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Can cognitive and psychosocial factors mitigate misinformation? Study in a Costa Rican sample

¿Pueden los factores cognitivos y psicosociales mitigar la desinformación? Estudio en una muestra costarricense

Podem fatores cognitivos e psicossociais mitigar a desinformação? Estudo em uma amostra costarriquenha

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ABSTRACT | The study aims to investigate biases related to socio-cognitive and psychosocial variables associated with misinformation. It examines cognitive reflexivity, metacognitive awareness, identification with a group, political ideologies and religiosity as predictors of both misinformation identification and intention to share. An online experiment was conducted with 328 university students (49% women) to determine the presence of illusory truth bias and the effect of inoculation conditions. Participants were assigned to one of three cognitive inoculation conditions (individual judgment, metacognition, or control condition) and read various false and true news items related to politics and public affairs. Our results showed the presence of the illusory truth effect. Individuals with higher metacognitive awareness were less affected by illusory truth bias when evaluating both false and true messages. Participants who tended to identify with their group were more likely to perceive false messages as true. The results showed no significant reduction in bias under the inoculation conditions.

KEYWORDS: misinformation, social-cognition, illusory truth bias, inoculation theory, social identity, political ideology

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RESUMEN | *Este estudio investiga sesgos asociados con variables sociocognitivas y psicosociales relacionadas con la desinformación. Examina la reflexividad cognitiva, la conciencia metacognitiva, la identificación endogrupal, las ideologías políticas y la religiosidad como predictores de la identificación de mensajes desinformativos y la intención de compartirlos. Se realizó un experimento en línea con 328 estudiantes universitarios (49% mujeres) para estimar la presencia del sesgo de la verdad ilusoria y el efecto de condiciones de inoculación. Los participantes fueron asignados a una de tres condiciones de inoculación cognitiva (evaluación individual, metacognición o condición de control) y leyeron varios mensajes falsos y verdaderos sobre política y asuntos públicos. Se encontró la presencia del efecto de la verdad ilusoria. Las personas con mayor conciencia metacognitiva se vieron menos afectadas por el sesgo de la verdad ilusoria al evaluar mensajes falsos y verdaderos. Los participantes que tienden a identificarse con su endogrupo presentan mayor probabilidad de percibir mensajes falsos como verdaderos. Los hallazgos no mostraron una reducción sustancial del sesgo con las condiciones de inoculación.*

PALABRAS CLAVE: *desinformación, cognición social, efecto de la verdad ilusoria, teoría de la inoculación, identidad social, ideologías políticas*

RESUMO | O estudo tem como objetivo investigar os vieses ligados às variáveis sociocognitivas e psicossociais relacionadas à desinformação. Pretende examinar a reflexão cognitiva, a consciência metacognitiva, a identificação endogrupal, as ideologias políticas e a religiosidade como preditores associados à identificação de desinformação e à intenção de partilhar. Foi realizada uma experiência online com 328 estudantes universitários (49% mulheres) para determinar a presença de preconceitos de verdade ilusória e o efeito das condições de inoculação. Os participantes foram designados para uma das três condições de inoculação cognitiva (avaliação individual, metacognição ou controle) e leram noticias falsas e verdadeiras sobre política e questões públicas. Os resultados revelaram a presença do efeito da verdade ilusória. Os indivíduos com maior consciência metacognitiva foram menos afetados por viés de verdade ilusória ao avaliarem mensagens falsas e verdadeiras. Os participantes identificados com o seu grupo têm maior probabilidade de perceber as mensagens falsas como verdadeiras. Os resultados não demonstraram uma redução substancial no viés com as condições de inoculação.

PALAVRAS-CHAVE: desinformação, cognição social, efeito da verdade ilusória, teoria da inoculação, identidade social, ideologias políticas

INTRODUCTION

This article contributes to the study of the cognitive and psychosocial factors associated with misinformation.

