Research on the Influence Mechanism of Text Emotion on Willingness to Cooperate Based on Computer Communication

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Abstract-Under the background of normalization of epidemic prevention and control, how to achieve effective cooperation in a remote office is an urgent problem for organizations. Online communication mainly uses text as the medium. Besides expressing meaning, text also contains the emotions of the transmitter, which has an important impact on the communication and cooperation between two parties. This study starts with the Emotions as Social Information theory (EASI theory) and explores the influence mechanism of emotions of texts on individuals' willingness to cooperate. The results of the experimental study (n=203) found that individuals have higher social perception of the sender of positive texts (i.e. perception of their warmth and competence), so they are more willing to cooperate with them. And social perception plays a partial mediating role in text emotion and willingness to cooperate. The results of this paper reveal the internal mechanism of text emotion promoting cooperation willingness in remote cooperation and provide a new perspective on how to improve cooperation willingness.

Keywords-willingness to cooperate; text emotion; social cognition

1 INTRODUCTION

With the spread of the Covid-19 epidemic and the development of information technology, more and more enterprises choose to work remotely and the number of remote teams has also increased significantly in organization[1]. Effective teamwork is critical whether working online or offline[10]. Compared with face-to-face cooperation in an offline office, remote cooperation through computer-mediated communication (CMC) lacks physical and social cues, such as

facial expressions, body language, social situations, etc. Much cognitive effort is required to interpret the speaker's intent. In this context, the barriers to building trust, cooperating, and sharing knowledge also increase[4]. Therefore, how to achieve effective remote cooperation becomes a challenge for organizations.

At present, research on the influencing factors of remote cooperation focuses on the influence of emotion on individual performance and cooperation[8]. For example, understanding each other's emotions can help remote collaborators improve performance and people are more willing to cooperate with individuals who display positive emotions. Individuals who display negative emotions are perceived to be more competitive than cooperative[7]. However, there are few studies on the influence of text emotion on cooperation willingness. According to the emotion EASI theory, the emotion receiver will evaluate the intention and situation conveyed by the expresser through the emotional process and the reasoning process[13]. The evaluation process is the social recognition of others. Social cognition consists of the perception of the warmth and competence of others, which can be used to measure the intentions of others and the likelihood that their intentions will be realized. And then form judgments about others, which in turn have important effects on various outcomes in social and organizational settings, such as information sharing, collaboration [9]. It can be seen that the two dimensions of social cognition provide a new perspective on the mechanism by which text emotion affects individuals' willingness to cooperate. Based on this, this study will explore the influence mechanism of Chinese text emotion on cooperation willingness in remote cooperation.

2 LITERATURE REVIEW AND HYPOTHESIS

2.1 Text Emotion and Social Cognition

In face-to-face communication, people often rely on non-verbal cues to effectively express their emotions and recipients can also rely on non-verbal cues to deeply capture the characteristics of others and form accurate judgments about others [6]. However, non-verbal cues are relatively scarce in CMC communication so people can only communicate effectively and identify others' intentions by capturing the emotions conveyed by the text. Therefore, in remote cooperation, text emotion is an important basis for an individual's social perception of others[8].

The perception of the warmth level of others is one of the dimensions of social perception. Warmth is an indicator of others' intentions, which is expressed as trustworthiness, closeness, friendliness, etc. In CMC communication, when we send positive texts the interacting objects will feel the social distance is reduced and they think the other party cares about each other's social relationship. In this way, they will feel close to them and the perception of their warmth level will also increase accordingly[2]. Positive emotional experiences also make individuals tend to make positive judgments about others and increase their trust in others. Conversely, when individuals experience negative emotions such as anger, their trust in them decreases. They feel socially distant from each other and less fond of each other with a corresponding decrease in their perceived warmth level[3]. Based on this we infer that:

Hypothesis 1: In CMC communication, the positive text positively affects warmth perception, while the negative text has a negative effect.

The perception of the competence level of others is another dimension of social perception. Ability is the competence of others to accomplish their intentions, which is expressed as skill, creativity, self-confidence, etc. In CMC communication, people tend to think that the individual who expresses positive emotions is confident and thus judges him to have the problem-solving ability, while the individual who expresses negative emotions is considered to be incompetent[5]. In addition, Moffitt (2020) linked positive emotions with thinking expansion and psychological resources, proposing that people with positive emotions have more creative thinking, individuals who can better regulate their emotions are considered to have higher self-control. It can be seen that in textual communication, individuals tend to judge that interactive objects that express positive emotions are confident, skilled, and creative. Self-confidence, skills, and creativity are the performance characteristics of ability[9]. Based on this, we hypothesize:

Hypothesis 2: In CMC communication, positive text positively affects competence perception, while negative text has the opposite effect.

