Within-subjects design counterbalancing

In a normal experiment, the order of treatments can actually influence the behaviour of subjects or provoke a false response due to fatigue or the behaviour of many subjects due to external factors. To combat this, researchers often use a counterweight, reducing the chances of a treatment order or other factors that are harmful to the results. What is the design of counterbalance measures? The simplest design of counterbalance measures is used when there are two possible conditions, A and B. As with standard repetitive procedure planning, researchers want to test each subject for both conditions. They divide the subjects into two groups and the other group is treated with Condition A, followed by Condition B, and the other is tested on condition B and then on condition A. Three conditions If you have three conditions, the process is exactly the same and you would divide the topics into 6 groups that are discussed in ORDERS ABC, ACB, BAC, BCA, CAB and CBA. Four conditions The problem with full counterweight is that in complex experiments with multiple conditions, permutations multiply rapidly and the research project becomes very difficult. For example, four possible conditions require 24 treatment prescriptions (4x3x2x1), and the number of participants must be a multiple of 24, since you need an equal number in each group. With more than four conditions of 5 conditions you will need a once-and-run machines 120 (5x4x3x2x1), and 7 you will need 5040! This is therefore impractical for all but large research projects with huge budgets, and a compromise is needed. Incomplete counterbalance measures Models Incomplete counterbalance measures are a compromise designed to balance counterweight strengths with economic and practical reality. One such imperfect counterweight design is Latin Square, which tends to circumvent some complex issues and keep the experiment in reasonable size. In Latin squares, a five-part research programme would look like this: Position 1 Station 2 Station 3 Station 4 Station 5 Order 1 A B C D E Order 2 B C D E A Order 3 C D E A B Order 4 D E A B C Order 5 E A B C D Latin Square Design has its purpose and is a good compromise in many research projects. However, it continues to suffer from the same weakness as the usual planning of repeated measures, as the transfer effects are a problem. Latin Square A always precedes B, and this means that anything in A mode that potentially affects B affects all but one of the orders. In addition, A always monitors E, and these intervals may compromise the validity of the test. This way is to use a balanced Latin square, which is a little more complex, but ensures that the risk of transfer effects is much lower. For tests with a steady number Formula 1, 2, n, 3, n-1, 4, n-2..., where n is the number of conditions, is followed in the first row of latin square. For the following lines, you add one to the previous one, returning to 1 after. Sounds complicated, so it's much easier to look at an example of a six-condition test. The test groups are marked A-F, the columns represent the conditions tested, and the rows represent the subject groups: Topics 1. 2. 3. 4. 5. 6.C 3 4 2 5 1 6 D 4 5 3 6 2 1 E 5 6 4 1 3 2 F 6 1 5 2 4 3 , this ensures that each disease monitors each other condition once, allowing researchers to pick up any transfer effects during statistical analysis. When planning an experiment with an odd number of conditions, the process is a little more complicated and two Latin Squares are needed to avoid transfer effects. The first was created in exactly the same way and the second is a mirror image: 1 2 5 3 4 2 3 1 4 3 4 2 5 1 4 5 3 1 2 5 1 4 2 3 4 3 5 2 1 5 4 1 3 2 1 5 2 4 3 3 3 5 4 3 2 4 1 5 This model , each disease follows twice more, and statistical tests allow researchers to analyze the data. This balanced Latin Square is a commonly used tool for running large repetitive measured models, and is an excellent compromise between maintaining competence and practicality. There are other variations in counterbalance measures, but these variations are by far the most common. This gives as many sets of data as there are conditions for each participant; the fact that subjects act as their own control is a way of reducing the number of errors due to natural variance between individuals. These tests are common in many areas of research. A parenting researcher may want to study the impact of the new program on children and test them before and after the new method. Psychologists often use them to test the relative effectiveness of a new treatment, often a difficult proposition. The complexity of the human mind and the large number of possible confusing variables often make the models between subjects unreliable, especially when small groups of samples make a more random approach impossible. Examples of Within Subject templates One of the simplest topic models is opinion - see all the official discussions and you will see the process. The President shall vote before the debate to form a basic opinion and shall ask the public to vote again at the end. Of course, the team with the most votes managed to shake opinions on the same subjects much better, so it can be announced as the winner. Another common example of the design of subjects is medical testing, in which scientists try to determine whether the drug is effective or if the placebo effect is okay. Scientists, in raw form give all participants placebo for a while and monitor the