

# The Effects of Exercise on Anxiety-Induced Insomnia

Project Overview	Data Collection	What Sleep Looks Like	Habits	Length of Time - Exercise and Deep Sleep	Heart Rates and Total Minutes	Results
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## Inquiry Question:

What effect does regular exercise have on the sleep patterns of a person with anxiety induced insomnia?

## Motivation:

Fitness has played a key role in my life since my freshman year of college (one can assume why). Sleep, as it does for most people, has also played a key role - unfortunately, it's often that of the villain.

When I started going back to school again, exercise became secondary to working full-time and going to school. I also noticed that my sleep patterns were becoming worse. At the beginning of this semester, I decided to try to kill two birds with one stone and record my activity levels and my sleep patterns to decipher if there was truly a link between my lack of exercise and my worsening sleep patterns.

## What is anxiety- induced insomnia?

Anxiety-induced insomnia is merely insomnia with a direct link to an anxiety disorder. Anxiety can make it difficult to "shut your brain off" in order to fall asleep and it can also make it difficult to stay asleep.

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## Data Gathering Tools:

### Apple iWatch:

Exercise - to track my exercise, I used the watch's built-in activity tracker.  
 Sleep - to track my sleep, I used the app "AutoSleep" that automatically syncs to my phone.

**Step 1:** Each day around 3pm, I would give a quality score to the sleep I'd had the night before according to the diagram to the right.

**Step 2:** Prior to going to bed, I would enter the data for that day's workout (if any) and also add the data from the previous night's sleep. I consciously did not look at the data prior to in order to ensure that my quality score wasn't biased by the data.

Note: All time is measured in minutes.

**Step 3:** Documented anything that may affect my ability to sleep/ exercise (column M, "Notes" in screenshot above).

A	B
1	<b>My Quality Score</b>
2	Give me coffee or face my wrath - lethargic,
3	unable to concentrate
4	Very low energy, difficult to concentrate
5	A bit lethargic
6	I could go for a nap - overall, I feel fully functional but could do with a 15 minute power nap
7	I feel fairly well rested
8	I've got energy to spare

A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	night	date	activity	exercise_time	exercise_hr	exercise_index	time_til_sleep	total_mins_sleep	deep_sleep	sleep_hr	sleep_index	quality_score	Notes
2	Thursday	2/20/20	yoga	20	79	55.32	20	486	88	60	57.90	0	
3	Friday	2/21/20	NA	0	0	0.00	138	288	64	64	15.08	0	
4	Saturday	2/22/20	run	34	180	121.68	24	552	89	61	63.92		
5	Sunday	2/23/20	NA	0	0	0.00	22	387	123	55	63.68		Sprained ankle
6	Monday	2/24/20	NA	0	0	0.00	3	387	0	58	15.20		
7	Tuesday	2/25/20	yoga	41	84	66.72	6	429	91	58	55.58	4	
8	Wednesday	2/26/20	run	46	182	127.68	6	415	61	61	40.76	5	
9	Thursday	2/27/20	indoor cycling	25	163	107.88	3	434	46	62	36.52	4	
10	Friday	2/28/20	NA	0	0	0.00	28	480	46	62	38.92	2	
11	Saturday	2/29/20	run	35	183	123.72	55	300	29	56	13.60	3	Slept off a headache with a 45 min nap ~ 7pm
12	Sunday	3/1/20	run	103	176	146.88	135	290	58	60	14.52	2	

**Exercise Index Calculation:**  
 $(\text{exercise\_time} * 0.5) + (\text{exercise\_hr} * 0.5)$

**Sleep Index Calculation:**  
 $(\text{time\_til\_sleep} * 0.25) + (\text{total\_mins\_sleep} * 0.25) + (\text{deep\_sleep} * 0.25) - (\text{sleep\_hr} * 0.25)$