Digital communication, whether interpersonal, intergroup, institutional or corporate, is intertwined with other forms of communication, whether face-to-face or media-based. In this context, citizens draw on various forms of existing communication in their actions and participation in the daily construction of public opinion to confirm, reinforce or inform their choices and assessments of what is happening in the country.

We have only just begun to understand the mechanisms of interpersonal or inter-group digital communication through messaging or computerized social networks, how they work and how they influence political decision-making – with misinformation playing a central role.

Progress has already been made in studying the role of these forms of communication in the spread of misinformation. However, sociocognitive research is just beginning to systematize some hypotheses that bring us closer to understanding some of the processing, evaluation and decision-making mechanisms associated with these messages.

Misinformation in the digital environment

Misinformation is not a new phenomenon, but the increasing importance of digitalization in shaping public opinion makes it relevant to investigate the mechanisms by which people accept such messages, distinguish between a misinformative and a true message, or are willing to share it.

Misinformation news refers to all messages that contain partially or completely false content (Egelhofer & Lecheler, 2019). They have been categorized into three types: those that do not explicitly aim to misinform but present partially or completely false information; those that explicitly aim to mislead; and those that aim to harm a person, group, institution or country (Shu et al., 2020).

The spread of misinformation appears to have a significant impact on political decision-making and even helps to determine the course of democracies. This was observed in the elections that brought Trump or Bolsonaro to power, as well as in the Brexit referendum, but was also repeated in various countries during the COVID-19 pandemic. It is a multidimensional phenomenon, which does not mean that misinformation has a unicausal effect on voting decisions, support for government policies and other socio-political outcomes. However, various observations of these processes highlight their importance as a component that feeds into decisions that ultimately lead to support for certain actions or actors (Ituassu et al., 2019; Oyserman & Dawson, 2020; Wang et al., 2021; World Health Organization, 2020).

To understand and mitigate the spread of misinformation in digital environments, researchers, policy makers, and other societal actors need to consider the complex interplay between the source of misinformation, its content, the characteristics of the information environment and social context (e.g., low media trust), and recipient-related factors (Chen et al., 2023). This study focuses on recipient-related or individual factors associated with susceptibility to accepting and sharing disinformation –such as demographics, worldviews, motivations, knowledge, and cognition.

First, sociodemographic data suggests that less educated (García-Borrego & Casero-Ripollés, 2022; Schaewitz et al., 2020) and older people (Bapaye & Bapaye, 2021) are more likely to believe and share misinformation. Second, susceptibility to misinformation has been associated with a conspiracy mentality (Halpern et al., 2019), conservative or strongly religious attitudes (García-Borrego & Casero-Ripollés, 2022). Third, individuals have different motivations for spreading misinformation, such as socializing and searching for information online (Shen et al., 2021), self-promotion, entertainment purposes, and sharing information they believe to be true (Melchior & Oliveira, 2023). Fourth, socio-cognitive variables have been found to protect individuals from disinformation. These include knowledge about a topic (Pennycook et al., 2020), critical thinking (Buchanan, 2020) and information literacy (Di Domenico et al., 2021).

In the case of Costa Rica, the acceptance and dissemination of misinformation is also widespread among highly religious people, people with authoritarian and conservative views, and those with low reflective thinking (Brenes Peralta et al., 2022, 2024). In addition, it is possible that structural inequalities, such as low income and lower opportunities for human development in some areas, reflect other inequalities related to the cognitive and informational competencies required to recognize false information (Brenes Peralta et al., 2022).

The illusory truth bias

It is essential to investigate the socio-cognitive variables associated with the acceptance of false messages in social networks and the intention to share it. Social cognition research has identified several heuristics, called cognitive biases, that favor the acceptance of misinformation. The best studied of these is the illusory truth bias, which operates such that cumulative exposure to one or more messages leads to their being ascribed the status of truth, regardless of whether they are true or false. It is therefore important for understanding the cognitive mechanisms of misinformation (Dechêne et al., 2010; Fazio et al., 2015, 2019; Pennycook et al., 2018).

