

# Message Framing Effects on Vaccination Intention: Taking the Novel Coronavirus Pneumonia Vaccine as an Example

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**Abstract:** By changing the expression of information, the behavioral decisions of information receivers can be affected. This phenomenon is called the framing effect. In this study, gain-loss frame and individual-collective frame were used as variables to study the promotion effect of different frames on subjects' willingness to vaccinate novel coronavirus pneumonia vaccine (COVID-19 vaccine), and their acceptance tendency to different frames was studied according to their individual basic situation and cognitive situation. It is found that people with higher perceived vaccine effectiveness are more likely to accept loss-framed messages, while people with higher social responsibility are more inclined to accept gain-framed messages. In general, the loss frame is better than the gain frame in promoting the vaccination of COVID-19 vaccine. However, there is no obvious difference in the promotion effect of individual frame and collective frame on subjects inoculated with COVID-19 vaccine.

## 1. Introduction

The outbreak of the new coronavirus pneumonia in early 2020 has involved the whole world in a fight against epidemic prevention. In the face of rampant viruses, China has developed a COVID-19 vaccine at the fastest speed. The epidemic is spreading, in order to make more people obtain immunity and form an immune barrier as soon as possible, the state must accelerate universal vaccination. However, studies have found that there are still very few people who are suspicious of the COVID-19 vaccine and are unwilling or even resistant to vaccination [1]. Convincing them is a difficult challenge. How to maximize the effect of vaccine publicity and what kind of information can most effectively motivate people to take the initiative to vaccinate COVID-19 vaccines are problems worthy of our study.

## 2. Research Foundation

### 2.1 Message framing

*Gain-loss frame.* Tversky's [2] study found that when a message is expressed in the form of gain or loss, the impact on the behavior decision of information recipients is different, and the gain-loss frame is also the most widely used framework in health behavior research. Ran Hua et al. [3] studied the effect of message framework on HPV vaccination willingness, and found that loss frame can promote the willingness of subjects to vaccinate HPV vaccine more than gain frame. On this basis, I make the following hypothesis:

*H1. The gain-loss frame will affect people's attitudes towards COVID-19 vaccination, and the effect of the loss framework is more obvious.*

*Individual-collective frame.* Since vaccination with COVID-19 is not only beneficial to the recipient himself, but also beneficial to society. I believe that subjects' attitudes towards themselves and society need to be taken into account. However, no research on this direction was found by reading relevant literature, so the "individual-collective framework" was innovatively proposed. The individual frame explores the impact of the information expression that is beneficial to the vaccinator

himself on the willingness to inoculate COVID-19 vaccine. The individual frame believes that when the information recipient realizes that vaccination has a positive impact on himself, his willingness to vaccinate is stronger. The collective frame explores the impact of different message expressions on the willingness of new coronavirus vaccination from the perspective of the society, that is, when the information recipient realizes that vaccination has a positive impact on society, his willingness to vaccinate is stronger. Since the reform and opening up until today, under the influence of the market economic system, the development of individuality and the increasing awareness of individual subject have made people more and more independent. Secondly, in the market economy environment, individual autonomy is stronger and stronger, people's demand for equality and fairness is higher and higher [4]. Based on these backgrounds, we make the following assumptions:

*H2. The individual-collective frame affects attitudes towards COVID-19 vaccination, and the effect of the individual framework is more pronounced.*

## 2.2 Physical condition and personal cognitive

Cognition will affect the process of information processing, and then affect people's behavior decision-making [5]. Therefore, in order to ensure scientific experimentation, this study incorporates the basic personal situation and cognitive situation into the experimental category, as shown in Table1. And the following assumptions were made:

*H3. Individual basic status and cognitive status will have an impact on the degree to which subjects accept the income-loss framework.*

*H4. Basic personal and cognitive conditions have an impact on subjects' acceptance of the individual-collective framework.*

Table 1. Possible influencing factors

Basic physical condition		
Physical condition	PC	I am very healthy now.
Self-efficacy [6]	SE	When faced with difficult tasks, I believe I will complete them.
Responsibility	R	I think I have the responsibility to participate in the epidemic prevention activities.
Cognitive situation		
Perceived effectiveness	PE	I believe that COVID-19 vaccine is effective
Perceived susceptibility [7]	PS	I think I may be infected with the new coronavirus
Perceived risk	PR	I am worried that the side effects of COVID-19 vaccine will affect my health.

