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Research Article

# The Influence of Information Relevance on the Continued Influence Effect of Misinformation

**Hua Jin[1,2,3], Lina Jia[1,2,3], Xiaojuan Yin[1,2,3], Shilin Wei[1,2,3], Guiping Xu[4]***

[1]Key Research Base of Humanities and Social Sciences of the Ministry of Education, Academy of Psychology and Behavior, Tianjin Normal University, Tianjin, China

[2]Faculty of Psychology, Tianjin Normal University, Tianjin, China

[3]Center of Collaborative Innovation for Assessment and Promotion of Mental Health, Tianjin, China

[4]Institute of Applied Linguistics, College of Chinese Language and Culture, Jinan University, Guangzhou, China

***Corresponding Author:** Guiping Xu, Institute of Applied Linguistics, College of Chinese Language and Culture, Jinan University, Guangzhou, China.

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## Abstract

Misinformation often continues to influence people's cognition even after corrected (the 'Continued Influence Effect of Misinformation', the CIEM). This study investigated the role of information relevance in the CIEM by questionnaire survey and experimental study. The results showed that information with higher relevance to the individuals had a larger CIEM, indicating a role of information relevance in the CIEM. Personal involvement might explain the effects of information relevance on the CIEM. This study provides insightful clues for reducing the CIEM in different types of misinformation and misinformation with varying relevance.

**Keywords:** Misinformation; Continued Influence Effect; Information type; Information relevance

## 1. Introduction

Information that is initially presented as true but later identified as false and explicitly retracted often continues to influence people's cognition, and this persistence is termed the 'continued influence effect of misinformation' (CIEM) [1-8]. We can easily get a lot of external information every day with the development of new media. At the same time, the number of misinformation is increasing gradually. For example, misinformation about the origin or the treatments of COVID-19 has come [9]. Although this misinformation has been corrected or denied subsequently, the misinformation sometimes still affects the general public's cognition of the relevant things or people. Misinformation already outraces the truth on Twitter [10]. The study for the CIEM can help us find a way to reduce the negative effects of misinformation on cognition and form accurate judgments [11].

Most studies on this topic focus on retraction methods [2,5,12-17] and motivational factors [1,18-20]. These studies have shown that retraction can reduce reliance on misinformation but cannot eliminate it, and one's intrinsic motivation would impact on retraction processing. For example, Swire et al. [7] employed short passages on scientific knowledge selecting from websites such as new scientist, scientific American, etc., to investigate the role of familiarity in correcting misinformation. Participants received either a brief or detailed explanation in the study. Results indicated that detailed explanations better elicit belief change than brief explanations. Familiarity may contribute to the false acceptance of corrected myths as true, which supports the notion that familiarity is indeed a driver of continued influence effects.

Authors proposed that information relevance might be another important factor in the CIEM. Walter and Murphy [21] used meta-analysis to systematically compare attempts to correct misinformation across the major contexts, including science, health, politics, marketing, and crime. They used correlation coefficient $r$ to indicate the correction effects. The result indicated that corrective information has a moderate influence on belief in misinformation. The misinformation about topics of politics ($r$ = 0.15) and marketing ($r$ = 0.18) was more difficult to correct compared with that about health ($r$ = 0.27), which indicated that the CIEM might vary with misinformation topics. Another similar meta-analysis [22], including 32 studies, concluded that misinformation could influence people's belief even after correction. However, it failed to find out the similar topic difference in the CIEM. We speculated that the misinformation relevance rather than misinformation topic resulted in the difference of misinformation category in the CIEM observed in the Walter et al.'s meta-analysis [21,22].

Rothman and Schwarz [23] investigated the effect of the personal relevance of information on health judgments. Participants were asked to list either the increasing or decreasing risk of developing heart disease. The manipulation of relevance was that half of the participant's listed risk factors that pertained to themselves, and the other half listed factors that pertained to ordinary people [23]. Following this, participants need to finish five questions such as

"the need to change their current behavior to reduce the risk of developing heart disease", along with 9-point Likert scales (1 = no need, 9 = need). The results showed that health judgment was different with different relevance. Participants reported greater vulnerability after having recalled three risk-increasing factors when information is not self-relevant, while they reported greater vulnerability after having recalled eight risk-increasing factors in self-relevant condition. Moreover, other studies also provide indirect evidence from the view of "relevance" and "involvement". For example, processing high-relevant information may induce greater individual involvement because of its greater impact on life [24-26]. To date, less attention has been paid to the effects of misinformation relevance on the CIEM.

The CIEM has been replicated across both a wide variety of news stories (e.g., a warehouse fire) [2,4-6,8,14] and scientific knowledge of physics or biology (e.g., a meteor or bull) [7,12,15,17,27]. Compared with fictional news stories or physical knowledge, the misinformation related to daily life events (misinformation of COVID-19, health, food safety, etc.) may have a closer relationship with people. Using daily life events (i.e., high-relevant misinformation) to explore the CIEM may have higher ecological validity and more social significance.

