

Science Education Collection

From Theory to Design: The Role of Creativity in Designing Experiments

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Overview

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Research studies come into being when a researcher speculates about human thought, emotions, or behavior, and has a theory that offers a potential explanation. Often the researcher's theory is firmly situated in everyday common experiences that may not naturally lend themselves to direct empirical study.

For example, researchers speculated that perception of a person on Facebook is influenced by the appearances and comments of the person's Facebook friends.¹ It is difficult to test this theory using real-life Facebook profiles. Instead, researchers must use their creativity to design a study—in this case, using fake profiles that look highly realistic—to test their theory.

This video demonstrates how researchers test a central tenet of a popular social psychology theory. Specifically, this video shows a test of whether engaging in a self-expanding activity leads a person to feel a greater sense of self-efficacy.²

Psychological studies often use higher sample sizes than studies in other sciences. A large number of participants helps to ensure that the population under study is better represented, *i.e.*, the margin of error accompanied by studying human behavior is sufficiently accounted for. In this video, we demonstrate this experiment using just 2 participants, one for each condition. However, as represented in the results, we used a total of 100 (50 for each condition) participants to reach the experiment's conclusions.

Procedure

Self-Efficacy Measure

Individuals encounter problems from time to time, and can resolve these problems to varying degrees. Please read the set of scenarios below and indicate how successful you think you would be in resolving the problem, as well as how difficult you believe it would be to resolve the problem.

<p>1) Your original plans for the day got ruined and you need to find something else to do.</p> <p style="text-align: center;">1 2 3 4 5 6 7</p> <p style="text-align: center;">I would not be very successful at resolving this problem</p> <p style="text-align: center;">I would be very successful at resolving this problem</p>	<p>5) You are gaining weight and feeling like you are getting out of shape.</p> <p style="text-align: center;">1 2 3 4 5 6 7</p> <p style="text-align: center;">I would not be very successful at resolving this problem</p> <p style="text-align: center;">I would be very successful at resolving this problem</p>
<p>2) Your life has become much too routine and you feel like you aren't having as much fun as you could.</p> <p style="text-align: center;">1 2 3 4 5 6 7</p> <p style="text-align: center;">I would not be very successful at resolving this problem</p> <p style="text-align: center;">I would be very successful at resolving this problem</p>	<p>6) You are lost in an unfamiliar area and need to get back home.</p> <p style="text-align: center;">1 2 3 4 5 6 7</p> <p style="text-align: center;">I would not be very successful at resolving this problem</p> <p style="text-align: center;">I would be very successful at resolving this problem</p>
<p>3) You are having trouble in a class and despite studying are doing poorly on the tests.</p> <p style="text-align: center;">1 2 3 4 5 6 7</p> <p style="text-align: center;">I would not be very successful at resolving this problem</p> <p style="text-align: center;">I would be very successful at resolving this problem</p>	<p>7) Your cell phone company overcharged you and you have to fix it.</p> <p style="text-align: center;">1 2 3 4 5 6 7</p> <p style="text-align: center;">I would not be very successful at resolving this problem</p> <p style="text-align: center;">I would be very successful at resolving this problem</p>
<p>4) You are having difficulty figuring out your life and career goals.</p> <p style="text-align: center;">1 2 3 4 5 6 7</p> <p style="text-align: center;">I would not be very successful at resolving this problem</p> <p style="text-align: center;">I would be very successful at resolving this problem</p>	<p>8) You realize that you don't have enough money for your bills.</p> <p style="text-align: center;">1 2 3 4 5 6 7</p> <p style="text-align: center;">I would not be very successful at resolving this problem</p> <p style="text-align: center;">I would be very successful at resolving this problem</p>

Appendix 1. Survey of self-efficacy given to participants.

1. Define key variables.
 1. Create an operational definition (*i.e.*, a clear description of exactly what a researcher means by a concept) of self-expanding activity.
 1. For the purposes of this experiment, a self-expanding activity is any activity that is novel, challenging, and interesting.
 2. Identifying an activity that meets all three criteria requires the researcher to be creative. In the video, the researcher will manipulate self-expansion by having participants transport several objects (*e.g.*, table tennis balls, paper clips, and rubber bands) across a room using only chopsticks.
 3. Due to the unique nature of the task, the researcher can assure that the task is novel (*i.e.*, something participants have never done), challenging (*i.e.*, picking up and moving a ping pong ball with chopsticks is difficult), and interesting (*i.e.*, this task is out of the ordinary which makes it intriguing).
 2. Create an operational definition of self-efficacy.

