



Group Cognition and Conformity under the Influence of Network Public Opinion Based on EEG Testing Technology

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ABSTRACT

After the 21st century, emergencies gradually increase, which affects the social stability and security. With the rapid development of network information, the network public opinion has a certain influence on emergencies. This paper uses EEG testing technology, adds the options that can be selected in turn based on group interaction platform and virtual context story, and analyzes the effects of the number of options on individual cognition and conformity. The results show that there was a certain mapping relationship between EEG power and emotional arousal degree, the situation has significant effect on the change of EEG power, and the EEG power induced by emergent situation is significantly higher than that induced by daily situation. As the number of options increases, the time-consuming of cognitive tasks decreases and the two are negatively correlated. In the same way, the cognitive level also decreases, which is negatively correlated with the number of options. Cognitive level is the intermediary variable of the number of options and conformity. As the number of options increases, the probability of conformity decreases, but there are certain fluctuations, which results from an increase in the amount of information, scattered options and some people's maverick. At the same time, when options are increased, the increased options will be lower in cost and cognition than those already provided, resulting in a reduction in the impact on conformity ratio changes.

Key Words: Network Public Opinion, Interactive Platform, Group, Conformity

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Introduction

Since entering the 21st century, emergencies have gradually increased, and led to the phenomenon of group panic to some extent, affecting social stability and security (Theiner *et al.*, 2010; Stahl, 2010; Nosek, 1998). Compared with daily life, people's cognition and conformity will be more complicated in emergencies (Tangpong *et al.*, 2007; Mills *et al.*, 2010), and with the rapid development of network information, network public opinion has had some impact on emergencies (Lichtneckert and Reichert, 2005; Nakagawa *et al.*, 2011). How does one to make a proper choice among a variety of alternatives that do not show

clear answers for a given situation (Annunziata, 2003; Aeshin *et al.*, 1998; Pappius, 1991). The main research in this aspect is to increase the choice difficulty by adding more options, that's, choice conflict. (Maki and Dumas, 2009; Dejda *et al.*, 2011; Qiu *et al.*, 2006). After making a choice, if the correct option is not chosen, the cost of the choice will be greater (Johnston and Silverstein, 1985; Naskar *et al.*, 2011). Meanwhile, in the choosing process, the department crowd will always pay attention to the change of information around, especially the update of network public opinion information (Rosenberg, 2017), and adjust the corresponding concerns, which is helpful for

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addressing the problem of decision-making when people face difficulties (Andersson and Eriksson, 1971).

Questions

A large number of theoretical analyses of social influence show that it is helpful for us to make choices under the norms of other people providing information or organizations, that's, social influence affects people making choices (Stahl, 2006). But at the same time, it is not known whether people can accept and emulate another people's behavior (Stahl, 2010). Also, if there are more options to choose from, it is not known whether people still accept other people's choices. Therefore, this paper mainly studies the cognition and conformity mechanism under the influence of network public opinion in the process of emergencies.

Methods

Selection of experimental subjects

This experiment divides the available options into 2, 3 and 4 options, and analyzed the effects of different numbers of options on people's cognition and conformity. The subjects are all undergraduate students. In order to call for voluntary participation, 168 students are selected without any mental problems through corresponding examinations, and the resulting data are screened and statistically analyzed to ensure the validity of the data.

Experimental materials

In this experiment, group interaction platform and virtual context story are used. The subjects are randomly assigned to 3 groups, of which the number of options faced by Group 1 is 2, the number of options faced by Group 2 is 3, and the number of options faced by Group 3 is 4.

Experimental procedure

When the experiment starts, the experimental subjects experience four scenes under the set

scenario, then the corresponding cognitive tasks or decision-making problems are presented, and each question will have a variety of options. As the story develops, the subjects continue to go through four scenes and make choices about the corresponding cognitive tasks or decision-making problems. When going through the above process, the subjects are asked to view information on the group interaction platform and provide one opportunity to modify the options.

