmed instruction and one class to receive lecture-discussion instruction. The random assignments to class type will also be performed through the use of a random numbers table. The programmed instruction class will utilize a computer program titled Herculette, published by the Programmers Institute of Technology School (1996), and used on IBM or IBM compatible computers with a Pentium 686 processor. In this program,

Example of Procedures

students are required to exhibit mastery learning on each lesson prior to making a transition to the next higher lesson in the math sequence. The lecture-discussion classroom teacher will present the same math concepts used in the Herculette program but through a lecture format instead of through use of a computer. Discussion will occur between the teacher and students when students ask questions about math concepts.

Data Analysis

- Describe techniques to analyze data
  - Quantitative studies – Statistics procedures
    - A brief description and explanation of the statistics you choose to use
    - The reason for choosing this statistical method
  - Qualitative studies – data summary, interpretation, and method of verification
    - Give as much details as possible
    - Remember triangulation – how you going to achieve that

Example of Data Analysis

A statistical analysis will be used for comparing the achievement, on a test of reading comprehension, of two randomly formed groups of second grade students. An independent samples t-test will be used to determine whether the means of these two groups are statistically significantly different from one another. Should the data analysis provide a statistically significant result at the .05 level, then null hypothesis will be rejected.

Example of Data Analysis

Should the statistical analysis not yield a statistically significant result at the .05 level, then the null hypothesis will not be rejected. For each comparison, an alpha level of .05 will be used for the level of statistical significance.

Class Activities

- Outline your Chapter 3
  - Population/Sample/Participants
  - Instrumentation
  - Data collection methods
  - Data analysis

A Quick Review of Quantitative Research Methods

Statistics Methods for Social Sciences

- Major assumptions in statistics
- Types of questions that can be answered
  - Are they different?
  - What is the relationship?
  - What cause it to happen?
  - What cause the whole thing to work like that?

Population vs. Sample

- **Population** is the entire group of individuals that we want information about

- **Sample** is the part of the population that we actually examine in order to gather information

Which is which?

A study of political orientation of African American female registered voters under age 25 in the 2008 presidential election

- All female African American undergraduates at UNT who said they are going to vote

Sample

Which is which?

A study of Latino freshmen at the Collin County Community College in terms of their intention to transfer to four-year institutions

- A survey of all Latino freshmen at the Collin County Community College with 100% response rate

Population

Population Research

No Statistics Required
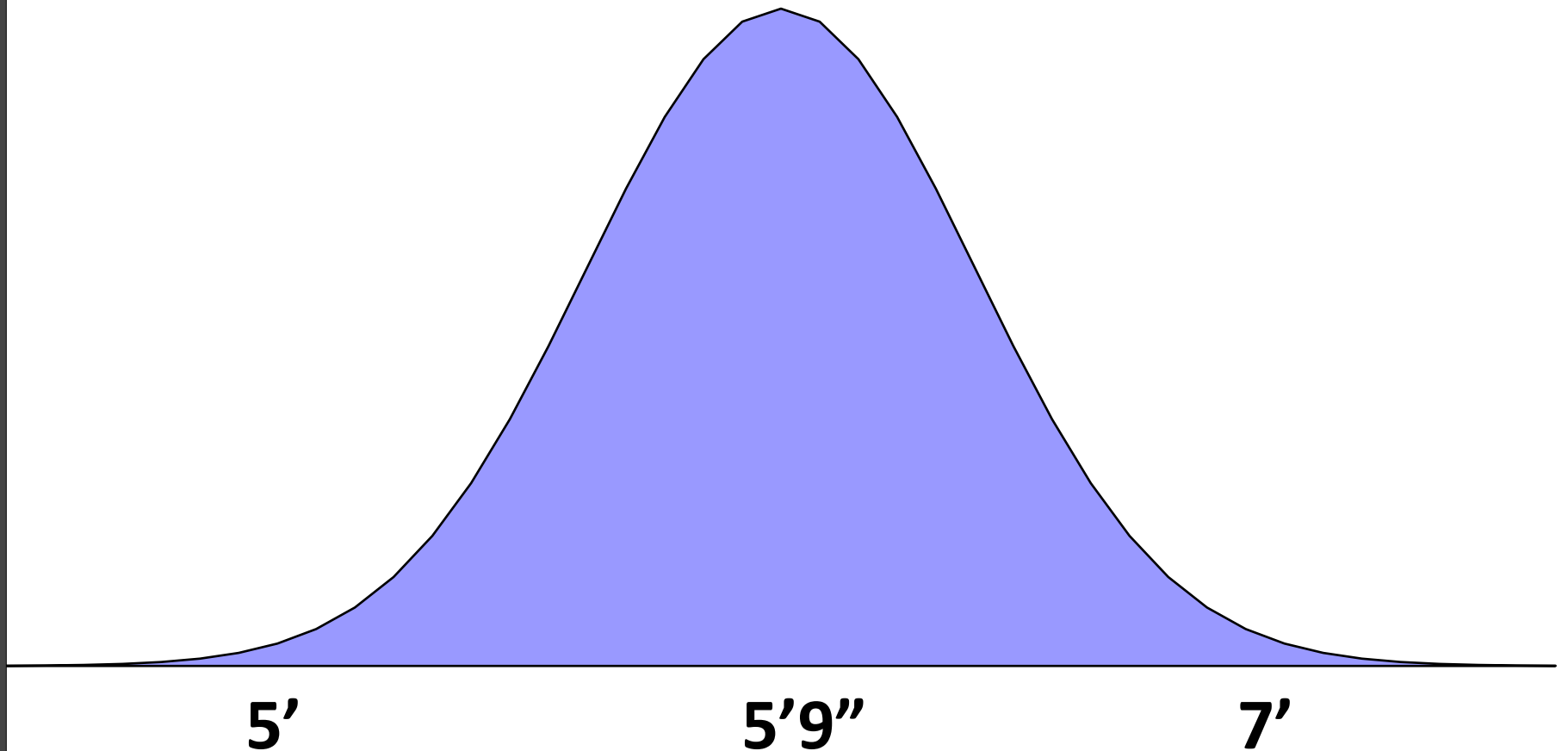
Is that good or bad?

