4-fluoramphetamine in the Netherlands: text mining and sentiment analysis of internet forums

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Lisbon, October 25th, 2019
New Psychoactive Substances (NPS) have become a growing global phenomenon (UNODC, 2016)

In the Netherlands, substantial increase acute emergencies due to the NPS 4-fluoroamphetamine (4-FA / 4-FMP), incl. media coverage

Monitoring data indicates increase in use of 4-FA during last years

Sale and exchange of information about NPS increasingly online (e.g. dark web, drug users online fora)

Online data can be accessed, scraped and analysed using statistical / data science software (e.g. R, Python)
Research questions

1. Can changes in the number of 4-FA related forum posts be observed?
   - Around the time 4-FA was increasingly found by monitoring services

2. Can changes in the sentiment of these posts be observed?
Methods

- Using Rselenium and PhantomJS browser, web forums accessed
- Search function of fora used to find relevant posts
  - Containing words associated with 4-FA, cocaine, ecstasy, and a neutral word (forum)
- Content of these posts (with meta-data) downloaded and stored as data objects in R
- Content of posts semantically analysed using pattern.nlp (Python)
Methods: search forum posts

```r
# search example #
remor$Screenshot(display=TRUE)
remor$navigate("http://drugsforum.info/search.php")
remor$Screenshot(display=TRUE)
searchTerms <- remor$findElement("id", "keywords")
searchTerms$sendkeystoElement(list("4fa + 4fmp"))
searchany <- remor$findElement("id", "terms2")
searchany$clickElement()
remor$Screenshot(display=TRUE)
searchnow <- remor$findElement("name", "submit")
searchnow$clickElement()
remor$Screenshot(display=TRUE)
```
Methods: sentiment analysis

```r
# sentiment analysis example #

pattern_sentiment("This is good", language="english")
pattern_sentiment("This is very good!", language="english")
pattern_sentiment("This is mediocre", language="english")
pattern_sentiment("This is very bad", language="english")

pattern_sentiment("This is less well than it should be", language="en")
pattern_sentiment("This is the truth", language="english")

## end.
```
Results

4-FA increasingly seen at first aid of dance events

4-FA scheduled May 25, 2017
Results

![Graph showing data for 4-FA, Cocaine, Ecstasy, and Forum over the years 2012 to 2017 with error bars and a star indicating significance.]

- **4-FA**: A significant increase in sentiment score is observed from 2014 to 2015, indicated by a star (*).
- **Cocaine**: A steady increase in sentiment score from 2012 to 2017.
- **Ecstasy**: A consistent pattern with moderate sentiment scores from 2012 to 2017.
- **Forum**: A noticeable increase in sentiment score from 2014 to 2015.
Conclusion

- It is feasible to monitor (anonymous) online drug discussion forums using statistical software.

- Trends in the number of posts and sentiment polarity observed compared to other substances

- General trends observed in 4-FA forums correspond with general trends in other monitoring instruments
  - Earlier than first aid reports?
Discussion themes

- Research ethics!
- Stable availability of data and forums
- Response forums / social media on monitoring activities
Thank you!

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