results. Then they would give the drug for a while and test the results. Of course, scientists could just as easily administer the drug first and then a placebo. This ensures that each topic acts as its own control, so there are few problems with age, gender and lifestyle matching, which reduces the chance of confusing. Benefits of Within Subject models The main advantage that subject design has between topic design is that it requires fewer participants, making the process much more streamlined and less resource-heavy. For example, if you want to test four conditions, a group of four 30 participants is difficult and expensive to use. Using one group, which is tested on all four, is a much easier way. Ease is not the only advantage, since well-designed test subject design allows researchers to monitor the impact on individuals much more easily and reduce the possibility of individual differences in misrepresenting results. Disadvantages of Within Subject models One drawback of this research design is the problem of transfer effects, where the first test adversely affects the second. Two examples of this, which have opposite effects, are fatigue and practice. In a lengthy experiment with multiple conditions, participants can be tired and thoroughly tired of researchers prying and asking questions and pressuring them to take tests. This can impair their performance in the last study. Alternatively, the practical effect may mean that they are more confident and will be achieved after the first condition, simply because experience has made them more confident about running tests. As a result, many experiments prefer counterbalance planning, where the order of treatments is preferred, but this is not always possible. Show page numbers Counterweight is a procedure that allows the researcher to control the effects of nuisance tappings on models where the same participants are repeatedly subjected to conditions, treatments or stimuli (e.g. inside subjects or patterns of repeated procedures). Counterweight refers to a systematic variation in the order of the conditions of the study, which improves the validity of the research interval. In the case of experimental models, the most common counterbalanced nuisances (perplexed) are procedural variables (i.e. tempor or space location) that can create sequence and sequence effects. In almost experimental models, inhibitors (e.g. age, gender) can also be balanced to control their effects with a dependent variable of interest, compensating for the lack of random task and the confusion that may result from systematic selection bias. ... All B C D E F G H I J J L M N O P Q R S T U V X Y Z per page: 20 40 60 Learning Learning Explain the difference between experiments between subjects and subjects, list the pros and cons of each approach, and decide which approach to use to answer a specific study question. Define a random task, separate it from random sample, explain its purpose in an experimental study, and use some simple strategies to implement Define multiple types of transfer effects, give examples of each, and explain how counterweight helps address them. In this section, we will look at some different ways to plan your experiment. The primary difference is in approaches where each participant experiences the level of one independent variable and in approaches where each participant experiences all levels of the independent variable. The latter are called experiments between subjects and the latter are called test subjects. Testing between subjects In the test between subjects, each participant is tested in only one space. For example, a researcher with a sample of 100 university students can order half of them to write about a traumatic event and the other half write about a neutral event. Or a researcher with a sample of 60 people with severe agoraphobia (fear of open spaces) can order 20 of them to receive each of the three different treatments for this disorder. In the experiment between subjects, it is essential that the researcher prescribes participants for the conditions so that the different groups are very similar on average. For example, those in trauma and neutral condition should include a similar proportion of men and women, and should have similar average IQ rates, a similar average level of motivation, a similar average number of health problems, and so on. This reconciliation point concerns the control of these foreign participant variables under different circumstances so that they do not become confusing variables. Random task The primary way researchers can manage foreign variables under different conditions is called a random task, which means using a random process to determine which participants are tested under which circumstances. Do not confuse random determination with random sample. Random sample is a method of selecting a sample from a population and is rarely used in psychological research. A random task is a method by which sample participants can be defined in different circumstances and is an important part of all experimental research in psychology and other fields as well. In the strictest sense, a random task should meet two criteria. One is that each participant has an equal chance of being assigned under each condition (e.g. a 50% chance of being assigned to each of the two conditions). The second is that each participant is assigned a condition remember to remember Thus, one way to determine two conditions for participants would be to flip a coin against