The Impact of COVID-19 Characterization on Public Psychology: A Study Based on Active Weibo Users

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Date: 2020-02-05T00:00:00+00:00

Abstract

[Objective] To investigate the impact of the classification of novel coronavirus pneumonia on public psychology, and to provide a scientific basis for effective psychological counseling. [Methods] Using Weibo user data, we calculated word frequency characteristics for the week before and after the 20th, including negative indicators (anxiety, depression, and compulsion), positive indicators (life satisfaction and Oxford happiness), and social attitude indicators (social risk judgment and anger emotion), and compared differences in these indicators before and after the 20th. [Results] After the 20th, the frequency of negative emotion words (t=-18.533, p<0.05) and anxiety words increased (t=-17.433, p<0.05), while the frequency of family words (t=7.907, p<0.05) and friend words decreased (t=6.897, p<0.05); levels of anxiety (t=-35.962, p<0.05), depression (t=-10.717, p<0.05), and compulsion (t=-24.755, p<0.05) increased; Oxford happiness (t=3.120, p<0.05) and life satisfaction (t=5.500, p<0.05) decreased; levels of social risk judgment (t=-8.832, p<0.05) and anger emotion (t=-11.415, p<0.05) increased. [Limitations] The granularity of data with week as the measurement unit is relatively coarse, which has certain impact on timely reflecting the changing trends of social mentality. [Conclusion] After the official classification of COVID-19 on the 20th, the overall social mentality exhibited increased negative emotions such as anxiety and anger, while happiness decreased, and sensitivity to social risks increased.

Full Text

The Psychological Impact of the 2019-nCoV Epidemic Declaration: A Study of Active Weibo Users

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Abstract

Objective: This study investigates the psychological impact of the official classification of COVID-19 on public mental health to provide scientific evidence for effective psychological intervention.
Methods: We analyzed data from active Weibo users, calculating word frequency features and psychological indicators for the week before and after January 20, 2020. Negative indicators included anxiety, depression, and obsession; positive indicators comprised life satisfaction and Oxford happiness; and social attitude measures encompassed social risk judgment and anger. Paired-sample t-tests compared these metrics between the two periods.
Results: Following January 20, frequencies of negative emotional words ($t = -18.533$, $p < 0.05$) and anxiety words ($t = -17.433$, $p < 0.05$) increased significantly, while family-related ($t = 7.907$, $p < 0.05$) and friend-related words ($t = 6.897$, $p < 0.05$) decreased. Anxiety ($t = -35.962$, $p < 0.05$), depression ($t = -10.717$, $p < 0.05$), and obsession ($t = -24.755$, $p < 0.05$) levels all increased. Conversely, Oxford happiness ($t = 3.120$, $p < 0.05$) and life satisfaction ($t = 5.500$, $p < 0.05$) decreased. Social risk judgment ($t = -8.832$, $p < 0.05$) and anger ($t = -11.415$, $p < 0.05$) also increased significantly.
Limitations: The weekly measurement interval provides relatively coarse temporal granularity, which may limit timely detection of rapid changes in social mentality.
Conclusions: Following the official COVID-19 classification on January 20, public mental health exhibited increased negative emotions such as anxiety and anger, decreased well-being, and heightened sensitivity to social risks.

Keywords: public health emergencies; word frequency analysis; anxiety; depression; well-being; social attitudes

1. Introduction

The novel coronavirus (2019-nCoV) causes coronavirus disease 2019 (COVID-19), first identified on December 12, 2019. Clinical manifestations closely resemble viral pneumonia, but with longer incubation periods and higher transmissibility. The outbreak coincided with the Lunar New Year travel rush, resulting in exponential case growth due to massive population movement.

On January 20, 2020, China' s National Health Commission classified COVID-19 as a Class B infectious disease while implementing Class A prevention and control measures. Concurrently, Wuhan established its epidemic prevention

command center and locked down the city on January 23. This official classification marked a critical escalation in pandemic response and unprecedented public attention.

