

# Gold vs. Fool's Gold:

## Critically Reading and Evaluating Clinical Research Papers

Presentation



# Contents

There are three aspects to a clinical research paper to explore...

The **Context** of a Clinical Research Paper

Critically Reading and Evaluating the **Content** of the Clinical Research Paper

**Professional Application** of the Information

# **The Context of a Clinical Research Paper**

# Before reading a clinical research paper, note the following elements:

## 1. Publication

The journal in which the paper was published

## 2. Title

The title should describe the content of the paper clearly and succinctly

## 3. Authors

Lists the names of individuals who have authored the paper

## 4. Date

Shows when the paper was published



# **Critically Reading and Evaluating the Content of a Clinical Research Paper**

Clinical research papers typically consist of **six major sections**:

- Abstract
- Introduction
- Materials & Methods
- Results
- Discussion
- Conclusion
- References

We will examine each of these sections in greater detail.



The **Abstract** is a short summary of the research paper, generally containing the four key elements below:

- Objective of the study
- Short description of the methodology
- Short description of major results
- Main conclusions of the study

The **Introduction** of a clinical research paper should clearly convey the purpose of the study.

A well constructed introduction will clearly show why the study is important and how it will contribute to the overall body of scientific knowledge.





## Content: Introduction

# Thinking Critically

After reading the Introduction, ask yourself the following questions to assess your own comprehension:

**What research influenced the authors' decision to engage in the described study?**

**What questions are the authors answering through the study?**

# Content: Materials & Methods

The **Materials and Methods** section provides technical information on the materials and methods used within the study

The section will often addresses the following:

- Research Subjects
- Treatment
- Study Design
- Treatment Groups
- Treatment Group Assignment
- Data Collection
- Endpoint
- Statistical Design

## Research Subjects

Information on the research subjects include:

- Demographic characteristics of the subjects
- Sample size
- Subject screening criteria used to include, exclude or withdraw research subjects from the study



## Treatment

Treatment refers to the specific clinical procedures and/or test material administered to research subjects during a study. The authors will typically provide information on the following:

- Description of treatment provided
- Treatment dosage
- Frequency of treatment provision
- Duration of treatment phase

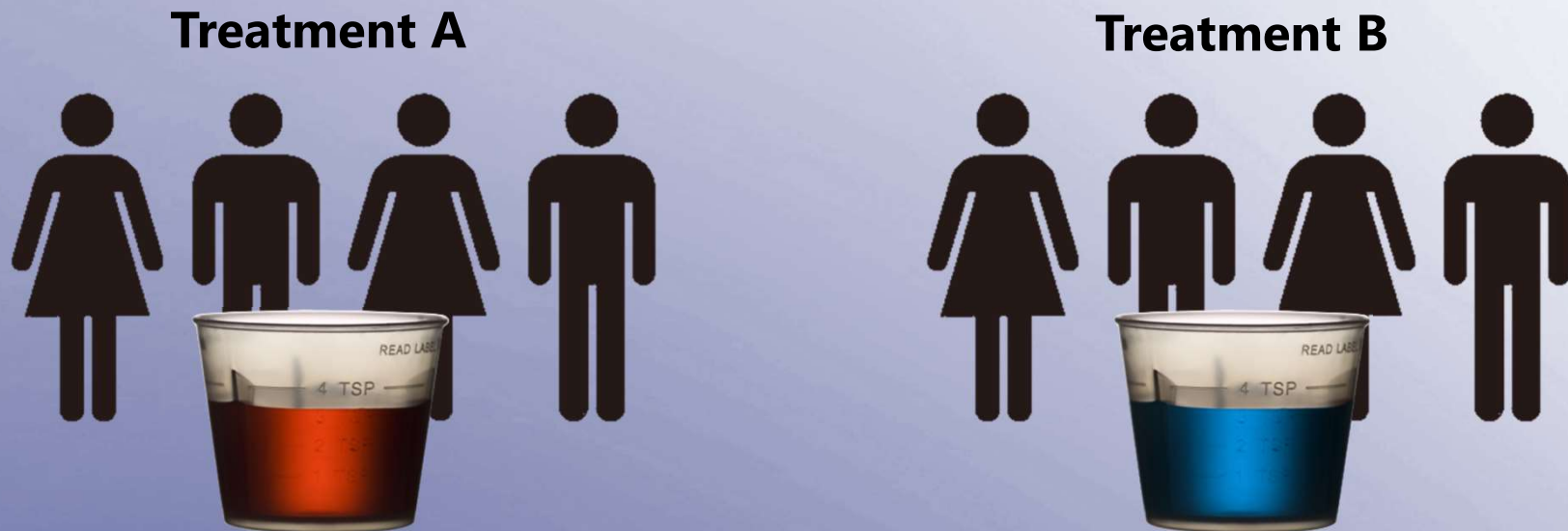


## Study Design

There are several types of clinical study design:

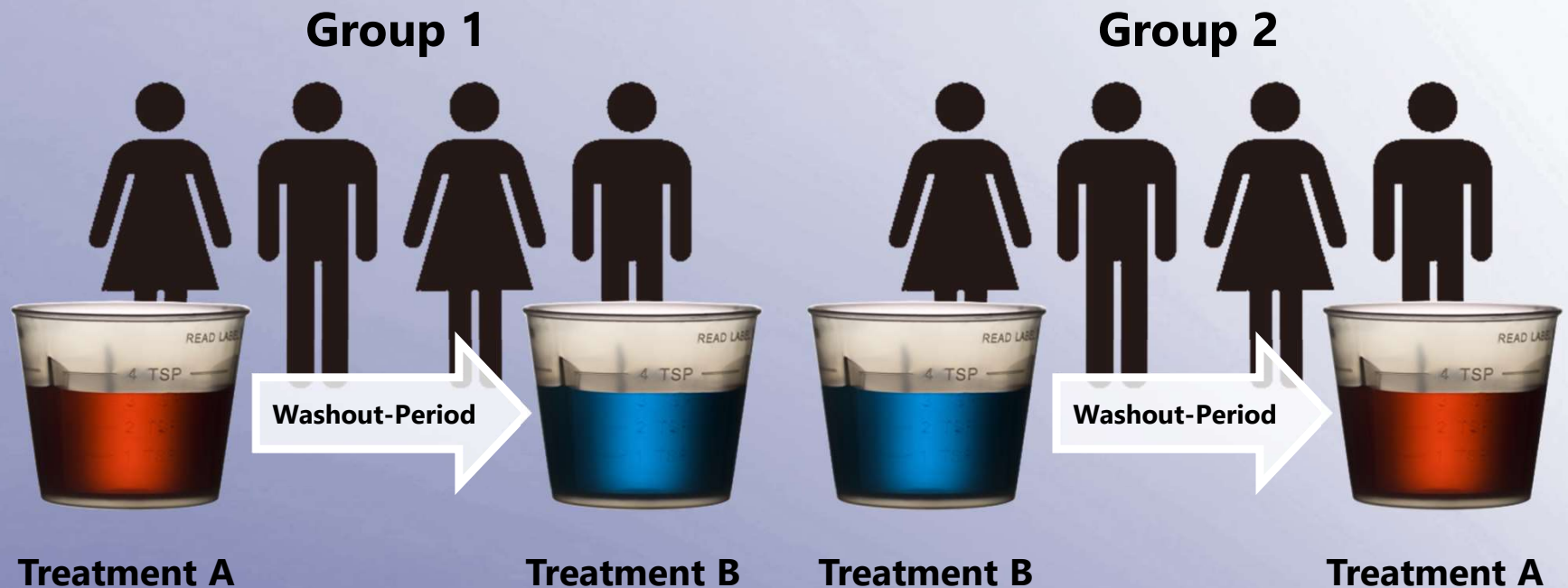
### Parallel Design

Subjects within each group simultaneously receive their respective treatment.



## Crossover Design

Subjects within each group simultaneously receive their respective treatment. After a washout period, the groups switch treatment.