Probability – The Foundation

Key Elements in Probability

- Randomness – the lack of bias or manipulation

- Law of large numbers
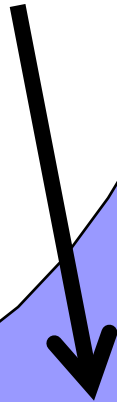
- Central limit theorem (CLT)
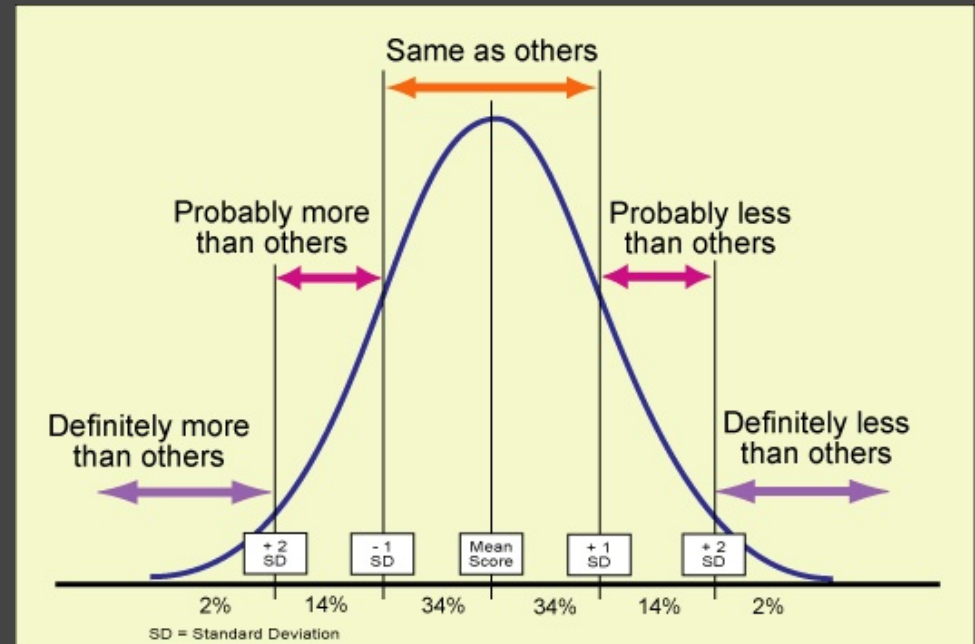
Example for CLT

Average Adult Male Height in the U.S.

