Effect of Exercise on Mood Dynamics and Resilience

Krishna Bathina, Onur Varol, Johan Bollen

bathina@indiana.edu
https://www.krishnacb.com

Indiana University
Center for Complex Networks and Systems Research
Center for Social and BioMedical Complexity
How do cardio exercises affect you?
Mental Health

- Reducing anxiety
- Reducing depression
- Improved mood
- Improved self esteem

Dopamine: Signals the motivation of an outcome
Norepinephrine: Signals brain and body for action
Serotonin: Somehow mediates mood
Questions

- Can we see this behavior on Twitter?
- Are people generally happier right after their exercise?
- Is there an effect of too much exercise? Possible diminished returns or concave relationship...
- Is there a difference by population? Marathon runners, sprinters, runners, beginners...
- Is there an effect by type of exercise?
Fitness Wearables

- Steps
- Distance
- Time
- Cadence
- Energy Expenditure
- Real time and Average Heart Rate
- Sleep Time
- VO2 max
“I was out cycling 21.19 km with #Endomondo #endorphins”

went for a 6007.9m Run in 33 minutes, 41 seconds #strava

“I just achieved my daily @Fitbit step goal of 6947~ ✨ @Achievement #fitbit”

“Just posted a 12.42 km bike - #Runkeeper”
Observatory on Social Media

OSoMe (awesome) is a joint project of the Network Science Institute (IUNI), the Center for Complex Networks and Systems Research (CNetS) at SICE, and the Media School at Indiana University. OSoMe unites data scientists and journalists in studying the role of media and technology in society, and curbing the spread of misinformation online and the manipulation of social media. Here we highlight tools, findings, publications, and resources.

Research from @TruthyAtIndiana

"How to slay a bot" -- BotSlayer as seen in @SciNode @OSoMe_IU
Read now: sciencenode.org/feature/Botsla...
OSOME

#mapmyrun
#strava
#runkeeper
#endomondo
#dailymile
#nikerunning
#fitbit
#garmin

535,593 tweets
101,074 users
Aug 2016 to 2019 Feb

Twitter API

64,646 english users
67,764 users w/ timezone
43,496 english w/ timezone

Exercise Tweets

Other Tweets

-4H 0H 4H

#1 #2 #3 #5 FE #7 #8 #9

😊使之
🙂😊使之
:wub:使之
😄使之
What is an exercise tweet?

I just finished running 5.2 km #Nikerunning #5k #gettingbettereveryday http://t.co/SHAypaVD4P

Can also have:
- Overall time
- Exact Time
Most walking events occur within one day.

Most running events occur within one week.
- Keep distances (0,50) km
- Keep times (0,4) hours
- Keep velocities (0,20) km/hour

**Exercise Speed**
Aggregating Data - NO EXERCISE TWEETS

3 users superimposed onto one timeline
Bootstrapping

resample tweets with replacement every 30 min

Repeat process 20k times

Resample with
- Same day of week
- Same 30 min interval with timezone
to remove trends

Repeat process 20k times
Exercise most likely happened in this 2 hour range.

Data has to be normalized per user and then aggregated so that we are looking at dynamics rather than overall sentiment.

Why would there be a significant increase before the exercise tweet was posted?
Users are posting a custom message about the tweet before they allow their wearable to post the official tweet.

“I ran 5.480 @CharityMiles for @everymomcounts! Thx2 @Humana for sponsoring me! #MCON14 #EveryMileMatters #beataverage http://t.co/SHAypaVD4P”

Decrease in activity over time.
How to proceed

1. Keep users with middle 95th percentile of exercise/non exercise tweet ratio
2. Filter out all tweets mentioning exercises. We are looking for general sentiment WITHOUT mention of exercise
3. Find exact times when exercise is not happening (if possible)
4. Separate users by intensity - combination of IET and consistency
Thank you!

bathina@indiana.edu

https://www.krishnacb.com