Module 7 Final Project

Matt Goeckel

Data Visualization
Spring 2024

Introduction

The Task

Create a custom data visualization project. Perform the calculations and visualization using Excel or Tableau or a combination of both. Document the project in a comprehensive final report that includes a description of the data, how it was cleaned, six visualizations and the stories & conclusions that go with them.

My Selection

I chose to create a project based on data I've collected on myself over the years. Starting in 2017, I began to track daily health habits like water intake and sleep duration. Over time, it grew to over 30 metrics across physical and mental health. Every January, I would update the process to expand my collection and make the process more efficient. With that, though, came six different files with different formatting, different categories, and different data types. The ultimate goal was always to explore the data I collected once I had enough. Now, with nearly 2000 rows of data, I'd say this is an appropriate time to analyze.

Data Description

Domain

This data falls into the area of health & fitness. The data is collected from an individual's (me) habits and daily actions.

Source

This data comes directly from me and includes only information about myself. No outside sources contributed to the collection or analysis of this data, and no data was collected on anyone besides myself.

The File

The dataset resides in a Microsoft Excel spreadsheet. A link is available HERE to view the file on GitHub. It has been cleaned from its original form, since there were six different versions of the data collection process over time. The original data files are also visible on the GitHub link, named after the years they were in production and shown in their original form. There are 1888 rows (not including the header). Each row contains 34 columns of data, listed on the next page, each with its data type and a short explanation.

Data Description

- Date (int) The day the data is associated with
- Attitude (int) My emotional wellbeing on a 1-5 scale
- Feeling (int) My physical wellbeing on a 1-5 scale
- RHR (int) Average daily resting heart rate
- HRV (int) Average overnight heart rate variability
- Run (int) Intensity of my run on a 1-10 scale
- Crosstrain (int) Same as run, but for other exercise
- Strength (Boolean) Did I strength train that day?
- Illness (Boolean) Was I sick that day?
- Injury (Boolean) Was I injured?
- Altitude (Boolean) Was I at an altitude of over 5000ft?
- Water (int) Water intake in ounces
- Sleep (float) Sleep duration in hours
- Stretch (Boolean) Did I complete my stretching routine?
- Roll (Boolean) Did I complete my foam rolling routine?
- Mobility (Boolean) Did I complete my mobility routine?
- NormaTec (Boolean) Did I use the NormaTec machine?
- Ice (Boolean) Did I use ice / cold therapy?
- Oxygen (Boolean) Did I complete my breathwork drill?
- Focus (Boolean) Did I complete my focus drill?
- Visualize (Boolean) Did I have a visualization session?
- Relax (Boolean) Did I take a moment to relax?
- Read (Boolean) Did I spend time reading?
- Compliment (Boolean) Did I give out a compliment?
- Vegetable (float) Servings of vegetables consumed
- Fruit (float) Servings of fruits consumed
- Iron, Creatine, T-30, Terminus, Cherry Juice, Vitamin C (Boolean) - Did I consume this supplement?

Data Cleaning

Strategies

I used the following strategies when cleaning my raw data.

- Handling incomplete or missing data
- Formatting & unit conversion
- Categorical encoding

The Process

The first step for me was re-formatting my data into a single combined sheet. Over the years, I changed and upgraded my formatting, so I had to merge them all into one major sheet and remove much of the old formatting such as color-coding. I then had to convert several text-based fields into numerical ones. For example I converted my "Great, Good, Okay, Poor, and Bad" scale to a 1-5 numerical scale for easier analysis. Additionally, there was some unit conversions that needed to be done, particularly with the servings of fruits & vegetables.

The Clean Data

The dataset resides in a Microsoft Excel spreadsheet. A link is available HERE to view the file on GitHub. It has been cleaned from its original form, since there were six different versions of the data collection process over time. There are 1888 rows (not including the header). Each row contains 34 columns of data, listed on the next page, each with its data type and a short explanation.

The Clean Set

Below is a small sample of the cleaned data set. The image is cut in half horizontally into two images to fit the page.

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Visualization Tools

Microsoft Excel

I used the following strategies when cleaning my raw data.