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Project Overview

Data Collection

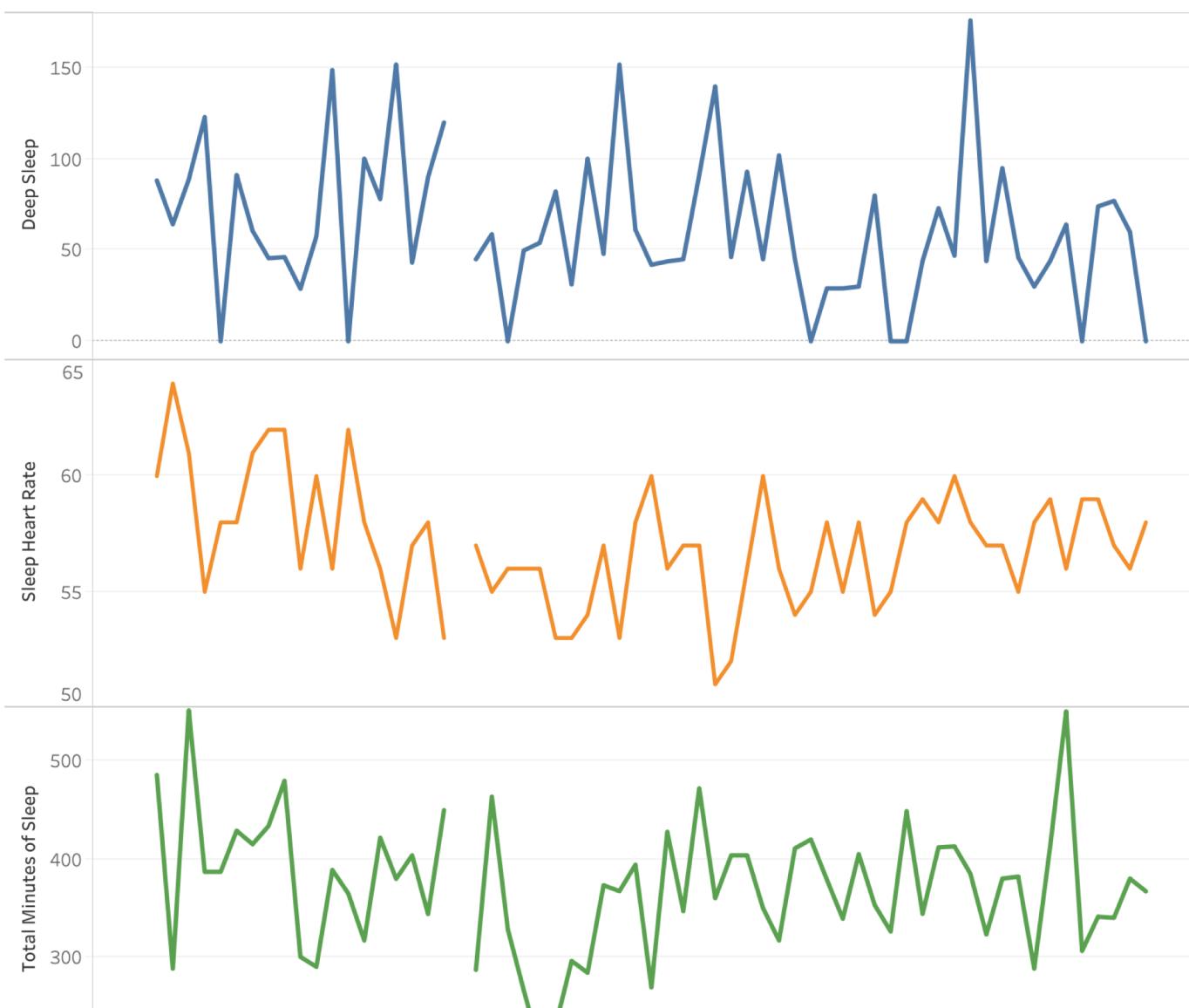
What Sleep Looks Like

Habits

Length of Time -  
Exercise and Deep  
Sleep

Heart Rates and Total  
Minutes

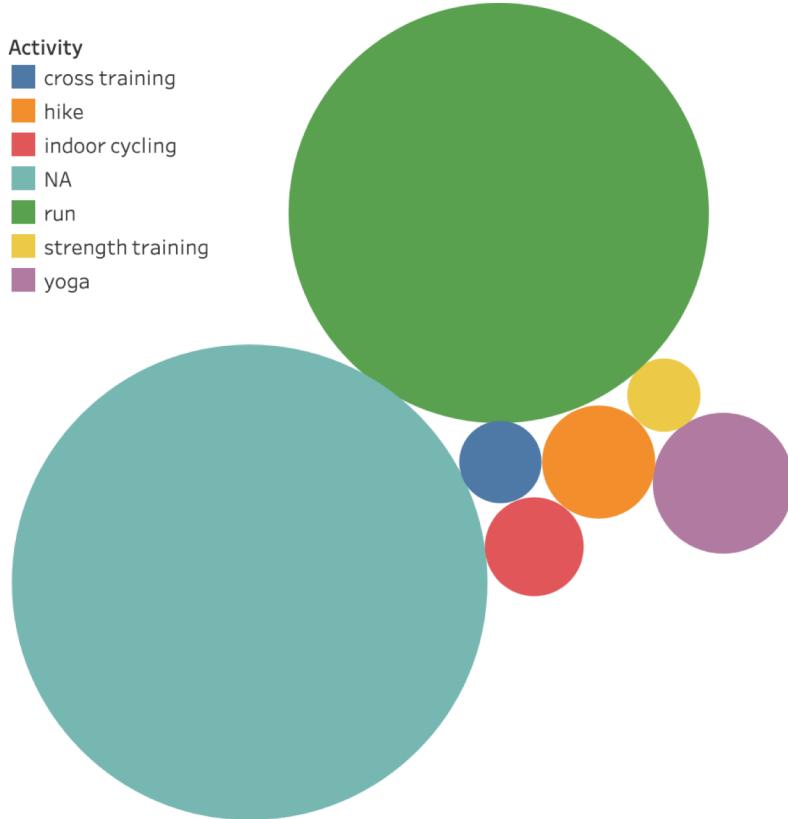
Results



