Items to Be Memorized: Clinical Trials

Remember first the mnemonic options you have available from which to choose:

Common sense thinking

Acronym

Acrostic

Categorization

Subject/Object/Verb imagery

Memory Palace imagery

Story Chain imagery

Data/Evidence

To remember what the plural word "data" refers to, you could **think your way** to the answer. "Data" should remind you of "date." Dates are NUMBERS. Even the words for the months represent the numerical order of each months during the year. However, that is just the basic meaning; data can occur in forms other than numbers (see next paragraph).

To remember the three kinds of variables, you might first **think** that the first stem in the word refers to VARY, and that suggests that variables are a class of possible responses in an experiment that vary, as affected by something. The values (data) of a variable come from a measurement, and that may be a number or an object, event, idea, feeling, time period, or any other type of response you are trying to measure.

If you think about an experiment, you must know by now that experiments measure something that is supposed to change or be affected by a treatment or manipulation of some kind. Thus, the data in this case will vary DEPENDING ON what the treatment is. This then would be a **dependent variable.**

Experiments usually have a variable that stands alone and IS NOT CHANGED by you are trying to measure. That is, this kind of variable is an **independent variable**. It doesn't depend on anything. You might say it is "baked into" the experimental design.

In a good experimental design, there must be a test group that is not treated or manipulated. This controls for the possibility that any test manipulation results might just occur by chance. Thus, this group is a **control variable.**

To remember an example of the three kinds of experimental variables, you might make a **Story Chain**. Think of yourself at your present age, and what happened to you yesterday. Make a list of the various things that happened yesterday in school. The impact of the classes changed

(dependent variable) as the day went along and depended on what classes you went to yesterday. You were still the same age (**independent variable**). Now imagine you repeated the day, but did not have any classes (**control variable**).

Scientific Method

How can you remember the elements of the scientific method? These are components of the modern scientific method.

1. **Question**

2. **Research**

3. **Hypothesis**

4. **Experiment**

5. **Analyze data**

6. **Conclusion**

7. **Communicate**

You might construct an acrostic: **Q**uizzes **R**equire **H**elp, **E**xpertise, **A**ttentiveness**, C**aution, and **C**are.

Or you could make a Memory Palace. Think, for example, imagine yourself as you enter the classroom. Posted on the door is a sheet of paper with **Questions** on it. You enter and, with the teacher's permission, you go to learning resource, like an encyclopedia, to do some **R**esearch related to the quiz questions. You don't find all the answers you need, so you guess some of them; that is you **Hypothesize** what the answers might be. Now you are not really so sure, so you go to another part of the room where demo **Experiments** are often done. You do an experiment or two to answer the questions you did not know the answers to, and then whip out a hand calculator to **Analyze** the data from the experiments. You rush over to your desk and write down your **Conclusions.** Then you read your conclusions to the class to **Communicate** to them what you figured out. (By the way, did you notice that this is also a Story Chain? What is different here is that each mental image is associated with a specifically located object).

Experimental Design

A **hypothesis** is a possible explanation that is based on knowledge, observations, and background research. Consider the stems in the word. "Hypo" means beneath or less than. "Thesis" is a position that you take, explain, try to defend. Thus, a hypothesis is something that is less than a definite thesis, but it is something you know a little about. That is, it is an uncertain possibility, not yet ready for taking a stand on. In other words, Hypotheses are **informed guesses**.

You hopefully learned that there three ways that a hypothesis can be written: cause and effect, comparison, correlation. How can you remember that? Maybe the acronym CECC would work. Saying it out loud with rhythm makes CECC easier to remember.

Or you could make a story chain where you are a baseball pitcher practicing your throw. You throw the ball and **hypothesize** that it will **cause** the **effect** of a strikeout. You **compare y**our curve and fastball. Is there any **correlation**? That is, do they both cause a miss or just one kind of pitch works.

You hopefully learned what experiments do: use appropriate selection of methods and groups to test a hypothesis. How can you remember that? You might use the Subject/Object/Verb technique. Your experimental task is to sort them into groups based on stage of ripeness. Picture yourself (you are the subject) looking at a bushel basket of bananas of various degrees of ripeness (green to yellow to brown) and scratch you head to decide what **method** to use to separate them into **groups** (pick them out one at a time, dump out on the table for hand selection, or dump them into a conveyor belt that sorts them automatically with a sorter based on color.

You are supposed to know about randomizing the assignment of subjects to each treatment group. You could use SOV. For example, picture yourself deciding to do homework today in two classes (math, biology). You could pre-determine a sequence based on the order of your grades in each class, which by definition is not random. You could also just flip a coin (heads = math first, tails = biology first), which would produce a **random** order.