Thus, the present research investigated the role of information relevance in the CIEM with two studies. Study 1 is an online survey to examine whether the information relevance is a possible factor affecting the CIEM using the misinformation related to COVID-19 as experimental material. Study 2 experimentally tested whether there are differences in CIEM when information relevance changes. This study used daily life events and physical scientific knowledge from a previous study [7] as materials. By selecting two kinds of misinformation with high and low relevance, to further examine the role of information relevance. Self-relevance includes the environment or stimuli that are relevant to oneself [28]. Thus, the information relevance is determined by asking participants to rate each information relevant to themselves in the current study.

For dependent variables, study 1 employed the difference of two ratings of believability in the misinformation between participants now seeing (referred to the moment they filled out the questionnaire) and first as an indicator of retraction effect or the CIEM. The retraction information for all misinformation included in the questionnaire had been widely published and spread by various media before our survey was conducted. Theoretically, the believability of now was decreased, resulting in a negative difference score. The smaller the difference of believability, the better the retraction effect and the smaller CIEM, while the larger the difference of believability, the worse retraction effect and the larger CIEM. Study 2 adopted direct belief change and indirect reasoning scores as dependent variables to assess the CIEM [29,30]. The experiment asked participants to rate initial information before and after manipulation and answer reasoning questions after reading. The belief change scores on fact were expected to increase after re-affirmative, resulting in a positive difference score; and to decrease in misinformation

after retraction, resulting in a negative difference score [29]. Similarly, the smaller the negative difference score of misinformation, the better the retraction and the smaller CIEM. For the inference score, the lower the inference score, the smaller the CIEM.

The difference score used a pretest-posttest design so that each individual could be their own control [7]. Therefore, the difference score is a more direct and explicit way to measure the CIEM [30]. While individuals are thought to integrate initial misinformation and retraction information to establish the causality of the event in the process of indirect reasoning [14]. The inference score is an indirect measure, attempting to avoid social desirability [7,30]. We speculated that both survey and experimental studies might observe the effect of information relevance on the CIEM, i.e., the higher information relevance resulting in the larger CIEM. Furthermore, the relationship between information relevance and the CIEM may not vary with dependent variables.

## 2. Study 1

### 2.1 Methods

#### 2.1.1 Participants

This study was run from March 10 to 14, 2020. 2864 participants living in 28 provinces in China filled out the questionnaire. The survey was organized by online and followed the principle of voluntary participation. The final sample consisted of 2522 participants (mean age = 22.1 ± 11.52, 1099 males).

#### 2.1.2 Measures

The survey included demographic questions and information evaluation. Demographic questions consists of sex (0 = female, 1 = male), age, education (1 = primary and below, 6 = graduate and above), the only child (0 = no, 1 = yes), health condition (1= good, 5 = poor), regional classification of the epidemic situation (1 = mildly epidemic area, 5 = severe epidemic area). In the information evaluation, we selected a list of 12 false and 2 true information relating to COVID-19. The misinformation is widely spread during the March epidemic and subsequently corrected in various media, such as “Eating more strawberries has a great effect on preventing COVID-19”. The true information used as filler materials. Participants were asked to rate four items for each information: 1) familiarity, 2) relevance (how relevant the information is to you), 3) believability (the first seeing), and 4) believability (now). All evaluation adopted 6-point Likert scales, and the higher scores indicate the deeper of extent. In the current data, the internal consistency (Cronbach’s coefficient) reliability of all four evaluations was 0.95.

### 2.2 Analysis and results

As mentioned above, the difference of belief judgments was used as the dependent variable in the following analysis. The correlations were based on participants’ average ratings across the 12 statements. Table 1 presents the

correlations for all variables. The results showed that demographic information (sex, age, etc.) was not related to the difference of believability (*ps* > 0.05), indicating that the demographic information does not affect the retraction effect or the CIEM. Difference of believability was significantly positively related to familiarity ($r$ = 0.07, p < 0.001) and relevance ($r$ = 0.05, $p$ < 0.05), indicating that the more familiar with the information, the larger the CIEM. And when participants thought the information was more relevant to themselves, the harder to retract it (i.e., the larger CIEM).

