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DSC 510
Case Study Report Assignment
Due: Sunday, October 4, 2020 by 11:59PM
Article to Read: Super Fluid Cognition in Trained Musicians

As we discussed in class, if you are completing a research study you should use an appropriate checklist when writing the manuscript or journal article for the study. For this assignment, you will be asked to read a specific journal article and check the Strobe Checklist (all 22 items) to determine if the journal article included the required items for a successful research study and journal article.

- Read the entire journal article, and report in 1-3 sentences per item (22 items in total) whether the authors have provided the information required for that line item, specifically Does the information in the article make sense for the line item? If not, why?
- If the authors did not include the required information, what should they have included?
- Finally, based upon what you learned from going through the Strobe Checklist, what do you think about the research study? Write a paragraph evaluating what you think of the study overall? Are you confident in the results of the study? Would you feel confident citing this article in a future study of your own or expanding upon their research? Why or Why not?
    - I liked the study and it laid out the background research well. It appears that fluid cognition may really be influenced by musical expertise, though not so much casually musical experience. I believe the study warrants additional use the NIHTCB to study the effects of musical experience. Some missing data and limited sample size did hinder the study though.

Title and abstract
1. (a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found

- The title accurately captures the study's focus and the abstract accurately lays out the purpose of the study, the test used to study fluid intelligence in the musicians, and the general findings from the study.

<u>Introduction</u>
Background/rationale
2. Explain the scientific background and rationale for the investigation being reported

- The authors do a good job of presenting prior research on the different aspects of cognition that may be benefitted by music experience. The rationale for studying fluid cognition in musicians versus nonmusicians is clearly explained to be for replicating prior research and presenting the standardized measure/toolbox as a means to study fluid

cognition in future research. They also provide some background on the battery of tests and some of the challenges with the study/defining things like musical expertise.

Objectives

3. State specific objectives, including any prespecified hypotheses

- They presented a very clear set of objectives/pre-specified hypotheses in the final paragraph of the introduction - essentially that the musical experts would perform better in terms of fluid cognition. They noted that they predicted episodic memory would not differ between groups as there is no research evidence for this or rationale for why musical expertise would influence this.

Methods

Study design

4. Present key elements of study design early in the paper

- The study design was simple and presented clearly. 72 undergraduate students were grouped based on survey responses as either musical experts (14), amatuers (38), or non-musicians (20). These students then completed the NIH Toolbox Cognitive Battery of tests for attention, working memory, executive function, processing speed, and episodic memory on computers in controlled locations.

Setting

5. Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection

- They did describe the setting as Elmhurst College and that multiple controlled testing locations were used. They did not clearly specify periods of recruitment or follow-ups made, though they also do not appear to be pertinent. Data was collected via the computerized testing of the NIHTCB.

Participants

6. (a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up.
Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls
Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants
(b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed Case-control study—For matched studies, give matching criteria and the number of controls per case

- I believe the study would fall under case-control and the eligibility for this was laid out in the paper. There weren't really controls in the strictest sense and self-evaluation surveys like the one used here could be problematic, especially with low sample size in case of individuals lying about experience. Participants volunteered and were paid/given course credit as incentive, but they weren't actually tested to see if they could perform musically, which is potentially problematic - besides that all good.

Variables

7. Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable

- The variables were more or less covered through explanations of the different tests, though the researchers did not put as much emphasis on the potential confounders as they could have. For example the missing demographic data and small sample sizes seem problematic. Would have been interesting to know the type of musical training participants had received as a potential predictor, etc.

Data sources/measurement

8. For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group

- This is covered, as all participants were given the same tests, and these were explained clearly in the paper. Data source was the test results and the scores were analyzed.

Bias

9. Describe any efforts to address potential sources of bias

- Not much emphasis was placed on addressing bias, though they did explain age-adjusted scores, control testing environments, etc. Without more detailed data on the participants, it would be hard to determine if other factors influenced the results. There could be some additional differentiating factors in that musical experts group besides their musical expertise.

