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Example of matched pairs design

TypesSummaryLearning CheckExperiment Terminology Experimental design refers to how participants are allocated to different groups in an experiment. Types of design include repeated measures, independent groups, and matched pairs designs. Probably the most common way to design an experiment in psychology is to divide the participants into two groups, the experimental group and the control group, and then introduce a change to the experimental group, not the control group. The researcher must decide how he/she will allocate their sample to the different experimental groups. For example, if there are 10 participants, will all 10 participants participate in both groups (e.g., repeated measures), or will the participants be split in half and take part in only one group each? Types 1. Independent Measures Independent measures design, also known as between-groups, is an experimental design where different participants are used in each condition of the independent variable. This means that each condition of the experiment includes a different group of participants. This should be done by random allocation, ensuring that each participant has an equal chance of being assigned to one group. Independent measures involve using two separate groups of participants, one in each condition. For example: Con: More people are needed than with the repeated measures design (i.e., more time-consuming). Pro: Avoids order effects (such as practice or fatigue) as people participate in one condition only. If a person is involved in several conditions, they may become bored, tired, and fed up by the time they come to the second condition or become wise to the requirements of the experiment! Con: Differences between participants in the groups may affect results, for example, variations in age, gender, or social background. These differences are known as participant variables (i.e., a type of extraneous variable). Control: After the participants have been recruited, they should be randomly assigned to their groups. This should ensure the groups are similar, on average (reducing participant variables). 2. Repeated Measures Design Repeated Measures design is an experimental design where the same participants participate in each independent variable condition. This means that each experiment condition includes the same group of participants. Repeated Measures design is also known as within-groups or within-subjects design. Pro: As the same participants are used in each condition, participant variables (i.e., individual differences) are reduced. Con: There may be order effects. Order effects refer to the order of the conditions affecting the participants' behavior. Performance in the second condition may be better because the participants know what to do (i.e., practice effect). Or their performance might be worse in the second condition because they are tired (i.e., fatigue effect). This limitation can be controlled using counterbalancing. Pro: Fewer people are needed as they participate in all conditions (i.e., saves time). Control: To combat order effects, the researcher counter-balances the order of the conditions for the participants. Alternating the order in which participants perform in different conditions of an experiment. Counterbalancing Suppose we used a repeated measures design in which all of the participants first learned words in "loud noise" and then learned them in "no noise." We expect the participants to learn better in "no noise" because of order effects, such as practice. However, a researcher can control for order effects using counterbalancing. The sample would be split into two groups: experimental (A) and control (B). For example, group 1 does 'A' then 'B,' and group 2 does 'B' then 'A.' This is to eliminate order effects. Although order effects occur for each participant, they balance each other out in the results because they occur equally in both groups. 3. Matched Pairs Design A matched pairs design is an experimental design where pairs of participants are matched in terms of key variables, such as age or socioeconomic status. One member of each pair is then placed into the experimental group and the other member into the control group. One member of each matched pair must be randomly assigned to the experimental group and the other to the control group. Con: If one participant drops out, you lose 2 PPs' data. Pro: Reduces participant variables because the researcher has tried to pair up the participants so that each condition has people with similar abilities and characteristics. Con: Very time-consuming trying to find closely matched pairs. Pro: It avoids order effects, so counterbalancing is not necessary. Con: Impossible to match people exactly unless they are identical twins! Control: Members of each pair should be randomly assigned to conditions. However, this does not solve all these problems. Summary Experimental design refers to how participants are allocated to an experiment's different conditions (or IV levels). There are three types: 1. Independent measures / between-groups: Different participants are used in each condition of the independent variable. 2. Repeated measures /within groups: The same participants take part in each condition of the independent variable. 3. Matched pairs: Each condition uses different participants, but they are matched in terms of important characteristics, e.g., gender, age, intelligence, etc. Learning Check Read about each of the experiments below. For each experiment, identify (1) which experimental design was used; and (2) why the researcher might have used that design. 1 . To compare the effectiveness of two different types of therapy for depression, depressed patients were assigned to receive either cognitive therapy or behavior therapy for a 12-week period. The researchers attempted to ensure that the patients in the two groups had similar severity of depressed symptoms by administering a standardized test of depression to each participant, then pairing them according to the severity of their symptoms. 2 . To assess the difference in reading comprehension between 7 and 9-year-olds, a researcher recruited each group from a local primary school. They were given the same passage of text to read and then asked a series of questions to assess their understanding. 3 . To assess the effectiveness of two different ways of teaching reading, a group of 5-year-olds was recruited from a primary school. Their level of reading ability was assessed, and then they were taught using scheme one for 20 weeks. At the end of this period, their reading was reassessed, and a reading improvement score was calculated. They were then taught using scheme two for a further 20 weeks, and another reading improvement score for this period was calculated. The reading improvement scores for each child were then compared. 