each one. If the heads of the coin land, the participant is given condition A, and if it lands the following, the participant is assigned to condition B. Three conditions can be used to create a random integer from 1 to 3 for each participant. If the integer is 1, the participant is assigned to condition A; if it is 2, the participant is assigned to Condition B; and if it is 3, the participant is assigned to condition C. When a procedure is computerized, the computer program often handles a random task. One of the problems with flipping coins and other strict procedures for random determinations is that they are likely to lead to sample sizes of different sizes under different conditions. Sample sizes of different sizes are usually not a serious problem, and data already collected should never be thrown away to equal sample sizes. However, for a fixed number of participants, it is statistically most effective to divide them into groups of the same size. Therefore, it is standard practice to use a type of modified random task that keeps the number of participants in each group as similar as possible. One approach is to prevent randomisation. When randomized a block, all conditions occur once in a series before any of them are repeated. Then they all happen again before any of them are repeated again. For each of these blocks, conditions occur in random order. Again, the order of criteria is usually created before the participants are tested, and each new participant is assigned to the next condition in the series. Table 5.2 shows such a series for the determination of nine participants under three conditions. The Research Randomizer website ( ) creates block randomting cycles for multiple participants and conditions. Again, once the procedure is computerized, the computer program often handles block randomisation. Table 5.2 Block random order for the determination of nine participants in three conditions Participant Condition 1 A 2 C 3 B 4 B 5 B 5 C 6 A 7 C 8 B 9 The random task does not guarantee the control of all foreign variables under different circumstances. The process is random, so it is always possible that only by chance, participants in one condition can be significantly older, less tired, more motivated or less depressed on average than participants in another condition. However, there are some reasons why this possibility is not a major concern. One is that the occasional task works better than one might expect, especially in large samples. is that the inconsable statistics used by researchers to decide whether the difference between groups reflects population differences take into account the instability of random divides. The second reason is that although a random task leads to a confusing variable and thus produces misleading results, this confusion is likely to be observed when the experiment is repeated. The end result is that randomly rediscovery – although not infallible, foreign variables to regulate – is always considered a strength of research planning. Matching groups The alternative to a simple random definition of participants for conditions is the use of the design of matched groups. Using this model, participants in different criteria match a dependent variable or some foreign variables before manipulating an independent variable. This ensures that these variables are not confused under experimental conditions. For example, if we want to find out whether expressive writing affects human health, we could start by measuring different health-related variables in our potential research partners. We could then use this information to rank participants according to how healthy or unhealthy they are. Next, the two healthiest participants are randomly assigned to perform different conditions (one randomly assigned to traumatic experiences in writing mode and the other to neutral writing condition). The following two healthiest participants are then randomly assigned to perform different conditions and so on until the two least healthy participants. This method would ensure that participants in the writing condition of traumatic experiences are adapted at the beginning of the study to participants in neutral writing fitness from their state of health. If a health difference was observed at the end of the experiment in two conditions, we know that it is due to writing manipulation and not to existing health incursions. Test subjects In the test subjects' test, each participant is tested under all conditions. Consider the test of the impact of the defendant's physical attractiveness on his guilty verdicts. In the test between the subjects, one group of participants was assigned an attractive defendant and asked to plead guilty, and another group of participants was assigned an attractive defendant and asked to convict him. However, in the test subjects' experiment, the same group of participants would assess the guilt of both the attractive and attractive respondents. The primary advantage of this approach is that it provides maximum control over external participant variables. Participants in all circumstances share the same IE and socioeconomic status IA, the number of siblings, and so on, because they are the same people. Experiments on subjects may also be used to use statistical procedures that eliminate the impact of these foreign participant variables on the dependent variable, thereby making the data less noisy and the effect of the independent variable easier to detect. We will look at this idea in more