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. Sex | 1 | | | | | | | |
| 2.Age | -0.13*** | 1 | | | | | | |
| 3.Education | -0.08*** | 0.40*** | 1 | | | | | |
| 4.Regional classification | 0.02 | -0.13*** | -0.23*** | 1 | | | | |
| 5. Only child | 0.04 | -0.08*** | 0.13*** | -0.02 | 1 | | | |
| 6. Health | -0.05* | 0.12*** | 0.10*** | -0.01 | 0.04 | 1 | | |
| 7. Familiarity | 0.02 | 0.04 | -0.05* | 0.02 | -0.02 | -0.01 | 1 | |
| 8. Relevance | 0.008 | 0.07** | -0.02 | 0.01 | -0.03 | 0.02 | 0.81*** | 1 |
| 9. Difference of believability | 0.03 | -0.01 | -0.03 | 0.01 | 0.02 | -0.03 | 0.07*** | 0.05* |
| Note: N = 2522 ; Regional classification = regional classification of the epidemic situation. *** $p$ < .001 , ** $p$ < .01 , * $p$ < .05 | | | | | | | | |

**Table 1:** Correlations for all included variables

### 2.3 Discussion

The demographic information of individuals did not affect the CIEM, and it indicated that the CIEM might be a more common phenomenon among different groups. While in information evaluation, results found that the relevance could affect the CIEM. So we speculated that the information relevance might be an important factor in the CIEM. Besides, for the rating of familiarity, we found that it was significantly correlated with the CIEM. This revealed that familiarity could also affect the CIEM partly.

However, the internal validity of this online survey is relatively low, though it has higher ecological validity. Although the retraction information for all misinformation included in the questionnaire had been widely published and spread by various media before our survey was conducted, we could not provide convincing evidence that each participant had read the retraction information. Besides, we acknowledged the limitation of using a retrospective self-report study to draw firm conclusions about participants' tendency to experience CIEM. Due to these limitations, the conclusion that information relevance can affect the CIEM drew from study 1 need to be further

validated by a more strict experiment. So study 2 further employed a typical paradigm in the CIEM to examine the impact of information relevance on the CIEM.

## 3. Study 2

Given the limitations of the online survey, study 2 further examined the role of information relevance in CIEM. Additionally, study 1 found that familiarity can affect the retraction effect. So we controlled the interference caused by familiarity to explore the specific role of information relevance in study 2 effectively.

### 3.1 Methods

#### 3.1.1 Participants

A priori power analysis (G*Power 3.1.9.2) using a small-to-medium effect size f = 0.20, with $\alpha$ = 0.05 and 1 − $\beta$ = 0.80, and a moderate correlation between repeated measures of r = 0.50, indicated that 36 participants should be recruited 2]. Given this experiment consist of two types of misinformation and the potential for incomplete or missing data, 80 healthy undergraduates participated in the experiment. Two participants were excluded as they did not complete the task. Our final sample thus included 78 participants (34 males) between 18 and 22 years of age (*M* = 19.63, *SD* = 1.13). The study was approved by the Tianjin Normal University Psychological Experiment Ethics Committee. All participants had signed an informed consent form and received a small remuneration for their participation.

#### 3.1.2 Materials and design

Materials included two parts. Forty items (20 facts and 20 myths) on some knowledge of physical or biological were selected from Swire et al. [7], which was initially from websites such as new scientist, scientific American, etc. Familiarity and believability of the items were rated before the experiment in Swire et al. [7]. Six native Chinese-speakers made minor revisions of the descriptions of these materials to make them more intelligible for Chinese participants. Given that our participants were undergraduate students, we believe that the possible campus life events were more closely related to themselves. So another part of the materials made by authors, who were selected from the Internet, students, and counselors self-report. A total of 40 items (20 facts and 20 myths) that undergraduates often pay attention to or contact with in their lives were made.

A pilot study was conducted before the formal experiment to select high- and low-relevant items and control the influence of familiarity. Twenty-six undergraduate students (10 males, ages 18-25 years, *M* = 20.31, *SD* = 1.64) took part in the pilot study and didn't participate in any of our formal studies. Participants indicated (1) the extent to which they familiarized each item from "definitely unfamiliar" to "definitely familiar" and (2) the extent to which they think the information in each item relating to themselves from "totally unrelated" to "totally related" on

7-point scales. 26 facts and 26 myths left after the pilot study. A significant difference in relevance was found between these two sets of items (low-relevance: 3.72 ± 0.70; high-relevance: 4.47 ± 0.64, $t(25) = 4.46$, $p < 0.001$, d = 0.87), while no significant difference in familiarity was found (low-relevance: 4.27 ± 0.50; high-relevance: 4.49 ± 0.65, $t(25) = 1.43$, $p = 0.17$). Besides, this experiment focused on the effect of misinformation relevance on the CIEM, so only the data from myth items were analyzed. The relevance and familiarity of the 13 high-relevant myths and the 13 low-relevant ones were further compared. Similarly, the familiarity did not differ between them (high-relevance: 4.56 ± 0.38; low-relevance: 4.23 ± 0.46, $t(12) = 1.67$, $p = 0.12$); but relevance differed (high-relevance: 4.55 ± 0.34; low-relevance: 3.64 ± 0.71, $t(12) = 4.67$, $p = 0.001$, d = 1.28).

