

Correlation Between Stages of Sleep and Sleep Quality
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Process Book

10/30/2020: Project Proposal

Basic Info:

- Title: Routines that Impact Sleep Quality
- Group Members:
 - Sahith Jampala:
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 - Kaivan Khazeni
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- Repository: <https://github.com/kkhazeni7/dataviscourse-pr-SleepQuality>

Background and Motivation:

- Inspiration behind the decision to dive into sleep data is based off of the leading fitness wearable, Whoop, which tracks numerous stats/data of the body ranging from Heart-Rate Variability, to Sleep Quality(REM, DEEP, SWS, LIGHT, ETC.)
- <https://www.whoop.com>
- Kaivan has had a whoop strap for the last year and has been interested in the health data field in terms of fitness and the body's overall readiness to take on strain versus recover.
- Since the strap and the company has had such an impact on Kaivan's mindset, Kaivan switched to Data Science as a major, and this would be the perfect opportunity to dive into that field(health/fitness data) with a visualization representation.
- Sleep has a profound impact on everyone's health, and the correlation between efficient sleep and better overall health is high. On the other end, those who do not sleep enough or sleep "well-enough" are not as healthy.

Project Objectives:

- Primary Question : What routines impact sleep quality/length? What is the correlation between sleep quality, and your readiness for your day tomorrow?
- Want to learn:
 - What routines have the most/least impact on sleep?
 - How sleep-quality is measured?
 - How does sleep impact your overall health?
 - What is a better indicator of sleep, length or consistency?
- What we want to accomplish:
 - Showing correlation between routines and sleep
 - Benefit: Knowing what routines have good/bad impact on sleep; by knowing this we can determine what are good/bad routines to have before sleeping.

- Showing the different measurements of sleep in terms of stages of sleep
 - Benefit: The benefit of this would be to know how long each stage lasts, around what time in the night each stage happens, and the importance of each stage for your body.
- Showing that sleep does have a profound impact on bodies readiness the next day
- Highlighting the difference between length of sleep and the consistency of a sleep schedule (no matter the length)
 - Benefit: To show that consistency is more important than length of sleep; i.e. quality increases with consistency not length.

Data:

- We are currently requesting a larger set of data rather than just having Kaivan's data. Because of this, the larger set of data we are requesting could contain sensitive information, therefore we are talking with the company to see the best way of going about getting all this data in a way that would not breach any privacy policies.
- If the larger dataset is not attainable, Kaivan's sleep and health data from the past 6 months will be sufficient for what we are trying to accomplish in the project, but the data might be biased since it is all from one person.
- <https://www.whoop.com>

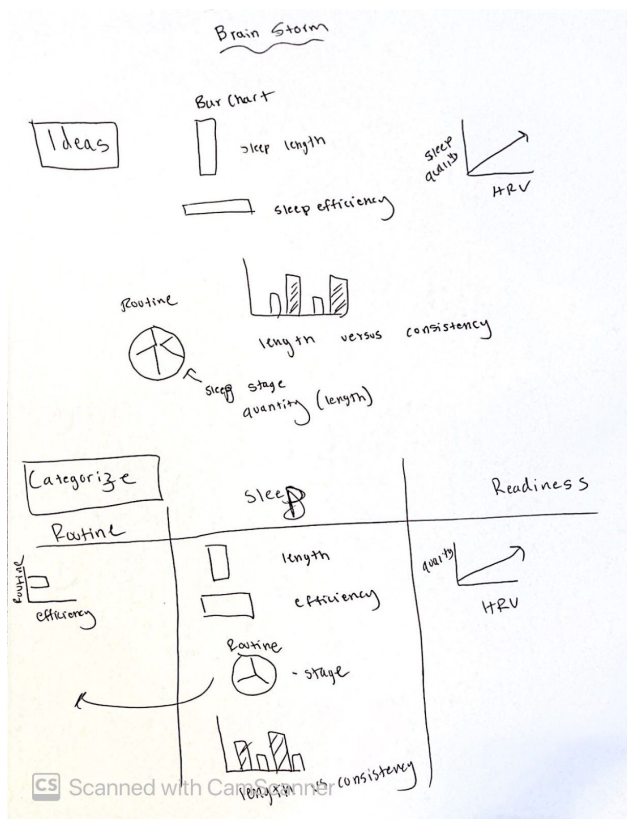
Data Processing:

- We are not sure the format that we will receive the data in, so we do not know how much cleanup we will have to do. We have requested a format such as a csv file, but we are not sure how we will receive it.
- Quantities of data :
 - Sleep length
 - Length of the duration of each sleep stage
 - Heart Rate and Resting Heart Rate during Sleep
 - Overall bodies readiness (percent)
- Implementation:
 - Implementation of the data depends on how the company shares their information (Kaivans Information) over time. Some ideas follow:
 - If it is Kaivans information, we would have the quantities of sleep be iterated over time, such as days or weeks for a n amount of days/weeks. This would give us an idea of trends over time. This would contain an object that holds the routine that occurred over time, and the impact on sleep that night.