According to Fazio and Pillai (2020), this heuristic has been explained cognitively as: a) familiarity, which is associated with an information signal; b) fluency, which

facilitates easy processing; c) coherence, which provides associations between concepts or events that are considered coherent and are assumed to be true when recalled; and d) convergent validity, as they are incorrectly assumed to come from different sources and are therefore perceived to be true.

The study of this bias is important because it has not been adequately researched in Latin America and Costa Rica.

Research shows that biases related to misinformation can be explained by both cognitive processing and psychosocial variables. In this study, we examine cognitive reflexivity, metacognitive awareness, ingroup identification, political ideologies, and religiosity as predictors associated with the identification of misinformation and the intention to pass it on.

Reflective processing refers to the ability to think analytically and promotes deliberation in problem solving and cognitive flexibility (Pennycook & Rand, 2019). People with analytical or reflective reasoning are more likely to identify false messages (Eker et al., 2022; Kaufman et al., 2022). However, the results are not conclusive, as this bias occurs regardless of whether people tend to have a reflective mindset or not. (de Keersmaecker et al., 2020).

Metacognition refers to a person's ability to monitor, visualize and track their own cognitive processes at a given time (Heyes et al., 2020), which contributes to their evaluation and decision in response to a message and to making a decision (Salovich & Rapp, 2020). Salivoch and Rapp (2020) point out that in experimental contexts, those who are encouraged to engage in metacognitive reflection tend to reduce their acceptance of false content.

Ingroup identification refers to the basic socio-cognitive mechanism of social identity, in which people gain information about themselves from belonging to social groups, tend to evaluate their own groups more positively, and feel more emotionally connected to them than to outgroups (Tajfel & Turner, 1986). Studies suggest that ingroup identification may lead to greater acceptance of false messages, especially in a conflict or threat context where emotional reactions predominate (Oyserman & Dawson, 2020; Ecker et al., 2022).

Political ideology encompasses a double spectrum of attitudes that oscillate between 1) the role of the state and the market in society and 2) right-wing conservatism and progressive left-wing liberalism (Jost, 2017; Pignataro & Cascante, 2018). Pillai and Fazio (2021) and Ecker (2022) suggest that political attitudes and worldviews may be associated with greater acceptance of misinformation, especially when the messages evokes emotional responses to potential identity threats and is more common among individuals closer to conservative ideologies. It is also relevant

to assess self-perceptions of religiosity as another way to examine conservatism, as it has been found that more dogmatic or fundamentalist people tend to accept more misinformation, which in turn is associated with a reduction in analytical or reflective thinking, as mentioned above (Bronstein et al., 2019).

Cognitive inoculation

In addition to investigating the presence of the illusory truth effect and its determinants in Costa Rica, we seek to identify socio-cognitive mechanisms that reduce this heuristic. Specifically, we focus on two cognitive inoculation mechanisms that encourage/push individuals towards controlled information processing: reflective evaluation and metacognitive tasks. Cognitive inoculation has been shown to facilitate false report detection and reduce sharing behavior (Pennycook & Rand, 2019; Salovich & Rapp, 2020; Van der Linden & Roozenbeek, 2021). This study goes further and examines the effectiveness of its mechanisms in the presence of the falsehood effect.

Inoculation theory stems from traditional research on persuasion and the identification of cognitive mechanisms to counteract fake news or the propaganda effect (Mcguire, 1964; Cook et al., 2017; Van der Linden & Roozenbeek, 2021). It states that people can recognize and counter misinformation if they are made aware in advance that they may be exposed to misinformation and that it is important to evaluate it – including the use of counterarguments.

This approach encourages individuals to engage in controlled processes of evaluation, judgment, and decision making regarding information, for which behavioral economics interventions have been used (Eckert, 2022; Kozyreva et al., 2020). The aim is to provide options that promote reflective evaluation of messages before people are exposed to them (Cook et al., 2017; van der Linden & Roozenbeek, 2020). In addition to cognitive evaluation, metacognitive processes can prepare individuals to recognize misinformation. Metacognitive priming and its effects on misinformation detection have not yet been extensively studied.

