KIN-610 - Stats Project

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Hint: use Control+F (Windows) or Command+F (Mac) to search this page

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2 Learning objectives

1. Identify variables from a research question statement
2. Formulate hypotheses from a research question statement
3. Identify the appropriate statistical procedure to test the formulated hypothesis
4. Conduct statistical analysis in `jamovi`
5. Interpret the results of the data analysis
6. Create tables and figures to illustrate the findings
7. Prepare a research report

3 Data

3.1 Data set

1. Download the data set: https://osf.io/8ehtw/
2. Download the data codebook: https://osf.io/b87a3/

3.2 Data Information

The date for this project come from the NFL Scouting Combine. The NFL Combine is held prior to the draft every year, testing players in the 40 yard dash, vertical jump, bench press, broad jump, shuttle, and three cone drill.

The description of each drill can be found here and here. Please, click here to learn about football positions.

> Note: This is NOT a true random sample since not everyone from the study population had the same chance to be included in the sample. This is important when deciding the appropriate statistical procedure (model) needed to test the hypothesis(ses).

3.3 Data modifications

For the final project, I have modified the data set in the following ways:

1. Extra variables were created for each dependent variable and random numbers were generated for these variables. Thus, the data for the "pos-test" variables are fabricated.
2. Scores were also fabricated using the test's population mean and standard deviation for the Wonderlic[1] variable. Due to privacy, the data for this variable are not publicly available.

[1] Wonderlic test - Wikipedia." https://en.wikipedia.org/wiki/Wonderlic_test. Accessed 21 Oct. 2020.

3.4 Statistical package

Although students are free to use the software of their choice, I recommend `jamovi`, which is covered extensively in my course.

4 Required steps

In a nutshell, you will be assigned a research question and be given a data set. Then, after running the appropriate statistical model, you can proceed to write your research report.

4.1 Preliminary information

Hint: copy the template associated with this assignment and paste it into a Google Doc document.

Before running the statistical test to answer your research question, you will be asked to complete these steps:

Part 1 - steps 1-3

1. Identify the DV and IV
2. State the Null (H_0) and the alternate hypotheses (H_1)
3. Choose the statistical model to test your Null hypothesis (H_0)

Part 2 - step 4

4. Search related articles + 2-page summary

4.1.1 Part 1

4.1.1.1 Dependent (DV) and independent variable (IV) The assignment of research question will be done on the first day of class and a record of the assignment will be available on Canvas (Modules > Project Information).

Once you are assigned a number, refer to Appendix B to identify the research question associated with your assigned #.

Once the research question is identified, proceed to identify the independent and dependent variables.

a. For the DV, identify whether it is *continuous* or *discrete* (nominal or ordinal).

b. For the IV, identify the levels associated with it (i.,e. sex - two levels; males and females)

Whenever applicable, run the normality plots with tests to verify whether the distribution of scores for the dependent variable is approximating or deviating from normality. Use this information to decide whether you will need to use a parametric or non-parametric test (i., e. independent-samples t-test vs Mann-Whitney test). If you do, then provide the information under Data Analysis.

4.1.1.2 Hypothesis(ses) for each of the dependent variable(s)

A hypothesis for each of the DVs must be formulated. First, state your prediction; i.e., `10-year-old girls will overperform 10-year-old boys on the skill of skipping`.

Next, you must decide whether you will be testing your hypothesis using the one-tailed or the two-tailed test. Once this is decided, you are ready to state the `Ho` (Null) and the `H1` (alternate Hypothesis). Below is an example of two-tailed test (non-directional hypothesis):

- H_0: 10-year-old girls and boys perform similarly on the skill of skipping
- H_a: 10-year-old girls and boys will perform differently on the skill of skipping

Notice above that `Ha` was stated as non-directional (two-tailed) because, even though we predicted that girls will do better than boys, we are uncertain of this prediction. Thus, the recommendation is to choose the two-tailed test.

Recall that you should only use a directional hypothesis (one-tailed) if you have strong evidence of the direction of the effect (refer to our textbook about one- and two-tailed tests).

4.1.1.3 Choose the appropriate statistical model to test the hypothesis(ses)

State the statistical procedure (i.e., ANOVA, Spearman rho) you selected to test the hypothesis(ses) and explain the rationale for choosing the procedure(s).

