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Public Negative Emotions Regulation During the COVID-19 Emergency : GIR's Content Features and Lingual Form Do Matter

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Short Research Paper**Public Negative Emotions Regulation During the COVID-19 Emergency:****GIR's Content Features and Lingual Form Do Matter***Xie Yu¹, Xuefeng Li¹, Wei Zhang^{1*}, Mei Zhang², Yanchun Zhu³*

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Abstract: Emergencies and their associated negative emotions have a great effect on public health. As a key part of emergency management, government information release (GIR) not only meets the public's health information seeking but also helps to eliminate the breeding and spreading of negative social emotions. From the two aspects of content features and lingual forms, a regression model was built to explore the mechanism of GIR on the regulation of public negative emotions by adopting the theoretical methods of content analysis and emotion calculation. During the emergency outbreak, if the government can timely release information on the incident and respond to the public using rational language, public negative emotions can be alleviated. During the emergency peak, the government should release the event progress, resolution, and disposal information to improve the recognition of public and eliminate negative emotions. According to different stages of emergencies, the government should timely and reasonably utilize the attitude tendency, content type, and lingual form of GIR to effectively regulate the public negative emotions.

Keywords: Public Health, Negative emotions, Government information release, Rhetorical strategies

1. INTRODUCTION

It is well known that emergencies and their associated social emotions, especially the collision of various negative emotions, have a great effect on public health^[1,2]. During emergencies, the positive psychological suggestion will make positive emotions generate, to avoid the influence caused by negative emotion, which is of great help in controlling disease and restoring healthy life^[3,4].

As a key part of emergency management, the government information release (GIR) not only meets the public's health behavior, but also helps to eliminate the public negative emotions, avoid secondary crises, and stabilize the social order^[5]. In recent years, governments at all levels have formed a relatively complete communication system in terms of the information disclosure of emergencies^[6]. However, in practice, such chronic diseases as the lack of dominant agenda setting, the information release delay, the misjudgment of public concern, and the loss of negative emotion guidance are still serious^[6,7]. Based on scientifically analyzing the rules of negative emotion infection-evolution, how to explore GIR strategies to effectively adjust and channel social emotions derived from emergencies has become a new topic to improve government emergency management level^[8].

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At present, the research on the GIR strategy during emergencies is still in its infancy. The existing studies focus on the perspectives of public opinion and analyze the distribution characteristics of positive and negative emotions at each stage of emergencies. Most of the proposed release strategies are descriptive and speculative, with weak operability^[8,9]. In terms of specific release strategy formulation, such as release timing, content composition, language style selection, and emotional guidance, no specific quantitative feasible plan is provided, which cannot provide decision support for information release strategy in emergency management and effective regulation of negative social emotions^[10,11].

Therefore, this paper tries to explore the mechanism of GIR on the regulation of public negative emotions based on the content type, attitude orientation, lingual form to accurately grasp the distribution of the public emotions in emergencies and to effectively regulate the social negative emotions.

The contributions of this paper: (1) deconstructed the content type and attitude tendency of GIR and measuring the polarity of emotion by using content analysis, and text mining; (2) conducted empirical researches on the influence of content features and lingual forms of GIR on public emotions through the construction of regression model.

The rest of the paper is organized as follows. First, we review previous literature on GIR. Second, we introduce our theoretical foundation and the analysis procedure of the influence of GIR content features. Next, we state data collection procedures, data analysis, and results. The effect of GIR lingual forms on regulating public negative emotion is conducted and discussed. Finally, implications, as well as opportunities for future studies, are discussed.

2. RELATED WORKS

2.1. Content components of the GIR

Scholars have studied the content components of GIR using theoretical methods of journalism, public management, administration, and communication, etc. They believe that the cause, nature, degree of harm, and disposal measures of the incident are the main components of information disclosure content^{[12][13]}. Most scholars at home and abroad think that the content of the government's emergency information disclosure is closely related to the development stage of the incident, and it varies at the three stages of the early warning period, the outbreak period, and the post-restoration period, each with its emphasis. However, in practice, it still needs to be enriched and improved on how to optimize the content components of GIR information disclosure^[14].