The uncertainty and unpredictability of the outbreak threatened not only physical health but also psychological well-being. Exposure to disease-related environmental cues triggers negative cognitive appraisals and emotions, leading to avoidance behaviors. The highly infectious nature of COVID-19 served as a significant stressor, causing emotional instability and herd behaviors such as panic buying. Without timely psychological intervention, these responses could severely impact individual mental health and social order. Traditional questionnaire methods, however, suffer from time constraints, high attrition rates, and participant compliance issues, making them ill-suited for providing timely psychological indicators.

Social media platforms like Weibo and Twitter offer new opportunities for real-time monitoring of population-level psychological characteristics. As a leading social platform, Weibo contains rich behavioral data through user posts, reposts, and comments. Ecological recognition methods enable automatic extraction of psychological indicators from these data. Word frequencies—such as emotional words (anxiety, sadness, anger) and cognitive words (family, money)—directly reflect psychological experiences, while validated metrics for anxiety and depression are crucial for assessing mental states during crises. Additionally, well-being and social attitudes represent important population characteristics that inform policy development.

This study employs ecological recognition to analyze word frequency features in posts from active Weibo users. Using established prediction models, we automatically calculated negative (anxiety, depression, obsession), positive (life satisfaction, Oxford happiness), and social attitude (social risk judgment, anger) indicators. Using January 20, 2020 as a pivotal date, we compared psychological characteristics between the week before (January 13-19) and the week after (January 20-26) to scientifically analyze COVID-19' s impact on public psychology and inform psychological support strategies.

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2. Methods

2.1 Data Collection

We collected data from Sina Weibo between December 31, 2019 and January 26, 2020, identifying active users who posted at least 50 original tweets during this period. Users were non-institutional accounts (e.g., verified individual users, ordinary accounts) with domestic location tags. From 1.16 million potential users, we identified 17,865 active Weibo users (25.2% male, 74.8% female). We downloaded all original posts from these users during the two-week study period

(January 13-26), dividing them into pre-January 20 (January 13-19) and post-January 20 (January 20-26) datasets.

2.2 Psychological Feature Prediction

We utilized the TextMind Chinese psychological analysis system, developed by the Computational Cyber-Psychology Laboratory at the Institute of Psychology, Chinese Academy of Sciences, to extract content features. TextMind integrates Chinese word segmentation tools and psychological analysis dictionaries. The system segments original posts into linguistically tagged words (e.g., verbs, nouns, adverbials, objects) and extracts features using the Simplified Chinese LIWC dictionary.

After feature extraction, we applied pre-trained psychological prediction models to estimate user psychological indicators. These models, developed using big data and deep learning techniques for cyber-psychology research, predict negative (anxiety, depression, obsession), positive (life satisfaction, Oxford happiness), and social attitude (social risk judgment, anger) metrics.

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3. Results

3.1 Word Frequency Analysis

Using the Simplified Chinese LIWC dictionary in TextMind, we calculated word frequency percentages for the pre- and post-January 20 periods. We examined two categories: emotional words (positive emotion, negative emotion, anxiety, anger, sadness) and cognitive concern words (health, work, family, friends, money, death, religion). Paired-sample t-tests revealed significant differences between periods, as shown in .

For emotional words, significant differences emerged for positive emotion words ($t = -26.096$, $p < 0.05$), negative emotion words ($t = -18.533$, $p < 0.05$), and anxiety words ($t = -17.433$, $p < 0.05$), with higher frequencies after January 20. Sadness words also differed significantly ($t = 4.66$, $p < 0.05$) but decreased in frequency. Anger words showed no significant change.

For cognitive concern words, health ($t = -80.668$, $p < 0.05$), work ($t = -4.920$, $p < 0.05$), death ($t = -8.269$, $p < 0.05$), and religion ($t = -15.296$, $p < 0.05$) words increased significantly after January 20. Family words ($t = 7.907$, $p < 0.05$) and friend words ($t = 6.897$, $p < 0.05$) decreased significantly. Money words showed no significant difference.

3.2 Negative Psychological Indicators

We calculated standardized scores for anxiety, depression, and obsession (range: 1-21, with extremes indicating weaker or stronger traits) for both periods. Paired-sample t-tests revealed significant differences, as shown in .