Recall that the selection of the procedure will depend on several factors, including but not limited to, `1)` the nature of the dependent variable (continuous, discrete), `2)` the level (nominal, ordinal, scale), `3)` the number of DVs/IVs. In addition, because the sample you are using is not a `true random sample`, normality cannot be assumed by default. You must run the normality plots with tests for each dependent variable and report it appropriately.

Hint: You may use the StatsKat website to help you choosing the test.

Note that you must chose a statistical model for each research hypothesis (H_a) formulated.

4.1.2 Part 2

4.1.2.1 Search for related articles

You will be asked to search and find at least *3 articles* related to your research question. These articles are to be used when writing the `Introduction` section of your report. Ensure to include these three sources under `References`.

Once you find the articles, read, summarize and create annotated bibliography entries for each. Note that you will be required to submit the links to the 3 articles and the annotated bibliography entries for each of the 3 articles before the deadline.

Then, proceed to write a 2-page summary that will be part of the `Introduction` section of the final project. Note that you will need to turn in the 2-page summary by the deadline.

Hint: Use the guidelines from Dr. McLeod (https://bit.ly/3C46nbw) when writing the `Introduction`*.*

4.2 Presenting results

You will be given 15 minutes to present the results of your project - 10 minutes (presenting) and 5 minutes (Q&A).

You will be required to use PowerPoint, Google Slides, or something similar. I have created a template you can use to get started. You can also import it to Keynote, Google Slides if needed. Please, do a search online to learn how this can be accomplished.

Presentation draft

You will be required to turn-in a draft of the slides the week before your presentation. Use the template above to create the presentation draft. **On each of the slides of the template, indicate what needs to be added**. For instance,

```
- SLide 1: The title and my name will be added
- Slide 2: ....
- ...
- Slide 6: Statistical Analysis
  - The nature of the test
  - The variables of interest
  - etc...
```

4.3 Written report

Once the preliminary information is gathered, and after running the appropriate statistical model to test your hypothesis(ses), you can proceed to write your research report. Below are the required sections of the written report.

A template was created following APA Style 7th ed. Ensure to use the template when completing the written report.

The template can be found here –> https://bit.ly/kin610-project-template

```
1. Title
2. Abstract
 - help found here --> https://bit.ly/3Npz1e7
3. Introduction
 - help found here --> https://bit.ly/3C46nbw
4. Method
 - help found here --> https://bit.ly/3iAR2rQ
   a. Participants
   b. Design
    - more help found here --> https://bit.ly/37TZdgE
   c. Statistical Analysis
    - help found here --> https://bit.ly/31skJ5I
   c. Materials
    - help found here --> https://bit.ly/3iAR2rQ
   d. Procedures
   - help found here --> https://bit.ly/3iAR2rQ
5. Results
 - help found here --> https://bit.ly/3Lg9qT5
6. References
 - help found here --> https://bit.ly/3tHqIm7
7. Appendix
```

```
7.1 Preliminary info
- Add here the preliminary info turned in previously
```

Hint 1: Download and read this article that covers the best practices of Methods/Results/Conclusion write-ups.

Hint 2: Follow the example proposed by Dr. McLeod.

Hint 3: Ensure to phrase your results following the APA Style

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5 Templates

Below you will find the templates you are to use when submitting the required assignments related to the final project.

1. Copy the content of each template
2. Open Google Docs and paste the content into the body of the blank document - Do NOT change the font type or size
3. Proceed to complete the assignment, then click on "File>Download>PDF Document"
4. Finally, submit the PDF file via Canvas

5.1 Preliminary info (Part 1)

Variables, Hypotheses, and Model

```
Cal State Northridge - Kinesiology
KIN-610 - Dr. Furtado
Points: ___/30

YOUR RESEAERCH QUESTION
Type here...


DEPENDENT AND INDEPENDENT VARIABLES (10 points)

IV:
Levels of the IV:
Scale:

DV:
Scale:

HYPOTHESES (10 points)

State your prediction (i.e., boys will perform better than gilrs on the skill of kicking)
Type here...

Type of hypothesis (e.g., directional vs non-directional)
```

State the null hyphothsis (Ho)
Type here...

State the alternative (aka research hypothesis) hyphothsis (Ha)
Type here...

STATISTICAL MODEL (10 points)

State the statistical model (test) that you chose to test the hypothesis
Type here...

Reason 1 for choosing the test:
Reason 2 for choosing the test:
Reason 3 for choosing the test:

5.2 Preliminary info (Part 2)

Articles and annotated bibliography entries

Cal State Northridge - Kinesiology
KIN-610 - Dr. Furtado
Points ___/30

YOUR RESEAERCH QUESTION
Type here...

