What is the definition of Permuted Block Randomization and can you provide examples?

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Permuted Block Randomization is a method used in research studies to ensure equal distribution of participants into different groups. It involves dividing participants into blocks, or small groups, and then randomly assigning them to different groups within each block. This helps to reduce bias and ensure that all groups are similar in terms of characteristics and potential confounding factors. An example of this could be a clinical trial where participants are divided into blocks of 10, and then randomly assigned to either the treatment or control group within each block. This ensures that each group has an equal number of participants with similar characteristics. Another example could be a survey where participants are divided into blocks based on age, and then randomly assigned to different versions of the survey within each block. This helps to control for the potential influence of age on the responses.

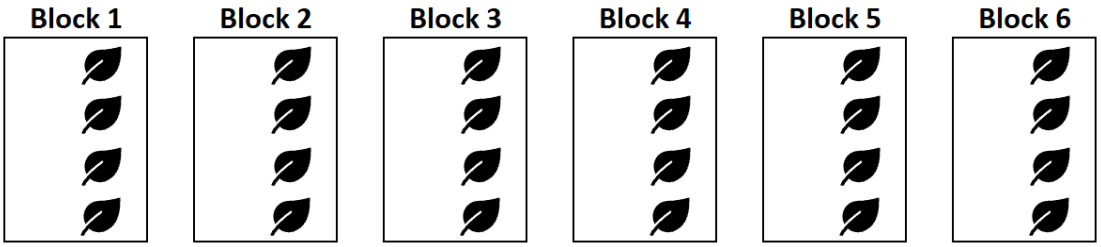
Permuted Block Randomization: Definition & Examples

Permuted block randomization is a technique that can be used to randomly assign individuals in an experiment to a certain treatment within a block.

For example, suppose we want to test whether or not fertilizer A or fertilizer B leads to more growth in 24 plants across six different fields. Our *treatments* are fertilizer A and fertilizer B while our *blocks* are the different fields.

We can use the following steps to set up a permuted block randomization for this experiment:

Step 1: Place each plant in one of the six blocks based on their field.



Step 2: Generate all of the possible treatment arrangements.

The total possible treatment arrangements can be calculated as:

Total arrangements = b! / (b - t)!

where:

b: Block sizet: Total number of treatments

In this example, there will be 4! / (4-2)! = 12/2 = 6 total arrangements.

Here's what they'll look like if we list them out:

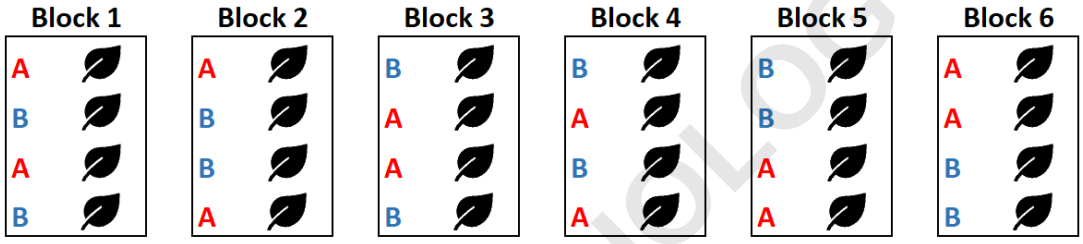
AABB
ABBA
ABAB
BBAA

BABA

BAAB

Step 3: Randomly assign one arrangement to each block.

Next, we'll randomly assign one of the treatment arrangements to each block:



Notice that each block has a different treatment arrangement. Thus, our permuted block randomization is complete and we can proceed with the experiment.

Potential Advantages & Disadvantages

There are two main advantages of using a permuted block randomization:

1. Each block has the same number of individuals in each treatment.

2. There are an equal number of individuals assigned to each treatment at *any point in the experiment*. This is especially valuable if the experiment were to end early because researchers would have the same amount of data for each treatment group.

There is one potential disadvantage to using a permutated block randomization:

1. If the researchers know the block size then they may be able to know which treatment group a given individual will be assigned to late in the block. For example, if the block size is 4 (like in the example above) and 2 plants have already been assigned to fertilizer A, then the researcher will know that the last plant will be assigned to fertilizer B.

In a given experiment, researchers should ideally not know which individuals are assigned to which treatment so they don't unknowingly act in a certain way to produce desired results.

One way to remedy this problem is through *blinding*, in which a third-party assigns individuals to treatments so that the researchers aren't aware of the treatment

assignments.

Pretest-Posttest Design

Matched Pairs Design

Treatment Diffusion