First Name:_____ Last Name:_____

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PSC 041 Research Methods in Psychology WQ 2023

Unit 5 Exam Version B

Research Summary

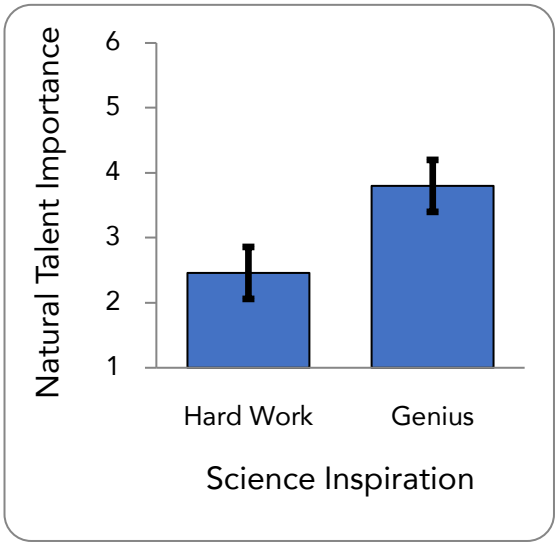
Adapted from: Hu, D., Ahn, J., Vega, M., & Lin-Siegler, X. (2020). Not All Scientists Are Equal: Role Aspirants Influence Role Modeling Outcomes in STEM, *Basic and Applied Social Psychology, 42*, 192-208.

Are we inspired to follow in the footsteps of a genius or of a hard-worker? Some scientists are portrayed as having an innate brilliance which erupts seemingly effortlessly into scientific discoveries while others are portrayed as diligent hard-workers who struggle with a problem and work long hours in the lab before finally arriving at a discovery. According to a recent study, it may in fact be hard work, not innate genius, that really inspires people to get into STEM.

This study focused on two specific scientists: Einstein, who is generally viewed as a genius whose success came from his talent, and Edison, whose success is seen to have come from hard work — famously, it took him over one thousand attempts to successfully create the light bulb. Researchers met with 176 high school students in a high school in the U.S. They randomly assigned each student to read a story about either Einstein or Edison. Both stories included details about struggles, challenges and setbacks the scientists had supposedly faced during their career (in fact, the stories for each scientist were exactly the same).

Participants then filled out a survey to measure their views on the important characteristics of successful scientists, rating how much they agreed from a low of 1 to a high of 6 with statements including "only geniuses can be good scientists", "some people just aren't cut out for science" and "you have a certain amount of intelligence, and you can't do much to change it". The scores were averaged for each participant resulting in a single number that indicates their view of the role of exceptional talent in scientists.

Those in the hard work condition (e.g., Edison) (n = 88) were less likely, $t(174) = 3.71$, $p = .03$ to report natural talent as necessary for a scientist's success (M = 2.46, SD = 0.5) than those in the genius (e.g., Einstein) condition (n = 88, M = 3.80, SD = 0.7). The researchers suggest that being exposed to a stereotypically "genius" scientist makes people feel that brilliance is essential to succeed as a scientist and could reduce a person's interest in science. Whereas exposure to scientists that are successful because of their effort and persistence may motivate people to become a scientist.



Predictor Variable

Thinking about the predictor / independent variable: Role Model Type

10 pts 1. How did the researchers **operationally define** the predictor / independent variable? Describe it using your own words. Be sure to include the levels or values and indicate how the codes will be interpreted.

1.5 pts 2. The predictor / independent variable is (fill in the box)

- □ **Categorical**
- □ **Continuous**

2 pts 3. How was the predictor / independent variable measured? (fill in the box)

- □ **Observation**
- □ **Physiological**
- □ **Self-Report**
- □ **It was manipulated**

5 pts 4. Is this a causal or associative claim? (fill in the box)

- □ **Causal**
- □ **Associative**

5 pts 5. This variable is (fill in the box)

- □ **between groups**
- □ **within group**

10 pts 6. Evaluate the **construct validity** of the predictor / independent variable.
ProTips: Give an overall evaluation. Think about the face validity, the procedure, and the method-match to inform your decision. Use specific vocabulary. Be sure to only discuss this one variable.

Outcome Variable

Thinking about the outcome / dependent variable: Importance of Natural Talent

Partial operational definition: The outcome was averaged responses to statements like "only geniuses can be good scientists" rated on a scale of 1-6.