Each item included an initial statement with a pre-manipulation belief rating, followed by a corresponding brief or detailed explanation, two inference questions, and a post-manipulation belief rating. The brief explanation simply stated whether the item was a myth or a fact without any further information, while the detailed explanation provided further clarification with three or four sentences [7]. Example items were presented in Table 2. Each item had two versions of explanations: brief and detailed. Participants were randomly assigned to one of the versions.

| | High-relevance | Low-relevance |
|---|---|---|
| Myth | A college cafeteria sells moldy steamed buns. | Bulls are mostly colorblind, but can see the color red vividly. |
| Brief retraction | The steamed buns sold in the cafeteria of a university are not moldy and spoiled. | Bulls are not mostly color-blind, nor can they see the color red vividly. |
| Detailed retraction | After investigation, the black spots on the steamed buns were not caused by mildew. The black spots were caused by the unturned yeast and did not affect consumption. The health department confirmed once again that the steamed buns were not moldy. And students did not report physical discomfort after eating. | The myth that bulls are infuriated by the color red has been around since at least 1580. Bulls can see color, but they only have two types of cones in their eyes, rather than three types like us humans. This means that they can see blues and greens, but ironically, not reds It is the movement of the bullfighter's cape that cause it to charge. |
| Inference question | The health department should supervise the quality of steamed buns effectively again? | Would it be attacked by bulls if someone wears red clothes? |
| Fact | Some undergraduates are keen to choose part-time tutoring. | An opera singer's piercing voice can shatter glass. |
| Brief affirmation | Some undergraduates are keen to choose part-time tutoring | An opera piercing voice can shatter glass. |

| | | |
|---|---|---|
| Detailed affirmation | These students believe that part-time tutoring can give full play to their expertise.<br>They can enrich professional knowledge and strengthening practical ability at the same time.<br>Part - time tutor's income and working environment are relatively good. If one person wants to increase experience and self-training, part-time tutoring is a good choice for undergraduates | Every piece of glass has a natural resonant frequency, which is the speed at which it will vibrate with a sound wave Glass goblets, such as wine glasses, are especially resonant due to their shape. If you rub the rim of the glass continuously, the pitch that you hear is its natural frequency. If a person sings this note loud enough and long enough, the glass will shatter. |
| Inference question | If one undergraduate wants to go part-time, how likely is he to choose tutoring? | What possibility of glass will be shattered by singer's voice? |

**Table 2:** Example of the high-relevance and low-relevance items.

The analysis only included myths, so this experiment used a 2 (misinformation relevance: high vs. low) × 2 (retraction type: brief vs. detailed) within-subjects design. The dependent variables were belief difference scores and inference scores. Studies have shown that the belief difference scores for myths were negative [29]. So the smaller difference scores and inference scores denote the smaller CIEM.

### 3.1.3 Procedure

All participants were instructed to read a series of messages. The experiment was conducted via E-prime 2.0. Each trial started with a fixation cross (500ms) and was followed by an initial statement with a pre-manipulation belief rating. Participants were instructed to indicate the extent to which they believed in each item on a 1-9 scale by pressing the corresponding number keys on a keyboard. After the rating, participants received either a brief or a detailed explanation, and then they indicated on two successively displayed inference ratings with the same 9-point scale. In the end, the belief rating was presented again (Figure 1). During the experiment, all the readings and ratings were self-paced, and the computer recorded the ratings. The program will prompt the participants to rest once and press "J" to continue.

