



MAYBE GABAPENTIN IS USEFUL. DISCOVERING POTENTIAL TREATMENTS FOR OPIOID USE DISORDER USING REAL-WORLD DATA FROM ONLINE FORUMS

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Introduction

- Despite therapy, many individuals with opioid use disorder relapse.
- Online commentary offers real-world data on self-treatment and may identify therapeutics that other approaches overlook.**
- Distinguishing plausible online claims from implausible ones remains a **key challenge**.
- We previously developed Jarvis, software that extracts drug names, dosages, and effects from online commentary.
- Here, we **extend Jarvis** to identify substances described specifically to treat opioid withdrawal.

Objective

To identify substances mentioned in online commentary to specifically treat opioid withdrawal.

Reddit Forums Discuss Opioid Use, Withdrawal, and Self-Treatment.

Reddit (n=706,322 comments [126,973 unique])

- r/heroin (n=50,299 [36,674])
- r/OpiatesRecovery (n=157,079 [100,140])
- r/fentanyl (n=14,254 [12,194])
- r/OurOverUsedVeins (n=161,766 [103,683])
- r/opiates (n=126,610 [77,889])
- r/suboxone (n=196,314 [126,871])

Substances	Effects
Ketamine (15,140, 23%)	Withdrawal (9,172, 41%)
Calcium (9,223, 14%)	Anxiety (2,255, 10%)
Phenibut (7,803, 12%)	Restless Legs (2,051, 9.1%)
Oxycodone (3,678, 5.7%)	Precipitated Withdrawal (1,815, 8.1%)
Suboxone (3,364, 5.2%)	Craving (994, 4.4%)

Table 1: Description of Data Source. Top: Forums used in analysis (n = comments [unique]). Bottom: 5 most frequent substances and effects (count of mentions, percentage)