Research questions

This study examines the effects of cognitive reflexivity, metacognition, political ideologies, and religiosity on the illusory truth bias in contexts that enhance or mitigate it. It focuses on the following research questions:

> *RQ1.* To what extent is the illusory truth effect present in the Costa Rican college students, separately for false and true messages?
>
> *RQ2.* What is the effect of the illusory truth bias on the intention to share false and true messages?

RQ3. What is the effect of different cognitive inoculation conditions on the illusory truth bias and the intention to share false and true messages?

RQ4. What is the effect of cognitive reflexivity and metacognition on the identification of false and true messages and the intention to share them?

RQ5. What is the effect of in-group identification, political ideology, and religiosity on the identification of false and true messages and the intention to share them?

METHOD

Study design

We conducted an online experiment with an intentional sample of Costa Rican university students in May 2023. Participants were assigned to one of three cognitive inoculation conditions (individual judgment, metacognition, or control) and read several false and true messages stories about politics and public affairs.

Sample

A total of 328 students agreed to participate, six of whom were excluded because they had answered a question on the attention test incorrectly. Thus, the final sample consisted of 322 students (49% female, mean age=19.41, *SD*=1.94), 99% from the four central provinces of Costa Rica and only 1% from the coastal areas.

Stimulus materials

Two months before the experiment, we collected misinformative content verified by two of the most important fact checkers in Costa Rica (*Doble Check* and *No Coma Cuento*). We extracted 16 misinforming messages about politics and public affairs. Simultaneously, we designed 16 true messages drawn from Costa Rican news media. Three academic judges from the fields of social cognition and communication decided whether each message was false or true and indicated how hard they rated the truthfulness of the message using a 5-point scale that ranged from very easy to very hard. We then selected those stimuli for which judges had 1) a higher rate of false truth ratings and 2) different levels of perceived difficulty. We reduced the final sample to 8 false and 8 true stimuli and homogenized the word expansion. Finally, we conducted a pilot study with 26 students who reported low familiarity with the content of the stimuli and a difficulty level above 6 (on a scale of 1 to 10) to assess the truthfulness of each material. These results suggest that the stimuli are likely to replicate the effect of illusory truth in our study (Fazio et al., 2015). An example of fake message is: "Ministry of Finance recovers 100% from the April 2022 cyber-attack." An example of true message is: "Inflation this January highest since 2018".

Illusory truth effect protocol

To replicate the illusory truth effect, we employed a commonly used protocol (Pennycook et al., 2018). In the familiarization phase, participants read half of the stimuli (four false, four true) in random order and answered the question of whether they already knew each stimulus. Cognitive, ideological, psychosocial and socio-demographic variables were measured in the distraction phase, which was followed by the evaluation phase. Participants were confronted with the same eight messages plus eight additional messages (four false, four true) that had not been presented to them previously. For each message, participants rated whether it was false or true. The false-truth effect states that exposure to false and true messages in the habituation phase increases the likelihood that the same stimuli will be judged as true in the evaluation phase –regardless of their actual truthfulness.

Experimental manipulations

Participants in the control condition (N=103) read the following text: "You are going to read several messages circulated in social media. Please indicate if the message is false or true and how willing you are to share it with others." Participants in the individual assessment condition (N=101) read the following text: "Be attentive. Sometimes we come across false or true information. It is important to read news carefully to determine their veracity. Make sure that a news item comes from a trusted source or person, that a news item you have received has been published by reliable media outlets, or that it is backed up by sources. Be suspicious of news that seems exaggerated or unrealistic. Read the following news and try to assess whether they are false or true and how willing you are to share them with others".