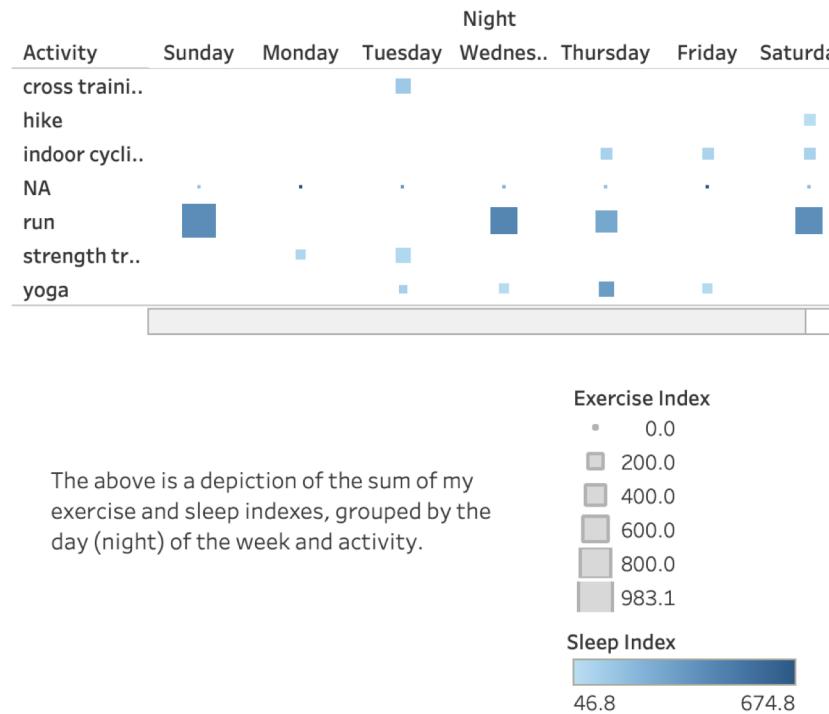
Total minutes of sleep has a direct relationship to deep sleep and heart rate while sleeping has a direct inverse relationship to both.

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Exercise's Affect on My Ability to Fall Asleep						