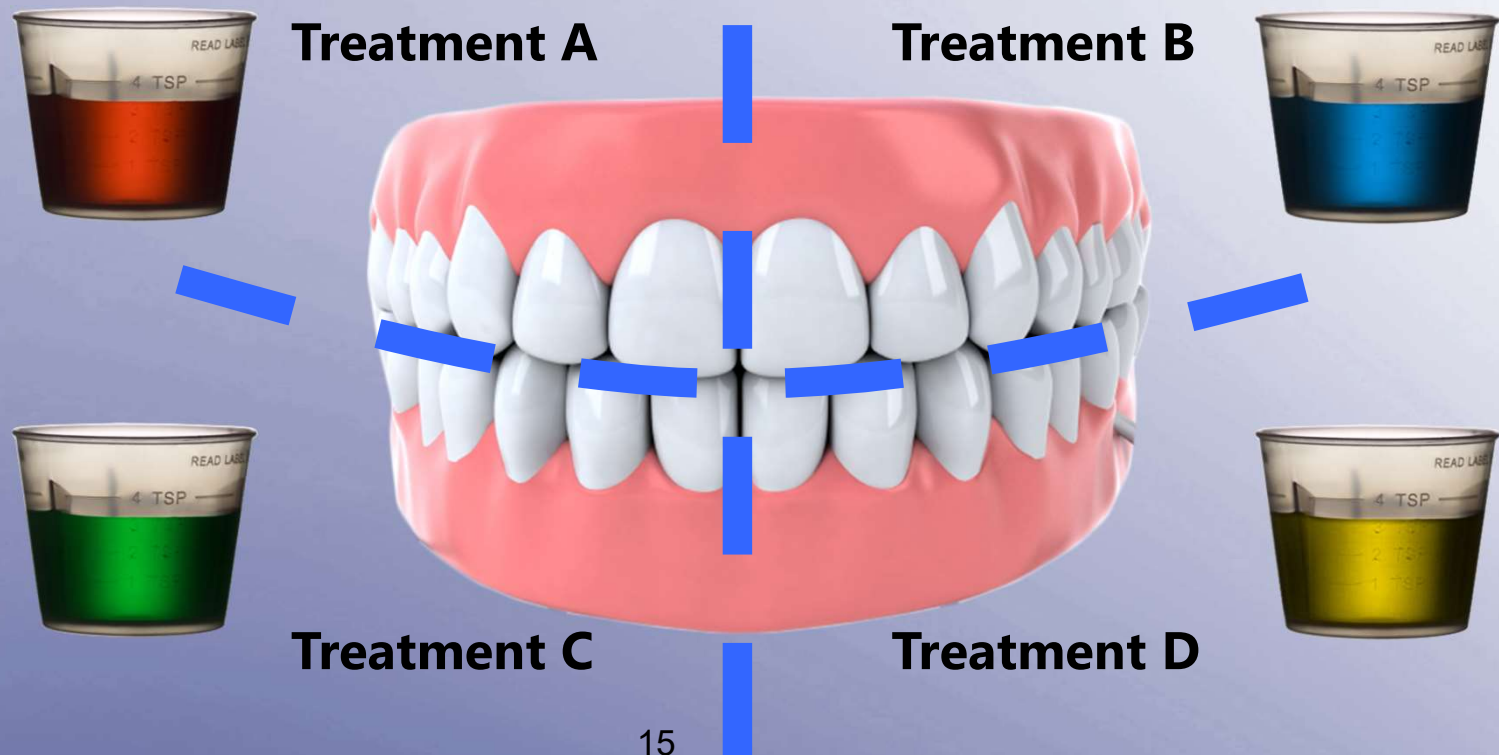




## Split Mouth

### – An example of a more specific dental design study

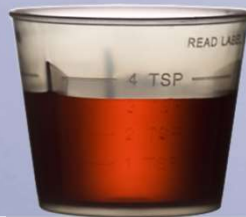
Within the split-mouth design, each subject's mouth is divided into units (i.e., quadrants) and each subject receives all treatments within the study.



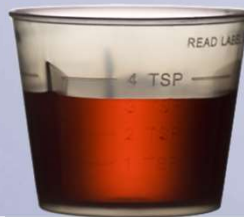
## Treatment Groups

Clinical studies are divided into treatment groups and each group receives a different treatment:

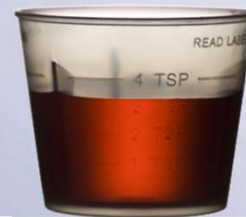
**Placebo  
Control**



**Positive  
Control**



**Negative  
Control**



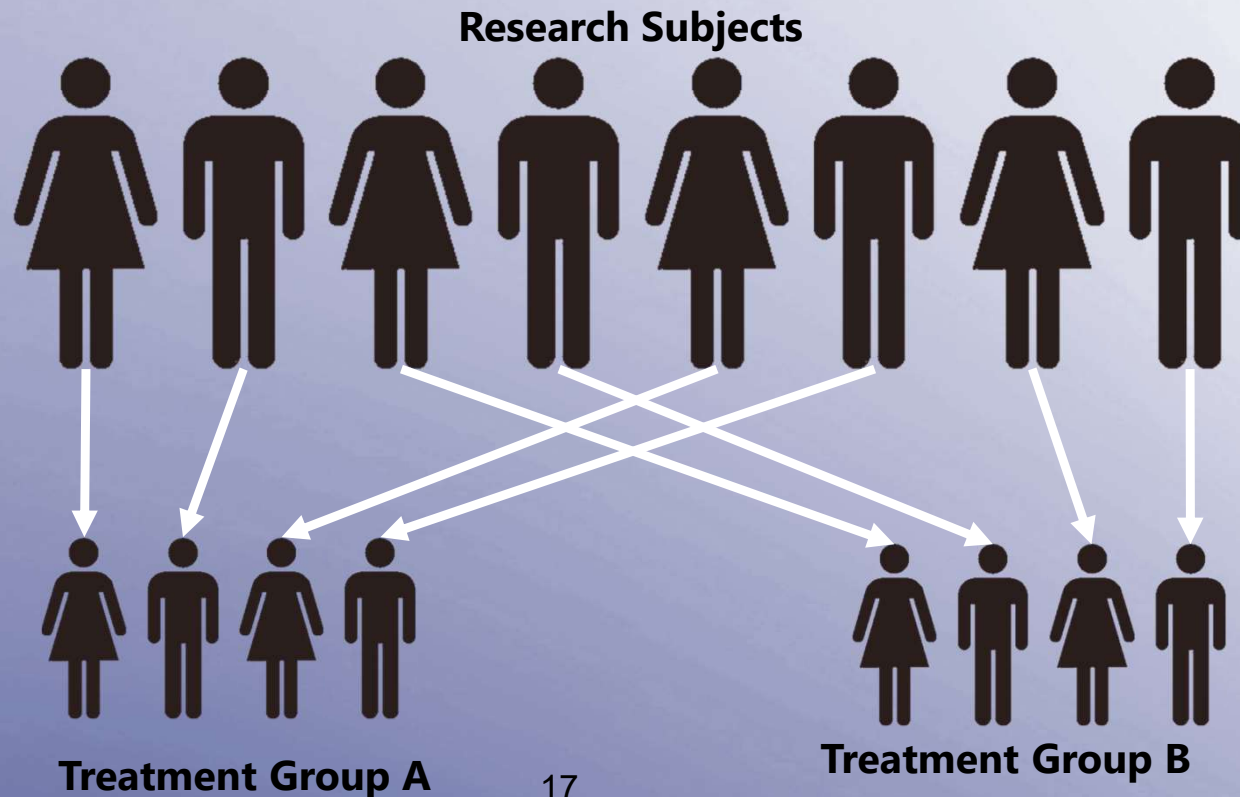
**Experimental  
Treatment**



Placebo Control Group	Positive Control Group	Negative Control Group	Experimental Group
Subjected to inert treatment	Subjected to treatment known to yield a positive result	Subjected to treatment known to yield no result	Subjected to the treatment under investigation