5'   5'9"   7'

Example for CLT
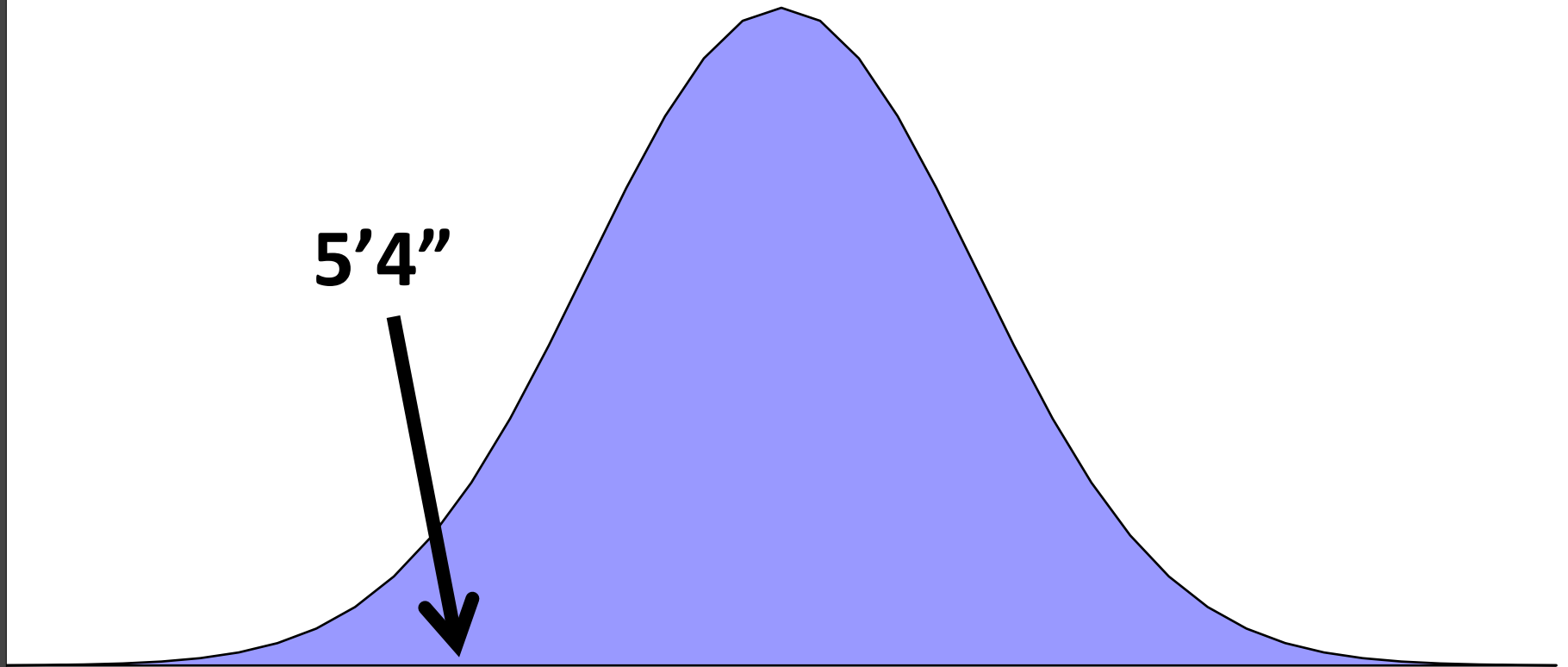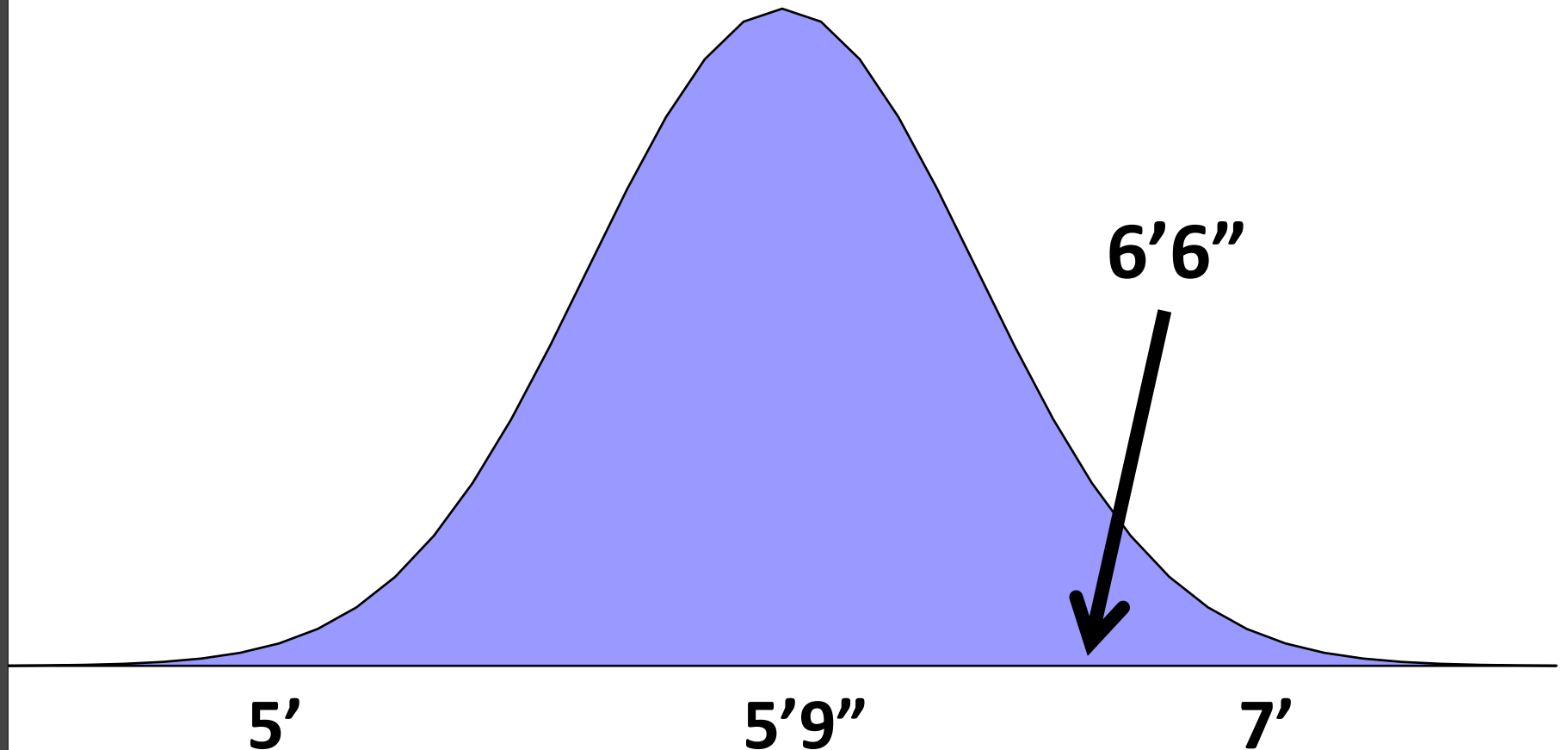