Following previous metacognitive prompts (Salovich & Rapp, 2021), participants read the following text in the metacognition condition (N=102): "Be attentive. Sometimes we come across information that is false and sometimes true. Humans can potentially recognize what is false or true. How good do you think you are at recognizing false or true news or messages? To assess your ability, ask yourself the following questions: When was the last time you recognized whether a message was false or true? When was the last time you read a message that you did not know was false? Why do you think you were not able to recognize that the information was false? What do you think you learned from this experience that prevented you from recognizing false information? Overall, how do you think you can better assess and recognize whether a new is false or true? Please use a scale of 0 to 10, where 0 means that you feel unable and 10 means that you are absolutely able to recognize whether a news story or report is false or true. In the next section, you will read a series of news stories. Try to assess whether they are false or true and how willing you are to share them with others".

Covariates

Instruments used to measure each covariate are described in table 1.

To measure cognitive reflexivity, we used the cognitive reflection test-2 (CRT-2), which measures a person´s tendency to replace an intuitive but incorrect answer with an analytically correct response (Thomson & Oppenheimer, 2016). The questions do not require a high level of mathematical sophistication to give a correct answer. For example: "If you are running in a race and you pass the person in second place, what place are you in?" The intuitive answer is first place, but the correct answer is second. We coded the answers with a value of 0 for incorrect answers and 1 for correct answers. We added up the number of correct answers to create a cognitive reflexivity index ranging from 0 to 4 (M=2.53, SD=.80).

To measure identification with one's group, we used a nine-item version of the collective self-esteem scale (Luhtanen & Crocker, 1992) adapted by González and Quirós (2014) for adults in the context of social media use. It consists of a 5-point Likert scale (1=strongly disagree, 5=strongly agree). The introductory prompt was: "Think about the people you are friends with or follow on social media". An example of an item is: "I agree with their opinions". The scale had satisfactory internal consistency (Cronbach´s alpha=.89, McDonald´s omega=.89; M=4.11, DT=1.09).

To measure metacognitive awareness, we used the metacognitive awareness inventory (Schraw & Dennison, 1994), specifically the short version developed by Harrison and Vallin (2018) with 19 items. The test has the following instructions: "Think about what you do when you need to learn something new, e.g., for study or work. You will read a series of sentences. Think and answer on a scale of 1 to 7, where 1 means that the sentences do not apply to you at all and 7 that they apply completely". An example is: "I set specific objectives before I begin a task". This test has two subscales: cognitive knowledge (Cronbach's alpha=.72, McDonald´s omega=.74; M=4.69, DT=1.29) and cognitive regulation (Cronbach's alpha=.74, McDonald´s omega=.69; M=5.0, DT=1.05). We summed both subscales to create the metacognitive awareness index (M=9.69, DT=2.08).

Variable	Mesure	Reference
Cognitive reflexivity	Cognitive reflection test-2	Thomson & Oppenheimer (2016).
In-group identification	Collective self-esteem scale in the context of social media	González Prieto & Quirós Araya (2014).
Metacognitive awareness	Metacognitive awareness inventory	Harrison & Vallin (2018).
Political ideology	Political ideology scale	Pignataro & Cascante (2014).

Table 1. List of measures by variable

Source: Own elaboration.

To measure political ideology, we used the nine-point scale developed by Pignataro and Cascante (2014), which consists of a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). It measures two dimensions: Four items measure conservative (low scores) versus liberal ideology (high scores); for example, "I agree with same-sex marriage". Five items measure pro-market (low scores) versus pro-state ideology (high scores); for example, "The state must guarantee free access to health care". The internal consistency coefficients were acceptable for both the conservative and liberal scores (Cronbach's Alpha=.69, McDonald´s Omega=.69; *M*=4.12, *DT*=.75) and pro-market vs. pro-state ideologies (Cronbach's Alpha=.67, McDonald´s Omega=.69; *M*=3.55, *DT*=.72).

To measure religiosity, participants indicated how religious they were on a scale from 0 (not at all) to 10 (very) points (*M*=3.44, *SD*=2.89).

Finally, in the familiarization phase of the study, participants read four false and four true messages and indicated whether they knew them beforehand (0=no, 1=yes). We totaled the number of affirmative responses to create two variables that ranged from 0 to 4: familiarity with false (*M*=1.24, *SD*=1.0) and true messages (*M*=1.0, *SD*=1.0).

