The Influencing Factors and Key Events of Public Psychological Status during the Lockdown Period

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Abstract: The psychological status of the public since the outbreak is more negative, and the negative emotion increase significantly. From the perspective of longitudinal research, this study applied sentiment analysis and text mining techniques to mine the basic emotions expressed in microblog posts. And addressed the research problem about the influencing factors and key events of negative emotions. This study shows a new method reference for psychological research and provides ideas for using social media to dynamically detect and intervene in public mental health.

1. Introduction

Since the discovery that the COVID-19 pandemic is infectious, lots of control measures had been rolled out. One of them is a series of lockdown policies to restrict the social activities of people, which has caused more and more negative emotions and brought quantities of negative effects such as emotional overeating via anxiety, children's emotion dysregulation, etc. One study points out that future public health policies should pay more attention to the unexpected negative impact of the lockdown on public sentiment, but this area has not been explored in depth.

Current research is mainly based on questionnaires or interview surveys, trying to find out the types of negative emotions and their possible influencing factors. However, this kind of self-reported research method is limited by the influence of the research content set in advance by the researchers, the ecological validity is low, the self-report is biased, and the potential negative effects cannot be deeply explored.

Based on this, this study selected the social media data during the lockdown period in Shanghai and innovated in content and methods. The main contribution of this study is to dynamically study the negative emotional changes of the public during the period of lockdown based on basic emotion theory. We uses more advanced sentiment analysis and text mining technology in the computer field, explores the influencing factors of negative emotions longitudinally, and proposes corresponding coping strategies.

2. Methods

2.1 Data Collection

Web crawlers, also known as web spiders, can automatically extract web page information by specifying the rules in advance. We set "Shanghai, lockdown" as the keyword for searching and then scraped and gathered original microblog posts made by different users from Sina Weibo through the web crawler using Python code. We deleted ads related to these keywords and collected a total of 58,606 original microblogs from March 15, 2022, to May 15, 2022, in comma-separated values (CSV) format.

2.2 Data Preprocessing

The original microblogs mentioned above contained various unnecessary symbols and characters like "@" and "#", which had to be removed for further data analysis. Therefore, we performed the filtration and cleaning process which is a very important step in any web scraping task. We mainly used regular expressions to write python code to remove special characters and symbols, user names and Weblinks,

duplicate records, etc. After the filtration and cleaning process, we finally got a dataset of 51,567 original microblogs, which can be used for sentiment analysis.

2.3 Sentiment Analysis

For microblog text classified as negative, We used Baidu Translation API to convert Chinese text into English and then used a DistilRoBERTa-base checkpoint previously fine-tuned on a balanced subset from six datasets to detect Ekman's emotions plus a neutral class. Its fine-tuning hyperparameters were: learning rate = $5\times10-5$, number of training epochs = 3.0, number of warmup steps = 500, and weight decay = $0.01^{[1]}$.

2.4 Dynamic Topic Model

The dynamic topic model (DTM) identifies and tracks the topics of datasets by dynamically processing time-based document datasets[2]. In this study, based on the results of sentiment analysis, we selected three emotions that are important but have not been researched in depth. We first established three corpora for analysis, including 4,336 microblog posts of "anger", 3,013 microblog posts of "disgust", and 5,185 microblog posts of "sadness". Then we used DTM to mine the main content of microblog texts that are detected as "angry", "disgust", and "sadness". It can be divided into four steps: data further processing, obtaining the optimal number of topics, training Models, and calculating the reliability of topic distribution. The whole analysis process was realized by the python program we wrote and the three corpora were analyzed independently by DTM.

3. Results

3.1 Anger

Through DTM analysis of angry microblog text, we got six topics. The topic distribution reflected the main related events of anger, and the topic evolution showed in Table 1.

Table 1 Topic Distribution of Anger Emotion.

