JoVE: Science Education

Pilot Testing

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Pilot Testing

Overview:

In any experiment researchers have the challenge of creating experiences for participants that are consistent (i.e. reliable) and authentic (i.e. valid). Yet there are many ways to manipulate any one variable. For example if you want participants to feel sad you can have them think of their own sad memory, watch a sad video, or read a sad story.

Researchers must find the best way to operationalize a psychological construct in order to produce the most effective manipulation possible. Often, before running the main study, researchers will pilot test (i.e., try out) their manipulations to check their effectiveness.

This video demonstrates how to operationalize the same independent variable (acute stress) in three different ways. Specifically, this study seeks to identify the best sound (static, ticking clock, crying baby) to play during a difficult task (solving complex math problems) to optimally manipulate stress.

Psychological studies often use higher sample sizes than studies in other sciences. A large number of participants helps to better ensure that the population under study is better represented and the margin of error accompanied by studying human behavior is sufficiently accounted for. In this video we demonstrate this experiment using just 3 participants, one for each condition. However, as represented in the results, we used a total of 120 (40 for each condition) participants to reach the experiment's conclusions reflected in the Results section.

Procedure:

1. Define Key Variables

1.1. Create an operational definition (i.e. a clear description of exactly what a researcher means by a concept) of "stressful sound."

1.1.1. For the purposes of this experiment, a "stressful sound" is any noise that creates a feeling of tension, immediacy, or anxiety within participants.

1.1.1.1. This will be manipulated through three different sounds: static, ticking clock, and crying baby.

1.2. Create an operational definition (i.e. a clear description of exactly what a researcher means by a concept) of "acute stress."

1.2.1. For purposes of this experiment, "acute stress" is defined as the stress or feeling of tension and strain resulting from recent demands or pressures.

1.2.1.1. In order to measure this accurately we will ask participants about their own stress levels using ~~with~~ a straightforward question. ~~This will be measured with a face valid self-report measure.~~

Comment [AK1]: I recommend more explanation of what this means for students. This bullet point is a bit to terminology intensive.

2. Conducting the Study

2.1. Meet student/participant at the lab.

2.2. Provide participant with "informed consent," a brief description of the research (Concentration on a Task), a sense of the procedure, an indication of potential risks/benefits, the right of withdrawal at any time, and a manner to get help if they experience discomfort.

2.3. Run the Static Condition

2.3.1. Tell the participant "I'm going to give you a series of math problems that should be easy to solve. Your job is to complete as many as possible in the 2 minute time limit. Please try to concentrate and ignore any sounds you may hear."

2.3.2. Give the participant the math problem sheet (attached below), start the timer (set for 2 minutes), play the static sound, and say "you may start."

2.4. Give the participant the dependent variable.

2.4.1. Give the participant a measure that asks him/her to indicate how he/she currently feels (attached below). The item "stressed" appears embedded within several other distractor items (i.e., items not related to the present study but included to make the true purpose of the study less obvious) and will be rated on a 1-7 scale.

Comment [AK2]: Will a student immediately recognize what is meant by distractor items?

Comment [AK3]: Also, how is the data quantified? It's not clear. Is the frequency with which "stressed" is reported per condition an option? How does one calculate a mean stress level, as shown in the results, based on this data.

3. Debrief

3.1. Participant is told the nature of the study.

3.1.1. "Thank you for participating. In this study I was trying to determine what type of sound led participants to experience the most stress. There were three conditions. Everyone worked on the same math problems for 2 minutes, but one group did so while hearing static, another group heard a ticking clock, while a third group heard a baby crying. We hypothesized that the group who listened to the baby crying would report the most acute stress."

3.2. Explain explicitly why deception was necessary for the experiment.

3.2.1. "We want to tell you about the deception we used in this study. We used deception by telling participants that the study was about concentration, which wasn't true, but we didn't want participants knowing that the study was actually about stress because it may have led to unnaturally increasing stress levels. We also indicated that the math problems were easy, when in fact they were not. We

chose difficult problems to increase demands on participants, which generally creates a sense of stress. In both cases, deception was necessary because we wanted to get participants natural reaction. If participants were to know the true reasoning and hypothesis behind the study they may perform in an unnatural way by trying to purposefully disprove the experimenter's hypothesis. Because of the nature of the deception, it is quite natural for participants to not realize that they were being deceived."

