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The Factorial Experiment

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Psychology Education Title:
The Factorial Experiment

Overview: A factorial design is a common type of experiment where there are two or more independent variables. This video demonstrates a 2 x 2 factorial design used to explore how self-awareness and self-esteem may influence the ability to decipher nonverbal signals. This video leads students through the basics of a factorial design including, the nature of a factorial design and what distinguishes it from other designs, the benefits of factorial design, the importance and nature of interactions, main effect and interaction hypotheses, and how to conduct a factorial experiment.

Procedure:

1. Introduction of Topic/Research Question

    1.1. Research Question: Human behavior is complex, such that a person's thoughts and behaviors are the results of several causes or factors. For example, if you wanted to know why some people are better at reading another person's facial expressions, there are many factors that can influence that ability.

    1.2. Justifying a Factorial Design: Rather than test potential explanations one at a time, you can use a factorial design, which is unique because it allows you to test two or more potential influences in the same study.

    1.3. Benefits of a Factorial Design: It saves time by testing causes simultaneously vs. sequentially. This allows the researcher to use fewer participants and reveals if the various causes combine in a special way to influence the outcome.

2. Key Variables

    2.1. Variable- Anything that changes in a study.

    2.2. Independent Variable – The cause or what the researcher manipulates/changes in order to detect changes in the participant

        2.2.1. Based on the researchers literature search, she believes that a person's self-esteem (i.e., a person's positive or negative evaluation of who they are as a person) and self-awareness (i.e., how conscious a person is about their own thoughts and feelings) are two independent variables to study

2.3. Dependent Variable – The effect or the outcome that the researcher measures in the participant.

2.3.1. Based on the research question, ability to accurately detect or decipher nonverbal communication is the dependent variable

3. Research Hypotheses

3.1. Main effect hypotheses definition: Hypotheses in a factorial design that focus on one independent variable at a time, while ignoring any other independent variables.

3.1.1. Main Effect 1: Those who experience high self-esteem will be more accurate judges of eye expressions than those who experience low self-esteem.

3.1.2. Main Effect 2: Those who experience high self-awareness will be more accurate judges of eye expressions than those who experience low self-awareness.

3.2. Interaction Hypothesis Definition: A hypothesis predicting that one independent variable changes the other independent variable's impact on the dependent variable.

3.2.1. Interaction: The impact of the self-esteem on the ability to accurately detect nonverbal communication will be enhanced for those who experience high self-awareness, but reduced for those how experience low self-awareness.

4. Defining the Variables

4.1. Self-Esteem – To manipulate the independent variable of self-esteem the researcher will provide participants with false-feedback regarding the participant's ability to accurately name countries in Europe.

4.2. Self-Awareness – To manipulate the independent variable of self-awareness the researcher will place participants in front of a mirror. (This is adapted from previous research Wicklund & Duval, 1971)

4.3. Accuracy in Decoding Nonverbal Communication – To measure the dependent variable of accuracy in decoding nonverbal communication the researcher will show participants several sets of eyes and ask them to identify the proper emotion being expressed. (This is also an established test. Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001)

5. Establishing Conditions

5.1. Self-Esteem – Everyone asked to "name as many countries in Europe as he or she could think of within 2 minutes" The researcher gives feedback based on condition:

5.1.1. High Self-esteem – participant learns they scored in the top 10% and that their performance was "superior and above average"

5.1.2. Low Self-esteem – participant learns they scored in the bottom 50% and that their performance was "inferior and below average)

5.2. Self-Awareness –

5.2.1. High = Participants sits in front of a mirror during the geography quiz (mirror should seem natural/inconspicuous as possible)

5.2.2. Low = No mirror present during geography quiz.

5.3. Combinations of Conditions – In a between subjects factorial design, each person gets one combination of the independent variables. In this study the 4 possible combinations are:

a) high self-esteem/high self-awareness
b) low self-esteem/high self-awareness
c) high self-esteem/low self-awareness
d) low self-esteem/low self-awareness