1.5 pts 7. The outcome / dependent variable is (fill in the box)

- □ **Categorical**
- □ **Continuous**

2 pts 8. How was the outcome / dependent variable measured? (fill in the box)

- □ **Observation**
- □ **Physiological**
- □ **Self-Report**
- □ **It was manipulated**

Use this only for the next two questions:
Another researcher wants to extend this finding using a different method to measure this variable. All participants were given the option to watch 4 different short documentaries: one was on impressionism (art), one was on underwater rugby (sports), one was the Barnum effect (psychology), and one was on dark matter (physics). Researchers recorded which documentary each participant chose to watch.

2 pts 9. How was this new outcome / dependent variable measured? (fill in the box)

- □ **Observation**
- □ **Physiological**
- □ **Self-Report**
- □ **It was manipulated**

10 pts 10. Does the new outcome variable (*Video Choice*) have stronger or weaker construct validity than the original variable (*Importance of Natural Talent*) at measuring the *construct* (**Interest in Science**)? Explain your reasoning in a few sentences.

Evaluate Internal Validity

10 pts 11. For the original research summary, 'reading a story' is **unlikely to be a confound** because…

10 pts 12. For the original research summary, there is ***not a testing effect*** because…

Summarize the findings

5 pts 13. How did the researchers summarize the findings? (fill in the box)

- □ **compare group means**
- □ **compare group frequency**
- □ **indicate strength and direction of the overall relationship**

5 pts 14. The error bars _____ overlap. Therefore, there likely ___ a real relationship between the variables? (fill in the box)

- □ **do not; is**
- □ **do not; is not**
- □ **do; is**
- □ **do; is not**

5 pts 15. The *p* value is _____ . Therefore, there ___ a statistically significant relationship between the variables. (fill in the box)

- ☐ **greater than 0.5; is**
- ☐ **greater than 0.5; is not**
- ☐ **less than 0.5; is**
- ☐ **less than 0.5; is not**
- ☐ **greater than 0.05; is**
- ☐ **greater than 0.05; is not**
- ☐ **less than 0.05; is**
- ☐ **less than 0.05; is not**

10 pts 16. Does this interpretation follow from this study: "Reading about a 'genius' scientist causes people to be more motivated to do science than reading about a 'hard-working' scientist"? Why or why not?

Evaluate External Validity

10 pts | 17. For this research, the participants were US high-school students. Evaluate this aspect of **external validity**.

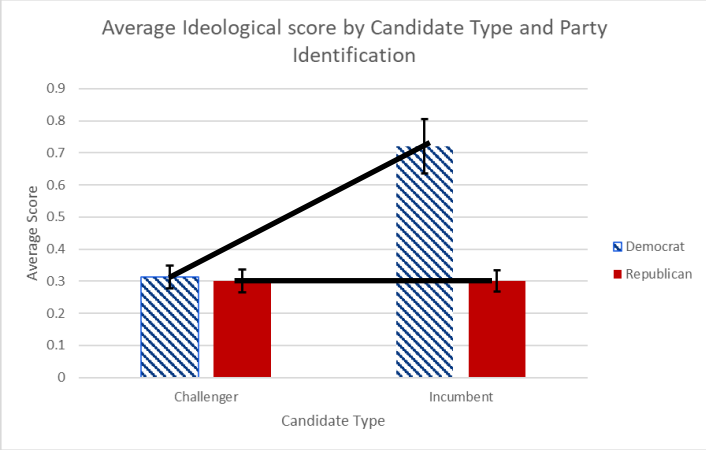
10 pts | 18. Another researcher attempted to replicate this study. They recruited another set of participants from the same population and in the same way. They carefully replicated every step of the procedure. They did not find the same results; there was no difference between the two conditions

Can the researchers defend their original findings given this failure to replicate? What logic or reasoning would they use to explain these different results?
ProTip: Clearly state your conclusion (the new findings can be explained in a way that coexists with the original findings or one of the findings is likely invalid) and explain your reasoning in a few sentences. Focus on the difference between internal validity (failure to replicate) and external validity (failure to generalize).

Multiple Choice

Select the single best answer. Indicate your choice by filling in the box to the left of your selection. Do not make stray marks in the other boxes.