Average Adult Male Height in the U.S.

5'4"

5'   5'9"   7'
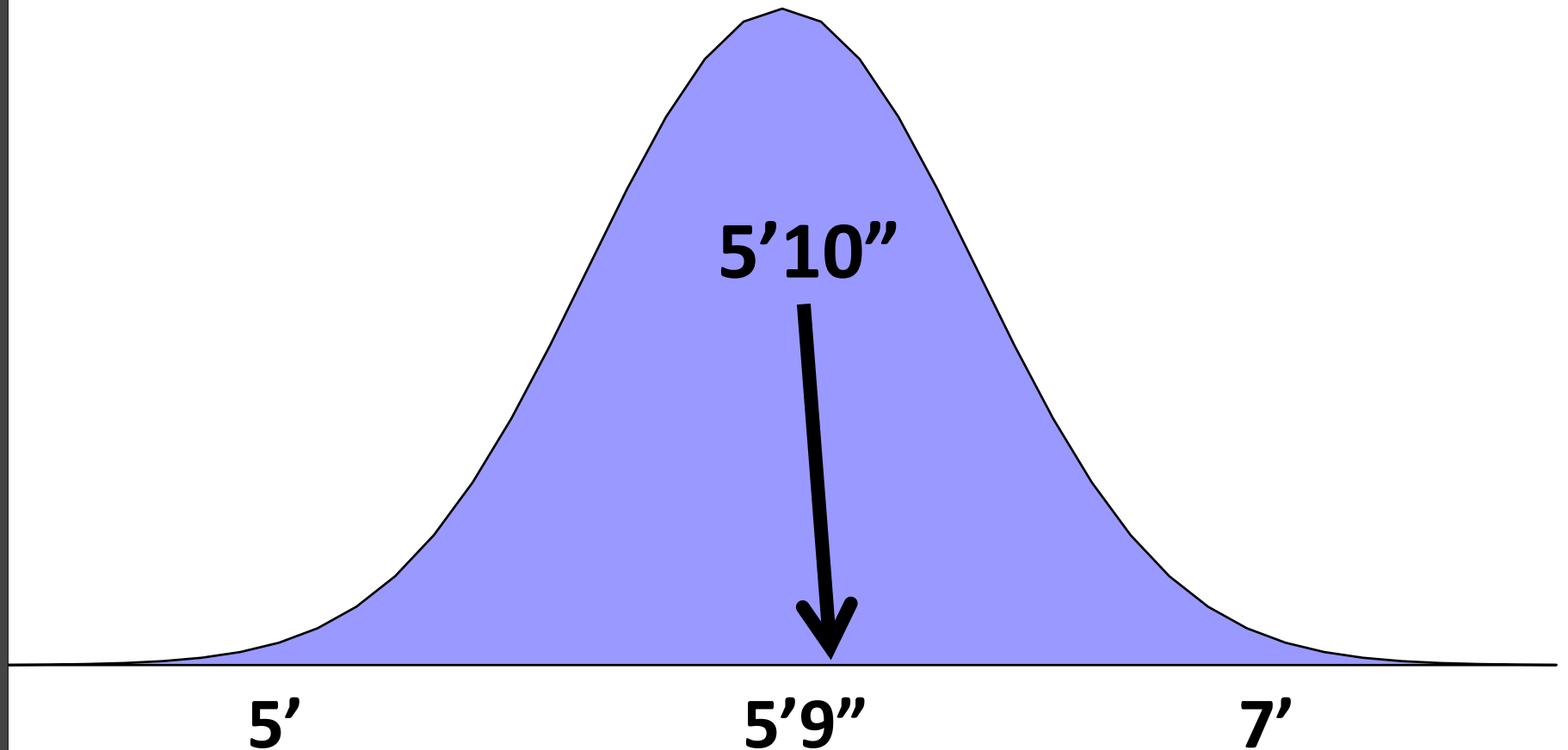
Example for CLT

Average Adult Male Height in the U.S.

6'6"

5'   5'9"   7'

Example for CLT

Average Adult Male Height in the U.S.

5'10"

5'   5'9"   7'

Example of CLT

Sample	Height
X_1	5'4"

Example of CLT

Sample	Height
X_1	5'4"
X_2	6'6"

Example of CLT

Sample	Height
X$_1$	5'4"
X$_2$	6'6"
X$_3$	5"10'

Example of CLT

Sample	Height
X_1	5'4"
X_2	6'6"
X_3	5"10'
$X_4, X_5, X_6, \ldots, X_n$	5'3", 6'9" …..
Average (X_1-X_n)	**5'9"**

Example for CLT

Example for CLT

Average Adult Male Height in the U.S.

<20% 5'4"