2.2 Social cognition and willingness to cooperate

The social cognitive model proposes that when people interact socially, they instinctively want to know the intentions of others towards themselves or the group for their interests to judge whether the other party is an enemy or a friend (whether they are enthusiastic) and whether the other party can achieve this intention (whether they have the ability or not)[8]. On the one hand, people with a high level of warmth are more friendly, which helps to form a good social atmosphere with others, and then form close and trusting social relationships with others[2]. Research points out that trust is an important mechanism to promote willingness to cooperate. When social relations are at a high level of trust, both volatility and uncertainty will decrease and cooperation stability will increase. A high warmth level plays an important role in improving interpersonal relationships and establishing intimate relationships; while interacting with objects with a low warmth level is considered indifferent, and individuals are reluctant to establish social relationships with such people, thus reducing their willingness to cooperate with them. Based on this, we hypothesize:

Hypothesis 3: Warmth perception has a positive effect on willingness to cooperate.

On the other hand, the ability of the interacting object is also a factor that affects individual's cooperation willingness. People with high competence levels have high a level of creativity and master skills that help solve problems and improve team performance[11]. Research indicates that people are more trusting and willing to form close relationships with those they perceive as competent. Trust and intimacy are factors that promote willingness to cooperate[2]. First, highly trusted social relationships among individuals are the basis for willingness to cooperate. Second, individuals trust and like competent colleagues more[12] and are more willing to establish close social relationships with them. Based on this, we hypothesize:

Hypothesis 4: Competence perception has a positive effect on cooperation willingness.

2.3 The mediating role of social cognition

In CMC text communication, individuals experiencing positive emotions of others will increase their perception of warmth and competence but accepting negative emotions will reduce their perception of warmth and competence. The social cognition of interacting objects is an

important driver of willingness to cooperate. Therefore, we speculate that two dimensions of social cognition: warmth and competence play a mediating role between textual emotion and willingness to cooperate. We believe that individuals will perceive the other's higher level of warmth and competence after receiving the other's positive emotions in CMC communication, which in turn affects their willingness to cooperate. Based on this, the following assumptions are made:

Hypothesis 5: Social cognition has a mediating effect on the influence of text emotion on willingness to cooperate.

Hypothesis 5a: Warmth perception has a mediating effect on the influence of text emotion on willingness to cooperate.

Hypothesis 5b: Ability perception has a mediating effect on the influence of text emotion on willingness to cooperate.

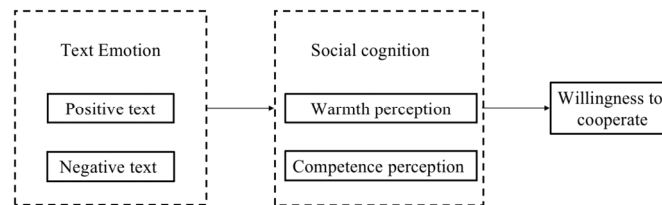The research model is shown in Figure 1.

Fig. 1 Research Model

3 EXPERIMENT

3.1 Subjects

227 subjects were recruited through the Internet. After excluding the subjects who did not complete the study and the unqualified data, 203 valid data were obtained (positive text group (n=102), negative text group (n=101). The summary of demographic information is shown in Table 1.

3.2 Experimental Design and Procedure

The experiment adopts a 2×2 mixed design. The between-group variable is text emotion, which is divided into positive emotion and negative emotion. The intra-group variable is social cognition, which is divided into two dimensions: enthusiasm and ability. The dependent variable is the subject and the text sender. willingness to cooperate.

Referring to other research on emotions, subjects were presented with positive or negative texts. This experiment adopts a scenario hypothesis assuming that the subject is an employee who has switched to an online office due to the epidemic. He or she will cooperate with a team member to complete certain tasks and communicates with team members through text during the process. We will manipulate text emotion through feedback from the other party, with positive text as "It was a pleasure working with you!" and negative text as "Are you serious? Is it so

hard to understand?". After reading the positive or negative test, subjects were required to rate the warmth (Perceived warmth level, 5 items, α = 0.88), competence level (Perceived competence level, 6 items, α for the sender of the positive or negative text) =0.92) and emotional valence (emotional valence, 1 item) and indicate their willingness to collaborate (Willing to collaborate, 3 items, α=0.87).