Subjects scored according to the actual situation, scores range from 1 to 7, the higher the score is, the more agree with the item.

## 3. Research design

### 3.1 Methods

Participants were randomly assigned to two groups: gain group and loss group. Each group of participants needs to browse two pieces of information, and select the information with stronger promotion effect on vaccination willingness. They were asked to score the level of information stimulation. 1 indicated that the promotion effect was the lowest, and 7 indicated that the highest.

The messages participants in the gain group need to browse are:

*G.I. Inoculation with COVID-19 vaccine will help to reduce your risk of infection with new coronavirus. Even if you are infected with COVID-19, it will also reduce your risk of getting severe.*

*G.C. Inoculation with COVID-19 vaccine will help to reduce the spread of new coronavirus, reduce the risk of infection with new coronavirus among relatives, friends and others (especially the*

elderly, pregnant women and vulnerable groups with immune deficiency), and help to build a group immune barrier.

The messages to be browsed by the loss group are:

*L.I. Not vaccinated with COVID-19 will increase your risk of contracting novel coronavirus and is more likely to become severe after infection, which is not conducive to your physical and mental health.*

*L.C. If the proportion of population inoculated with COVID-19 vaccine is very low, it will increase the risk of novel coronavirus infection among your relatives, friends and others (especially the elderly, pregnant women and vulnerable groups with immune deficiency), which is not conducive to building a population immune barrier.*

### 3.2 Results

#### 3.2.1 Message Framing

Number of samples of the gain frame collected in this study is 391, while the loss frame is 328. According to the descriptive statistical results, the average attitude of the loss frame group (M=5.88 SD=1.254) was higher than that of the gain frame group (M=4.96 SD=1.241), as shown in Table2. Further independent-sample t test analysis showed that the differences of attitude scores between different message frameworks were statistically significant ( $p=0.000<0.05$ ), as shown in Table3.

Table 2. Descriptive statistical results of gain-loss frame

	Message frames	N	Mean	Std.
Vaccination willingness	Loss frame	328	5.88	1.254
	Gain frame	391	4.96	1.241

It shows that the gain-loss framework can significantly affect people's attitudes towards novel coronavirus vaccination, and people have stronger willingness to vaccinate after receiving the message of the loss framework. Hypothesis 1 holds.

Table 3. Independent-sample t test results of gain-loss frame

		F	Sig.	t	df	Sig.(2-tailed)
Vaccination willingness	Equal variances assumed	0.309	0.578	9.841	717	0.000
	Equal variances not assumed			9.832	692.894	0.000

Similarly, the statistics of individual-collective frame show that the mean of vaccination intention in the individual frame group (M=5.33 SD=1.433) is slightly smaller than that in the collective frame group (M=5.42 SD=1.213). But there is no significant difference in attitude scores between different message frameworks ( $p=0.345>0.05$ ). Therefore, the effect of individual-collective frame on people's attitudes towards COVID-19 vaccines is not obvious. Hypothesis 2 doesn't hold.

#### 3.2.2 Physical condition and personal cognitive

When studying the factors that may affect the promotion effect of the gain-loss framework, binary Logistic regression was carried out with the loss framework as a reference. The result shows in Table4 and Figure 1.

The results showed that when other conditions remain unchanged, social responsibility ( $p=0.005<0.05$  OR=1.349) and perceived vaccine effectiveness ( $p=0.03<0.05$  OR=0.762) have a significant impact on the intensity of people's acceptance of the gain-loss frame. People with stronger social responsibility are more likely to accept the gain framework, and the possibility of choosing the gain framework increases by 34.9 % for each increase in the degree of social responsibility. People who think vaccines are more effective are more likely to accept the loss framework. For every 1 increase in human perception of vaccine effectiveness, the possibility of choosing the loss framework decreases by 23.8 %. Hypothesis 3 holds.