2.2. Disclosure strategy of the GIR

Scholars mostly are based on the case analysis and content analysis methods to summarize the existing problems in the GIR disclosure on emergencies, and also to propose improvement measures^[15-17]. Existing research shows that the current GIR disclosure focuses on eliminating the strangeness of the people and reducing the intrusion of the social order by the incident, but pays little attention to the adjustment of negative emotions^[15,18,19], resulting in the defects such as slow response, lack of guidance of topic setting, and insufficient guiding role for emotions, etc^[20], so the relevant countermeasures have been proposed; however, most of them are descriptive with low operability^[9,16].

2.3. Rhetorical features of the GIR

The rhetorical strategy is an important means to improve the persuasiveness of information posted by the GIR and effectively express their positions and opinions^[21-23].

Based on Aristotle's rhetoric theory of three persuasive audience appeal, Lim analyzed the specific manifestations of the lack of emotional appeal, lack of rhetorical personality, and messiness of rational appeal in the response of local governments to crisis events, and proposed that the use of multiple rhetoric methods should be emphasized when dealing with emergencies^[21]; Arendt et al. believed that charismatic political language and pro-political behavior can help the government to alleviate the short-term crisis^[22].

In summary, the scholars have summarized the problems in GIR based on the micro-blogs data and verified the effectiveness of the strategy through simulation. These results provide theoretical references for this study, but there are still some shortcomings: (1) They focus on the information dissemination of emergencies, construct the content of released information, and clarify the form of information content, but rarely involving the mechanism of action, and paying less attention to the content type and components of GIR, attitudes, and the influence of lingual forms on social-emotional communication; (2) The improvement measures and policy suggestions are mostly descriptive and speculative discussion.

3. RESEARCH ON THE INFLUENCE OF THE GIR CONTENT FEATURES ON THE public'

EMOTIONS

3.1. Data collection and processing

Considering the event types, timeliness, attention, and social impact of public emergencies, we selected recent seven typical emergencies as research cases. The GIR of the above incidents was selected for the trial survey. On this basis, the number of published micro-blogs and their forwards, comments, and likes were used as indicators of activity, and the GIR with more active performance were selected as samples. It collected a total of 413 pieces of GIR and 203,854 comments.

Based on the trial survey, inspired by reference^[15], this paper divides the content features of the GIR samples into the following two aspects:

- **Attitudes** There are three main types of attitudes: Positive attitudes; neutral attitudes; negative attitudes.
- **Content types** It includes 6 types, namely event progress, popular science; rumor-removal; resolution and disposal; summary and reflection; others.

When classifying the emotions of the GIR comment data in this study, we adopted the classification method of seven emotions, that is, anger, disgust, fear, joy, love, sadness, and surprise. The manual coding was used to classify the types of GIR samples. "NLPIR Chinese word segmentation system" was applied to perform GIR recognition and emotion computing. The evaluation of emotions should take into account the GIR comment data.

Through the kappa calculator, the reliability test was performed on the variables of the GIR content type, to obtain the reliability value of about 86.8%. This indicates higher reliability. For emotion analysis of comments, 1,000 comments were randomly selected for manual labeling, and then compared with the emotional analysis results of the NLPIR, to obtain the reliability value of the information expression form for about 75.2%, indicating that the platform is credible for emotional analysis on GIR to a greater degree.

3.2. Descriptive statistical analysis

Through screening all 15,200 comments, a total of 165 met the requirements. Emotion analysis was then performed on these comments. In terms of the number of likes, there were 446,076 comments from public, of which the comments with anger had the highest proportion of up to 38.04%, and those with surprise and joy were the lowest, to be 0.97% and 0.10% respectively. Therefore, this paper selects anger, sadness, disgust, fear, and love as research objects, excluding surprises and joy.

Public emotion have different characteristics for GIR in various phases, which indicates that GIR information influences public emotions in emergencies (see Fig 1.). It can be seen that the number of public in anger was relatively high during the outbreak phase of an emergency; as the government continues to release information, the proportion of public in anger constantly declines; sadness peaks during the climax phase; the proportion of disgust is relatively high in the flat phase; the proportion of public negative emotions declines in the recession phase, and the proportion of love reaches a peak.

Therefore, in the outbreak and climax phases, the GIR should play a good role in guiding public opinion and better assuming the government's social responsibility, and efforts should also be done to emotional channeling in the flat phase, but during the recession phase, the frequency of information disclosure should be reduced accordingly to allow emergencies to slowly withdraw from the public eye.