detail later in the book. However, not all experiments can use the design of subjects and would not be desirable. One drawback of the subjects' experiments is that they facilitate the guessing of the participants' hypothesis. For example, a participant who is asked to judge the guilt of an attractive defendant and is then asked to convict an unprofessional defendant is likely to guess that the hypothesis is that the defendant's attractiveness affects guilt judgments. This information may result in the participant judging the impetrance of the defendant more harshly because he or she believes he or she is expected to do so. Or it could lead participants to convict the two defendants in the same way in an attempt to be fair. Transfer effects and counterbalance The primary drawback of the models of subjects is that they can lead to sequential effects. The subscription effect occurs when participants' responses under different circumstances are influenced by the conditions under which they were exposed. One type of subscription effect is the transfer effect. The transfer effect affects being tested in one state on the behavior of participants in a later state. One transfer effect is the practical effect, in which participants perform the task better in later circumstances because they have had the opportunity to practice it. The second type is the fatigue effect, in which participants perform the task worse later because they get tired or bored. Testing in one mode can also change how participants can see stimuli or interpret their task later. This type of effect is called a context effect (or contrast effect). For example, the average-looking respondent can be judged more harshly when participants have just assessed an attractive respondent than when they have just assessed an attractive respondent. Experiments in subjects also make it easier for participants to guess the hypothesis. For example, a participant who is asked to judge the guilt of an attractive defendant and is then asked to convict an unprofessional defendant is likely to guess that the hypothesis is that the defendant's attractiveness affects guilt judgments. The transfer effects can be interesting in them. (Does the attractiveness of one person depend on the attractiveness of other people that we have seen recently?) But when they are not the focus of research, the transfer effects can be problematic. Imagine, for example, that: assess the assessment of the the guilt of the attractive defendant and then convicts the unassisted defendant of guilt. If they judge a rude defendant more harshly, this may be because of his rudeness. But instead, they judge him more harshly because they get bored or tired. In other words, the order of the terms is a confusing variable. Attractive fitness is always the first condition and the attractive space the second. Therefore, the difference between the conditions of the dependent variable may be due to the order of the conditions and not to the independent variable itself. However, there is a solution to the problem of subscription effects that can be used in many situations. It's a counterbalance, which means testing different participants on different orders. The best counterbalance method is a full counterweight, in which an equal number of participants perform each possible condition sequence. For example, half of the participants are tested in an attractive defendant's condition, followed by an attractive respondent's condition, and the other half are tested in attractive condition, followed by an attractive space. With three conditions, there would be six different subscriptions (ABC, ACB, BAC, BCA, CAB and CBA), so some participants will be tested on each of the six orders. With four conditions, there would be 24 different orders; with five conditions, there would be 120 possible orders. As a counterbalance, participants are randomly assigned to orders using techniques that we have already discussed. Random configuration therefore plays an important role in inter-topic models, just as in models between subjects. Here, the criteria are randomly delegated, but randomly assigned to the order of the different terms. In fact, it can safely be said that if a study does not involve a random task in one form or another, it is not an experiment. A more effective counterbalance is the Latin square formatting, which is randomized through equal rows and columns. For example, if you have four treatments, you must have four versions. Like the Sudoku puzzle, no treatment can repeat succession or column. In four versions of the four treatments, the Latin square form would look like: A B C D B C D A C D D D A B D A B C The diagram above shows that the square is built to ensure that each condition occurs in each order (A occurs for the first time, the second time, the third time and the fourth time) and each space precedes and follows each other once. A Latin square for an experiment with 6 conditions would be 6 x 6 in a dimension, one for an experiment with 8 conditions, would be 8 x 8 in a dimension, and so on. Although a full counterweight to 6 conditions would require 720 orders, a Latin square would require only 6 orders. Finally, when the number the conditions are large tests may be used as a random counterweight, where the sequence of conditions is randomly determined for each participant. This technique is used to determine all possible conditions, and then one of these orders is randomly selected for each participant. This is not as