## Index Interactions



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What Sleep Looks Like

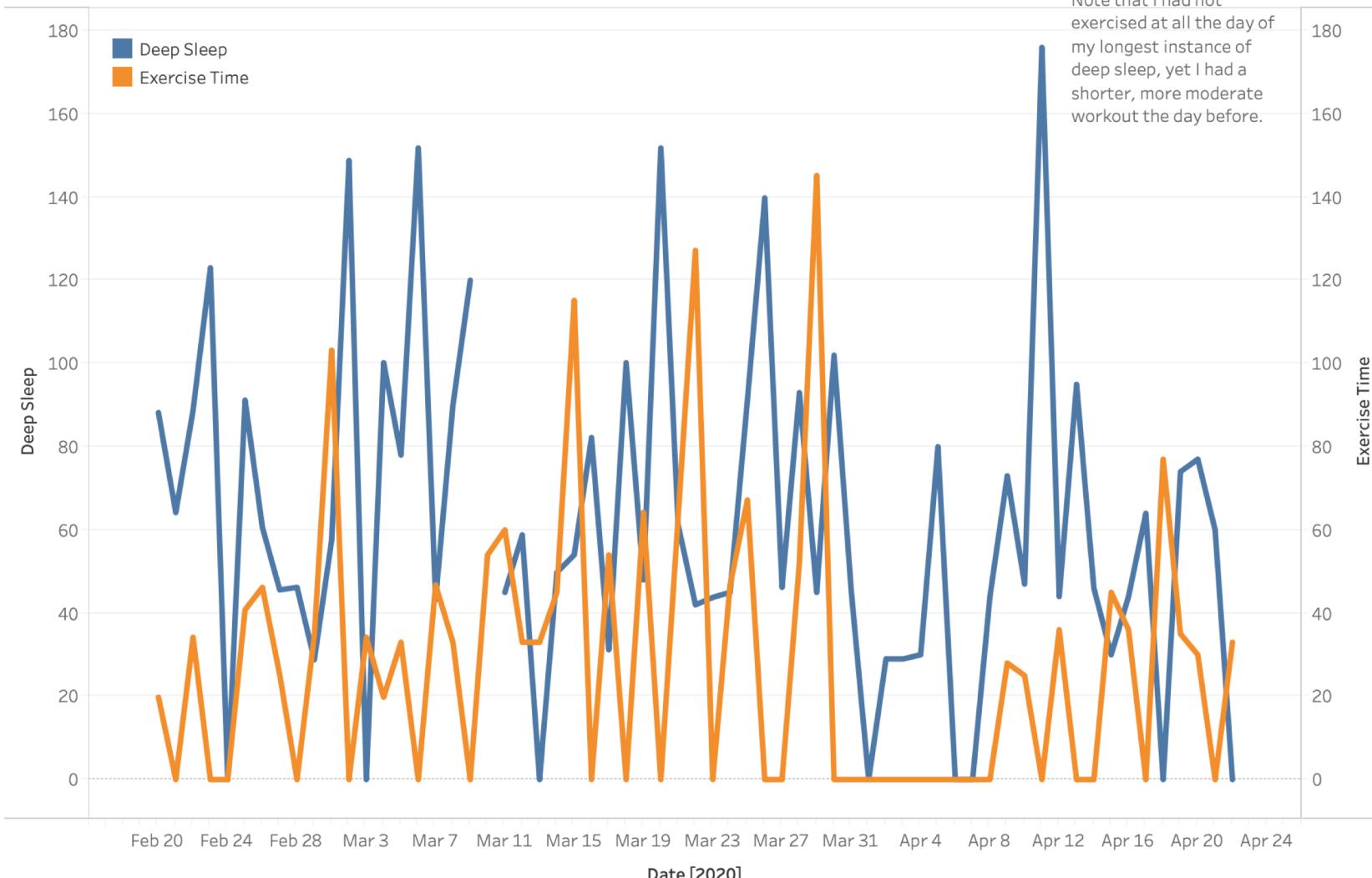
Habits

Length of Time -  
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## Length of Time Exercised & Minutes of Deep Sleep



You may notice in the above graph that the nights of my longer workouts, the length of time I am in a deep sleep plummets. This suggests that longer work outs are