3.3. The influence of GIR's attitudes on public emotions

To study the relationship between public emotions and attitudes, an independent sample means the test was used to statistically analyze three qualitative variables: positive, neutral, and negative. A regression model of GIR attitude tendency and netizen emotions was established

$$attitude_i = a_1 \ln(fear) + a_2 \ln(anger) + a_3 \ln(sadness) + a_4 \ln(disgust) + \varepsilon \quad (1)$$

Here, $attitude_i$ indicates three tendencies of attitudes: positive, negative, and neutral; fear, anger, sadness, and disgust respectively indicate four types of negative emotions.

The results of regression analysis validate: (1) A positive attitude to posting information has a significant effect on the "fear" emotion of public ($P < 0.01$), and the mean number of "fear" emotion (0.767) using a positive attitude in posting information was significantly lower than that (1.412) in other types of attitudes, indicating that positive attitudes can relieve the fear emotions of public. Meanwhile, positive attitudes in posting information are significant for the public disgust emotions ($P < 0.05$), and the mean number of disgust (2.057) generated by using positive attitudes was significantly lower than that (2.771) in other types of attitudes, indicating that using positive attitudes in posting information can reduce the public disgust emotions. (2) The neutral attitude in posting information shows significance for public fear emotions ($P < 0.01$), and the mean number of fear emotions (1.526) using positive attitudes was significantly higher than that (0.684) caused by other types of attitudes, indicating that using a neutral attitude can stimulate public fear emotions. (3) The use of negative attitudes in the information disclosure can reduce the fear and sadness of public, while significantly stimulating their anger. For example, in the Wuxi viaduct

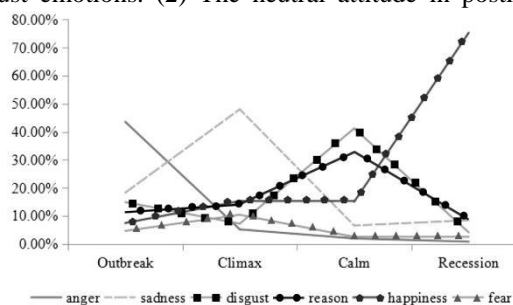


Fig 1. Emotional changes in various periods.

collapse incident, the GIR, Wuxi's Release was questioned for the delayed disclosure of the emergency information, while it posted short comments to criticize online rumors, which triggered a wider range of controversy. This shows that the GIR should talk to public with an equal attitude when facing public opinions, rather than criticize public with a negative attitude.

3.4. The influence of GIR content types on public emotions

There are 6 content types of GIR information: event progress, popular science, rumor removal, resolution and disposal, summary and reflection, and others. Through statistical analysis of the 165 pieces of information released, it can be seen that the GIR information content is mainly the event progress, and the resolution and disposal; the information on the event progress accounted for the vast majority, up to 41.2%, followed by information on incident resolution and disposal, accounting for 25.5%.

The independent sample means the test was used to study the relationship between the content type of information and the public emotions. The regression model is constructed as:

$$c_type_j = a_1 \ln(fear) + a_2 \ln(anger) + a_3 \ln(sadness) + a_4 \ln(disgust) + \varepsilon \quad (2)$$

The results of the regression coefficients and their significance show that: (1) The disclosure of event progress information by the GIR shows significance for public fear emotions ($P < 0.01$), and the mean number of "fear" emotions (1.529) generated by disclosing event progress was significantly higher than that by the release of other types of information (1.038). This shows that the disclosure of event progress by the GIR can easily stimulate the fear of public. (2) The disclosure of popular science information by the GIR is significant for "anger" and "sadness" emotions ($P < 0.01$). From the mean numbers of these two emotions, the disclosure of popular science information by the GIR can easily dispel public anger and sadness. (3) The disclosure of rumor removal information by the GIR has a significant effect on public "anger" ($P < 0.1$) and "sadness" emotions ($P < 0.05$). From the mean of these two emotions, the disclosure of rumor removal information by the GIR can easily dispel public anger and sadness. (4) The disclosure of resolution and disposal information by the GIR is significant for public sadness emotions ($P < 0.05$), and the mean number of sadness emotions (3.909) generated by disclosing such information was significantly higher than that by the release of other types of information (2.75). This shows that the disclosure of resolution and disposal information by the GIR can easily stimulate the sadness of public. (5) The disclosure of summary and reflection information by the GIR shows significance for public negative emotions such as fear, anger, sadness, and disgust. From the mean numbers of these four emotions, the disclosure of summary and reflection information by the GIR can easily dispel these emotions of the public. (6) The disclosure of other information by the GIR has no significant influence on negative emotions.