Anxiety (t = -35.962, p < 0.05), depression (t = -10.717, p < 0.05), and obsession (t = -24.755, p < 0.05) all increased significantly after January 20. Post-January 20 levels (Anxiety: M = 12.79, SD = 4.66; Depression: M = 15.27, SD = 5.08; Obsession: M = 14.10, SD = 3.51) exceeded pre-January 20 levels (Anxiety: M = 11.69, SD = 4.61; Depression: M = 14.87, SD = 4.81; Obsession: M = 13.43, SD = 3.41).

3.3 Positive Psychological Indicators

We calculated standardized scores for Oxford Happiness (range: 1-100) and life satisfaction (range: 1-21) for both periods. Paired-sample t-tests revealed significant differences, as shown in .

Oxford Happiness (t = 3.120, p < 0.05) and life satisfaction (t = 5.500, p < 0.05) decreased significantly after January 20. Post-January 20 scores (Oxford Happiness: M = 89.71, SD = 8.84; Life Satisfaction: M = 14.24, SD = 2.28) were lower than pre-January 20 scores (Oxford Happiness: M = 89.91, SD = 9.48; Life Satisfaction: M = 14.33, SD = 2.47).

3.4 Social Attitudes

We calculated standardized scores for social risk judgment and anger (range: 1-5) for both periods. Paired-sample t-tests revealed significant differences, as shown in .

Social risk judgment (t = -8.832, p < 0.05) and anger (t = -11.415, p < 0.05) increased significantly after January 20. Post-January 20 levels (Social Risk Judgment: M = 4.12, SD = 0.25; Anger: M = 1.86, SD = 0.45) exceeded pre-January 20 levels (Social Risk Judgment: M = 4.10, SD = 0.27; Anger: M = 1.83, SD = 0.43).

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4. Discussion

On January 20, 2020, Dr. Zhong Nanshan confirmed human-to-human transmission in a live CCTV interview, prompting comprehensive societal attention and response measures. Wuhan' s lockdown on January 23 further intensified public discourse. Compared to the pre-January 20 period, societal attention and mental states changed substantially, making the comparison of word frequencies and psychological indicators across these two weeks effective for understanding shifts in public mentality.

Our ecological recognition analysis of 17,865 active Weibo users revealed increased anxiety word frequency, negative emotional word frequency, and elevated scores for anxiety, depression, and obsession after January 20. These findings reflect heightened emotional problems as the outbreak intensified, particularly pronounced anxiety increases. Following confirmation of human-to-

human transmission, the public—previously immersed in New Year festivities—experienced uncertainty about personal safety and "illness anxiety," worrying about potential infection. Experts recommended protective measures such as mask-wearing and hand-washing, which, driven by anxiety, manifested as compulsive behaviors like repeated hand-washing due to perceived infection risk. Notably, positive emotional word frequency increased slightly after January 20. Following the outbreak, especially after Wuhan' s lockdown, reports expressing concern and support for Wuhan proliferated, demonstrating positive societal solidarity. Thus, while public health emergencies trigger anxiety about personal safety, they can also evoke positive emotions like unity and compassion.

Cognitive concern word analysis revealed increased health, death, and religion word frequencies, a modest increase in work-related words, and decreased family and friend word frequencies. The rise in health words and decline in family/friend words align with societal trends: to prevent outbreak spread, people responded to "no gathering" calls, avoided contact, and consequently used fewer interpersonal group-related terms.

Positive psychological indicator analysis showed significantly lower life satisfaction and Oxford Happiness scores after January 20. The outbreak' s disruption, increased negative emotions, and lifestyle changes significantly impacted population well-being. The Lunar New Year typically represents a time for reunion and celebration, but human-to-human transmission concerns reduced gatherings, forced home isolation, canceled outdoor activities like temple fairs, and severely affected businesses, collectively reducing quality of life and happiness.

Social attitude analysis revealed significantly higher social risk judgment and anger after January 20. Official confirmation increased societal uncertainty regarding unknown etiology, unclear transmission routes, and long incubation periods, heightening risk sensitivity. Additionally, after initial reports on December 31, 2019 claimed "no human-to-human transmission," the subsequent confirmation contradicted earlier statements, causing panic among those who had previously dismissed the threat and anger toward official misjudgment and delayed response.