Topics		Keyword clustering
Topic A1	Food shortage	Community, daily, group-buying service, supplies, lockdown area, isolation, antigen, dare not, go downstairs, Going out of the house
Topic A2	Epidemic prevention team	Community,the COVID-19 pandemic,control,work,neighborhood committee,secretary,frontline,civil policeman,Medical care,medical staff
Topic A3	Disturbing the social order	police,stipulation,according to law,administrative penalty,criminal,supermarket,raise a price,violate,market,compulsory measure
Topic A4	Psychological expectation and reality gap	the COVID-19 pandemic,the whole nation,city,come on,people,life,wish,Social Zero Covid,policy,economics
Topic A5	Imperfect epidemic prevention measures	nucleic acid,test,positive infected,neighborhoods,management,lockdown area,requirement,screen,isolation,control
Topic A6	Voluntary duties	neighborhood committee,volunteer,government,solve,supplies,trouble,life,guarantee,street,laissez-passer

Topic A1-Food shortage: Positive infections multiplied every day, and community transmission was accelerating. Fear of being infected, in addition to taking supplies and doing nucleic acids, the public generally reflected that they did not dare to go downstairs. The most worrying thing for residents was that there was no food at home. Especially in the early days of the blockade, vegetables became scarce resources. The major e-commerce platforms were fully booked before dawn, and many residents had nowhere to buy vegetables. To solve this problem, many places began to use the form of "community group buying" to solve. However, many residents reflected that the group-buying service near the lockdown area had been shut down, which can only reduce their demand for vegetables.

Topic A2- Epidemic prevention team: Sudden sealing control made the regions unprepared, and the temporary epidemic prevention team had various problems due to the lack of corresponding experience. However, with continuous reform and improvement, a team of epidemic prevention had been gradually built up from top to bottom, including social police, medical workers, neighborhood committees, etc.

Topic A3- Disturbing the social order: Due to the shortage of living materials caused by the lockdown, the market supervision department severely cracked down on various price violations according to the law. For example, some merchants deliberately raised the price of goods without significant changes in costs. The price difference between red radish, white radish, tomato, and onion is 369.5 %, 154.5 %, 133.3 %, and 213.3 % respectively.

Topic A4- Psychological expectation and reality gap: In addition to complaining about life's dissatisfaction on social media, many users also expressed their hopes after venting their emotions, hoping to get through the epidemic early and achieve Social Zero Covid. But the gap between reality and expectation made people feel hopeless.

Topic A5- Imperfect epidemic prevention measures: Shanghai implemented the control method of "precise prevention and control, grid screening". Although the purpose of this measure was to minimize the impact of the epidemic, because it was still in the exploratory stage, there were many problems in the implementation process leading to residents' dissatisfaction, such as "each street was in charge of each, not unified deployment, no material help to the sealed community". Governments at all levels had been constantly improving over time.

Topic A6- Voluntary duties: During the period of closure and control, there were many areas where the volunteer team was not perfect and there was a lack of volunteers. For example, the living materials purchased by many people were stacked at the entrance of the community without volunteers for distribution. With the continuous construction of volunteer service teams, volunteers gradually began serving in streets and other places.

3.2 Disgust

Through DTM analysis of disgust microblog text, we got six topics. The topic distribution reflected the main related events of disgust, and the topic evolution showed in Table 2.

Table 2 Topic Distribution of Disgust Emotion.

Topics		Keyword clustering
Topic D1	Violating epidemic prevention policies	the elderly,go downstairs,stroll,woman,neighbor,epidemic prevention,civil policeman,persuade,discourage,helpless
Topic D2	"Running enthusiasts go out without permission" event	man,violate,stipulation,without permission,go out,running,show off,police,according to law,administrative punishment
Topic D3	Forced to live and work at home	neighborhoods,residents,the COVID-19 pandemic,hospital,isolation,ubieties,at home,work,balcony,isolation,hope
Topic D4	Unstable lockdown control logistics support	every day,nucleic acid,supplies,volunteer,residents,antigen,testing,Positive infected,lockdown area,rubbish
Topic D5	Disputes over the lockdown policy	the COVID-19 pandemic,city,discovery,plenty of,problem,COVID-19,virus,infect,place,control
Topic D6	Difficulty in obtaining living supplies	the COVID-19 pandemic,supplies,isolation,residents,receive,friend,see,guaranteed supply,vegetable,egg