5'   **5'9"**   **7'**
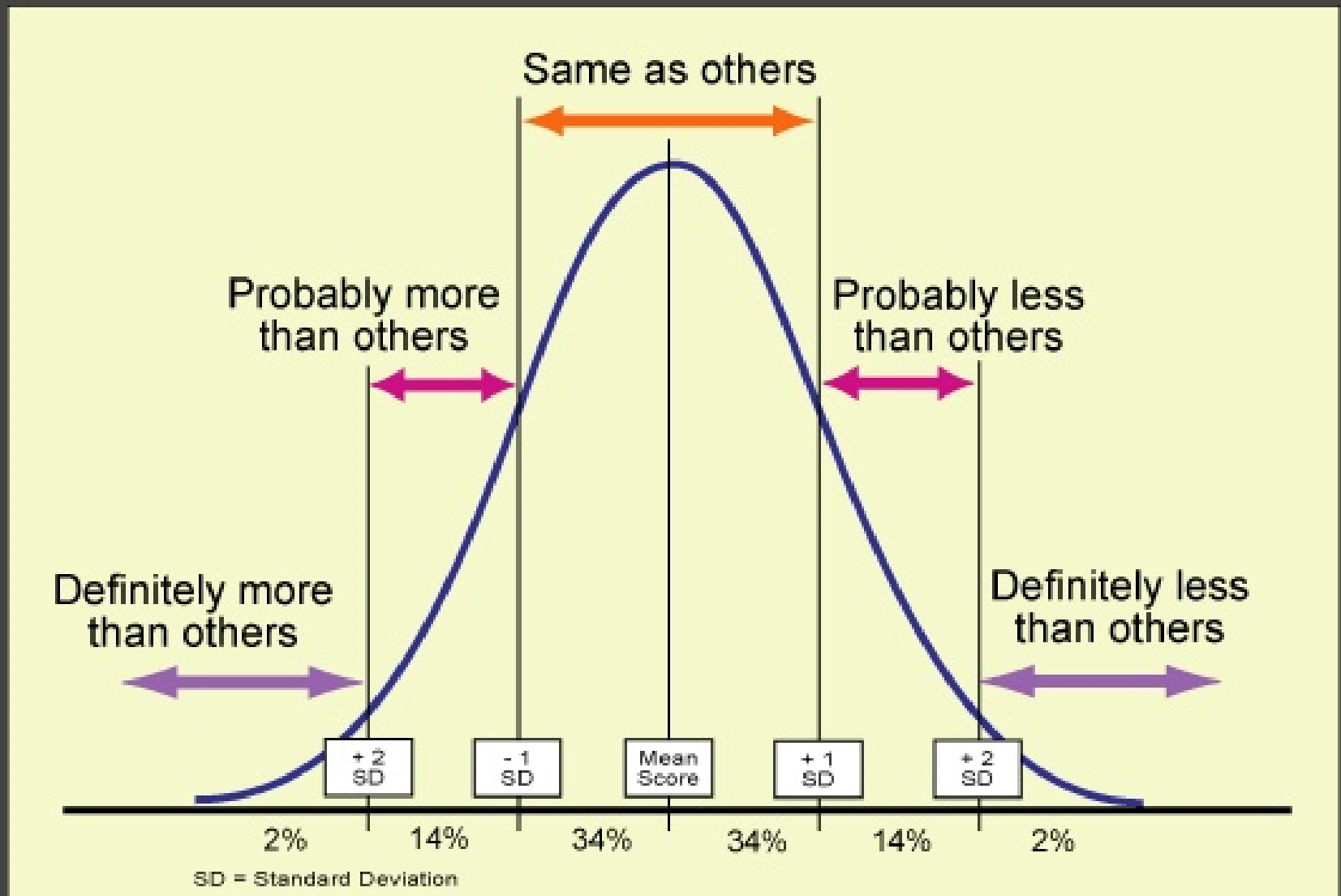