4. RESEARCH ON THE INFLUENCE OF GIR LINGUAL FORMS ON public' EMOTIONS

4.1. Theoretical analysis and main hypothesis

Rhetoric is the art of persuasion for the audience, allowing them to form some kind of judgment, and recognize, approve and adopt the opinions or take some action. Aristotle's rhetorical theory divides lingual forms into three types, namely, ethos, pathos, logos. Wang cited the three elements of propaganda in journalism: truth, emotion, and reason as theoretical references, and divided the lingual form of GIR into three major categories: character appeal (i.e., concise in text, with a clear attitude and a firm tone), emotional appeal (i.e., mainly uses

interrogative and exclamatory sentences and makes good use of implicit expressions with the diverse texts and soft tone), and logic appeal (i.e., personalized positioning, strict wording, and neutral tone, with statements mostly, and updated and profound content)^[17]. Wang's classification method of the micro-blogs is based on the theory of three persuasive audience appeals, and it is more suitable for the classification of the GIR lingual form. Thus, in this paper, the GIR lingual form was classified in terms of character appeal, emotional appeal, and logic appeal.

Studies have shown that in case of an emergency, a "venting" response and dishonest manner are likely to cause public outrage^[23], and a positive response to public concerns and a frank and humble attitude can win the favor of public and resolve the crisis of public opinion. Hovland's persuasion model considers the objectivity and credibility of the disseminator as the basic conditions for persuasion. Among them, credibility depends mainly on the qualifications and reliability of experts^[21]. This is similar to Aristotle's reliance on the "character" element to increase the credibility of the persuasive and to improve the persuasive effect. Both of them emphasize the credibility of the information disseminator to achieve the purpose of persuading the audience. Therefore, the following hypotheses have been made.

H1: The character appeal-based GIR disclosure has a dispelling effect on negative emotions.

In terms of different negative emotions, H1 can be clearly defined as the following hypotheses:

H1a: The character appeal-based GIR disclosure has a dispelling effect on fear.

H1b: The character appeal-based GIR disclosure has a dispelling effect on anger.

H1c: The character appeal-based GIR disclosure has a dispelling effect on sadness.

H1d: The character appeal-based GIR disclosure has a dispelling effect on disgust.

With the development of the incident, the GIR disclosure is adjusted timely in a humane and daily language style. This will not only show the government's confidence and ability to handle the incident to the public but also minimize public panic^[16]. The key to relief of the public's "hate" is to alleviate the repression of institutions on them in terms of information, power, and discourse^[17], and rely on metaphorical rhetoric, symbolic and mythical interpretive policy discourse systems in information disclosure. Thus, it can better achieve the purpose of maintaining and realizing the public interest, and actively lead the public's feelings to positive emotion, thereby forming a harmonious atmosphere of public opinion^[23].

Therefore, the following hypotheses have been made:

H2: In emergencies, the emotional appeal-based GIR disclosure is prone to sadness, but alleviates other negative emotions of the public, thereby improving the public recognition of government work.

In terms of emotion classification, H2 can be clearly defined as:

H2a: The emotional appeal-based GIR disclosure has a dispelling effect on fear.

H2b: The emotional appeal-based GIR disclosure has a dispelling effect on anger.

H2c: The emotional appeal-based GIR disclosure is prone to sadness.

H2d: The emotional appeal-based GIR disclosure has a dispelling effect on disgust.

H2e: The emotional appeal-based GIR disclosure is prone to love emotions.

Studies have shown that accurate numbers in authoritative information released by government departments are more effective than vague numbers in reducing public anxiety^[17-20]. Accurate numbers can also increase the credibility of information disseminators. Zhou et al. found that the structure of the speech according to the steps

of the current situation of the incident, the cause of the incident outbreak, and the measures taken by the government is relatively clear, allowing the audience to understand the content of government leaders’ speech clearly^[11]. Thus, the following hypotheses have been made:

H3: The logic appeal-based GIR disclosure has a dispelling effect on negative emotions.