Topic D1- Violating epidemic prevention policies: The topic # You have a home do not want to stay, I have a home cannot return # was widely discussed, the cause was that the elderly went out to walk the dog and did not comply with the regulations, the police officer Mr. Chen who did not go home for 34 days because of the epidemic prevention work persuaded him to retreat, and said this sentence. The public showed disgust at not complying with epidemic prevention requirements and adding chaos to society.

Topic D2-"Running enthusiasts go out without permission" event: It was discussed that men violated the epidemic prevention regulations, went out to run privately, and sent photos to show off

among a group of long-distance runners. This matter had been widely discussed by netizens and triggered a strong disgust. The heat of the topic was small and gradually declined.

Topic D3- Forced to live and work at home: The epidemic lockdown had caused most people to isolate at home and work at home. Long-term travel restrictions, as well as inconvenience to life, work, and study, had caused public boredom.

Topic D4- Unstable lockdown control logistics support: After the lockdown and control, the logistics support work had become a major test, and various problems had arisen, such as no management of garbage stacking which hid health hazards. The public had a negative attitude toward this. At the beginning of the control, there was the insufficient experience in various places, and the number of volunteers was not enough. As time went by, various places gradually found the experience, as well as the opening of policies in various places, the negative emotions of the public in the later period also decreased.

Topic D5- Disputes over the lockdown policy: People were more controversial about the lockdown policy. Some people thought that "this was a brave innovation, not to implement the previous one-size-fits-all policy, but to ensure the stable development of the economy while precise prevention and control". However, some people were confused about the policy and thought that the virus was very weak now. Why should we pay so much to deal with the virus?"

Topic D6- Difficulty in obtaining living supplies: There was a shortage of goods and materials during the period of lockdown. However, after opening up gradually, the living materials in many areas could not be supplied quickly, and some people could not get them for the time being. Watching others get materials in succession, but they still cannot get them. In contrast, negative emotions were more intense.

3.3 Sadness

Through DTM analysis of sadness microblog text, we got six topics. The topic distribution reflected the main related events of sadness, and the topic evolution showed in Table 3.

Table 3 Topic Distribution of Sadness Emotion.

Topics		Keyword clustering
Topic S1	Difficulty to guarantee the life of vulnerable groups	supplies,residents,the COVID-19 pandemic,the elderly,life,vegetable,buy vegetables,every day,no place to buy,starve
Topic S2	Difficulties in maintaining treatment for cancer patients	tumor hospital,patients,cheer up,close,Issued in Shanghai,Puxi area,Pudong area,notification,continue,lockdown
Topic S3	Disturbing the pace of life	hope,the COVID-19 pandemic,end,express delivery,cannot ship,living at home,isolation,influence,life,work
Topic S4	Problems in community work management	discovery,lots of,problem,neighborhoods,control,Group-Buying Service,work,serious,time,management
Topic S5	Affecting medical treatment	neighborhoods,the elderly,isolation,need,medical treatment,nucleic acid,unable,telephone,contact,hospital
Topic S6	Affecting production operations	personnel,infected person,influence,factory,company,administration,carry out,control,suspend,production

Topic S1- Difficulty to guarantee the life of vulnerable groups: During the lockdown period, the vulnerable groups and the elderly in society, especially the lonely and widowed elderly, faced many challenges. For example, many elderly people do not use mobile phones, and the problem of food and clothing is even more difficult to solve. Previously, "an old man in the sealed area begged passersby to buy eggs through the fence" was widely discussed, and many netizens said it was very uncomfortable. With the extension of the lockdown time, the heat of the topic gradually increased, and the public's sadness continued to rise. As the regions gradually open ease.