Given these psychological impacts—increased anxiety, decreased happiness, heightened social risk judgment, and anger—timely monitoring and intervention are crucial. Elevated social risk judgment stems largely from information uncertainty; authoritative institutions should provide timely, transparent information to reduce public uncertainty and perceived risk. We recommend implementing social psychological guidance measures, such as hotline counseling and psychological aid groups, to effectively support individuals with strong negative emotional reactions and reduce anxiety. Simultaneously, while controlling the outbreak, policymakers should address livelihood issues.

In summary, analyzing psychological changes in active Weibo users before and after COVID-19' s official classification enables timely understanding of public mental states. Compared to questionnaires, ecological data acquisition is faster,

more direct, and feature-rich, enabling effective social mentality monitoring to inform policy measures that promote social stability during crises.

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5. Conclusion

This study employed ecological recognition to analyze word frequency changes and psychological indicators—including SCL-90 metrics (anxiety, depression, obsession), well-being (life satisfaction, Oxford Happiness), and social attitudes (social risk judgment, anger)—among active Weibo users during the critical period of the 2019-nCoV outbreak. Results demonstrate that following the official COVID-19 classification, public mentality exhibited increased negative emotions such as anxiety and anger, decreased well-being, and heightened sensitivity to social risks.

Our Weibo-based analysis may have age-related biases, as the platform' s user base skews younger. Additionally, the weekly measurement granularity limits its timely detection of rapid social mentality changes. Future research should leverage social media data to study public health events' psychological impacts, providing effective methods for monitoring population mental states during pandemics and informing measures to promote social harmony and collective resilience.

References

[1] Huang, C. L., Wang, Y. M., Li, X. W., Ren, L. L., Zhao, J. P., Hu, Y., ···Cao, B. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*, 2020 Jan 24. pii: S0140-6736(20)30183-5.

[2] Terrizzi, J. A., Shook, N. J., & Mcdaniel, M. A. (2013). The behavioral immune system and social conservatism: a meta-analysis. *Evolution and Human Behavior*, 34(2), 99-108.

[3] Yang, S., Li, C., & Wu, Q. (2015). Review of the disease-avoidance function of human social behavior. *Advances in Psychology*, 5(10), 593-603.

[4] Liu, M., Xue, J., Zhao, N., Wang, X., Jiao, D., & Zhu, T. (2018). Using social media to explore the consequences of domestic violence on mental health. *Journal of Interpersonal Violence*, 2, 1-21.

[5] Tang, Q. P., Cheng, Z. H., & Yuan, A. H. (1999). Application and analysis of SCL-90 in China. *Chinese Journal of Clinical Psychology*, 7(1), 16-201.

[6] Liu, X., Zhao, J. X., & Shen, J. L. (2013). The effect of perceived discrimination on the well-being of migrant children: Mediating mechanisms and moderating role of sense of belonging. *Acta Psychologica Sinica*, 05.

[7] Schaller, M. (2006). Parasites, behavioral defenses, and the social psychological mechanisms through which cultures are evoked. *Psychological Inquiry*, 17(2), 96-101.

[8] Gao, R., Hao, B., Li, H., et al. (2013). Developing simplified Chinese psychological linguistic analysis dictionary for microblog. *International conference on brain and health informatics*. Springer, Cham, 2013: 359-368.

[9] Zhao, N., Jiao, D., Bai, S., & Zhu, T. (2016). Evaluating the validity of simplified Chinese version of liwc in detecting psychological expressions in short texts on social network services. *PLOS ONE*, 11(6), 1-15.

[10] Hao, B., Li, L., Li, A., et al. (2013). Predicting mental health status on social media. *International Conference on Cross-Cultural Design*. Springer, Berlin, Heidelberg, 2013: 101-110.

[11] Liu, T., Che, W., & Li, Z. (2011). The linguistic platform technology. *Journal of Chinese Information Processing*, 6, 53-62.

[12] Gao, W. B., Chen, Z. Y., & Wang, Y. N. (2003). Analysis of public mentality impact and change trends during SARS. *Chinese Mental Health Journal*, 17(9), 594-596.

[13] Shi, K., & Zhang, J. F. (2004). Comparative study of social psychological characteristics between Beijing and Chongqing during SARS. *Journal of Southwest University (Social Sciences Edition)*, 30(2), 53-57.

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Note: Figure translations are in progress. See original paper for figures.