5.4. Conditions are often displayed this way (Table 1)

6. Measuring the Dependent Variable (Accuracy in Decoding Nonverbal Communication)

6.1. Quiz

6.1.1. Participants goes through the quiz (should mouse over pictures during the it to show eyes more clearly)

6.1.2. Score = total number correct which will result in a 0-36 score

7. The Procedure/Conducting the Study

7.1. Setting = Research Lab with a computer and space for a person to sit in front of mirror

7.2. Informed Consent

7.2.1. In a research lab, Researcher/actor meets participant/actor for study on "The Faces of Culture"

7.2.2. Researcher/actor goes through Informed Consent "As you'll read in the informed consent this study is about perceptions of nonverbal communication and cultural knowledge. The purpose of this research is: to learn how people interpret facial expressions. You'll also read about any risks/benefits of participation, and that you are free to quit at any time"

7.3. Random Assignment to Condition

7.3.1. The researcher randomly ordered the packets so that the participant's combination of conditions (high self-esteem/high self-awareness; low self-esteem/high self-awareness; high self-esteem/low self-awareness; low self-esteem/low self-awareness)
*should show all 4 combinations on the video

7.4. Running the Study

7.4.1. Self-Awareness – depending on condition, the participant will sit in front of mirror or not

7.4.2. Self-Esteem

7.4.2.1. Researcher gives the participant a sheet with 50 spaces on it and asks them to list as many countries in Europe as they can in the next 2 minutes. Starts timer. After "analyzing the participants results compared to past participants" the researcher provides feedback (based on condition) on a sheet of paper

7.4.3. Rating Attractiveness of Pictures

7.4.3.1. Researcher sits participant in front of computer to take the online version of this quiz (http://www.questionwritertracker.com/quiz/61/Z4MK3TKB.html) The quiz asks "For each pair of eyes, choose which word best describes what the person in the picture is thinking or feeling" Score will be how many the person gets right out of 36

7.5. Debriefing

7.5.1. Researcher/actor explains the purpose of the study to the participant/actor reads from debriefing sheet "Thank you for participating. Our study was on the effects of self-esteem and self-awareness on how people perceive ambiguous facial expressions. We hypothesized that people with low self-esteem and low self-awareness would interpret facial expressions as more judgmental and aggressive than others with high self-esteem and high self-awareness. Do you

have any questions?"

7.5.2. Address Deception

7.5.2.1. Researcher/actor explains "It is important that we get a natural performance, not one that the participant feels is expected. If participants were to know the true reasoning and hypothesis behind the study they may perform in an unnatural way by trying to live up to the experimenters perceived expectations. To eliminate this problem it is necessary for the experimenter to provide the participant with false information. In this experiment, we did this by providing you with false feedback of the geography quiz you took. In actuality we did not score the quiz in any way. The feedback you received was based on random assignment and is in no way a true indication of your abilities. This was necessary so that we could be sure everyone would experience a short boost or drop in self-esteem. Because of the nature of how we did the study, it is quite natural for participants to have believed the feedback, but rest assured that it was not real."

8. Results

8.1. Figure

8.2. Explanation of Results & Statistical Analysis

8.2.1. After collecting data from 136 people, the researcher ran a two-way analysis of variance (ANOVA) testing the two main effects and interaction. As the viewer can see from the figure, Contrary to the hypothesized pattern, when participants had high self-awareness, they were more accurate when they had low-self-esteem, however when they had low self-awareness they were more accurate when they had high self-esteem.

9. Discussion/Implication

9.1. Relate "present study" back to previous research

9.1.1. "Beyond their influence on deciphering the meaning in a person's eyes, greater self-awareness can lead those with low self-esteem to experience more negative emotions such as feeling depressed"

9.2. Apply findings from "present study" to everyday life

9.2.1. "If researchers can identify factors that cause greater accuracy in understanding non-verbal communication, it is possible that individuals can learn how to read other's nonverbal signals better. Think of all of the contexts where being able to accurately understand a person's expressions would help. Working in sales, playing sports, interviewing job candidates, going on dates. Really,

nonverbal communication is everywhere and figuring out ways to read it more accurately can only help."

Results:

Figure 1.

Related Articles/Additional Reading:

- Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The 'Reading the mind in the eyes' Test revised version: A study with normal adults, and adults with Asperger syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry*, *42*(2), 241-251. doi:10.1111/1469-7610.00715
- Stevenson, M. T., Soto, J. A., & Adams, R. Jr. (2012). More than meets the eye: The role of self-identity in decoding complex emotional states. *Emotion*, *12*(5), 882-886. doi:10.1037/a0028628

Class Demonstration Idea:

- Give half of the students in class a cup of orange juice, and the other half a cup of water. Also give half of the students a chocolate chip cookie, and the other piece of banana. Ask students to take a bite of their food, then a sip of their drink, and then rate how pleasant the taste is on a 1-10 scale (1=Awful; 10=Delicious). Afterward, ask students to identify the independent variables, dependent variable, and possible hypotheses.