Data Analysis

In the experiment, there are 1,334 valid data in total, of which the conformity cases account for 9.33%, and the rest are the unconformity cases, which is obviously superior, as seen in Table 1, from which the personality characteristics of conformity and inconformity can be obtained. In this experiment, decision-making execution and tasks refer to the choices made by the subjects after they first see the options without referring to the results of others.

EEG power and emotional arousal degree

In this study, we compare the mean, standard deviation and range span of EEG power in 8 scenarios of daily and emergent scenarios. It is found that the EEG power evoked in emergent scenarios is significantly higher than that in daily scenarios. The variance analysis shows that there is a significant difference between the EEG power evoked by the middle arousal degree of daily scenarios and that by the higher arousal degree of emergent scenarios.

A linear trend is obtained by the EEG power of the subjects evoked under two scenarios, as shown in Figure 4.1.

The linear trend establishes the mapping relationship between EEG power and emotional arousal degree, and further proves that the effect of scenarios on EEG power is significant, that's, the EEG power induced by emergent scenarios is significantly higher than that induced by daily scenarios.

Table 1. Mean and standard deviation of all variables of conformity and inconformity individuals

All data in this experiment									
	Number	Gender		Age		Right or wrong		Time consuming	
		M	SD	M	SD	M	SD	M	SD
Collectivity	1334	0.43	0.49	22.10	1.24	0.56	0.50	3.59	1.60
Conformity	123	0.36	0.48	22.29	1.07	0.19	0.39	3.67	1.59
No conformity	1221	0.44	0.50	22.08	1.25	0.60	0.19	3.58	1.60



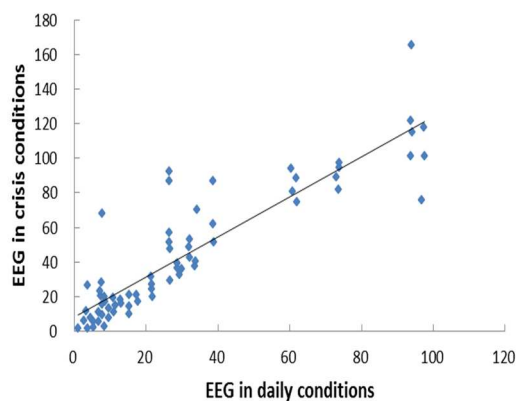


Figure 1. Change of EEG power from daily scenarios to emergent scenarios

Time-consuming test of each variable

See Tables 2-5 for the time-consuming test of each variable. The following results can be obtained.

1. By applying the variance test to study the time-consuming of scenarios, it's found that there is no significant difference between the time-consuming in the emergent scenario sand the time-consuming in the daily scenarios.

2. In terms of the test of time-consuming to the number of options, the experiment finds that the time-consuming will decrease correspondingly when the number of options is increased, and the two have negative correlation, and the variance test shows a significant difference. The time-consuming is significantly higher when the number of options is 2 than 3. However, the time-consuming difference between 3 options and 4 options is not obvious.

3. In terms of the test of the time-consuming to sex. When the subjects are female, the difference is not significant compared with male subjects.

4. In terms of the test of the time - consuming to age. When the subjects' age increases, the time required increases accordingly. This may be due to an increase in the time required for the overall thinking of the subjects as the subjects' age increases.

Test of cognitive level by variables

See Table 4.2-4.5 for the time-consuming test of each variable. The following results can be obtained.

1. In terms of the test of scenarios to the cognitive level, the variance test finds that there is no significant difference between the time-consuming in the emergent scenarios and in the daily scenarios. However, the data of the two

option groups show an obvious difference. Therefore, the main reason why the scenarios have no significant effect on cognitive level is the addition of different numbers of options.

2. In terms of the test of the number of options to the cognitive level, the variance test shows a significant difference. There is a negative correlation between options and the cognitive level. The increase in the options will lead to the decrease in the cognitive level.

3. In terms of the test of the time-consuming to the cognitive level, the variance test shows a significant difference. There is a negative correlation between time-consuming and cognitive level.

4. In terms of the test of sex to the cognitive level, the proportion of women with correct cognition is significantly lower than that of women with wrong cognition, and the variance test shows an obvious difference. The cognitive level of men is significantly higher than that of women, especially in emergent scenarios, the proportion of women with correct cognition is lower than that of women with wrong cognition. The variance test shows a significant difference. However, there is no significant difference between sex and cognitive level in daily life.