3.3 Research results

3.3.1 Emotional manipulation

As shown in Table 2,one-way ANOVA on the perceived text emotion of senders found that the main effect of text emotion type was significant. Compared with the negative emotion group (M=1.11, SD=0.93), the positive emotion group (M=4.17, SD=0.73) was rated more positive. It can be seen that the subjects experienced a more positive emotion in positive emotion and more negative emotion in negative emotion, which indicated that the manipulation of text emotions in this experiment was reliable.

3.3.2 Positive prediction of text emotion on social cognition level

As shown in Table 3,the experiment takes the text emotion score experienced by the subjects as the independent variable, and the warmth and ability score as the dependent variable for regression analysis. The results show that text emotions significantly positively predict warmth (b=0.73, SE=0.02, p<0.001) and competence level (b=0.66, SE=0.02, p<0.001). Thus，it can be seen that subjects perceive higher level of warmth and competence in individuals who send positive texts than those who send negative texts. Therefore, H1 and H2 are verified.

3.3.3 The positive prediction of social cognition level on willingness to cooperate

As shown in Table 3,the experiment takes warmth and ability perception of remote partners as the measurement index, and willingness to cooperate with them as the dependent variable, the analysis results show that: warmth (b=0.44, SE=0.09, p<0.001), ability level (b=0.44, SE=0.09, p<0.001) had a significant positive predictive effect on willingness to cooperate. That is, the higher the individual perceives the warmth and ability level of the interacting object, the higher the willingness to cooperate with it. Therefore, H3, H4 are verified.

3.3.4 The mediating role of social cognition

The process macro (model 1) developed by Hayes (2013) was used to test the mediating effect of social cognitive warmth and ability level between text emotion and willingness to cooperate. Using Bootstrap to calculate the mediating effect value and judging the significance of the mediation effect. Depending on whether the 95% confidence interval contains "0" or not.

As shown in Table 4,the results show that the mediating effect of text emotion on cooperation willingness through warmth perception was 0.10 and the 95% Bootstrap confidence interval was [0.04, 0.16], excluding "0". The mediating effect of competence perception on cooperation willingness was 0.15 and the 95% Bootstrap confidence interval was [0.09, 0.20], excluding "0". Indicating the mediating effect is significant. After adding the mediating variables warmth and competence perception, the direct effect of text emotion on cooperation willingness was 0.17 and the 95% Bootstrap confidence interval was [0.11, 0.24], excluding "0", indicating that the mediation effect was incomplete mediation. Therefore, H5, H5a and H5b are validated.

4 CONCLUSION AND FUTURE ENLIGHTENMENT

4.1 Conclusion

This paper aims to explore the influence mechanism of text emotion on cooperation intention. The empirical results show that: (1) in CMC communication, positive text has a positive impact on warmth perception and ability perception, while negative text has the opposite; (2) Warmth perception and ability perception have a positive impact on cooperation intention; (3) Warmth perception and ability perception play an intermediary role in text emotion and willingness to cooperate. To sum up, in CMC communication, positive text emotion helps to improve the willingness of text recipients to cooperate. In the past, there were many studies on the impact of sender's text emotion on receiver's warmth perception, but this study found that text emotion also has an impact on ability perception. This conclusion reveals the internal mechanism of text emotion promoting cooperation intention in distance cooperation, and provides a new perspective for expanding and enriching the research of employees' cooperation intention.

4.2 Management recommendations

The conclusion of this study provides an important reference for how to improve employees' willingness to cooperate in the context of remote work.

First, from the personal level, employees need to deeply realize that the ability to correctly and clearly present emotional clues is very important, which not only determines the text receiver's perception of the sender's emotional attitude, but also has an impact on the perception of his ability level. Individuals should consciously exercise their emotional control ability. Positive expression will make the communication atmosphere better, which is more conducive to both sides to clarify each other's intentions and reduce the low cooperation efficiency caused by communication ambiguity.