Design Your Own:

- Instructors could ask groups of students to brainstorm additional variables that may influence a person's ability to decode emotions in the 'Reading the Mind in the Eyes' Test. Next, have students select the two best ideas and describe a factorial experiment that tests their ideas. Students could then present their ideas to the class.

Legend:
Table 1. Conditions are often displayed this way

Figure 1. Score on Nonverbal Communication Deciphering by Self-esteem and Self-Awareness

Please list below as many countries in Europe that you can think of in 2 minutes

1 _____
2 _____
3 _____
4 _____
5 _____
6 _____
7 _____
8 _____
9 _____
10 _____
11 _____
12 _____
13 _____
14 _____
15 _____
16 _____
17 _____
18 _____
19 _____
20 _____
21 _____
22 _____
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31 _____
32 _____
33 _____
34 _____
35 _____
36 _____
37 _____
38 _____
39 _____
40 _____
41 _____
42 _____
43 _____
44 _____
45 _____
46 _____
47 _____
48 _____
49 _____
50 _____

Feedback for Task

Your performance during this 2 minute task was:

___ above average
___ average
___ below average

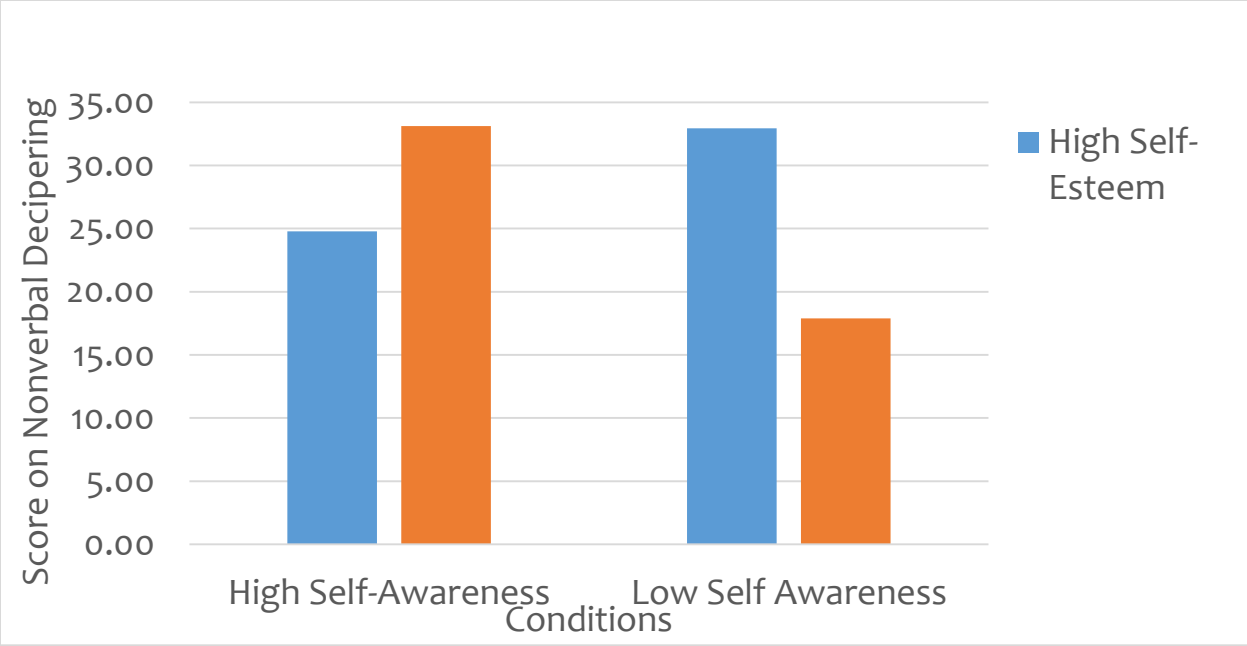
Compared to others you ranked in the:

___ inferior ranks
___ normal ranks
___ superior ranks

Overall this places you in the _____

Photo or Graphic File

Click here to download Photo or Graphic File: Lewandowski_factorial_figure1.docx



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		Self-Esteem	
		High	**Low**
Self-Awareness	**High**	a)	b)
	Low	c)	d)