In terms of emotion classification, H3 can be clearly defined as:

H3a: The logic appeal-based GIR disclosure has a dispelling effect on fear.

H3b: The logic appeal-based GIR disclosure has a dispelling effect on anger.

H3c: The logic appeal-based GIR disclosure has a dispelling effect on sadness.

H3d: The logic appeal-based GIR disclosure has a dispelling effect on disgust.

4.2. Research design

In this paper, a multiple regression model was adopted to study the influence of the GIR lingual form on public emotions. It usually includes the following steps:

(1) Variable selection

The lingual form of GIR information disclosure was used as independent variables, the public emotion ratio was used as the dependent variable, and GIR content features were used as control variables^[10] (shown in Fig. 2).

(2) Model construction

The regression model was analyzed using the multivariate regression analysis method. The basic regression model established was as follows:

$$Emotion = \beta_0 + \beta_1 Ethos + \beta_2 Pathos + \beta_3 Logos + \beta_4 phase + \beta_5 video + \beta_6 picture + \beta_7 link + \beta_8 topic + \beta_9 original + \beta_{10} len + \beta_{11} content + \beta_{12} attitude + \beta_{13} follower + \beta_{14} forward + \beta_{15} comment + \beta_{16} like + \varepsilon \quad (2)$$

Here, *Emotion*, as the dependent variable, indicates the emotional characteristics of public comments on the GIR, including five types of emotions: love, anger, sadness, fear, and disgust; the number of public emotions was calculated by adding the number of comments and likes; *Ethos*, *Pathos*, *Logos* are the lingual forms of the GIR, which are character appeal, emotional appeal, and logic appeal, the classification method is based on the method given by Wang et al.^[17]; *phase* is the stage of GIR information disclosure, which is divided into outbreak phase, climax phase, flat phase, and recession phase^[34]; *video*, *picture*, and *link* indicate whether there are related videos, pictures, external links in the GIR disclosure; *topic* indicates whether it is included in the information; *original* refers to whether the information is original; *len* refers to the length of the micro-blog words; *content* refers to the content type, including event progress, popular science, rumor removal, resolution and disposal, summary and reflection, and others; *attitude* means the attitude tendency, which is divided into positive, neutral, and negative; *follower* refers to the number of GIR fans; *forward* and *comment* are the number of GIR messages forwarded and commented by public; *like* is the number of likes of the GIR information.

According to the classification method given by Wang et al. ^[17], the GIR is classified in lingual forms (as shown in Table1).

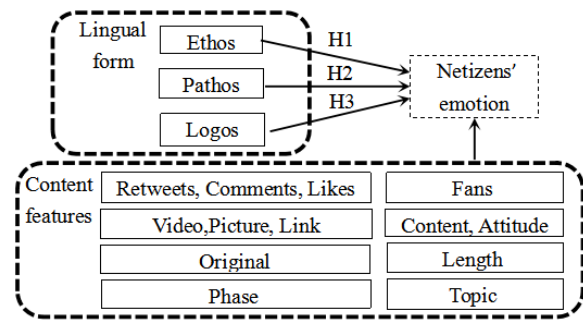


Fig 2. Conceptual model

Table 1. Classification basis of lingual form.

Lingual form	Feature	Sentence structure	Intention
Ethos	The text is concise, the attitude is clear, and the tone is firm	Commonly used imperative sentences, parallelism, and contrast	Explain the reason and show the attitude of the government
Pathos	Variety of text, soft tone	Commonly used interrogative sentences and exclamation sentences	Emotional counseling
Logos	Strictly worded and neutral	Commonly used declarative sentences	Convey the facts

4.3. Empirical analysis

According to the regression analysis results of Model 1, R^2 was adjusted to 0.402, indicating the influence of the GIR information disclosure on public loves. The coefficient of the emotional appeal-based lingual form was 0.213, which indicates that this lingual form can increase the love emotion of public, while the coefficients of the character appeal-based and logic appeal-based lingual forms were -0.361 and -0.401, indicating that these two lingual forms will reduce the proportion of public love emotion. In addition, the coefficient of the original was 0.107, and that of the video was 0.002, indicating that the original micro-blog disclosure by the GIR, attached with video can improve the recognition of public (as shown in Table 2).