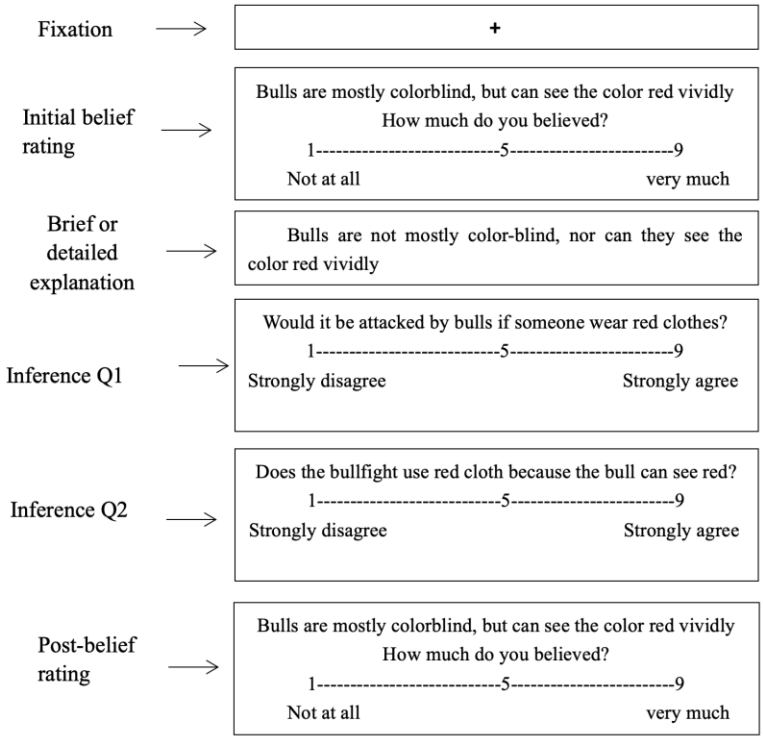


**Figure 1:** Illustration of procedure for the misinformation task.

### 3.2 Results

#### 3.2.1 Analysis of belief difference scores

A within-subjects ANOVA comparing the pre-manipulation belief scores showed that participants' initial belief in low-relevant misinformation ($M$ = 6.06, $SD$ = 0.80) was slightly higher than high-relevant misinformation ($M$ = 5.17, $SD$ = 1.00), $F(1, 77) = 56.56$, $p < 0.001$, $\eta^2 = 0.42$, which indicated that there was a difference in believability between high- and low-relevant misinformation before retraction. This analysis again showed the necessity of adopting the difference scores between post- and pre-manipulation.

A 2 × 2 repeated measure ANOVA was performed on the belief difference scores. The analysis revealed the main effect of misinformation relevance was significant, $F(1, 77) = 57.29$, $p < 0.001$, $\eta^2 = 0.43$. The difference scores in high-relevance condition were higher than those in low-relevance condition, which indicated the larger CIEM in misinformation with high-relevance. The main effect of retraction type was also significant, $F(1, 77) = 16.36$, $p < 0.001$, $\eta^2 = 0.18$. The difference scores in detailed condition were significantly smaller than those in brief, which indicated that detailed retraction was slightly better at belief change than brief. The interaction between misinformation relevance and retraction type of was also significant, $F(1, 77) = 8.53$, $p = 0.005$, $\eta^2 = 0.10$. A further simple effect analysis showed that the difference scores in high-relevance condition did not differ between detailed and brief (detailed: -1.77 ± 0.91; brief: -1.61 ± 1.11, $F(1, 77) = 1.53$, $p = 0.22$, $\eta^2 = 0.02$); while the difference scores in low-relevance condition in detailed were significantly lower than those in brief (detailed: -2.94 ± 1.51; brief: -

2.31 ± 1.41, $F(1, 77) = 25.61$, $p < 0.001$, $\eta^2 = 0.25$), which indicated the smaller CIEM in low-relevant misinformation with detailed retraction (Figure 2).

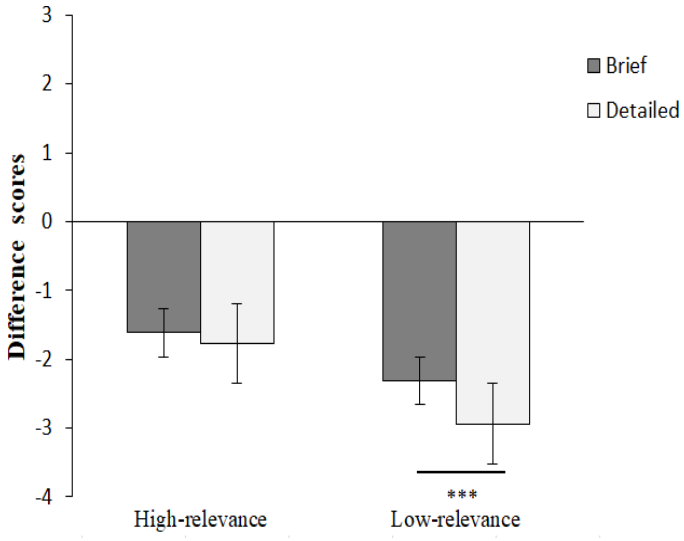


**Figure 2:** Belief changes in high- and low-relevance.

### 3.2.1 Analysis of inference scores

Analogous to the belief difference scores analysis, a 2 × 2 repeated measure ANOVA was performed on the post-manipulation inference scores (Figure 3). The analysis revealed the main effect of item relevance was significant, $F(17,7) = 43.27$, $p < 0.001$, $\eta^2 = 0.36$. The inference scores in high-relevance condition were higher than low-relevance condition. It was indicated that the stronger reliance on misinformation with high-relevance. The main effect of retraction type was significant, $F(1, 77) = 24.22$, $p < 0.001$, $\eta^2 = 0.24$, the inference scores of detailed were lower than brief, indicating the smaller CIEM in detailed retraction. The interaction between item relevance and retraction type was not significant, $F < 1$, $p > 0.05$. This result again revealed larger CIEM in high-relevance condition.