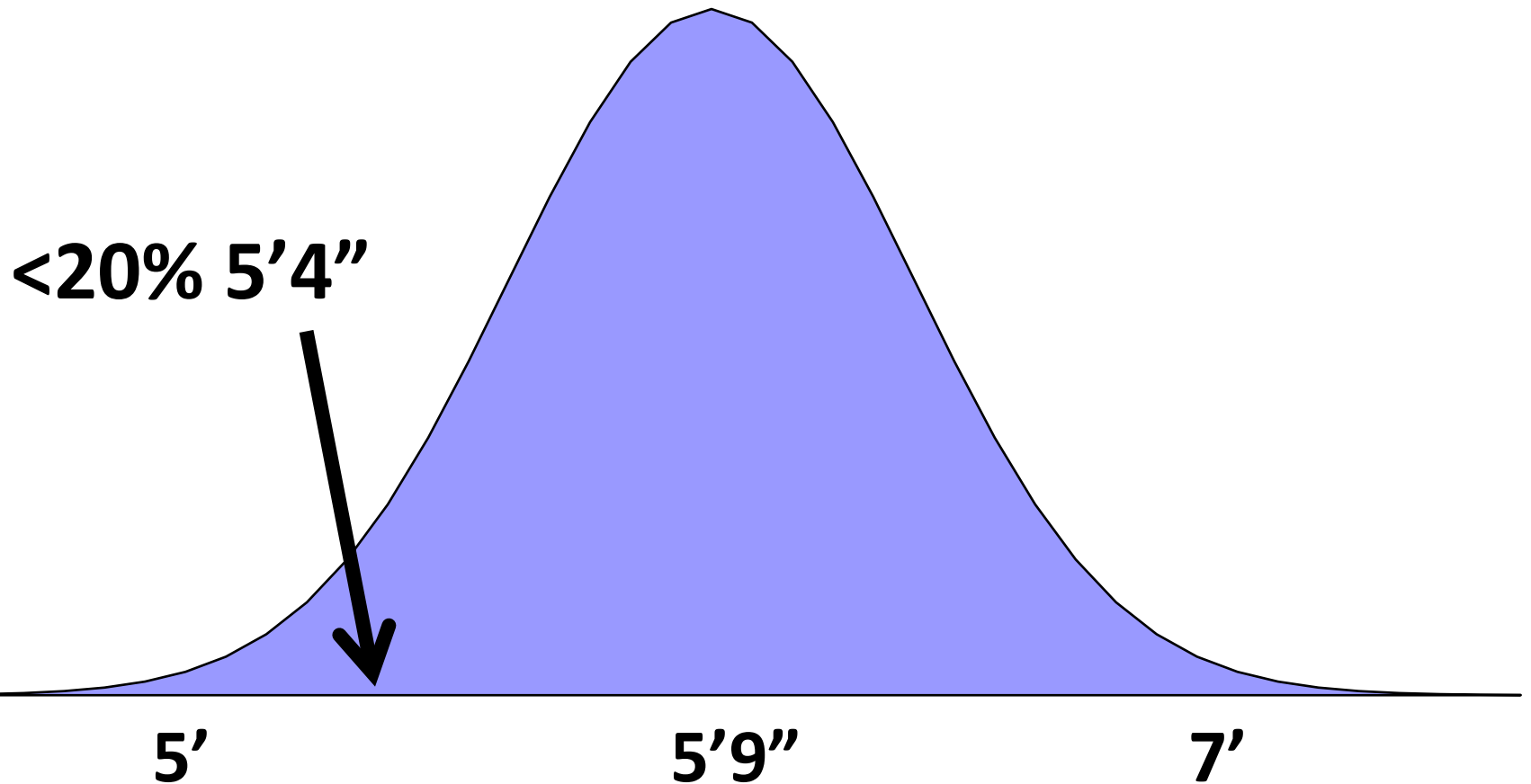
What does p < .05 mean?