19. According to this graph, what type of relationship do Candidate Type and Political Party share on ideological score?



- ☐ Additive because the lines are parallel
- ☐ Additive because the lines are not parallel
- ☐ Interaction because the lines are parallel
- ☐ Interaction because the lines are not parallel
- ☐ null

20. Which of these two statements describes the pattern above?
    - ☐ The effect of one predictor variable on the outcome variable differs depending on the level of the other predictor variable.
    - ☐ The effect of each predictor variable on the outcome variable does not depend on the level of the other

21. This is a ____ design
    - ☐ 2x2
    - ☐ 2x3
    - ☐ 3x3
    - ☐ 2x2x2
    - ☐ 2x2x3
    - ☐ 4x4

22. How many possible main effects could there be in this study?
    - ☐ 1
    - ☐ 2
    - ☐ 3
    - ☐ 4

23. Anna is interested in the relationship between how attractive a defendant is and how guilty they seem. She wants to test the hypothesis that the rating of guilt (measured on a 7-point scale with 1 being "certain innocence" and 7 being "certain guilt") decreases as the rating of attractiveness (measured on a 7-point scale with 1 being "very unattractive" and 7 being "very attractive") increases. The appropriate inferential statistic would be the
    - ☐ correlation coefficient r.
    - ☐ t-test.
    - ☐ ANOVA.
    - ☐ chi-square

24. Tayisha wants to test the hypothesis that the mean amount of sales dollars spent in a month will vary between Oak Ridge, Oak Wood, and Oak Park shopping malls. The appropriate inferential statistic would be the
    - ☐ correlation coefficient r.
    - ☐ z-score.
    - ☐ ANOVA.
    - ☐ chi-square.

25. Aviva wonders if having a visible tattoo during a job interview is related to being hired or not. The appropriate inferential statistic would be the

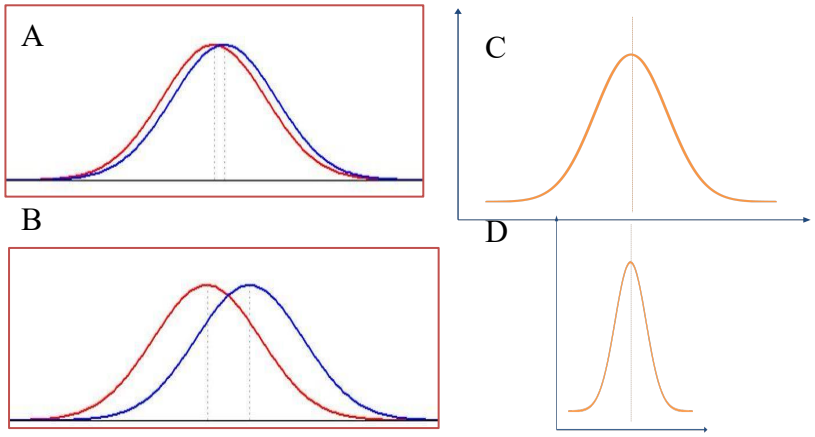
- ☐ correlation coefficient r.
- ☐ t-test.
- ☐ ANOVA.
- ☐ chi-square.

26. A Cohen's d value of 0.56 can be interpreted as indicating a

- ☐ small effect
- ☐ weak positive correlation
- ☐ strong positive correlation
- ☐ medium effect

27. Which of these sketches shows a small effect size?

- ☐ A
- ☐ B
- ☐ C
- ☐ D



28. Qiankun's class takes a personality test in which openness is measured on a scale from 1-7. Based on the distribution of responses from her class, her z-score on openness is 2.5. Which of the following sentences best describes this result?

- ☐ Qiankun is about average for her class on openness.
- ☐ Qiankun is extreme for her class on openness.
- ☐ Qiankun is slightly above average for her class openness.

29. The mean is the most widely used statistic for describing central tendency. However, the mean is heavily influenced by ___.

- ☐ spread
- ☐ the range
- ☐ dispersion
- ☐ outliers

30. Dr. Johal concludes that their patient does not have Covid-19 but they are wrong. What type of error have they committed?

- ☐ Type II – false negative
- ☐ Type I – false positive
- ☐ P-hacking
- ☐ HARKing
- ☐ File drawer