- Handling incomplete or missing data
- Formatting & unit conversion
- Categorical encoding





Tableau

The first step for me was re-formatting my data into a single combined sheet. Over the years, I changed and upgraded my formatting, so I had to merge them all into one major sheet and remove much of the old formatting such as color-coding. I then had to convert several text-based fields into numerical ones. For example I converted my "Great, Good, Okay, Poor, and Bad" scale to a 1-5 numerical scale for easier analysis. Additionally, there was some unit conversions that needed to be done, particularly with the servings of fruits & vegetables.

Visualization Goals

These are the six goals I laid out upon starting the project. Each one has its own section in the pages below.

Goal #1

• Find the relationship (if any) between Feeling & HRV.

Goal #2

• Find which drills I have the highest consistency with.

Goal #3

• Find which times of the year I have the highest consistency with.

Goal #4

• Find which True/False category has the highest correlation to feeling.

Goal #5

• Determine if resting heart rate has a positive, negative, or no correlation with heart rate variability.

Goal #6

Create a dashboard that shows current relevant habit trends

Find the relationship (if any) between Feeling & HRV.

Chart - Conditional Format

Figure 1: Days in each 'Feeling' category for HRV ranges Figure 2: Percentage values for each row

	1	2	3	4	5	Total
0-98	0	1	20	13	1	35
99-102	2	5	16	15	2	40
103-106	1	0	11	17	1	30
107-110	1	4	13	19	1	38
111-114	0	4	15	19	1	39
115-118	0	8	13	22	1	44
119-122	0	3	13	15	1	32
123+	0	2	12	7	0	21
Total	4	27	113	127	8	279

0-98
99-102
103-106
107-110
111-114
115-118
119-122
123+
Total

1	2	3	4	5
0%	3%	57%	37%	3%
5%	13%	40%	38%	5%
3%	0%	37%	57%	3%
3%	11%	34%	50%	3%
0%	10%	38%	49%	3%
0%	18%	30%	50%	2%
0%	9%	41%	47%	3%
0%	10%	57%	33%	0%
1%	10%	41%	46%	3%

Figure 3: Percent above/below average

	1	2	3	4	5
0-98	-1%	-7%	17%	-8%	0%
99-102	4%	3%	-1%	-8%	2%
103-106	2%	-10%	-4%	11%	0%
107-110	1%	1%	-6%	4%	0%
111-114	-1%	1%	-2%	3%	0%
115-118	-1%	9%	-11%	4%	-1%
119-122	-1%	0%	0%	1%	0%
123+	-1%	0%	17%	-12%	-3%

Find the relationship (if any) between Feeling & HRV.

Story

I chose to create a conditionally formatted table to show the relationship between heart rate variability (HRV) and overall feeling. Generally, HRV is a recovery metric where higher values indicate higher recovery within the central nervous system. The question being answered here is: How does that translate to physically feeling good during exercise?

In figure 1, I tallied the number of days for each 'feeling' rating that applied to a given HRV range. It is similar to a histogram but with an added dimension.

In Figure 2, I converted these to percentages for each row, and added an overall percentage row at the bottom. For example, the 3% in the top right box means that when HRV is 0-98, I recorded a feeling of 5 3% of the time.

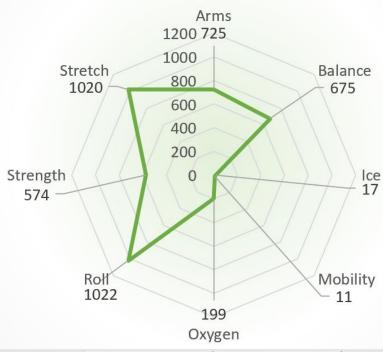
Finally, in Figure 3, I found the difference between the overall average (on any given day, regardless of HRV) for that 1-5 value and the corresponding value in figure 2. This shows how much more or less likely I am to record that rating than average.

The results showed that I am more likely than average to have a rating of 4/5 when HRV is between 103 and 122, and much less likely when it is above or below that range, indicating that there is a 'sweet spot' range to shoot for.

Find which drills I have the highest consistency with.

Chart - Radar





Drill	TRUE Values
Arms	725
Balance	675
Ice	17
Mobility	11
Oxygen	199
Roll	1022
Strength	574
Stretch	1020

Find which drills I have the highest consistency with.