TF-IDF Discriminates Therapies Mentioned to Help with Withdrawal

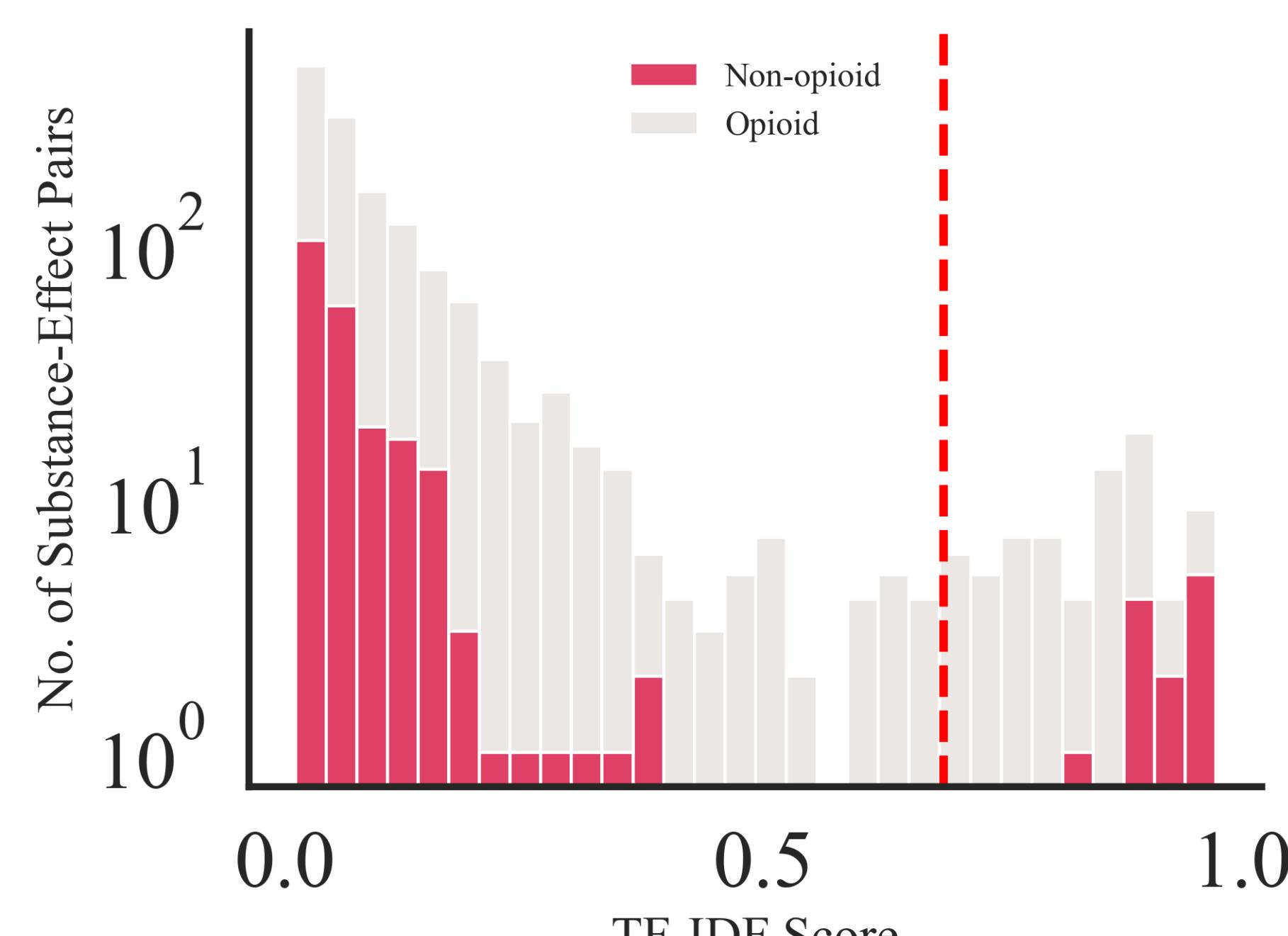


Table 2: Histogram of TF-IDF scores. Grey: Descriptions involving opioids. Black: Descriptions involving non-opioids. The dashed vertical red line denotes threshold of 95th percentile.

Non-Opioids Specifically Described To Ease Withdrawal

Effect	Substance
Anxiety	LSD, CBD, SSRI
Nausea	Promethazine
Restless Legs	Magnesium, Diphenhydramine, Gabapentin
PAWS	Pregabalin, Gabapentin, Ibogaine, Clonidine

Table 3: Top 10 Non-Opioid Substance-Effect Associations by Clinical Domain. Substances most specifically associated with treating aspects of opioid withdrawal, corresponding to items to right of threshold line in Figure 2. (TF-IDF > 0.64, 95th percentile). PAWS, post acute withdrawal syndrome.

Methods (Theory)

- The effect of a substance described online is more likely to be truly due to that substance if that effect is described more frequently with that substance than other substances (textual specificity of substance-effect association).
- Term frequency-inverse document frequency (tf-idf, τ) quantifies textual specificity.