Topic S2- Difficulties in maintaining treatment for cancer patients: "Many cancer patients rented to live near the tumor hospital, because of the community lockdown control, hospital shutdown, treatment difficulties, hope for help!" This caused widespread concern among the public. At the beginning of the lockdown, the problem was more difficult. With the intervention of relevant

departments, the topic heat declined, but it remained at a high level, which also reflected the kindness of the public.

Topic S3- Disturbing the pace of life: The lockdown had brought many influences on the public's life and learning, and disrupted the original pace of life. After unsealing, many people had new inadaptability when they were accustomed to the original or even new pace of work and life. Therefore, the topic had been widely discussed, and with the passage of time, the greater the negative impact.

Topic S4- Problems in community work management: Many people reflected on the improper management of the community, such as "have to consider the problem of food and clothing every day" and "the chicken wings purchased by the neighborhood committee were smelly". Some people also pointed out that "the performance of the control management was very indecisive, resulting in the delay of time". The topic was hot for the first month of lockdown and then began to decline.

Topic S5- Affecting medical treatment: Many acute and chronic patients and elderly residents had difficulties in seeking medical treatment and medication. And many hospitals required nucleic acid testing before treatment, resulting cannot seek medical treatment in time. In a period, the problem was on the rise. As the regions strengthen management and adjust the corresponding policies, the social impact was gradually reduced.

Topic S6- Affecting production operations: The lockdown of the whole city means that the economic development of Shanghai, the strongest economy in China, had been affected to a certain extent. Especially at the beginning of the lockdown, many people paid attention to this issue and had heated discussions.

4. Discussion

4.1 Influencing Factors of Negative Emotions

In this study, we used sentiment analysis and DTM to mine the potential information of social media users' microblogs during the lockdown period through a longitudinal perspective. Since current studies have pointed out that future studies should pay more attention to the mental health status of the public during lockdown[3], and the current research mainly focuses on cross-sectional studies in the form of questionnaires or interviews[4], leaving a large gap in this field. And this study tries to fill this gap. We can find that during the period of lockdown, although the overall emotion has a tendency to become positive, it was still dominated by negative emotions, which was consistent with previous studies. We tried to explore these negative emotions from the perspective of Maslow's hierarchy of needs theory which divides needs into physiological needs, safety needs, belongingness & love needs, esteem needs, and self-actualization[5]and provides a basic perspective for explaining psychological phenomena.

In this study, as for anger emotion, Topic A1 and Topic A4 were the most talked about among the public. During the lockdown period, the shortage of living materials led to unmet physiological needs. The risk of being infected with COVID-19 at any time threatened people's safety-security needs. According to Maslow's hierarchy of needs, physiological needs and safety needs are basic needs. When these two needs are not met, it is easy to produce negative emotions such as anger and fear[6]. The "unstable lockdown control logistics support" and "disputes over the lockdown policy" became the main source of disgust emotion. These factors lead to people's skepticism about the outside world and great distrust of politics, police, regional governments, etc., resulting in disgust[6]. Moreover, disgust was mainly related to violations of epidemic prevention regulations and disruption of social order. For example, Topic D1 mainly detailed the old man s insistence on going downstairs. Topic D2 mainly discussed the long-distance running enthusiasts out running and taking pictures to show off to others. People believed that these people ignored the rules, damaged their right to life and health of themselves, is not respect the epidemic prevention staff, do not respect the performance of other social citizens. Esteem needs were challenged and people showed great disgust. The disgust here was more of social-disgust, a way of symbolizing human social relations in emotional theory, and an emotional process[7]. Sadness was mainly manifested in the

public's concern about groups in need of help and social development. For example, Topic S1 focuses on the difficulty of ensuring the lives of vulnerable groups such as the elderly, and Topic S2 focuses on the inability of cancer patients to treat normally. The frailty of life, and the compassion for society, triggered public sadness. At the same time, in the events related to sadness, we found that Topic S4 had always occupied a high discussion heat. In the face of the problems of community management, such as the poor quality of community group purchase materials, and even many communities were not responsible for the group purchase of residents, and the shortage of food for residents. This made many people realize that they can only rely on themselves during the lockdown period, which reduced their sense of trust and belonging to the community. There was no guarantee of "belonging & love need", which made people show disappointment and sadness.