1. For purposes of this experiment, self-efficacy is defined as the participant's perception of his or her ability to successfully complete a series of everyday tasks (e.g., getting directions when lost, dealing with an overcharge from the cell phone company, etc.).
2. Conduct the study.
 1. Meet student/participant at the lab.
 2. Provide participant with informed consent, *i.e.*, a brief description of the research, a sense of the procedure, an indication of potential risks/benefits, the right to withdraw at any time, and a manner to get help if he or she experiences discomfort.
 3. Run the self-expanding condition
 1. Instruct the participant: "For this activity, you need to carry these objects (a ping pong ball, a key, a rubber band, and a paper clip) over to the other side of the room and drop each in the basket. To move the objects you may only use these chopsticks. You have 5 minutes to complete this task."
 2. The researcher should have the items on the table for the participant to see and the basket set up. Give the participant the chopsticks, start a timer, and say "You may begin."
 4. Give the participant the dependent variable.
 1. The researcher will give the participant an 8-item measure that asks him or her to indicate self-efficacy (**Appendix 1**).
3. Debrief.
 1. Tell participant about the nature of the study.
 1. "Thank you for participating. In this study, I was trying to determine if engaging in self-expanding activities that are novel, challenging and interesting would increase a person's self-efficacy, *i.e.*, his or her perception of being able to successfully accomplish several common goals. There were two conditions. Everyone carried the objects from one side of the room to the other within 5 minutes, but one group did so using chopsticks, while the other group used their hands. The idea is that using chopsticks for this purpose is a new and interesting, yet difficult activity, especially when compared to doing the same thing simply using one's hand. According to the self-expansion theory, engaging in these self-expanding activities that are novel, challenging, and interesting increases a person's self-efficacy, or one's confidence in successfully accomplishing other tasks."
 2. Explain why the researcher could not reveal the study's true purpose.
 1. "We purposefully did not tell you the true purpose of the study ahead of time. 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."
4. Run the procedure one additional time for the non-self-expanding condition.
 1. Everything is identical except for the part where the researcher describes the study during debriefing. It should instead read "For this activity, you need to carry these objects (a ping pong ball, a key, a rubber band, and a paper clip) over to the other side of the room and drop each in the basket. To move the objects, you may only use your hands. You have 5 minutes to complete this task."

Results

Data were collected from 50 participants per condition—100 participants overall. These numbers reflect the mean reported self-efficacy levels for participants in each condition. This large number of participants helps to ensure that the results are reliable. If this research were conducted using just two participants, it is likely that the results would have been much different, and not reflective of the greater population.

After collecting data from the 100 participants, a t-test was performed for independent means comparing the self-expanding condition (achieved through carrying items with chopsticks) to the low self-expansion condition (achieved through carrying items by hand) to see how they influenced self-efficacy. As shown in **Figure 1**, the self-expansion condition reported greater self-efficacy than the low self-expansion condition.

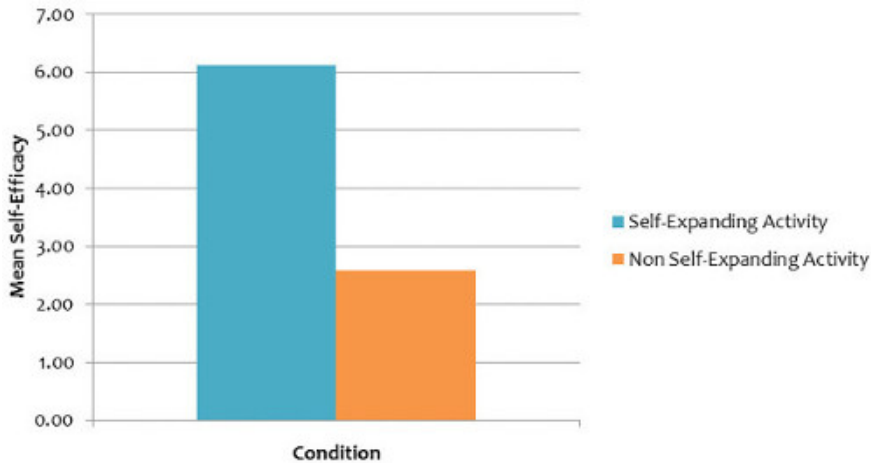


Figure 1. Self-efficacy by self-expansion condition. Averages were calculated from the ratings reported from survey questions.

Applications and Summary

This two-group experiment exemplifies how researchers can devise creative ways to manipulate theory-based experiences. The creative solution shown in this video was necessary to adequately meet the required conditions of novelty, challenge, and interest. As a result, the study design was able to test the prediction from the self-expansion theory that these activities would increase self-efficacy.

A similar study creatively manipulated self-expansion in married couples to determine if novel, challenging and interesting activities improved relationship quality.³ To manipulate self-expansion, the couples carried a foam pillow between them, without using their hands, while moving through an obstacle course. The results indicated that those who engaged in the self-expanding activity reported higher relationship quality.

Another creative study tested whether people act more nurturing toward cute things than non-cute things.⁴ Because you cannot have participants hold cute vs. ugly babies and see which one they treat in a more nurturing manner, researchers devised a creative solution. They had participants look at pictures of cute vs. non-cute animals and then play the game Operation, which requires a person to very carefully remove small pieces from electrically charged openings. As predicted, those who viewed the cute animals pictures were more careful when playing the game.

References

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