For Model 2, R^2 was adjusted to 0.357, indicating the influence of the GIR information disclosure on public fear. The coefficients of the lingual forms based on character appeal, emotional appeal, and logic appeal were -0.259, -0.326, and -0.129 respectively, which indicates that these three forms can all reduce the fear of public, and the emotional appeal-based lingual form has the greatest influence. Meanwhile, the coefficients of the pictures and videos in the GIR were positive, and passed the significance test, indicating that the GIR attached with pictures and videos are more likely to generate fear.

For Model 4, R^2 was adjusted to 0.668, indicating the influence of the GIR information disclosure on public sadness. The coefficient of emotional appeal-based lingual form was 0.097, which indicates that this form can easily lead to the sadness emotion of public. Also, the pictures and original information in the GIR can easily cause the public to have sad emotions.

For Model 5, R^2 was adjusted to 0.549, indicating the influence of the GIR information disclosure on public which can dispel the disgust emotion of public. What's more, the GIR information with external links and more

Table 2. Regression results of language forms on the public emotions.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
	Happiness	Fear	Anger	Sadness	Disgust
Con	1.335**	0.063***	3.759**	-1.74**	0.461*
Outbreak	-0.267	-0.113	0.126*	0.254*	0.114*
Climax	-0.101	-0.104	0.035	0.156	0.026
Calm	-0.067	-0.043	-0.03	-0.069	0.07
Video	0.002*	0.052**	0.008	-0.005	-0.081
Picture	-0.005	0.044*	0.041*	0.063*	0.036
Link	0.027	0.017	0.039	-0.058	0.09***
Topic	0.076	-0.092	-0.153**	0.023*	0.031
Original	0.107**	0.007	0.001	0.023**	-0.033*
Length	-0.007	-0.009	0.118	0.055	0.071*
Fans	0.043	0.012	-0.335	-0.017	-0.162
Retweets	0.094	0.026	0.036	0.017	0.038
Comments	0.498*	0.574***	0.483**	0.656***	0.691***
Content	—	—	—	—	—

Attitude	——	——	——	——	——
Ethos	-0.361**	-0.259**	-0.035*	0.095	-0.054
Pathos	0.213***	-0.326**	-0.119**	0.097***	-0.179*
Logos	-0.401**	-0.129***	-0.102*	0.089	-0.15*
R2	0.464	0.424	0.532	0.703	0.595
Adj R2	0.402	0.357	0.477	0.668	0.549
N	165	165	165	165	165

* p < 0.1, ** p < 0.05, *** p < 0.01.

length will also cause public to have disgust. The original video will have a dispel effect on disgust.

According to the results of regression analysis, the authors concluded the influence of the GIR lingual form on the emotions of public and the verification of their hypotheses, as shown in Table 3

Table 3. Regression results of lingual forms on the public emotions.

Lingual Form	Happiness	Fear	Anger	Sadness	Disgust
Ethos	Negative	Negative (H1a support)	Negative (H1b support)	(H1c unsupported)	(H1d unsupported)
Pathos	Positive (H2e support)	Negative (H2a support)	Negative (H2b support)	Positive (H2c support)	Negative (H2d support)
Logos	Negative	Negative (H3a support)	Negative (H3b support)	(H3c unsupported)	Negative (H3d support)

5. CONCLUSION

By using content analysis and regression analysis, this paper analyzed the content features of GIR and the influence mechanism of lingual forms on public emotions and made a case analysis based on the COVID-19 emergency in Wuhan. The results show that: (1) The event progress information issued by GIR tends to generate negative emotions such as anger, sadness, and disgust; Refuting rumors can reduce public sadness, but it is also positively correlated with "disgust", indicating that refuting rumors may increase public disgust. (2) The positive attitude released by GIR can stimulate public "likes" and relieve their "fears" and "dislikes". And the neutral information can increase public "fear" emotion. While the negative information can stimulate "anger" and relieve "fear" and "sadness". (3) The use of character appeal-based lingual form has a dispelling effect on negative emotions like "anger" and "fear", that is, it can dispel public negative emotions and improve the proportion of rational emotions. While The emotional appeal-based form can help eliminate negative emotions such as fear, anger, and disgust, and increase the proportion of "sadness" and "preference". The use of the logic appeal-based lingual form has a good dispelling effect on public negative emotions such as "fear", "anger" and "disgust", could promote public to be rational, but it will reduce the goodwill of public to government agencies.

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