Second, from the organizational level, enterprises should pay attention to the emotional management of employees, and carry out training on the expression and perception of employees' emotions, such as behavior training, counseling, course lectures, etc., so that employees can know what kind of text and expression to display are more easily accepted by everyone. The organization should also popularize and publicize to the staff and engineering department. When conducting online office, using positive text to communicate with others is more conducive to mutual understanding and promote bilateral cooperation.

According to the results of this study, employees use positive text as much as possible in the communication of remote work will also produce positive results, that is, the improvement of warmth perception and ability perception. Positive emotions in CMC communication help to improve and maintain the willingness of other members to cooperate, which can promote individual work enthusiasm and team performance, and alleviate the negative impact of telecommuting to a certain extent.

4.3 Deficiency and prospect

There are still some deficiencies in this study, which need to be improved in the future. Firstly, our experiment simulates the scenario of remote cooperation. All tasks are communicated online through computers, but the experiment is carried out in the same space. It is still

different from the real remote cooperation in terms of communication efficiency and task duration. In the future, we can experiment in the real scenario and test the results again. In addition, this study only involves a single type of electronic communication, and future research should explore richer text emotional media. In conclusion, the above deficiencies can be considered in future research for further research.

TABLE 1. THE SUMMARY OF DEMOGRAPHIC INFORMATION

Information category	*Basic information*	*Number of samples*	*Percentage*
Gender	Female	119	58.62%
	Male	84	41.38%
Education	Junior college and below	8	3.94%
	Undergraduate	103	50.74%
	Master	92	45.32%
	Doctor and above	2	1.94%
Age	Under 18	0	0.00%
	18-23 years old	70	34.48%
	24-29 years old	109	53.69%
	30 years old and over	24	11.82%

TABLE 2. CORRELATION TABLE OF EACH VARIABLE

	1	2	3	4	5	6	7
1.Gender	1						
2.Education Background	.147*	1					
3.Age	-.078	-.033	1				
4.Text emotion	.024	.027	-.037	1			
5.Competence perception	.011	.052	-.067	.664**	1		
6.Warmth perception	-.034	.005	-.005	.731**	.835**	1	
7.Willingness to cooperate	-.005	.013	.009	.735**	.784**	.784**	1

TABLE 3. REGRESSION ANALYSIS TABLE

Model		*Nonstandardized coefficient*		*Standardized coefficient*			*Collinearity statistics*	
		B	**S.E.**	**Beta**	**T**	**Sig.**	**Tolerance**	**VIF**
Control variables	（Constant）	3.190	.373		8.554	.000		
	Gender	-.002	.112	-.001	-.021	.448	.925	1.081

	Education	-.079	.085	-.066	-.928	.323	.937	1.067
	Age	.066	.094	.050	.706	.382	.982	1.019
Warmth	（Constant）	2.346	.294		7.968	.000		
	Gender	-.087	.086	-.049	-1.010	.314	.923	1.084
	Education	.024	.066	.018	.371	.711	.937	1.067
	Age	-.010	.072	-.007	-.135	.893	.981	1.019
	Text emotion	.366	.024	.733	15.152	.000	.997	1.003
Competence	（Constant）	2.416	.286		8.436	.000		
	Gender	-.021	.084	-.013	-.251	.802	.923	1.084
	Education	-.052	.064	-.043	-.807	.421	.937	1.067
	Age	.047	.071	.035	.660	.510	.981	1.019
	Text emotion	.293	.023	.662	12.488	.000	.997	1.003
Willing to Cooperation	（Constant）	-.647	.325		-1.991	.048		
	Gender	.020	.083	.010	.234	.815	.962	1.039
	Education	.063	.064	.041	.986	.325	.979	1.021
	Age	-.021	.070	-.012	-.293	.770	.982	1.018
	Warmth	.481	.085	.421	5.640	.000	.990	1.010
	Competence	.560	.096	.435	5.808	.000	.998	1.002

TABLE 4.   TOTAL EFFECT, DIRECT EFFECT AND INTERMEDIARY EFFECT

	Effect	*Boot Standard error*	*Boot CI Lower limit*	*Boot CI Upper limit*	*Effect proportion*
The mediating effect of warmth control	0.10	0.03	0.04	0.16	23.80%
The mediating effect of competence control	0.15	0.03	0.09	0.20	35.72%
Direct effect	0.17	0.03	0.11	0.24	40.48%
Total effect	0.42	0.03	0.37	0.47	

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