Story

In this goal, I wanted to have a strong visual approach for each of the drills & routines that I do. I tried to organize the chart so that the more physical ones were in the upper-left, and the more sedentary ones were in the lower-right. That way, the radar chart is able to show that added dimension. Clearly, I am much more inclined towards the physical side, with the polygon's area filling much of the upper-left portion of the chart. The lower-right areas with the sedentary drills hardly hold a candle to the consistency and volume of the physical drills.

Ultimately, this is explained by my natural inclination of feeling fulfilled by movement. The stationary drills do not 'feel' like I'm doing much, and apparently that makes me much less consistent with them.

Find which times of year have the highest consistency.

Charts - Line Plot



Find which times of year have the highest consistency.

Story

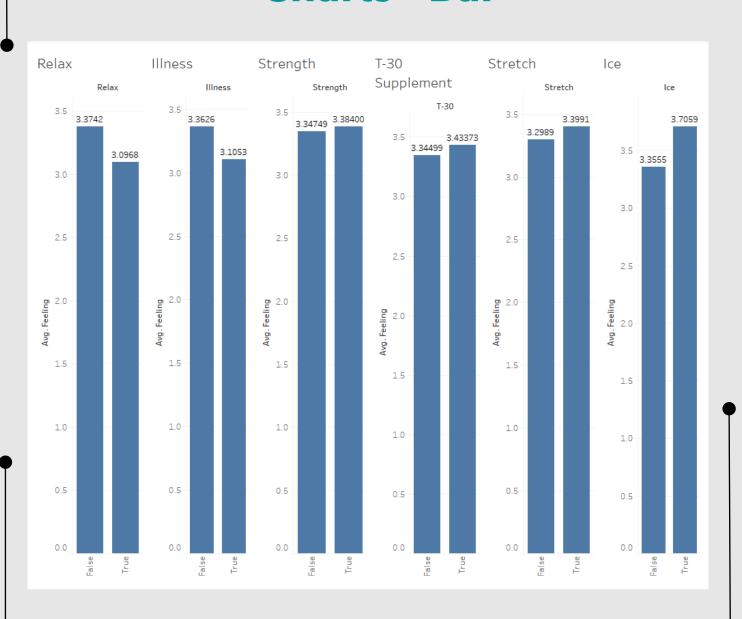
I chose my three most consistent drills (as determined in Goal #2) for this because it gave me the most data points to work with. The line plots show the number of TRUE values in each month over the course of six years. Since the cycle of Indoor, Outdoor, Summer, and Cross Country is the same every year, my tendencies should be roughly the same year-over-year at the same time.

The trends appear to show a much higher consistency with drills during track season (December-April). There is variation among the drills during the rest of the year, but all are at their peak during March, which is the start of the Outdoor track season.

This is an interesting insight, since I would expect cross country and track seasons to both hold a higher standard than the summer months. However, it appears that my consistency during track season is much better, and there is minimal difference between summer and fall.

Find which T/F category has the highest correlation to feeling.

Charts - Bar



Find which T/F category has the highest correlation to feeling.