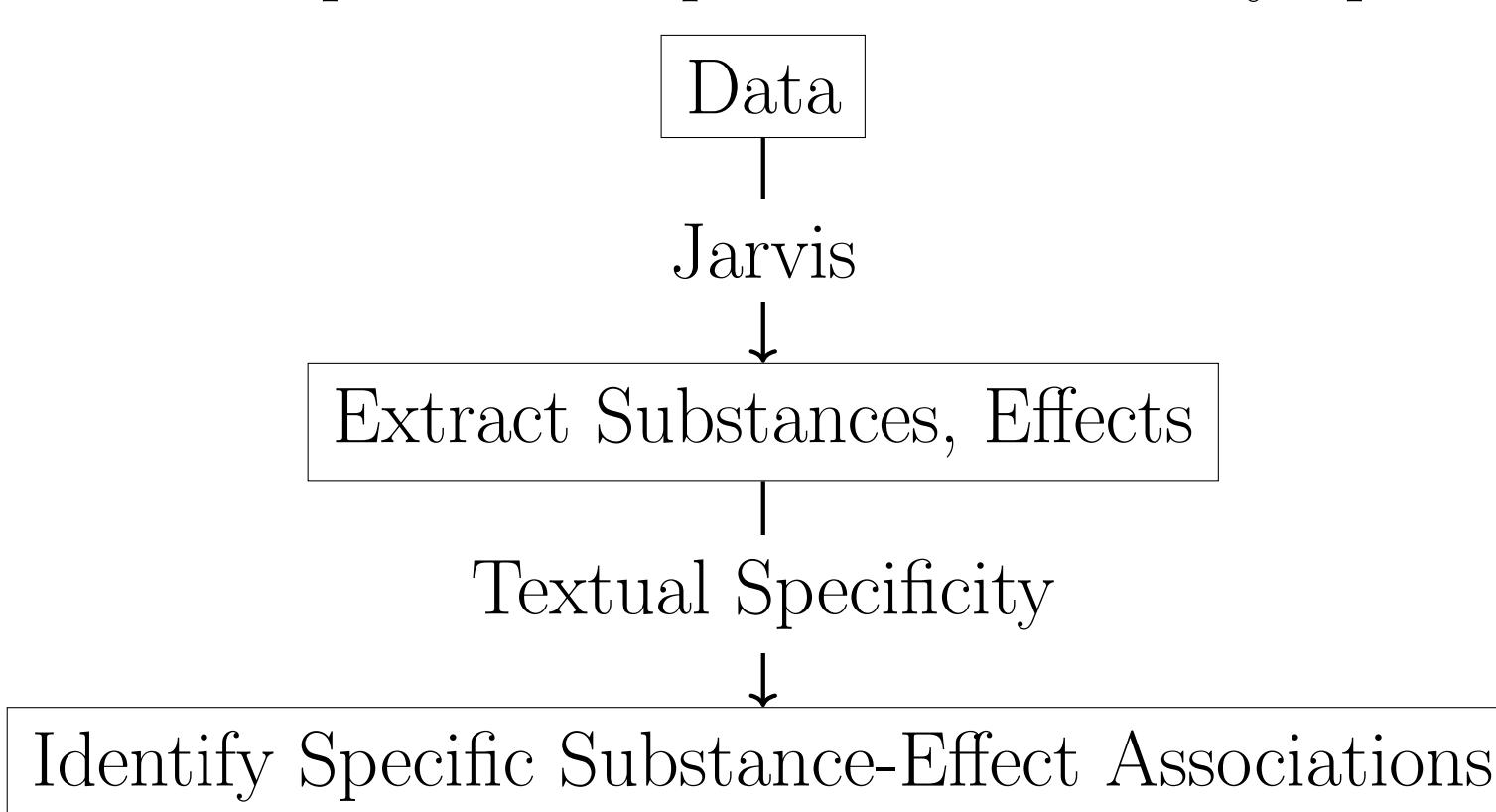
$$\tau = \frac{\# \text{ of times } term \text{ is mentioned}}{\# \text{ of times all words are mentioned in data set}} \cdot \frac{1}{\# \text{ of documents mentioning } term}$$

word	f_1	f_2	\dots	f_{25}	τ
aspirin	.04	.04	\dots	.04	.04/25 \rightarrow .0016
gabapentin	.04	0	\dots	0	.04/1 \rightarrow .04

→ Select words with τ above 95th percentile of empiric distribution.

Methods (Experiment)

- We acquired comments from 6 Reddit forums dedicated to opioid use disorder.
- We used Jarvis to identify compounds.
- We calculated term frequency-inverse document frequency (tf-idf) to determine how often a compound is mentioned for particular opioid withdrawal symptoms (textual specificity).



Discussion

Validity of Data Extraction. Most frequently mentioned substances include suboxone and oxycodone. Most frequently mentioned effects include withdrawal, precipitated withdrawal, and craving.

Validity of TF-IDF Measure. Most substances are mentioned indiscriminately and are filtered out by tf-idf. Opioids mentioned more frequently than non-opioids. SSRIs are a recommended treatment for anxiety disorders.

New findings Online discussions discuss leg paresthesias (“restless legs”) and PAWS, effects less described in the scientific literature, for which gabapentinoids may be useful treatments

Conclusion

We found that TF-IDF can separates plausible claims of substance efficacy from implausible ones and identifies new therapies.

Next steps: We will test Jarvis on other platforms and evaluate the lead compounds we discover.

Acknowledgments

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Further Reading