4.2 Suggestions and Strategies for Negative Emotions

At present, most of the existing studies regarded negative emotions as a general concept, and do not propose regulatory strategies for specific negative emotions. In this study, by trying to take the most concerned events of the public under each negative emotion as a breakthrough point, the corresponding negative emotion coping strategies are proposed.

The first is to meet the physiological needs and safety needs of the public. In this study, each kind of emotional public mentioned the most, is the lack of living supplies, epidemic prevention work is not in place easy to increase the risk of infection, and medical treatment difficulties. Therefore, especially in the context of today's epidemic normalization, relevant departments should make emergency plans, reserve materials, establish experienced and professional epidemic prevention teams, and prepare for large-scale epidemic infections that may erupt at any time. At the same time, improve the medical service system, taking into account the requirements of epidemic prevention, while ensuring the normal medical treatment of other patients.

Second, pay attention to the public's need for belonging & love. Especially with disgust and sadness emotion, many people feel not respected by them. Not satisfied with the work of the neighborhood committee, feel no sense of belonging. At the same time, long-term isolation at home allows people to spend time with their families, exacerbating conflicts between families. On the contrary, some people are isolated in different places, unable to meet with family and friends. These all make people's belonging needs affected. In addition to the negative emotions caused by the unmet basic needs, people had gained these new negative experiences. In the future management process, community workers should effectively protect the public daily life order, do a good job in logistics support services, and convey warmth to the public. At the same time, due to the differences in residents' educational backgrounds and other factors, we should increase quality education, let the public understand the policy, cooperate with the epidemic prevention rules, make reasonable attribution, and restrain their behavior.

Third, we can mobilize positive emotions by emphasizing the pursuit of self-esteem needs, even self-realization. It is generally believed that people can only enter the next level after meeting the needs of the lower level. However, Sackett (1998) pointed out that some people seem to be self-actualized without first meeting the lower needs of Maslow's hierarchy. This made researchers begin to notice the need-level jump phenomenon. In the context of the pandemic, it reflects the moral side of many human natures. For example, the public vigorously forwarded the relevant help-seeking microblog posts, so that the relevant departments noticed the needs and took measures to solve the problem. Many people felt that they had contributed to this matter, and realized the value to society. It helped to alleviate negative emotions greatly. Some people chose to be volunteers. In the process of volunteer service, more positive emotions were formed and transmitted[8]. When low-level needs are not well met, the pursuit of higher-level needs can increase positive emotions. Therefore, in the future, if encounter similar situations such as lockdown charges, the media can increase the publicity of kind people and kind things, form a good social atmosphere, and fully mobilize people's positive emotions.

5. Conclusions

In this paper, we applied the sentiment analysis and dynamic topic model to test the negative emotion changes in different periods through social media data. We found that during the lockdown period, the overall emotion had a tendency to become positive, but still dominated by negative emotions. The time difference was significant in anger, disgust, and sadness. We obtained the main events related to each negative emotion and the changes over time. These changes and adjustments of emotions can be understood and applied through Maslow's hierarchy of needs theory. In addition, this study creatively combined quantitative and qualitative methods and used big data analysis technology to study emotions. This article can help us to better understand each specific emotional change in dynamic text from a longitudinal perspective. This study provides a new application reference for the interdisciplinary research of psychology and computer science and provides ideas for using social media to dynamically detect and intervene in public mental health, which can help to reduce the negative impact of major public health emergencies or risks on people.

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