## Treatment Group Assignment

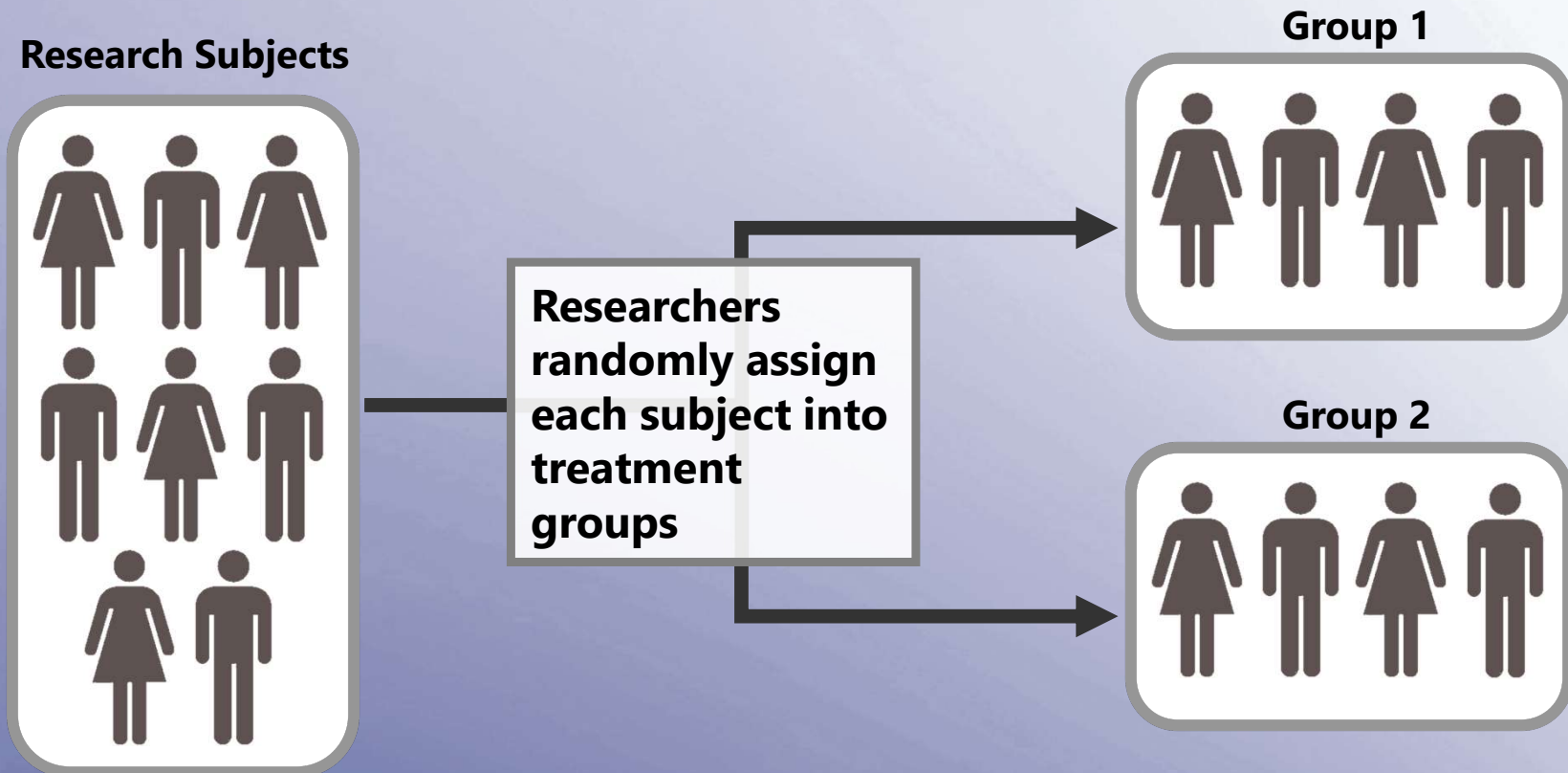
Prior to the administration of treatments, researchers will randomly divide research subjects into treatment groups. Doing so helps ensure that the particular grouping of subjects is not the cause of observed results



## Treatment Group Assignment

### Simple Randomization

is one assignment method researchers may use



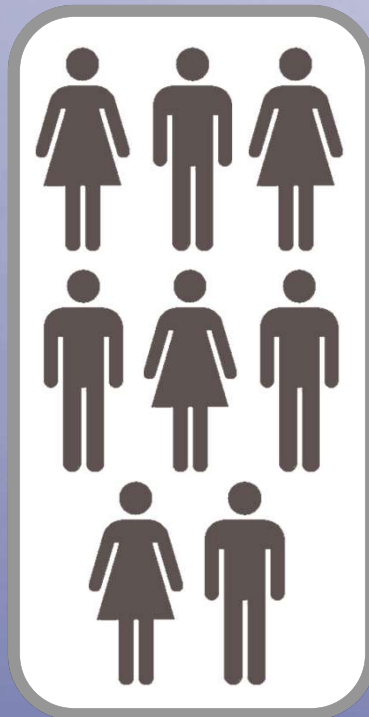


## Treatment Group Assignment

### Stratified Randomization

is another assignment method researchers may use

Research Subjects



Subjects are first split according to characteristics such as gender

Strata 1



Strata 2



Researchers randomize subjects within each strata to a treatment group.

Researchers randomize subjects within each strata to a treatment group.