Study Size

10. Explain how the study size was arrived at

- It appears the study authors got as many participants as they could motivate though $5 payments and course credit incentives. Only 72 participants signed up, which is not a great number, but for an initial study was sufficient to produce interesting results. Would liked to have seen a more even split between the number of experts, amateurs, and non-musicians. There were almost 3x the number of amateurs as experts for example.

Quantitative Variables

11. Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why

- Well the tests were chosen because they serve as measures of cognition relevant to the study of fluid cognition and the groupings of students were to identify differences in cognition between music experts and others. Not much else was needed as the tests just return scores. Survey response variables were dealt with appropriately, except for the missing demographic data from their ‘computer glitch’ later.

Statistical methods

12.

(a) Describe all statistical methods, including those used to control for confounding

- One way ANOVA on fluid cognition and subscores was fine. Regression on these was problematic.

(b) Describe any methods used to examine subgroups and interactions

- Again the ANOVA and Regression mainly. But missing demographic data.

(c) Explain how missing data were addressed

- Limited to 21 participants and 14 were experts so not good at all on the regression. I would not have included it at all in this case. Or they could have followed up with the participants to get the demographic data after the fact.

(d) Cohort study—If applicable, explain how loss to follow-up was addressed
Case-control study—If applicable, explain how matching of cases and controls was addressed
Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy

- They didn't have to do much matching as it was all via computerized assessment and questionnaire.

(e) Describe any sensitivity analyses

- Not very clear or lacking outside of the ANOVA

Results

Participants

13. (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed

- Lacking here - seems like they accepted all participants though, as they could be expert, amateur or non-musician based on the initial survey responses. No info on follow-up, but they could have or perhaps respondents saw their own scores post test.

(b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram

- They didn't really do this, though their 'computer glitch' demographic data missing could be from non-participation in that questionnaire and not really a glitch.

Descriptive data

14.

(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders

- Lacking - needed better demographic data. Could have followed up with participants to get data.

(b) Indicate number of participants with missing data for each variable of interest

- They were not clear here. Only age was available for all participants, demographic data problems as mentioned before.

(c) Cohort study—Summarise follow-up time (eg, average and total amount)

- NA

Outcome data

15.

Cohort study—Report numbers of outcome events or summary measures over time
Case-control study—Report numbers in each exposure category, or summary measures of exposure
Cross-sectional study—Report numbers of outcome events or summary measures

- Basically they validated their predictions that musical experts would show higher fluid cognition scores than the non-musicians and amateurs. They reported relevant numbers and stats to support this, though their findings could have been enhanced by larger sample size and some more descriptive statistics on each group's scores.

Main results

16.

(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included

- Lacking here, confidence intervals are not very explicitly stated and explained. Large Standard deviations though which seemed problematic to their conclusions.

(b) Report category boundaries when continuous variables were categorized

- Yeah categories are explicit no problem here.

(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period

- NA

Other Analyses

17. Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

- Well they did do the ANOVA for the different groups and on subscores. Sensitivity was done but again it seems lacking with the large standard deviations and small sample sizes.

<u>Discussion</u>

Key results

18. Summarise key results with reference to study objectives

- They determined that fluid cognition was higher in self-reported musician experts than amateurs and non-musicians. As predicted episodic memory did not show these effects.

Limitations

19. Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias

- Sample size, lack of test to determine musical expertise, info on type of musical expertise, and missing demographic data from glitch are some potential problems

Interpretation

20. Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence

- It was a good initial study and use of the NIHTCB to measure fluid cognition in musicians versus non-muscians. Results back existing research and researcher hypotheses were mostly validated despite limitations. I believe follow-up research is warranted as more studies using this method could provide interesting results.

Generalisability

21. Discuss the generalisability (external validity) of the study results
    - Well, based on the research, it seems that fluid cognition really is correlated with increased musical experience and the reasons for it seem logical. If tests replicate conditions that participants have practiced in then logically they will see an increase in performance. The small gains for amateurs suggest that limited musical practice is not really going to confer and serious benefits in fluid cognition as measured by the NIHTCB though.

Other information

Funding

22. Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based
    - Well only 72 participants at $5 could just be the department budget. Couldn't find the source but doesn't seem suspect.