Modeling Stress with Social Media Around Incidents of Gun Violence on College Campuses

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Mental Health Crisis Affects both individual and collective wellbeing
“3 out of 4 college students say they’re stressed!”

Liu, Wong, Yasui, Chen (2018)

Academic
Personal
Relationships
Social
Crisis Events
Crisis on College Campus: Gun Violence

175+ gun violence incidents on U.S. college campuses (2007-)
300+ casualties

Affects the psychological wellbeing of college students
## Assessing Mental Health on College Campuses

### Limitations:
- Scalability
- Biases (e.g., retrospective recall)
- Stigma about availing mental healthcare
- Reactive
- Implementational difficulty

### Advantages (Social Media Data):
- Large-scale and Longitudinal
- Self-recorded in the present
- Requires no active intervention

### Social Media bridges some of these gaps
Our Work

We leverage social media data to study the evolution of stress around gun violence incidents on college campuses.
Research Questions

Identify stress expressions in social media

*Temporal* changes in stress expressions after gun violence on college campuses

*Linguistic* changes in stress expressions after gun violence on college campuses
Online College Communities on Reddit
Data

- 12 subreddits of colleges where gun violence occurred between 2012 and 2017
- **Treatment Period**: 2mo. *before* and 2mo. *after* each event
- **Control Period**: Similar period in the previous year
- Google BigQuery to collect the dataset
- Net dataset: 113,337 posts
Research

Question 1

Inferring Stress Expression

Stress Classifier (High and Low Stress)

+ **r/stress**
- Non-Mental Health subreddits *(r/movies, r/music, r/aww, r/Jokes, etc.)*

“Feel like I am burning out (again...)”

“Help: what do I do?”

“I have been way too lax, and unfocused, taking way too long for basic assignments or just not finishing them, which evolves into not submitting them.”
Stress Classifier

- 5000 n-gram & 3 sentiment Features
- SVM Classifier
- Accuracy: 0.82 k-fold cross-validation ($k=5$)
- Machine labeled stress in college dataset

Validated on college subreddit dataset: 82% accuracy

Top Features

- stress
- luck
- meet
- try
- breathing
- life
- work
- techniques
- sleep
- anxiety
- exercise
- problems
- focus
- meditation
- control
- help
- body
- job
High stress posts as a Time Series

- **Time domain**
  - **Compare Treatment vs. Control**
    Controls for academic calendar, local, seasonal etc. factors.
  - **Compare Before vs. After**
    Relative changes as trends.

- **Frequency domain**
  Disruption in the periodicities

![Diagram of time series study](#)
Time Domain Analysis of Stress Expressions

Treatment vs. Control

Before-After Change Analysis

Stress experiences throughout the year, but sudden increase after gun-violence
Research Question 3
Linguistic Dynamics of Stress Expression

- Psycholinguistic characterization
- Incident-specific lexical analysis
Psycholinguistic Characterization

**INCREASE**
- Anger
- N. Affect
- Sadness
- Swear
- Feel
- Bio
- Health
- Death
- Health
- Home
- Family
- Friends

**DECREASE**
- P. Affect
- Causation
- Inhibition
- Hear
- Insight
- See
- Preposition
- Future Tense
- Present Tense
- Money
- Achievement

“I guess since campus is a gun free zone we are all f*ked.”

“I hope that no one is seriously killed or is injured.”
Psycholinguistic Characterization: Temporal

Pronoun usage
• Depressed-or-dealing with crisis
• Increased concern at traumatic event
• Collective Identity
• Sense-of-community

Cohn et al. (2004), Pennebaker et al. (2003)
Lexical Analysis

Incident Specific Keywords: r/fsu: safe, shooting, strozier, news, library, shooter, friends, victims, stay, post, time, people, information
Summary of Findings

- Built a Stress Classifier on social media
- Examined *Temporal* and *Linguistic* dynamics of stress around gun violence on college campuses
- Immediate rise in the volume of High Stress posts
- Emergence of collective identity, and seeking solidarity in friends
- Decreased *cognitive processing*, and *academic- & career- related conversations*
- Increased *self-attention, social orientation, death- & family- related conversations*

Students experience chronic stress throughout, but acute stress after gun violence on college campuses
Evidence of Impact on the Community

Constructivist Self Developmental Theory

Psychological need areas that can be affected and disrupted by crises.

*McCann and Pearlman (1993)
Implications

- No clinical assessment
- Socio-psychological response after crises
- Quantify impacts and severity of crises
- Population-centric tracking tools
- Informed policy-making on campuses
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