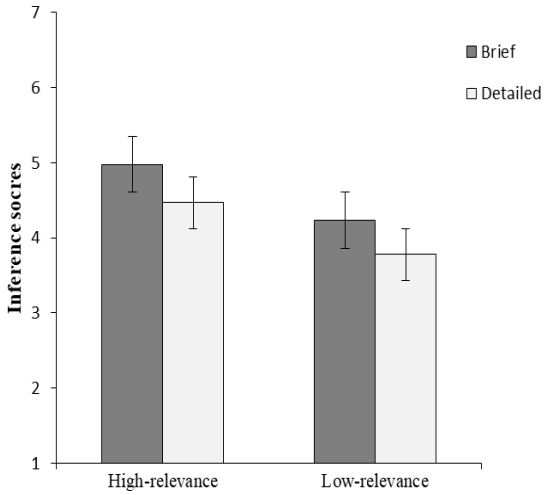


**Figure 3:** Post-manipulation inference scores in high and low relevance.

### 3.3 Discussion

Study 2 demonstrated that the CIEM varies with misinformation relevance by experimental manipulation.

The analysis of both belief changes and inference scores revealed the significant main effect of misinformation relevance. It is more difficult to retract high-relevant misinformation, either using a brief or a detailed retraction. Specifically, participants exhibited greater reliance on the initial misinformation (i.e., have larger CIEM) in high-relevant misinformation condition than in low-relevant misinformation condition. This result might be attributed to different personal-involvement [25,31] and various cognitive processes [26].

The interaction between item relevance and retraction type for belief scores showed that detailed retraction was more effective than brief ones in low-relevance condition, but not in high-relevance condition. It suggested that misinformation relevance may influence the CIEM by modulating retraction effects produced by different retraction methods. However, we didn't find an interaction for inference ratings, indicating that misinformation relevance did not affect retraction effects by brief or detailed retraction in indirect measurement. This may be due to different measurements resulting in these differences.

In sum, no matter what kind of measurement and retraction were applied, it is found that the CIEM in high-relevant condition was greater. Besides, the different effects of information relevance were also found in the interaction. So this result again demonstrated the importance of misinformation relevance.

## 4. General discussion

The current research examined the role of information relevance in the CIEM by questionnaire survey and further experiment with strict control. The results showed that information relevance could affect the CIEM, and that the high-relevant information had a larger CIEM. The online survey (study 1) for demographic characteristics indicated that the CIEM might be a normal phenomenon in population. The results of the information evaluation found that information relevance had a significant effect on the CIEM. In the empirical design (study 2), we control interferes of familiarity to examine the information relevance. Results found that after controlling the information familiarity, the information relevance can also influence the CIEM.

One possible explanation is that high-relevant information processing leads to higher personal involvement when compared to low-relevant information processing. Participants tend to believe that information has a significant impact on their lives when it is highly correlated with themselves. Thus, higher personal involvement occurs when they process such information [24,25]. Social Judgment Theory (SJT) posited that high personal involvement inhibits acceptance of persuasive messages. That is, the more involved a person is with an issue, the more that person will resist attitude change [32]. Results from Park et al. [32] partly support the social judgment theory. Park et al. [32] assessed how recipient involvement affected message persuasiveness. They varied topic, position advocated, outcome relevance, and argument quality in the experiment. The results found that personal involvement negatively affected the degree of attitude change. Petty and Cacioppo [33] varied involvement and the direction of a message (proattitudinal or counterattitudinal) in the experiment. They found that increasing involvement enhanced persuasion for the proattitudinal but reduced persuasion for the counterattitudinal advocacy, which suggested that high involvement with an issue enhanced message processing, and therefore, can result in decreased acceptance for counterattitudinal persuasion. Qi and Zhang [26] also found that individuals are more likely to maintain their original attitudes if their involvement was high. For the misinformation retraction, the retraction information is contradictory to its initial misinformation. And retraction aims to persuade people to change their views or judgments based on misinformation to some extent. Therefore, high-relevant information processing, due to higher personal involvement, may make a person more likely to resist the subsequent correction information and maintain its belief in the initial information. The high-relevant misinformation is thus more difficult to be retracted compared to the low-relevant misinformation (i.e., larger CIEM).

This explanation seems compatible with speculation based on the mental model account of the CIEM. According to the mental model account, the existence of the CIEM relates to a mental model construction for an event. Individuals will construct a mental representation for an unfolding event when they first read its misinformation, and struggle to retain a coherent understanding of that event [5,34]. The subsequent retraction can undermine the internal consistency of the initial mental model about that event [5,35]. People prefer an incorrect but complete model to an

incomplete model [14,34]. The initial high-relevant misinformation, which is closer to an individual's life and higher personal involvement than low-relevant misinformation, facilitates the detection of conflicts between initial misinformation and correct information. Individuals will strongly realize that the retraction would break the consistency of the existing model about the event, and make more efforts to prevent integration of correct information into the model, resulting in a larger CIEM.