5. In terms of the test of age to the cognitive level, there is no significant difference between age and cognition. The variance test shows no significant difference.

Test of each variable on conformity

The experiments show that the mean value and standard deviation of all variables with different number of options in emergent and non-emergent scenarios. See Tables 4.2-4.5 for details.

Table 2. Mean value and standard deviation of all variables of conformity and non-conformity individuals in the different scenarios (2 options)

Variable	2 options			
	Conformity		No conformity	
	M	SD	M	SD
Non-crisis situation				
Gender(M=1)	0.36	0.49	0.5	0.5
Age	21.95	1.21	22.08	1.31
Time consuming	3.86	1.93	4.04	1.91
Cognitive level	0.36	0.49	0.73	0.44
Crisis scene				
Gender(M=1)	0.5	0.51	0.48	0.5
Age	22.24	1.16	22.04	1.32
Time consuming	3.76	2.02	3.81	2.17
Cognitive level	0.24	0.43	0.68	0.47



Table 3. Mean value and standard deviation of all variables of conformity and non-conformity individuals in the different scenarios (3 options)

Variable	3 options			
	Conformity		No conformity	
	M	SD	M	SD
Non-crisis situation				
Gender(M=1)	0.13	0.35	0.43	0.5
Age	22.53	0.83	22.19	1.2
Time consuming	3.13	1.3	3.35	1.18
Cognitive level	0	0	0.63	0.49
Crisis scene				
Gender(M=1)	0.39	0.5	0.41	0.49
Age	22.48	0.95	22.16	1.2
Time consuming	3.35	1.23	3.58	1.43
Cognitive level	0.17	0.39	0.61	0.49

Table 4. Mean value and standard deviation of all variables of conformity and non-conformity individuals in the different scenarios (4 options)

Variable	4 options			
	Conformity		No conformity	
	M	SD	M	SD
Non-crisis situation				
Gender(M=1)	0.18	0.41	0.4	0.49
Age	22.27	1.01	22	1.25
Time consuming	3.64	1.21	3.31	1.25
Cognitive level	0.09	0.3	0.45	0.5
Crisis scene				
Gender(M=1)	0.32	0.48	0.39	0.49
Age	22.37	1.12	22.02	1.35
Time consuming	4.11	0.99	0	1.35
Cognitive level	0.11	0.32	0.48	0.5

Table 5. Mean value, standard deviation and correlation coefficient of each variable

Variable	Mean	SD	2	3	4	5	6	7
Gender(M=1)	0.43	0.5	.04	0	-.07**	.01	.06*	-.05
Age	22.1	1.24		0	-.02	.06*	.00	.05
Scene	0.5	0.5			0	.02	-.02	.07*
Number of options	3	0.82				-.13**	-.17**	-.09**
Time consuming	3.59	1.6					-.11**	.02
Cognitive level	0.56	0.5						-.24**
Conformity	0.09	0.29						

* $p < .05$, ** $p < .01$.

1. In terms of the test of scenarios to conformity, the proportion of conformity is obviously larger in emergent scenarios compared with non-emergent scenarios, and the variance test shows a significant difference.

2. In terms of the test of the number of options to conformity, the proportion of conformity is significantly larger in 2 options than in 3 options and is much greater in 4 options. The variance test shows an obvious difference. This indicates that there is a negative correlation between the number of options and the conformity, and the results are shown in Figure 4.2.

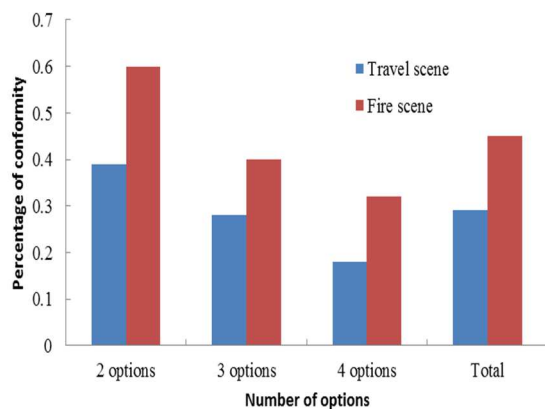


Figure 2. Conformity percentage of the different numbers of options

3. In terms of the test of the time-consuming to the conformity, there is no significant difference between conformity and non-conformity, and the variance test shows no obvious difference.