effective a technique as a complete counterweight or partial counterweight to the design of Latin squares. The use of a random counterweight leads to a more random error, but if the sequence effects are likely to be small and the number of conditions is high, this is an option available to researchers. There are two ways to think about what to achieve with the counterweight. One is that it controls the order of the terms so that it is no longer a confusing variable. Instead of always prioritising attractive fitness and always being one ugly space, the attractive space is first for some participants and the other for others. Similarly, the unathical condition is first for some participants and for others. Consequently, the overall difference between the two conditions in the dependent variable could not have been due to the order of the circumstances. Another way to think about what the counterweight will achieve is that if there are transfer effects, it allows them to be detected. The information in each order can be analyzed separately to see if it has an impact. Concurrent test subject designs So far, we have discussed the approach to the subjects' plans, in which participants are tested in one space at a time. However, there is another approach that is often used when participants make multiple responses in each condition. Imagine, for example, that participants rate the guilt of 10 attractive respondents and 10 attractive respondents. Instead of people evaluating all 10 respondents, followed by all 10 other types of respondents, the investigator could present all 20 respondents in the order that confused the two types. The researcher could then calculate the rating of each respondent type for each participant. Or imagine an experiment designed to determine whether people with social anxiety disorder remember negative adjectives (e.g. stupid, incompetent) better than positive ones (e.g. happy, productive). The researcher could get participants to study one list that contains both words, and then make them try to remember as many words as possible. The researcher could then calculate the number of each type of word recalled. Between subjects or between subjects? Almost every experiment can be carried out either through the design between subjects or through the planning between subjects. This possibility means that researchers will have to choose between the two approaches based on how they are relatively merited in this Tests between subjects shall: be conceptually simpler and require less testing time per participant. They also avoid transfer effects without counterbalance. The advantage of experiments in subjects is to monitor foreign participant variables, which usually reduces data noise and facilitates the detection of the relationship between independent and dependent variables. So a good rule of thumb is that if it is possible to take a test of subjects (with an appropriate counterweight) within the time available per participant – and you don't have serious concerns about transfer effects – this model is probably the best option. If planning between topics would be difficult or impossible to implement, you should consider planning between topics instead. For example, if you tested participants in a doctor's waiting room or shoppers lined up at a grocery store, you may not have enough time to test each participant in all circumstances and therefore choose cross-topic planning. Or imagine trying to reduce people's prejudices by making them interact with another race. The design of the subjects, designed in return, would require first testing of some of the participants in the condition of treatment and then the control condition. But if the treatment works and reduces people's level of prejudice, they would no longer be suitable for testing in control condition. This difficulty applies to many models involving treatment aimed at achieving a long-term change in participants' behaviour (e.g. studies testing the effectiveness of psychotherapy). It is clear that cross-topic planning would be needed here. Also, remember that the use of one type of design does not prevent the use of another type in another study. There is no reason why a researcher should not be able to use both the design between subjects and the design between subjects to answer the same research question. In fact, professional researchers often take this type of mixed approach. The most important takeaways can be carried out on models between subjects or subjects. The decision to be taken in a given situation requires careful consideration of the benefits and disadvantages of each approach. Random assays in experiments between subjects or as a counterbalance to the conditions of the test subjects are a fundamental element of experimental research. The purpose of these techniques is to monitor foreign variables so that they do not become confusing variables. Exercises Discussion: List the pros and cons of planning between topics and topics in each of the following topics, and decide which would be better. You want to test the relative effectiveness of two training programmes to run a marathon. Using photos of people with stimuli, you want to see if you're smiling perceived to be smarter than people who don't smile. In the field test, you want to see if the panhandler's dressing (neatly vs. carelessly) affects whether passersby give him money or not. You want to see if concrete puppets (e.g. dog) are better called than abstract lifts (e.g. truth). (e.g. truth).