Link to 1st article:
URL here....

Annotated bibliography entry:
Type text here...

Link to 2nd article:
URL here....

Annotated bibliography entry:
Type text here...

Link to 3rd article:
URL here....

Annotated bibliography entry:
Type text here...

Note: visit the following link to see examples of annotated bibliography entries: https://bit.ly/2YIGK2t

5.3 Two-page summary

Introduction for the final written report

```
Cal State Northridge - Kinesiology
KIN-610 - Dr. Furtado
Points ___/20

YOUR RESEAERCH QUESTION
Type here...

Type your summary here...

Note: This assignment will become the "Introduction" section of your final
project's written report.
```

5.4 Written report

Similar to the Presentation Template, students are required to use a template created to write the report. The template is based on APA 6th ed. and can be downloaded here.

6 Appendices

6.1 A: Correlation criteria

When evaluating the size of a bivariate correlation, please use Cohen (1988)

Coefficient Value	Strength of Association
$0.1 < r < .3$	small correlation
$0.3 < r < .5$	medium/moderate correlation
$r > .5$	Large/strong correlation

6.2 B: Research Questions

6.2.1 RQ #1

It has been reported that players from `Iowa State` work harder during practice compared to players from any other college teams in the country.

Since you had access to players from another university in the State of Iowa `(University of Iowa)`, you decided to test this hypothesis.

As a group, do players from `Iowa State (70)` perform better than players from `Iowa University (69)` on the **Bench Press** (`bench_press_post)` test? How about for **vertical Leap** (`vert_leap_post`)?

You will need to filter cases to perform this analysis so that only values `69` and `70` is selected for `college`. Notice that you will need to run the analysis for bench press and vertical leap.

6.2.2 RQ #2

Research has shown that in the general population there is a `negative` and `moderate to high` correlation between `weight` and `performance on the test of`Broad Jump‘. In other words, the heavier the person, the poorer the performance on the test, and vice-versa.

Assume that you are specially interested in football players that play as `Defensive Ends (3)`. Is there a relationship between `Weight` and `Broad Jump (pre)` scores among `Defensive Ends (3)`?

You will need to filter cases to perform this analysis so that only value `3` is selected/checked for `position`.

6.2.3 RQ #3

Defensive players are known to be stronger than those playing on other positions. But how about if we compare defensive players among themselves from different positions?

Are Defensive `Tacklers (4)`, `Linebackers (10)`, and `Cornerbacks (2)` different when it comes to `bench press (pre)` scores?

You will need to filter cases to perform this analysis so that only the values `4`, `10` and `2` are selected/checked for `position`.

6.2.4 RQ #4

As an athletic trainer working for the NFL Scouting Combine, you decided to test the effectiveness of a program you developed to improve players' `agility`. If deemed effective, the program could eventually be sold to NFL professional teams.

To test the effectiveness of the program, you invited players from `Ohio State University` to participate in this 2-week program (3 hours everyday). At the end of the 2-week period, players were re-tested on the `20-yard Shuttle` and the `3-cone Drill`.

Do players from `Ohio State University (127)` improve their scores on the `20-yard Shuttle` from pre to post-test? How about for the `3-cone Drill`?

You will need to filter cases to perform this analysis so that only the value `127` is selected/checked for `college`. Notice that you will need to run the analysis for 20-yard Shuttle and 3-cone Drill.

6.2.5 RQ #5

There is evidence that `Wide Receivers` and `Running Backs` have a higher incidence of concussion compared to players from other football positions. Over the years, this may negatively affect the players' cognitive ability. For instance, how would they compare to `Quarterbacks`, who arguably are less likely to suffer concussions during a football match.

How do players playing as `Wide Receivers (22)`, `Running Backs (18)` and `Quarterbacks (17)` compare on the Wonderlic scores? For this analysis, please, **ONLY use the data for 2020 data**.

You will need to filter cases to perform this analysis so that only the values `17`, `18` and `22` are selected/checked for `position`.

6.2.6 RQ #6

Quarterbacks must have excellent decision-making skills and act quickly under pressure during game plays.

Since the Wonderlic[2] test assesses cognitive ability under pressure, an interesting question is whether QBs are above average when it comes to cognitive ability.

According to the test developers, the average (mean) score on the Wonderlic test is 20 and the median score is (19).