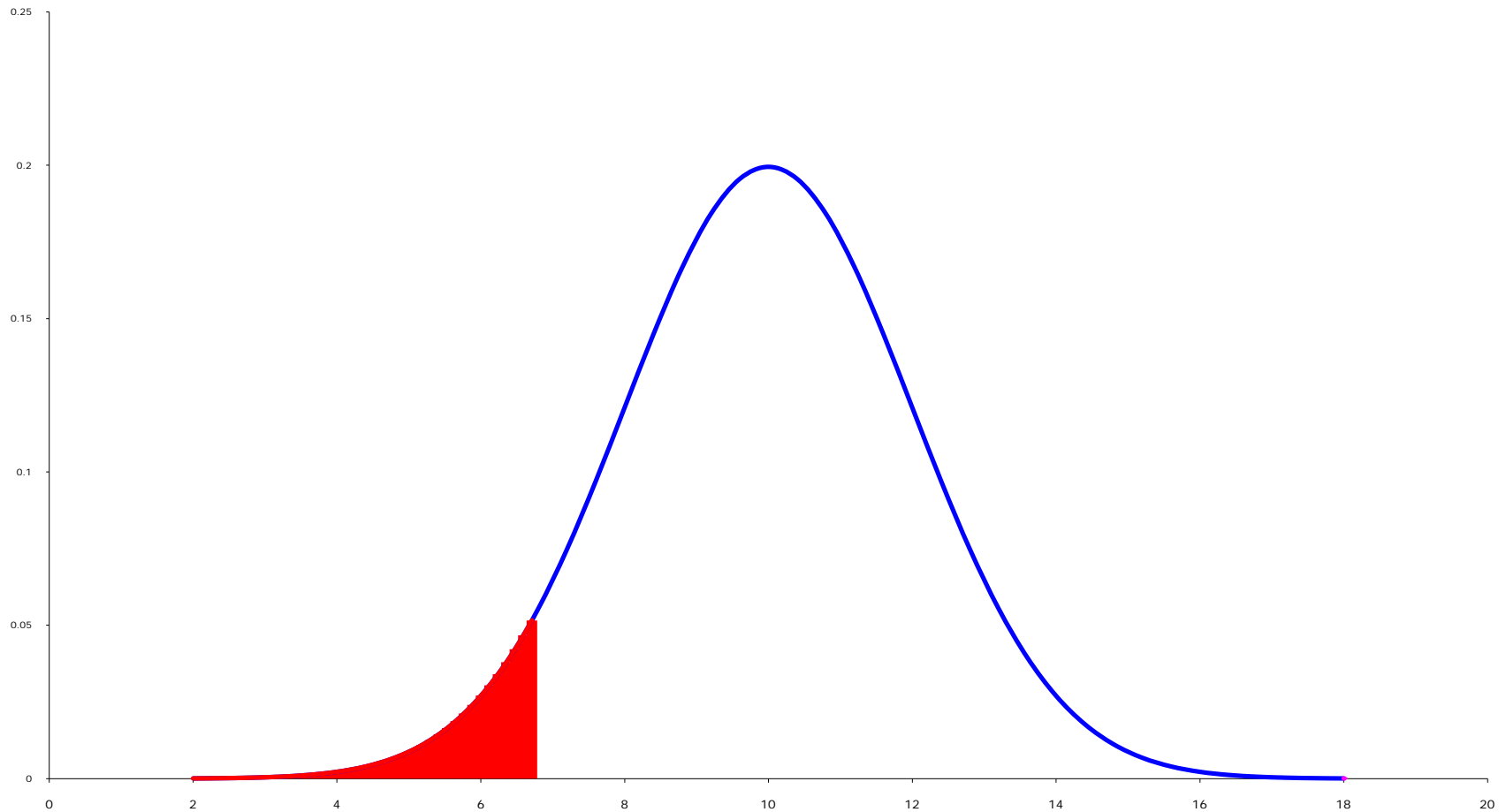
Null Hypothesis Significance Testing (NHST)