4. Run steps 2 & 3 above 2 additional times - once for ticking clock and once for crying baby.

   4.1. Each condition has a unique participant with everything being exactly the same except for the sound played.

5. **Results:**

Figure 1. Stress Level by Condition

5.1. The researcher used 40 participants per condition and as a result collected data from 120 participants overall. Numbers above reflect the mean reported stress levels that participants indicated on the 1-7 scale for the "stressed" item ~~for participants~~ in each condition.

5.2. A large number of participants is necessary to ensure that the results are reliable. If this research were conducted using just a few participants, it's likely that the results would have been much different, and not reflective of the greater population.

5.3. After collecting data from 120 people, an analysis of variance (ANOVA) comparing the static, ticking clock, and crying baby conditions was performed to see how they influenced stress level.

5.4. As seen in the figure, the crying baby condition reported the most stress as hypothesized.

Comment [AK4]: A bit more could be said about how the stress level is calculated. Is it based on the same type of survey that participants fill out in the experiment described in the procedure section. What exactly does the mean here represent and how does it relate to the data collected in the experiment that will be demonstrated?

6. Applications:

6.1. This multi-group experiment shows how researchers can operationalize the same construct in multiple ways.

6.2. The use of a pilot test helps researchers determine the most effective way to manipulate stress. With this knowledge, researchers can use the best manipulation in their future study.

6.3. For example, researchers manipulated stress by having participants do easy or difficult math problems to determine how stress influenced relationship behaviors (Lewandowski, Mattingly, & Pedreiro, 2014). The results indicated that those under stress were more likely to pay attention to alternate partners and were less likely to give their own partner compliments.

6.4. Another study of stress used an entirely different method for manipulating stress (Trammerll & Clore, 2014). In this study researchers induced stress by having participants immerse their arm in cold water to see how stress influenced long-term memory. Results indicated that exposure to stress led to worse performance on long-term memory tasks.

References

Lewandowski, G. W., Jr., Mattingly, B. A., & Pedreiro, A. (2014). Under pressure: The effects of stress on positive and negative relationship behaviors. *Journal of Social Psychology, 154,* 463-473. doi: 10.1080/00224545.2014.933162

Trammell, J. P., & Clore, G. L. (2014). Does stress enhance or impair memory consolidation?. *Cognition and Emotion*, *28*(2), 361-374. doi:10.1080/02699931.2013.822346

Math Task for Manipulation of Stress

INSTRUCTIONS: **Please answer each question and briefly explain how you got your answer.**

1. **87, 174, 261, 348, 435, _____, _____, _____**

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2. **13, 14, 16, 19, 23, 28, _____, _____, _____**

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3. **1, 8, 22, 43, 71, 106, _____, _____, _____**

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4. **60, 30, 20, 15, 12, _____, _____, _____**

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5. **2, 4, 12, 48, 240, 1440, _____, _____, _____**

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6. 4, -12, -36, -108, _____, _____, _____

7. 1, 4, 13, 40, 121, 364, _____, _____, _____

8. 1, 1, 2, 2, 3, 4, 4, 8, 5, 16, 6, _____, _____, _____

9. 1, 2, 4, 5, 10, 11, 22, 23, _____, _____, _____

10. 17, 19, 23, 29, 31, 37, _____, _____, _____

INSTRUCTIONS:

Using the following scale, answer each question according to the way you feel at this moment. Please place your answer in the space next to each item.

1 2 3 4 5 6 7

Not At All Very Much

_____ 1. Happy

_____ 2. Stressed

_____ 3. Sad

_____ 4. Excited

_____ 5. Upset

_____ 6. Strong

_____ 7. Proud

_____ 8. Afraid

_____ 9. Inspired

_____ 10. Nervous

Figure 1. Stress Level by Condition

Photo or Graphic File
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