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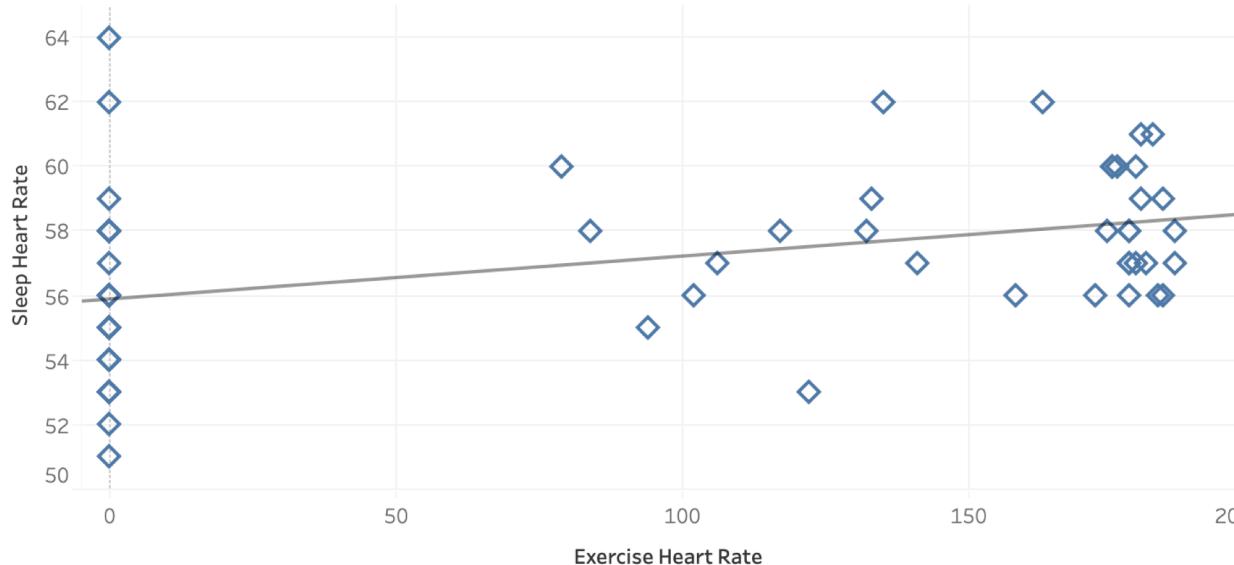
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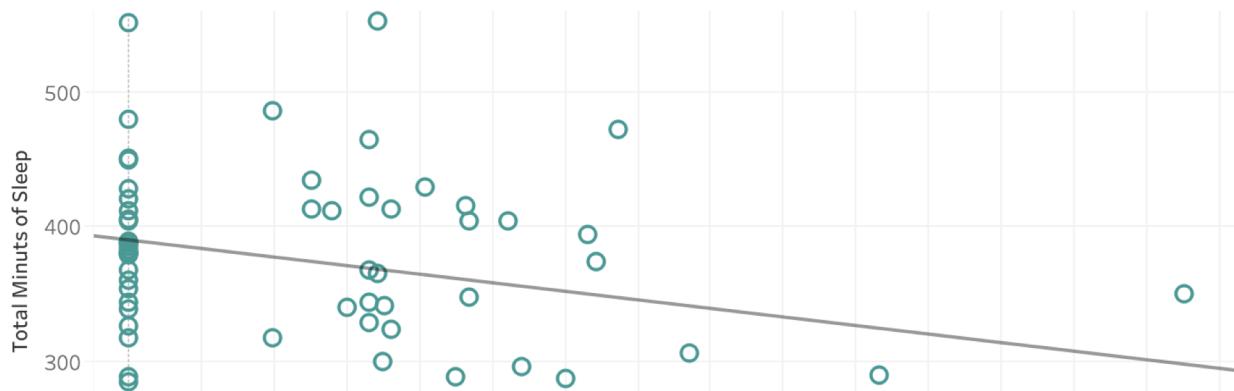
Results

## Exercise HR & Sleep HR



It appears that as my average heart rate during exercise increases, my average sleep heart rate the same night also trends upward, suggesting that the more cardio-centric a workout is, the more likely it is that my sleep quality the same night will suffer.

## Exercise Time & Total Minutes of Sleep



This shows that as the length of time I workout increases, the length of time I actually sleep the same night decreases.

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## Note:

I chose to focus only on the effects that exercise had on my sleep on a day-to-day basis rather than its effects on my overall sleep patterns. This decision was due to the lack of data from prior to when I decided to start exercising regularly again and therefore do not have the data to definitively say what changed. For this reason, results focus solely on the time frame in which the data was gathered.

## Findings:

I've found that the longer and more cardio intensive a workout is, the more likely it is that I will have a lower quality of sleep the night of. This is most likely due to the muscular fatigue and soreness causing a difficulty in getting comfortable.

However, while the less cardio intensive workouts do seem to benefit my sleep to a degree, on a day-by-day basis - focusing solely on the sleep index scores - the days when I didn't exercise at all were the nights that I slept the best.