

Understanding Public's Intentions on Stay-at-Home Orders During the COVID-19 Pandemic Using Twitter Semantic Analysis



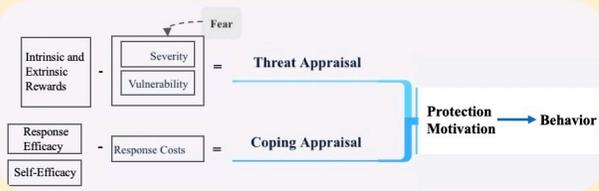
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Introduction

Stay-at-home order limits people's freedom of movement and therefore poses a challenge to public health officials to ask the public to adopt such recommended behavior. This study investigates people's intentions toward stay-at-home order by analyzing Twitter posts (March - April 2020) using the Protection Motivation Theory (PMT) framework and computational semantic analysis. The goal is to recommend important messaging elements for public health officials to help people adopt stay-at-home orders.

PMT Framework



Protection motivation theory (PMT) was originally developed by Rogers (1975, 1983), which provided a general theory of persuasive communication and underlying cognitive mediating processes leading to adopt recommended behavior. **PMT serves as the main framework for this research to understand the effects of emotions (threat appraisal) and the psychological variables (coping appraisal) underlying intentions for protective behavior (stay-at-home).**

The three psychological variables are self-efficacy, response efficacy, and response cost. **Self-efficacy** indicates individual's capacity to perform recommended behavior; **Response Efficacy** indicates the belief of the recommended behavior's effectiveness to reduce the risk; **Response Cost** indicates the perceived loss or costs of performing the recommended behavior.

Method

Applied computational semantic analysis on collected tweets, including supervised machine learning, emotion analysis and topic modeling.

Supervised Machine Learning: Used BERT, a supervised neural network algorithm to label 18,000 tweets on their self-efficacy, response efficacy, response cost & intention based on our 2,000 manually coded tweets (ICR = 0.90). 17,620 tweets out of 20,000 are relevant to our topic.

Topic Modeling: Leveraged Latent Dirichlet Allocation (LDA) topic modeling (Blei et al., 2003) in R to classify tweets expressing self-efficacy, response efficacy, and response cost into different topics.

Emotion Analysis: Utilized 'syuzhet' R package, which applies Saif Mohammad's NRC Word-Emotion Association Lexicon, to get emotion of each sentence in tweets.

PMT Factors and Intention

H1: The demonstration of **self-efficacy** is associated with the **intention** to follow stay-at-home orders.
H2: The demonstration of **response efficacy** is associated with the **intention** to follow stay-at-home orders.
H3: The demonstration of **response cost** is associated with the **intention** to follow stay-at-home orders.

Results

Using supervised machine learning, all PMT coping appraisal factors are significantly associated with intention to follow stay-at-home orders.

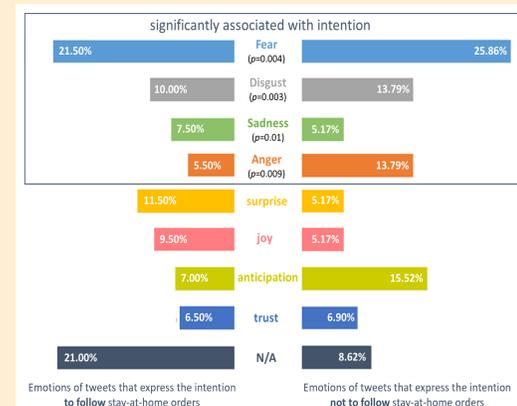
IV		DV
Self-Efficacy (13.21%)	$\chi^2 (2, N=17,620) = 515.27$ $p = .000, v = 0.17$	Intention to Follow Stay-at-Home Orders (31.61%)
Response Eff. (15.08%)	$\chi^2 (2, N=17,620) = 1397.88$ $p = .000, v = 0.28$	
Response Cost (25%)	$\chi^2 (2, N=17,620) = 941.36$ $p = .000, v = 0.23$	

Emotions and Intention

RQ: What kinds of **emotions** are associated with people's intention to follow stay-at-home orders?

Results

Negative emotions (anger, disgust, fear & sadness) are significantly associated with intention.



Topic Modeling Results

CDC guidelines and friendship constitute positive tweets; Job loss and boredom constitute negative tweets.



Discussion

- Applied PMT into social media big data analysis
- Provided a coding rationale of PMT factors in content analysis
- Policy makers should assess the public response to the pandemic, especially the burdens associated with the stay-at-home orders
- Health communication should address the benefits of stay-at-home orders towards individuals and the society
- Negative emotions are predictors of citizen's intention during the pandemic
- Tweet analysis is unable to generate directions of correlation (whether negative or positive)

Future Directions

- Add PMT threat appraisal to the research framework on social media
- Conduct complementary survey to further testify the correlation between PMT factors, emotion and intention.

Reference

Blei, D. M., Ng, A. Y., & Jordan, M. I. (2003). Latent dirichlet allocation. *Journal of machine learning research*, 3(Jan), 993-1022.
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 Rogers, R. W. (1983) Cognitive and physiological processes in fear appeals and attitude change: a revised theory of protection motivation. In J. T. Cacioppo and R. E. Petty (eds) *Social Psychophysiology: a Source Book*. New York: Guilford Press, 153-76.