You were supposed to learn that "placebos" are a fake treatment, such as a sugar pill instead of the drug being tested or a fake simulated operation procedure instead of the real one. Moreover, the patient is not supposed to know if they are getting the placebo. Maybe the word makes you **think** of "placid," which means extremely calm where nothing much is going on.

You learned about "blind" and "double-blind" testing. How to remember that? Well, you could use SOV, where you inject a drug into an animal with a blindfold on (**blind**), just using your sense of touch to guide the injection. Then you repeat, but there is a blindfold also on the patient (**double blind**).

You hopefully learned that **conclusions** are based on whether or not the data supported the hypothesis, the significance of the study, and future research. How can you remember that? You could probably **think this through**. Experiments test a hypothesis. So did the results **support the hypothesis**? The next question is "Can I believe the effect? Were results clearly not due to chance? Or was the effect so small that it doesn't make much practical difference" (**significance**). Whether they did nor did not, your next issue is, "What do I do next?" (**future research**).

Pre-clinical Trials

You learned that preclinical trials typically use animal experiments before performing the same results in humans. You should be able to remember that just by **thinking about** the word. "Clinical" implies you are referring to a test of drugs or treatment procedure in sick people. "Pre-

implies you are not ready to test this out in people, because you don't have enough information about the proposed treatment. So, you have to do something else first, such as use animals first to get some rough idea about safety, dose, side effects, likely response, and so on.

You may not like the idea of doing things to animals that might be unsafe or upsetting to the animal. But animal testing in medicine is deemed necessary before you try the same things in humans. Can you remember the reasons why? The reasons involve the following facts: animals are inexpensive to test, they have similar biology and diseases as humans, their short life cycles allow testing across long stretches of life span, even across several generations, and the experiments can help animals in veterinary medicine. Maybe the following **Story Chain** would help: you go to the doctor's office and on the way out you stop at the clerk's desk to make payment. Picture this scene: You whip out your wallet and grab some cash (**animals are less expensive**). The clerk grabs the bill while you are still holding it, and the bill stretches (**study across life span**). You grab another bill, which happens to be a Euro (**animals and humans are similar**). You had brought your pet dog with you to the office, and after finishing payment, the doctor gives a courtesy check of your dog (the whole thing **helps animals too**).

Clinical Trials

Just **thinking about the words** tells you what this is: medical testing in "real-world" conditions (usually thought of as being in humans, but in veterinary medicine, similar procedures apply to animals).

You are supposed to know the two things being tested in a clinical trial: safety and efficacy. How to remember? Just t about think it. Picture yourself as the owner of a drug company developing a new drug. What do you want it to do? You obviously want it to work (**efficacy**), otherwise nobody will buy it. You also want it to be **safe**, so you don't harm patients and maybe even get sued out of business.

You are also supposed to know where clinical trials are performed. How to remember? Just think of all the places where medicine is practiced: doctor offices, small medical clinics, medical schools, hospitals, and even businesses that act as contractors for clinical trials.

Finally, you are supposed to know what happens in the four phases of clinical trials. How do your remember what distinguishes them? You could just create a table with the four **categories**, with short-cut descriptions in each. Now you have much less to memorize.

Phase 1	Phase 2	Phase 3	Phase 4

Few people (20-80)	More people (100-300)	Even more people (300-3000)	FDA approval
Test for safety, look for side effects	More tests safety, for side effects	More effectiveness tests	Monitoring in medical practices
	Test effectiveness	Compare with existing treatments	

Wrap Up

If you made good mnemonics, here is all you need to remember:

Information to be Memorized	Mnemonic Approach
What are data?	Think your way to the answer (date)
Meaning of "variables?"	Think your way to the answer (word stem)
The three kinds of variables	Story Chain (what happened to you in school)
Elements of the scientific method	Acrostic (**Q**uizzes **R**equire **H**elp ….) or Memory Palace (walking to objects in classroom)
Meaning of "hypothesis"	Think your way to the answer (stems in the word)
Three ways to state a hypothesis	Acronym (CECC) or Story Chain (you pitching a baseball)
The two things experiments do	Story Chain (sort bananas into groups)
What is randomizing in experiments?	SOV (flip a coin to decide what to study first)
What are placebos?	Think your way to the answer (word stem)
What are blind and double-blind conditions?	Who wears blindfold during injections
How do you arrives at conclusions?	Think your way to the answer (what happens with the hypothesis)
Definition of pre-clinical trials	Think your way to the answer (word stems)
Why is animal research permitted?	Story Chain (paying a doctor bill)

What are Clinical Trials	Think your way to the answer (word meaning)
What are the phases of Clinical Trials?	Categorize in a four-column table

If you have trouble with remembering any of these, consider re-making the mnemonic in a way that creates a stronger association for you.