Group A



Group B



Group C











Group D



## Blinding

is a technique used to minimize the impact of psychological bias on study results by ensuring that the subject and/or investigator/researcher do not know which treatment is received by which subject.

Blinding Type	Single Blind	Examiner Blind	Double Blind	Open
Subject				
Examiner				



## Data Collection

The clinical research paper should describe the study's data collection design by providing information on the following:

- Description of the data that was collected
- Method of data collection
- Instruments used for data collection
- Timing of data collection

To help demonstrate that the results are reproducible, researchers should also provide information on the following:

- Validity and reliability of data collection instruments
- Intra-rater & Inter-rater reliability

## Endpoints

The criteria used to determine whether a treatment is effective.

If you are testing the effectiveness of a **mouthrinse . . .**

... then the endpoint could be **reduction of gingivitis**

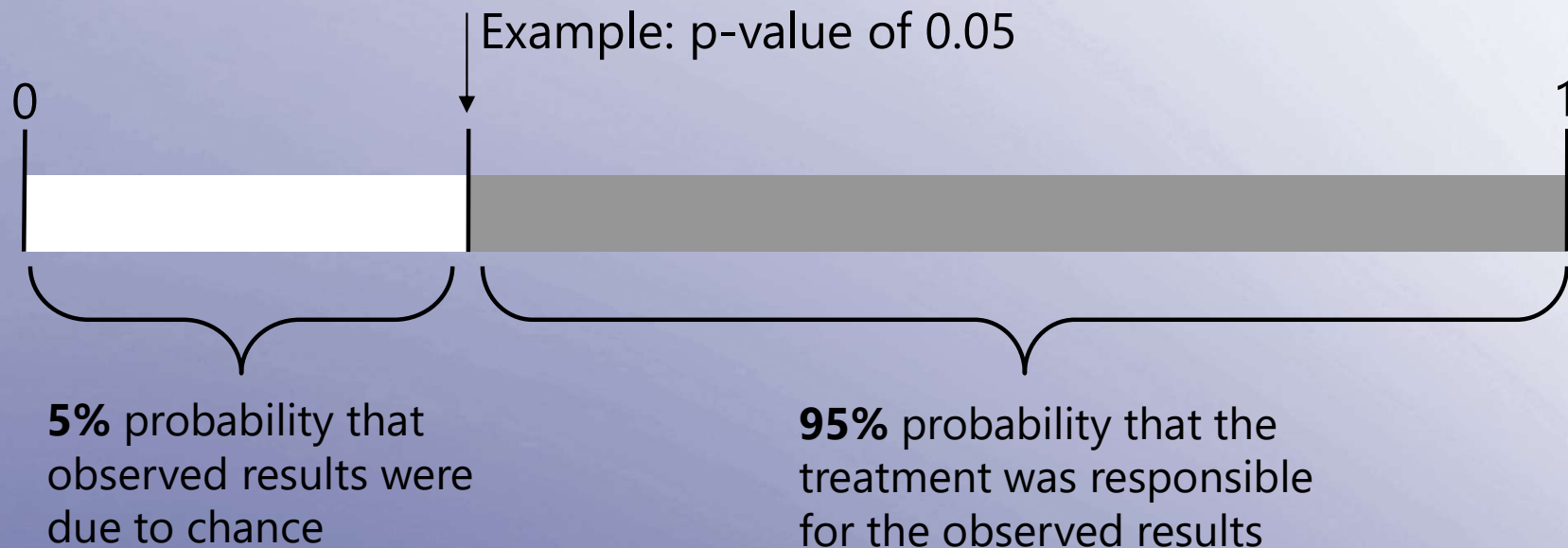


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## Statistical Design

To ensure the applicability of a study's findings to the general population, a variety of statistical techniques are applied during data analysis.

The **P-value** is used to assess whether a result is statistically significant



## Statistical Design

The size of the sample is another important consideration. The table below provides a general guideline for determining when a large or small sample size should be used.