Table 4. Logistic regression: Gain-loss frame

	p	OR	Lower	Upper
PC	0.210	0.878	0.715	1.076
SE	0.261	0.895	0.737	1.086
R	0.005	1.349	1.093	1.664
PE	0.030	0.762	0.597	0.974
PS	0.372	0.962	0.883	1.048
PR	0.802	1.012	0.920	1.114

Table 5. Logistic regression: Individual-collective frame

	p	OR	Lower	Upper
PC	0.992	1.001	0.821	1.220
SE	0.988	1.002	0.829	1.209
R	0.998	1.000	0.818	1.222
PE	0.987	1.002	0.795	1.263
PS	0.955	1.002	0.921	1.091
PR	0.950	1.003	0.913	1.102

Similarly, when studying the individual-collective frame, the binary logistic model was established with the individual framework as a reference, and Table 5 was obtained. The results show that personal factors have no significant impact on the acceptance of the individual-collective framework. Hypothesis 4 doesn't hold.

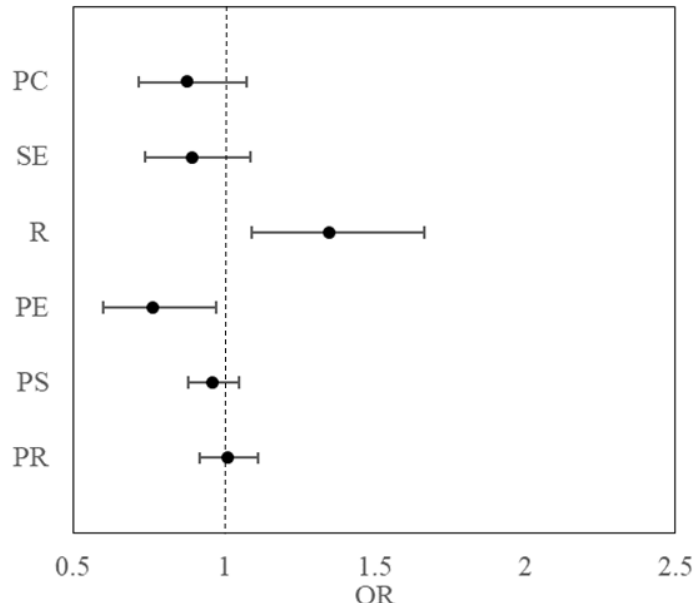


Figure 1. Forest map of logistic analysis: gain-loss frame

#### 4. Conclusions

When information is expressed in the form of gain or loss, the impact on the behavioral decisions of information receivers is different. The effect of the publicity information of the new corona pneumonia vaccine expressed in the form of loss is generally better than that expressed in the form of gain. The promotion effect is also related to the information recipient's own situation. People with high social responsibility are more affected by the gain frame, while those who believe that the vaccine is more effective are more likely to be encouraged by the loss frame.

Therefore, it is important to give priority to expressing the benefits of vaccination in the form of loss when making propaganda information on COVID-19 vaccines. If you want to maximize the

promotion effect, you can emphasize the high efficiency of the vaccine in the message and improve the message receiver's recognition of the effectiveness of the vaccine. Under the conditions permitted, we can analyze the general situation of social responsibility of information receiving groups and carry out publicity activities flexibly. Use the gain framework to publicize the groups with a generally high sense of social responsibility, while use the loss framework to publicize the groups with a relatively low sense of social responsibility.

The study found that there was no significant difference in the promotion effect of the individual frame and the collective frame on the willingness to vaccinate COVID-19 vaccines. The reasons for this need to be further explored. Although the individual-collective frame does not show its uniqueness when studying the vaccination intention of COVID-19 vaccine, it is proposed for the first time that the individual-collective framework is an innovation for the research of message framing. It is hoped that the individual-collective frame can play a role in future research.

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