4. In terms of the test of cognition level to conformity, the proportion of conformity with wrong cognition is significantly higher than that with correct cognition, and the variance test shows no obvious difference.

5. In terms of the test of sex to the conformity, there is no significant difference between conformity and non-conformity, and the variance test shows no obvious difference.

6. In terms of the test of the age to the conformity, there is no significant difference between the mean age of conformity and non-conformity, and the variance test shows no obvious difference.

Test of intermediate variables

According to the hypothesis model, tasks and decision-making results play an important role in the number of options and the connection of conformity. When there are different numbers of options, it will affect task and decision results as well as the conformity of individuals. According to the criterion of the intermediate variables, the intermediate relation between the conformity and



Table 6. Analysis of the mediating effect of cognitive level

Relationship path		-0.37	0.002	Significance evaluation
Number of options → conformity	$Y=cX+e1$	-0.43	0.000	Significance
Number of options → cognitive level	$M=aX+e2$	-0.59	0.000	Significance
Number of options * cognitive level → conformity	$Y=C'X+bM+e3$	-2.06	0.000	Significance

the number of options is tested as shown in Table 6. It can be seen that there is a negative correlation between task and decision result and conformity, and there is a negative correlation between task and decision result and the number of options. For the fourth criterion, whether an intermediate variable is added or not, the selection format is significant for the binary logistic regression coefficients of conformity. This

shows that for the number of options and conformity, the task and decision result are intermediate variables but only some intermediate variables. It can also be concluded that the number of options has an effect on conformity with the experimental task and decision-making results as intermediary variables.

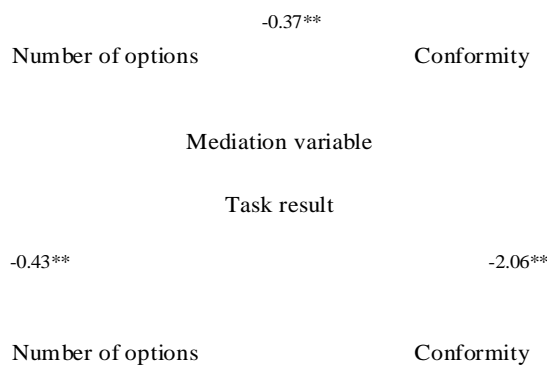


Figure 3. Task result is a mediation variable between number of alternatives and conformity

Test of scenarios and and number of options to conformity

It can be found that there is a significant correlation between both scenarios and the number of options, and conformity, as shown in Figure 4.4-4.6. Using the binary logistic regression model, the main influence factors are obtained such as cognitive level, scenarios and the number of options.

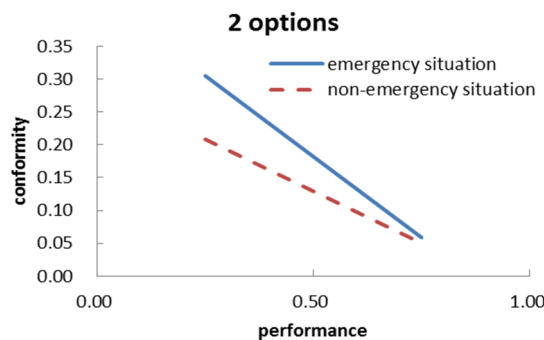


Figure 4. Tendency of the conformity to change with the change of cognitive level (2 options)