Sample Size Guide		
Situation	Large sample size	Small Sample Size
Assessing rare occurrences	X	
Homogeneous populations / little variability exists within the population		X
Heterogeneous populations / great variability/diversity	X	
Assessing for small differences	X	
Pilot study		X



## Thinking Critically

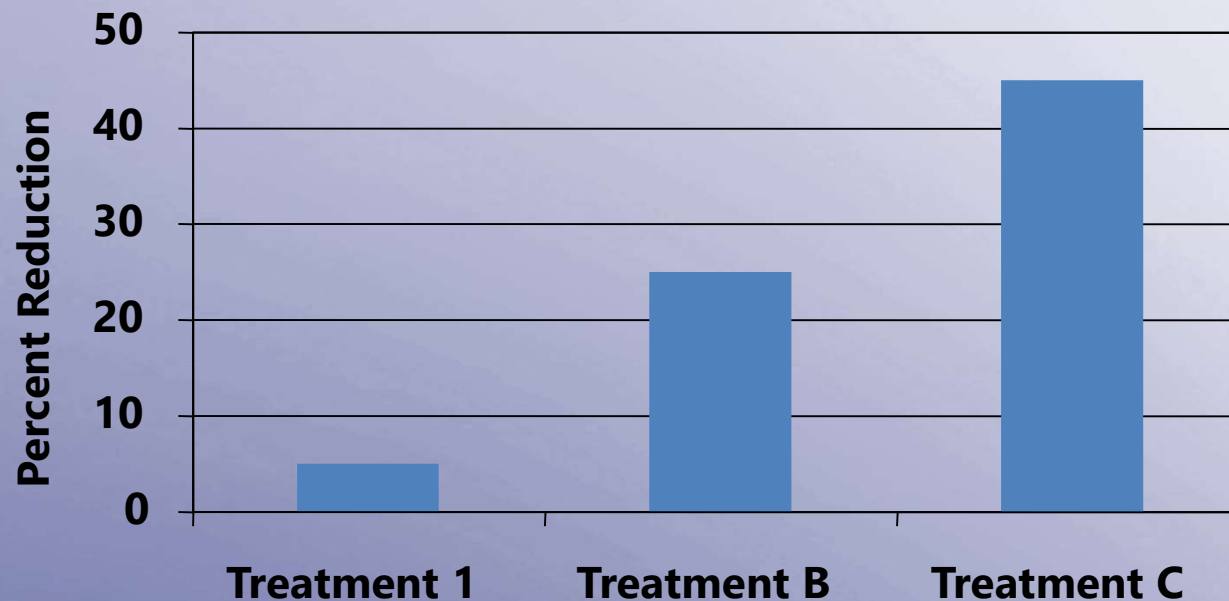
After reading the Materials & Methods section, ask yourself the following questions to assess your own comprehension:

- **What is the number of study subjects?**
- **What is the duration of treatment?**
- **Is there a control? If so, what is it?**
- **Are the subjects randomized into treatment groups?**
- **What type of study was used? Double blinded, single blinded, crossover, etc?**



**The Results section should summarize the study's findings without introducing interpretations of the data.**

**Reduction in Gingivitis Compared to Positive Control Group**



***Illustrative Example***





# Thinking Critically

After reading the Results section, ask yourself the following questions to assess your own comprehension:

- **What were the main study findings described in the Results section?**
- **Was a statistical method used to ensure an adequate sample size?**

**The Discussion section identifies the major findings within the study and also provides the authors' interpretation of the study results.**

Within this section, the authors may:

- Explain how their results fit within the existing body of scientific knowledge
- Address the clinical significance of the results
- Describe limitations of the study
- Suggest topics for further research



# Thinking Critically

After reading the Discussion section, ask yourself the following questions to assess your own comprehension:

- **What were the key findings?**
- **What limitations, if any, were described about the study?**

**The Conclusion section provides the authors' conclusions from the study.**

The conclusions should be logical and supported by data presented and analyzed in the Results and Discussion sections.





## Content: Conclusion

### Thinking Critically

After reading the Conclusion, ask yourself the following questions to assess your own comprehension:

- **Did the results support the conclusion?**

**The References section lists sources of information cited within the clinical research paper. It can help you:**

- Look up additional information on the subject
- Understand the types of sources that the author relies on most heavily





## Content: References

### Thinking Critically

The following questions can be used to critically examine the references section:

- **Are the references recent and up to date?**

# Professional Application

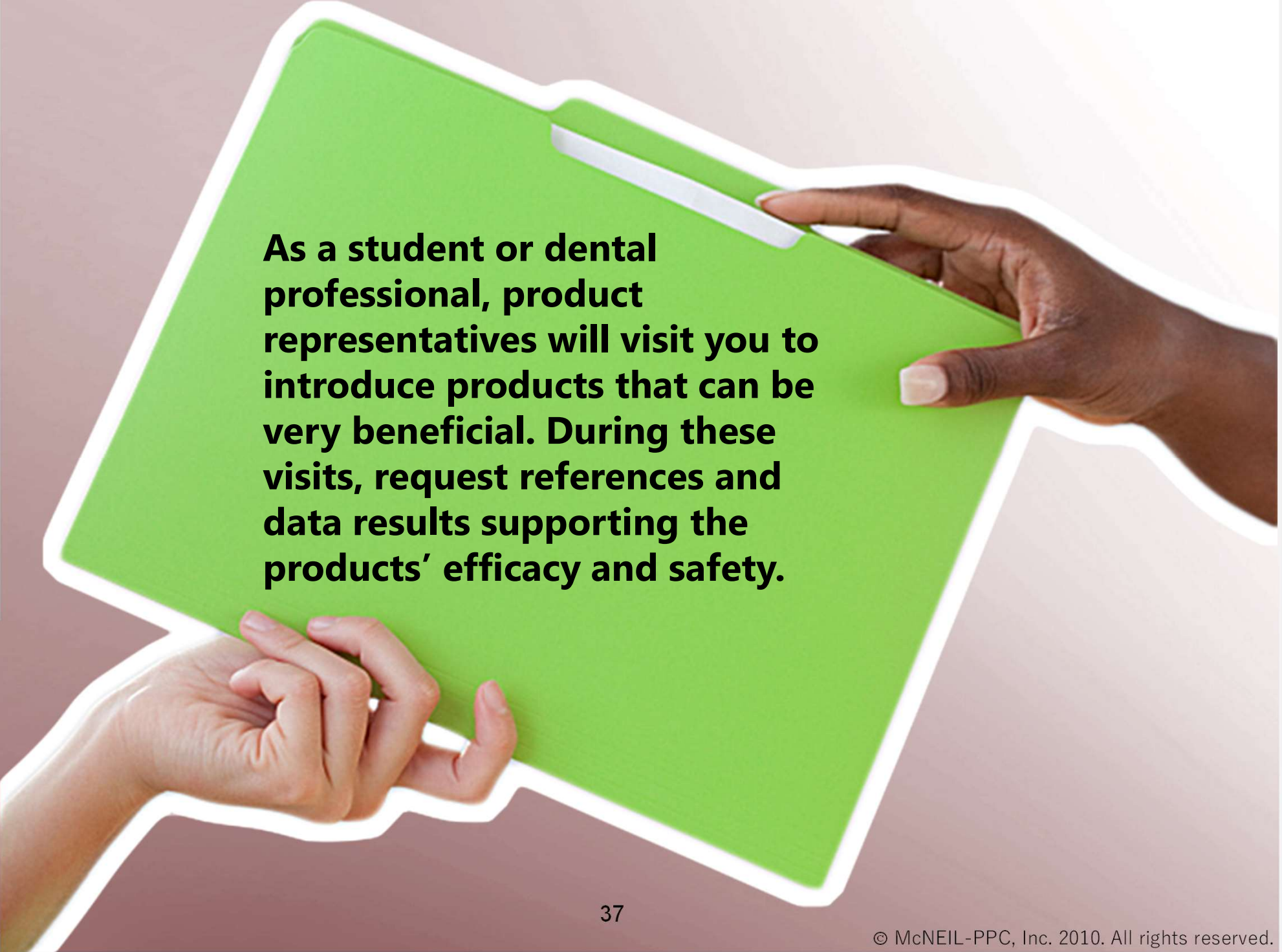


Science is evolving every day and the ability to critically read and evaluate clinical papers is a key skill needed in the professional world.

As you maintain your knowledge of oral healthcare science, you will encounter new and sometimes conflicting information. Try to find the supporting clinical research papers and review them to draw your own conclusions.





A hand with dark skin is holding a bright green folder. The folder has a white tab on the right side. The text is printed on the front of the folder. The background is a soft, out-of-focus light brown.

**As a student or dental professional, product representatives will visit you to introduce products that can be very beneficial. During these visits, request references and data results supporting the products' efficacy and safety.**



As with any other skill, critically reading and evaluating clinical research papers may be a challenging experience at first.

But these skills will help you lead an evidence-based practice, ensuring that you can give your patients the best possible care and recommendations.