4 . To assess the effect of the organization on recall, a researcher randomly assigned student volunteers to two conditions. Condition one attempted to recall a list of words that were organized into meaningful categories; condition two attempted to recall the same words, randomly grouped on the page. Experiment Terminology The degree to which an investigation represents real-life experiences. These are the ways that the experimenter can accidentally influence the participant through their appearance or behavior. The clues in an experiment lead the participants to think they know what the researcher is looking for (e.g., the experimenter's body language). The variable the experimenter manipulates (i.e., changes) is assumed to have a direct effect on the dependent variable. Variable the experimenter measures. This is the outcome (i.e., the result) of a study. All variables which are not independent variables but could affect the results (DV) of the experiment. Extraneous variables should be controlled where possible. Variable(s) that have affected the results (DV), apart from the IV. A confounding variable could be an extraneous variable that has not been controlled. Randomly allocating participants to independent variable conditions means that all participants should have an equal chance of taking part in each condition. The principle of random allocation is to avoid bias in how the experiment is carried out and limit the effects of participant variables. Changes in participants' performance due to their repeating the same or similar test more than once. Examples of order effects include: (i) practice effect: an improvement in performance on a task due to repetition, for example, because of familiarity with the task; (ii) fatigue effect: a decrease in performance of a task due to repetition, for example, because of boredom or tiredness. Olivia Guy-Evans, MSc BSc (Hons) Psychology, MSc Psychology of Education Associate Editor for Simply Psychology Olivia Guy-Evans is a writer and associate editor for Simply Psychology. She has previously worked in healthcare and educational sectors. Saul McLeod, PhD Editor-in-Chief for Simply Psychology BSc (Hons) Psychology, MRes, PhD, University of Manchester Saul McLeod, PhD., is a qualified psychology teacher with over 18 years of experience in further and higher education. He has been published in peer-reviewed journals, including the Journal of Clinical Psychology. A matched pairs design is an experimental design that is used when an experiment only has two treatment conditions. The subjects in the experiment are grouped together into pairs based on some variable they "match" on, such as age or gender. Then, within each pair, subjects are randomly assigned to different treatments Example of a Matched Pairs Design Suppose researchers want to know how a new diet affects weight loss compared to a standard diet. Since this experiment only has two treatment conditions (new diet and standard diet), they can use a matched pairs design. They recruit 100 subjects, then group the subjects into 50 pairs based on their age and gender. For example: A 25-year-old male will be paired with another 25-year-old male, since they "match" in terms of age and gender. A 30-year-old female will be paired with another 30-year-old female since they also match on age and gender, and so on. Then, within each pair, one subject will randomly be assigned to follow the new diet for 30 days and the other subject will be assigned to follow the standard diet for 30 days. At the end of the 30 days, researchers will measure the total weight loss for each subject. Advantages & Disadvantages of a Matched Pairs Design There are some notable advantages and some potential disadvantages of using a matched pairs design. Advantages: 1. Controls for lurking variables. A lurking variable is a variable that is not accounted for in an experiment that could potentially affect the outcomes of the experiment. In the previous example, both age and gender can have a significant effect on weight loss. By matching subjects based on these two variables, we are eliminating the effect that these two variables could have on weight loss since we're only comparing the weight loss between subjects who are identical in age and gender. Thus, any difference in weight loss that we observe can be attributed to the diet, as opposed to age or gender. 2. Eliminates order effect. Order effect refers to differences in outcomes due to the order in which experimental materials are presented to subjects. By using a matched pairs design, you don't have to worry about order effect since each subject only receives one treatment. In our previous example, each subject in the experiment was only placed on one diet. If instead we made one subject use the standard diet for 30 days, then the new diet for 30 days, there could be an order effect due to the fact that the subject used one particular diet before the other. Disadvantages: 1. Losing two subjects if one drops out. If one subject decides to drop out of the study, you actually lose two subjects since you no longer have a complete pair. 2. Time-consuming to find matches. It can be quite time-consuming to find subjects who match on certain variables, particularly if you use two or more variables. For example, it might not be hard to find 50 females to use as pairs, but it could be quite hard to find 50 female pairs in which each pair matches exactly on age. 3. Impossible to match subjects perfectly. No matter how hard researchers try, there will always be some variation within the subjects in each pair. The only way to match perfectly is to find identical twins who essentially share the same genetic code, which is actually why identical twins are often used in matched pairs studies. Advantages of Using Ranges in a Matched Pairs Design One way to make it slightly easier to find subjects that match is to use ranges for the variables you're attempting to match on. For example, instead of matching a 22-year-old with another 22-year old, researchers may instead create age ranges like 21-25, 26-30, 31-35, etc. so they can match one subject in the 21-25 age range with another subject in the 21-25 age range. Using ranges has pros and cons. The obvious pro is that you can find matches more easily, but the con is that the subjects will match less precisely. For example, using the approach above it's possible for a 21-year-old and a 25-year-old to be matched up, which is a rather notable difference in age. This is a trade-off that researchers must decide is worth or not in order to find pairs more easily. In order to continue enjoying our site, we ask that you confirm your identity as a human. Thank you very much for your cooperation. A matched pairs design is an experimental design that is used when an experiment only has two treatment conditions. The subjects in the experiment are grouped together into pairs based on some variable they "match" on, such as age or gender. Then, within each pair, subjects are randomly assigned to different treatmentsExample of a Matched Pairs DesignSuppose researchers want to know how a new diet affects weight loss compared to a standard diet. 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