- Originated from agricultural sciences

- Test the probability of null hypothesis

- If the probability for null hypothesis to happen is less than a certain value ($p<.05$ or $p<.01$) we call it statistically significant

The Problems with NHST

- The size of p value does NOT indicate the strength of the relationship

- Statistical significant does NOT imply theoretical or practical significance

- Sample size has a great impact (if you have enough power, you will always reject null hypothesis)

- Does not work for population study

Solutions

- Reporting confidence interval (CI), standard errors, and effect sizes

- Discuss theoretical and practical importance using effect sizes

- Downgrade the importance of p value

Are they different

- T-test
- Analysis of Variance (ANOVA)
- Chi Square
- Wilcoxon signed-rank test
- Cluster Analysis
- Discriminant Function Analysis

What is the relationship

- Correlational Coefficients
  - Pearson's product-moment coefficient
  - Spearman's rank correlation coefficient
- Presumptions
  - Randomness
  - Linearity

What cause it to happen?

- Linear regression
- Multiple regression
  - Multiple linear regression
  - Logistic regression
  - Ordered logistic regression
  - Multinomial logit regression

What cause the whole thing to work like that?

- Structural equation modeling
  - MANOVA, MANCOVA
  - Factor Analysis
  - Path Analysis
- Hierarchical linear modeling
- Repeated Measure
  - HLM growth model
  - Time series
  - GLM repeated measure

Common Mistakes

- Ignoring assumptions for a specific method

- Conducting multiple t-tests without Bonferroni correction

- Misusing Exploratory Factor Analysis (EFA)

- Inferring casual relationship in a correlational study

Other Mistakes

- Not reporting the quality measures of your instrument

- Ignoring the problems of missing data

- Ignoring the problems of self-selection bias

- Using statistical methods that you don't really understand

Remember

Restate your research questions in your method chapter

Remember

Someone should be able to replicate your study by following your method chapter