It seems that the impact of relevance on the CIEM varied with indicators reflecting the CIEM and retraction methods. When using belief change to assess the CIEM, there was an interaction between retraction type and information relevance. The CIEM of high-relevant misinformation didn't differ between two retraction methods, while detailed retraction had a smaller CIEM in low-relevant misinformation than brief retraction. When using inference scores as an indicator, no such interaction was observed. The different ways to obtain the scores of belief change and inference may cause such inconsistency. Pre- and post-retraction belief ratings were completed with the appearance of initial misinformation. But the inference questions were displayed after the retraction without the presence of initial misinformation. Thus, participants reread the misinformation in the post-retraction belief rating. This repetition made participants more familiar with initial misinformation and to process it more fluently [36]. Familiarity was found to make misinformation to receive higher truth ratings [36,37]. Furthermore, as mentioned above, individuals tend to believe in the initial high-relevant misinformation and refuse the retraction. Taken together, it is more difficult for high-relevant misinformation to be corrected, which weakens the role of the detailed retraction and reduces the difference in the CIEM between retraction types.

The present research demonstrates the universality of the CIEM in information types and information processors, and the role of information relevance in the CIEM [38-40]. The finding that the CIEM may vary with information relevance offers some cues for misinformation retraction in practice. And, given that high-relevant information was more difficult to retract than low-relevant information, future works should also focus on how to reduce the CIEM of high-relevant information. Besides, Gordon et al. [4,35] started to reveal the neural basis of the CIEM, and an attempt could be made to investigate whether information relevance would modulate the neural correlates of the CIEM [41-48].

## 5. Conclusion

This research aimed to investigate the impact of information relevance on the CIEM through online survey and offline experiment. The findings of two studies suggest that information with a higher relevance has a larger CIEM. Information relevance is an essential factor that affects the CIEM.

## References


1. Ecker UKH, Lewandowsky S, Fenton O, et al. Do people keep believing because they want to? preexisting attitudes and the continued influence of misinformation. Mem Cogni. 42 (2014): 292-304.
2. Ecker UKH, Hogan JL, Lewandowsky S. Reminders and repetition of misinformation: helping or hindering its retraction?. J Appl Res Mem Cog. 6 (2017): 185-192.
3. Ecker UKH, Lewandowsky S, Cheung CSC, et al. He did it! she did it! no, she did not! Multiple causal explanations and the continued influence of misinformation. J Mem Lang. 85 (2015): 101-115.
4. Gordon A, Brooks JCW, Quadflieg S, et al. Exploring the neural substrates of misinformation processing. Neuropsychologia. 106 (2017): 216-224.
5. Johnson HM, Seifert CM (1994) Sources of the continued influence effect: when misinformation in memory affects later inferences. J Exp Psychol Learn Mem Cogn. 20 (1994): 1420-1436.
6. Rich PR, Zaragoza MS. The continued influence of implied and explicitly stated misinformation in news reports. J Exp Psychol Learn Mem Cogn. 42 (2016): 62-74.
7. Swire B, Ecker UKH, Lewandowsky S. The role of familiarity in correcting inaccurate information. J Exp Psychol Learn Mem Cogn. 43 (2017): 1948-1961.
8. Wilkes AL, Leatherbarrow M. Editing episodic memory following the identification of error. The Q J Exp Psychol Section A. 40 (1988): 361-387.
9. Pennycook G, McPhetres J, Zhang Y, et al. Fighting COVID-19 misinformation on social media: Experimental evidence for a scalable accuracy-nudge intervention. Psychol Sci. 30 (2020): 770-780.
10. Vosoughi S, Roy D, Aral S. The spread of true and false news online. Science. 359 (2018): 1146-1151.
11. Pennycook G, Cannon TD, Rand DG. Prior exposure increases perceived accuracy of fake news. J Exp Psychol Gen. 147 (2018): 1865-1880.
12. Diakidoy IAN, Mouskounti T, Ioannides C. Comprehension and learning from refutation and expository texts. Read Res Q. 46 (2011): 22-38.
13. Ecker UKH, Lewandowsky S, Tang DTW. Explicit warnings reduce but do not eliminate the continued influence of misinformation. Mem Cognit. 38 (2010): 1087-1100.
14. Ecker UKH, Lewandowsky S, Swire B, et al. Correcting false information in memory: manipulating the strength of misinformation encoding and its retraction. Psychon Bull Rev. 18 (2011): 570-578.
15. Kendeou P, Walsh EK, Smith ER, et al. Knowledge revision processes in refutation texts. Discourse Processes. 51 (2014): 374-397.
16. Rapp DN, Hinze SR, Kohlhepp K, et al. (2014). Reducing reliance on inaccurate information. Mem Cognit. 42 (2014): 11-26.
17. Rich PR, Van Loon MH, Dunlosky J. Belief in corrective feedback for common misconceptions: implications for knowledge revision. J Exp Psychol Learn Mem Cogn. 43 (2016): 492-501.