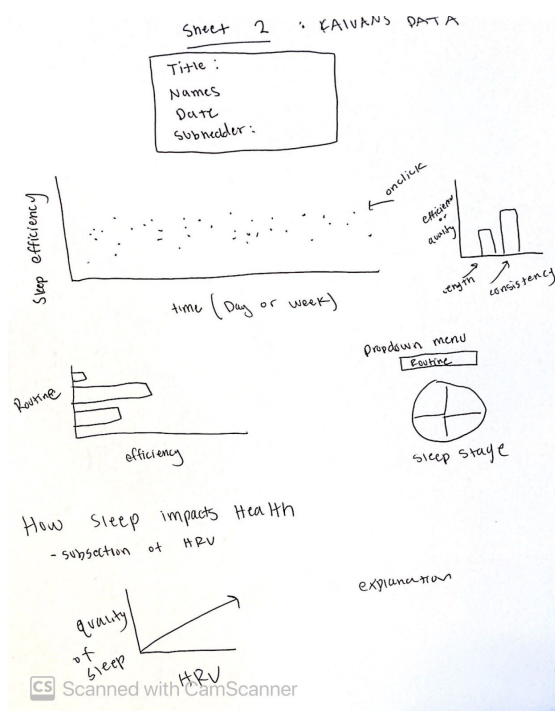
- If the data is sample data with more individuals, then the data could be organized by routines, and the individual points would be the data points/peoples sleep quality and bodies readiness the following day.
- Example:
 - Kaivans Data:
 - October 28th
 - {
 - Length of sleep: 6 hours
 - REM Sleep: 2 hours
 - Deep Sleep: 1 hour
 - Light Sleep: 4 hours
 - Awake: 1 hour
 - Routines:
 - Device in bed:
 - YES
 - Caffeine:
 - YES
 - HRV(Heart-Rate Variability)
 - 55
 - RHR
 - 60
 - }
 - Sample data with more points
 - Routine : Device in Bed
 - {
 - Length of sleep(Average): 7 hours
 - REM, Deep, Light,Awake -
 - HRV:
 - RHR:
 - }

Visualization Design:

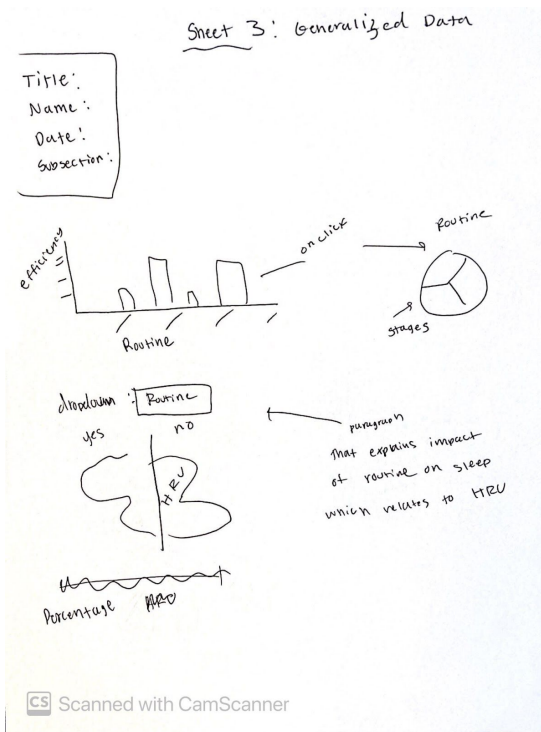
Sheet 1: Brainstorm



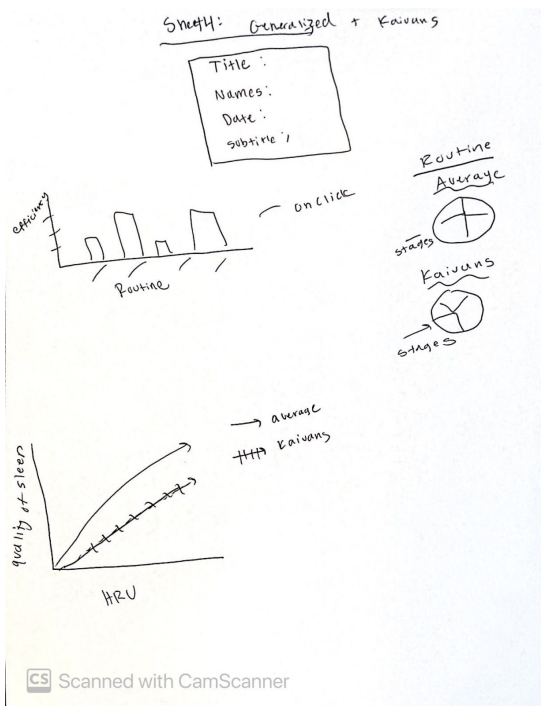
Sheet 2: Kaivans Data



Sheet 3: Generalized Data



Sheet 4: Generalized and Kaivans Dat



Sheet 5:

- If we have access to Kaivans data, sheet 2 will be the final, if we have generalized only, then we will use sheet 3, if we have both data, then we will have sheet 4 be the final one.

Must-Have Features:

- Dropdown menu when appropriate (Routines)
- General bar graph/Scatter plot displaying sleep quality/efficiency

Optional Features:

- Dropdown showing Kaivan's efficiency vs general
- Brush feature which highlights specific day's data of Kaivan's sleep
- Piecharts splitting stages of sleep

Project Schedule:

- (From Today (10/29) - Deadline (12/2))
 - Week of 11/2:
 - Project Peer Feedback: due by Nov. 5th
 - Have data/plan to take ready to go
 - Have data clean up finished, and loaded, ready to use
 - Week of 11/9:
 - Project Milestone: due by Nov. 15th
 - Have main/general visualization of sleep implemented
 - Set in stone all other visualizations to implement/functionality of interactions that will be used
 - Week of 11/16:
 - Complete all other visualizations throughout the week.
 - All visualizations should be ready to go, with interactivity in place.
 - Week of 11/23:
 - Have website done, as well as 2-minute screen cast with narration
 - Final touch ups, any changes needed must happen this week.
 - Use this week to talk over project with mentor.
 - Week of 11/30:
 - Final Project: due by December 2nd.
 - Final touch ups, have project wrapped up and ready to go.

11/05/2020: Peer Feedback Review

Peers: Anne Senay, Jacob Flosiand, Kenny Ho

Notes Received:

(Note: our previous project plan was not attainable due to the lack of data available. The routine before bed we planned on using came from data from Whoop, however they were not able to supply Kaivan with his data in time for this project. We moved on to sleep stages and its effect on sleep quality, therefore the notes received are about the previous iteration of our proposal.)

- Choose two routines and compare them side by side
- Bar chart instead of column chart if using a lot of routines
- Clarify HRV Chart more; how generalized data will fit into the “blob chart”
- HRV Chart mainly to show which routine has the best HRV
- Possibly hover function on HRV chart where it shows the actual number of people in each percentage
- Possibly onclick function on HRV chart where it shows the details on yes/no; details shown through storytelling?
- Add good amount of storytelling components (with routine, “on average, ‘routine’ shows that ...”)
- Possibly add functionality for user to input their own info
- Ex. Body Figure, showing which areas of body user is taking care of
- Possibly reduce amount of visualizations, can be overwhelming, or maybe guide user through in detail, so that it is not

Thoughts on Feedback Session:

- Session was helpful in the sense that it helped us walk through the ideas with people that knew nothing about the topic. Basically like if a new user were to look at our visualization, we figured out what we need to explain/what we don't with the help of our peers.
- It was also helpful because they were able to provide unique ideas for the visualizations that we already have that we did not think about. They also provided alternate solutions to the problem we are facing with attaining data.

11/09/2020: Data Collection

- On this date, we were able to find data on sleep stages from a study. This data included the stages of sleep and the efficiency, however on another .csv file, the data had the quality of sleep and more information on the in and out of each sleep stage.
- We were able to use Python to manipulate and combine the two .csv files into one, and convert to Json.

11/10/2020: First commits on Github

- Our first step was to load the data into JS and read it
- After we were able to load the data and save to an object, the goal was to access a point of data and see how the Python conversions parsed from csv to Json and we fixed any errors we found
- Our main chart was created, which was a line chart showing the relation between sleep length and sleep quality.
- Our first implementation for interactivity was an onclick function that allows the user to click on a specific data point and to see how the stages compare to each other(Deep, Rem, Light, Awake) in a pie chart
- The axis labels are not final and the pie chart is not crisp however it is a step in the right direction