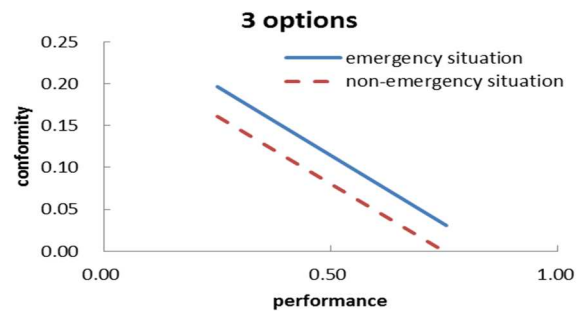


Figure 5. Tendency of the conformity to change with the change of cognitive level (3 options)

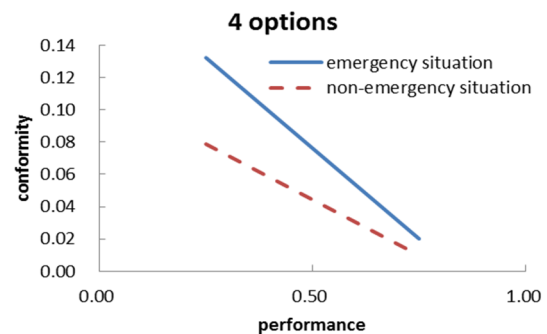


Figure 6. Tendency of the conformity to change with the change of cognitive level (4 options)

Discussion

Through the experiment, we can find that there is a negative correlation between the number of options and the proportion of conformity regardless of moderate arousal or high arousal of emotional experience. When the emotion is in a moderate arousal state, the proportion of conformity is slowly reduced when people are faced with a different number of options, which results from the sufficient thinking time and fewer errors in non-emergent scenarios

The influence of network public opinion indicates that the group is regarded as an effective



information source. The influence of public opinion may distort the individual's opinion, cause the individual's illogical reasoning in judging their own decision and group decision, which influences the individual's conformity. No matter whether the influence of public opinion is positive or negative, it will affect the generation of conformity. Assuming that public opinion influences the application, the conformity will reduce the decision-making conflict between the group and the individuals, and increase the incentive feedback after conformity, and it is also the result of choosing the real change. If people need to obtain more information to judge the correctness of the choice in the process of emergency, the individual will think that the group's decision-making should be made with more information than the information he or she obtained, so the conformity psychology comes into being.

The experiments show that if the number of options increases, the probability of conformity decreases instead. This is because the increase of options causes more information of different goal orientation, which increases the difficulty of identification, reduces the determination degree of decision-making for most people, and finally causes the reduction of conformity. In addition, the increase in the number of options contributes to the decentralization of selection and the failure of forming effective clustering, resulting in a reduction in conformity pressure on the scale of the group. There are also special cases where the increase in options gives individuals the possibility of a different self-expression. This situation also reduces conformity and facilitates the creation of diversity in the group.

However, when the individuals are in a state of higher emotional arousal and the options are changed from 2 to 3, the change in conformity is obvious, but when the options are changed from 3 to 4, the change in conformity slows down. It may be in the process of emergency, time is compressed, individuals may make a choice among the most effective or cheapest options that they consider, when the options are changed from 2 to 3, the probability of options is significantly increased, resulting in population diversion, which reduces the number of people in subgroups and thus results in a reduction in conformity. However, if options continue to increase, the increased options will be lower in cost and cognition than the options already provided,

resulting in the change in the conformity proportion and thus reducing the effect.

Conclusions

Using EEG testing technology and based on group interaction platform and virtual context story, this paper divides the options into 2, 3 and 4 options, and analyzes the effects of different numbers of options on individual cognition and conformity. The following conclusions are obtained:

There is a certain mapping relationship between EEG power and emotional arousal degree. The scenarios have significant effect on the change of EEG power, and the EEG power induced by emergent scenarios is significantly higher than that induced by daily scenarios.

As the number of options increases, the time-consuming of cognitive tasks decreases, and the two are negatively correlated. In the same way, the cognitive level also decreases and is negatively correlated with the number of options. Cognitive level is the intermediate variable between the number of options and conformity.

As the number of options increases, the probability of conformity decreases, but there are certain fluctuations, which result from an increase in the amount of information, the scattered options and some people's maverick. At the same time, when more options are increased, the increased options will be lower in cost and cognition than those already provided, resulting in a reduced impact on the change in conformity proportion.

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