18. Guillory JJ, Geraci L. Correcting erroneous inferences in memory: the role of source. (2013).
19. Lewandowsky S, Stritzke WGK, Oberauer K, et al. Memory for fact, fiction, and misinformation the Iraq war 2003. Psychol Sci. 16 (2005): 190-195.
20. Jolley D, Douglas KM. The effects of anti-vaccine conspiracy theories on vaccination intentions. PLoS ONE. 9 (2014): e89177.
21. Walter N, Murphy ST. How to unring the bell: A meta-analytic approach to correction of misinformation. Communication Monographs. 85 (2018): 423-441.
22. Walter N, Tukachinsky R. A meta-analytic examination of the continued influence of misinformation in the face of correction: how powerful is it, why does it happen, and how to stop it?. Commun Res. 47 (2019): 155-177.
23. Rothman A, Schwarz N. Constructing perceptions of vulnerability: personal relevance and the use of experiential information in health judgments. Pers Soc Psychol Bull. 24 (1998): 1053-1064.
24. Apsler R, Sears DO. Warning personal involvement and attitude change. J Pers Soc Psychol. 9 (1968): 162-166.
25. Muscatell KA, Addis DR, Kensinger EA. Self-involvement modulates the effective connectivity of the autobiographical memory network. Soc Cogn Affect Neurosci 5 (2010): 68-76.
26. Qi XD, Zhang DJ. The Effects of ego-depletion on attitude in different level of issue involvement. Chin J Clin Psychol. 27 (2019): 10-13.
27. Broughton SH, Sinatra GM, Reynolds RE. The nature of the refutation text effect: an investigation of attention allocation. J Educ Res. 103 (2010): 407-423.
28. Cunningham SJ, Turk DJ, Macdonald LM, et al. Yours or mine? Ownership and memory. Conousness & Cognition. 17 (2008): 312-318.
29. Ecker UKH, O'Reilly Z, Reid JS, et al. The effectiveness of short-format refutational fact-checks. Br J Psychol. 111 (2020): 36-54.
30. Rich PR, Zaragoza MS. Correcting misinformation in news stories: an investigation of correction timing and correction durability. J Appl Res Mem Cogn. In press (2020).
31. Krugman HE. The Measurement of Advertising Involvement. Public Opinion Quarterly. 30 (1966): 583-596.
32. Park HS, Levine TR, Westerman CYK, et al. The effects of argument quality and involvement type on attitude formation and attitude change: a test of dual-process and social judgment predictions. Hum Commun Res. 33 (2007): 81-102.
33. Petty RE, Cacioppo JT. Issue involvement can increase or decrease persuasion by enhancing message-relevant cognitive responses. J Pers Soc Psychol. 37 (1979): 1915-1926.

34. Lewandowsky S, Ecker UKH, Seifert CM, et al. Misinformation and its correction: continued influence and successful debiasing. Psychol Sci Public Inter. 13 (2012): 106-131.
35. Gordon A, Quadflieg S, Brooks J CW, et al. Keeping track of "alternative facts": The neural correlates of processing misinformation corrections. Neuroimage. 193 (2019): 46-56.
36. Unkelbach C, Koch A, Silva RR, et al. Truth by repetition: explanations and implications. Curr Dir Psychol Sci. 28 (2019): 247-253.
37. Fazio LK, Brashier NM, Payne BK, et al. Knowledge does not protect against illusory truth. J Exp Psychol Gen. 144 (2015): 993-1002.
38. Chaiken S, Liberman A, Eagly AH. Heuristic and systematic information processing within and beyond the persuasion context. In Eds: Uleman JS & Bargh JA, Unintended thought. New York, NY, US: Guilford Press. 1989. pp: 212-252.
39. Conway MA. Memory and the self. J Mem Lang. 53 (2005): 594-628.
40. Evans JSBT. Dual-processing accounts of reasoning, judgment, and social cognition. Annu Rev Psychol. 59 (2008): 255-278.
41. Evans JSBT, Stanovich KE. Dual-process theories of higher cognition: advancing the debate. Perspect Psychol Sci. 8 (2013): 223-241.
42. Hupfer NT, Gardner DM. Differential involvement with products and issues: an exploratory study. Association for Consumer Research (1971).
43. Lewandowsky S, Ecker UKH, Cook J. Beyond misinformation: understanding and coping with the "Post-Truth" Era. J Appl Res Mem Cogn. 6 (2017): 353-369.
44. Ozubko JD, Fugelsang J. Remembering makes evidence compelling: Retrieval from memory can give rise to the illusion of truth. J Exp Psychol Learn Mem. 37 (2011): 270-276.
45. Pennycook G, Fugelsang JA, Koehler DJ. What makes us think? a three-stage dual-process model of analytic engagement. Cogn Psychol. 80 (2015): 34-72.
46. Schwarz N, Newman E, Leach W. Making the truth stick and the myths fade: Lessons from cognitive psychology. Behav Sci Policy. 2 (2016): 85-95.
47. Sui J, Humphreys GW. The integrative self: how self-reference integrates perception and memory. Trends Cogn Sci. 19 (2015): 719-728.
48. Yin S, Sui J, Chiu YC, et al. Automatic prioritization of self-referential stimuli in working memory. Psychol Sci 30 (2019): 415-423.