Do QBs tested in 2018, 2019, and 2019 perform better than the general population on the Wonderlic Cognitive ability test?

You will need to filter cases to perform this analysis so that only the value `17`, is selected/checked for `position`.

6.2.7 RQ #7

It has been reported that as a group, `Offensive Tackles` perform better than `Full Backs` on the `Wonderlic test`.

Test the hypothesis that OT (15) players tested in 2018, 2019, and 2020 perform differently than FB (6) players on the Wonderlic Cognitive Ability test.

You will need to filter cases to perform this analysis so that only the values `5` and `15` are selected/checked for `position`.

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[2] https://en.wikipedia.org/wiki/Wonderlic_test

6.2.8 RQ #8

In the general population, there is a strong positive correlation between `weight` and `speed`. In other words, the heavier the player the slower the individual is, and vice-versa.

Considering that defensive players do train speed during football practices, it would be interesting to verify whether college players have a similar pattern compared to the general population.

Is there a correlation between `weight` and `speed` among football `Defensive Tackles (4)`? How about `Defensive Ends (3)`?

For this analysis, use the variables `Weight` and `40-yard Dash Pretest`, and filter cases so that only positions `3` and `4` are selected/checked.

6.2.9 RQ #9

As a Motor Behaviorist, you work for the NFL Scouting Combine and see the opportunity to collect data and test some of the research questions you have in mind.

In 2020, you designed a program to help players improve their `speed`.

`Quarterbacks (17)` from all attending colleges were selected to be part of the intervention. Test the hypothesis that the players would improve from pre to post-test on the `40-yard Dash`.

For this analysis, use the variables `40-yard Dash`, and filter cases so that only position `17` is selected/checked. Also, note that this study involves only players who were tested in `2020`.

6.2.10 RQ #10

As a Motor Behaviorist, you work for the NFL Scouting Combine and see the opportunity to collect data and test some of the research questions you have in mind.

In `2020`, you designed a program to help players improve their `speed` scores.

`Running Backs (18)` from all attending colleges were selected to be part of the intervention. Test the hypothesis that the players would improve from pre to post-test on the `40-yard Dash`.

For this analysis, use the variable `40-yard Dash`, and filter cases so that only position `18` is selected/checked. Also, note that this study involves only players who were tested in `2020`.

6.2.11 RQ #11

As a Motor Behaviorist, you work for the NFL Scouting Combine and see the opportunity to collect data and test some of the research questions you have in mind.

In 2020, you designed a program to help players improve their `agility`.

`Quarterbacks (17)` from all attending colleges were selected to be part of the intervention. Test the hypothesis that the players would improve from pre to post-test on the `3-cone Drill`.

For this analysis, use the variable `3-cone Drill`, and filter cases so that only position `17` is selected/checked. Also, note that this study involves only players who were tested in `2020`.

6.2.12 RQ #12

As a Motor Behaviorist, you work for the NFL Scouting Combine and see the opportunity to collect data and test some of the research questions you have in mind.

In 2020, you designed a program to help players improve their `agility`.

`Running Backs (18)` from all attending colleges were selected to be part of the intervention. Test the hypothesis that the players would improve from pre to post-test on the `3-cone Drill`.

For this analysis, use the variable `3-cone Drill`, and filter cases so that only position `18` is selected/checked. Also, note that this study involves only players who were tested in `2020`.

6.2.13 RQ #13

In football, the size of a player's hand may make a difference at a decisive moment during a game. Test the hypothesis that `Wide Receivers (WR)`, `Quarterbacks (QB)`, and `Defensive Lines (DT)` will show differences in the size of their hands. Your prediction is that `WR` and `QB` players will have significantly larger hands compared to `DT` players and `WR` and `QB` players will show no differences in the size of their hands when compared.

6.2.14 RQ #14

Certain football positions require players to perform extraordinary moves. `Wide Receivers` (WR) must show blazing speed and strong hand-eye coordination. But in some situations during a football game, `WR` must jump over players who try to tackle them.

Test the hypothesis that `WR` will perform differently when compared to `Quarterbacks` (QB) and `Defensive Line` (DT) players on the test of `Broad-Jump` (broad_jump_post). Your prediction is that `WR` will overperform both `QB` and `DL` players and the last two positions will not show difference when compared.

Hint: use ***`position_labels`*** *for this analysis.*

6.3 C: Deadlines

Refer to Canvas

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7 License