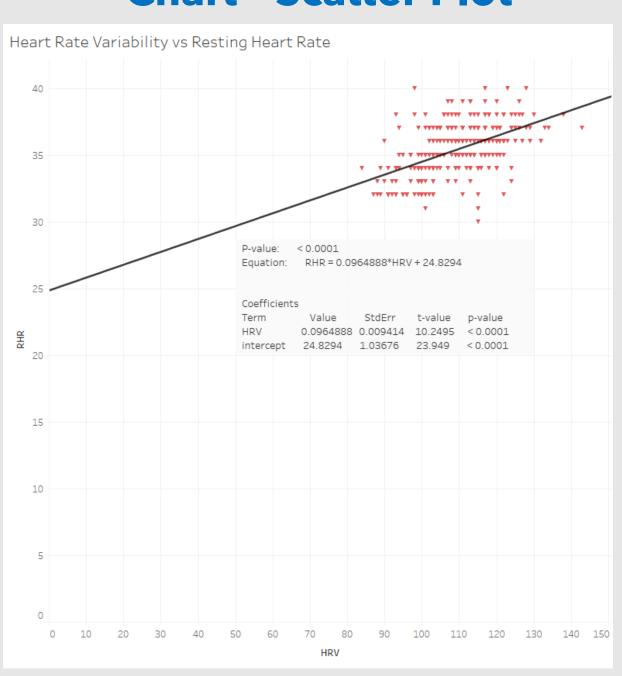
Story

This was an interesting experiment. Shown is a sample of 5 of the Boolean categories. I tested all of them, but decided to show only a sample for simplicity. The chart shows side-by-side comparisons of feeling when true, and feeling when false for each category.

The highest negative correlation was with illness, which makes sense, since being sick never feels good! The highest positive correlation was with ice. This one wasn't what I expected. Apparently, the bloodflow effects of ice really work for me and get me feeling good before my next training session.

Determine if RHR has a positive, negative, or no correlation with HRV.

Chart - Scatter Plot



Determine if RHR has a positive, negative, or no correlation with HRV.

Story

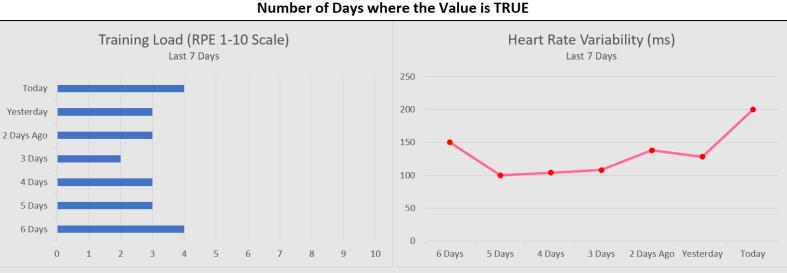
Heart rate variability (HRV) and resting heart rate (RHR) are presumably linked since they are both heart rate metrics, but the link itself isn't common knowledge. HRV is a measure of the variance (in milliseconds) of the time between heart beats. A heart rate of 60 beats/min does not beat exactly every second, there is slight variances. These variances are a result of conflicting impulses from the "fight or flight" and "rest and digest" nervous systems. If one side is worn out, the signal isn't as conflicted, leading to a more regular heart rhythm and lower HRV.

The chart is a simple scatter plot with a trendline, and it has a very clear positive correlation. Higher RHR means higher HRV. The reason for this could be that when the "fight or flight" nervous system is worn down from overtraining (which I am prone to), the "rest and digest" not only takes over the rhythm, but lowers the heart rate itself, leading to both low HRV and RHR.

Create a dashboard that shows current relevant habit trends

Dashboard





Create a dashboard that shows current relevant habit trends

Story

This dashboard is a dream come true for me. I've always wanted to make it but haven't had the chance to put my ideas to paper yet. Using the INDIRECT formula in Excel and a handful of hidden references, the dashboard reactively looks at the most recent 7 days of data and charts them out. The top two bar charts are a display of this week's hydration & sleep, while the bottom two plot HRV and training load with my run intensity rating.

The middle section is a great motivational tool, as it displays how many days I've completed my drills, and uses conditional formatting on a red-green scale. Obviously in this screenshot, I'm not doing very well! Luckily, that's intentional, though, since this is the de-load week between the indoor and outdoor track seasons.

Ultimately, there will be a nutritional section as well, but that will have to wait for the future!

Conclusions

Get your HRV between 103 and 122

 Goal #1 showed that I feel better when my HRV is in that range. I should monitor my performance so I stay in that range.

Consistency on sedentary drills needs work

 Goal #2 clearly showed that I am lacking in the sedentary drills like oxygen breathwork, ice, and mobility.

Drill consistency during track is good, cross country needs work

 Goal #3 showed that I get my drills in during track season, but not XC. That is an area where improvement could be made!

Get your ice baths & don't get sick

 Ice shows up for a second time in Goal #4 as having a high correlation to feeling good. Illness has the opposite effect.

Low RHR is a red flag for overtraining

 Goal #5 revealed that a low RHR correlates to a low HRV. If your resting pulse is lower than normal, you could be overtraining.