Dependent variables

To measure the truthfulness rating of each message item, we used the following question: "Indicate whether the message you just read is false or true". The response options were false (value=0) and true (value=1). On this basis, we created two index variables. First, the number of false messages rated as true was the sum of the ratings of the 16 false messages (*M*=4.36, *DT*=1.66; minimum=0, maximum=8). Second, we summed the number of true messages rated as true (*M*=4.73, *DT* =1.82; minimum=0, maximum= 8).

To measure intention to share false and true messages, participants indicated how willing they were to share each message with friends or family, ranging from "not at all (value=1), a little willing (value=2), and a lot (value=3)". We calculated the sum of the responses to the 16 false and 16 true messages to create two variables: the intention to share false messages (*M*=13.53, *DT*=4.02; minimum=8, maximum=24) and to share true messages (*M*=13.38, *DT*=4.03; minimum=8, maximum=24).

Procedure

This study is part of a research project approved by the ethics committee of the university where it was conducted. To contact and recruit participants, we visited classrooms in different courses at the University of Costa Rica. We obtained permission from the teacher and scheduled another visit to conduct the experiment in the classroom. Participants used their smartphones to access the online study.

Students gave their informed consent to participate. They were informed about the objectives and description of the study, as well as about voluntary participation, data confidentiality, and how to contact the research team. The participants then answered a question about the attention test. They were then exposed – in random order– - to four false and four true messages and asked whether they knew them beforehand. Cognitive reflexivity, identification with their own group, metacognitive awareness, political ideology, socio-demographic data and religiosity were then measured. Participants were then randomly assigned to one of three cognitive inoculation conditions and read the instructions: individual assessment, metacognition, or a control condition. The three groups were randomly exposed to the same four false and four true messages that they had previously read, as well as eight others (half false, half true) that they had not been shown. After reading each message, participants rated whether it was false or true and how willing they were to share it. Participants were reminded of the instructions twice during this phase to increase the strength of priming of the experimental prompts. Participation ended with a briefing on the study –including which stimuli were false or true.

Analytical strategy

To answer research questions 1 to 5, we ran four regression models. The first two included as dependent variables the number of false messages rated as true and the number of true messages rated as true, respectively. The predictors were familiarity with false and true messages, cognitive inoculation conditions (control as reference group), cognitive, psychosocial and ideological covariates (cognitive reflexivity, identification with own group, metacognitive awareness, political ideology, religiosity). The dependent variables in the third and fourth models were intention to share false and true messages, respectively. The predictors in these last models were the number of false and true messages rated as true, the cognitive inoculation conditions, and the cognitive, psychosocial, and ideological covariates.

RESULTS

The bivariate correlations are shown in table 2. The experimental condition variable was coded as two individual dummies. The number of false messages rated as true showed positive moderate correlations with the number of true messages rated as true (r=.41, $p<.01$) and intention to share false messages ($r=.30$, $p<.01$); and positive small correlations with intention to share true messages ($r=.17$, $p<.01$) and familiarity with false messages ($r=.12$, $p<.05$).

The number of messages rated as true showed a positive moderate correlation with the intention to share true messages ($r=.40$, $p<.01$), and positive small correlations with the intention to share false messages ($r=.26$, $p<.01$), familiarity with false messages ($r=.11$, $p<.05$) and true messages ($r=.18$, $p<.01$).

Intention to spread fake messages showed a strong positive correlation with willingness to spread true messages (r=.85, p<.01), and positive small correlations with familiarity with fake news (r=.21, p<.01) and true messages (r=.18, p<.01), free market ideology versus the state (r=.21, p<.01), metacognitive awareness (r=.12, p<.05), and religiosity (r=.15, p<.05).

Finally, intention to share true messages showed positive small correlations with familiarity with false (r=.19, p<.01) and true messages (r=.26, p<.01) and free market ideology toward the state (r=.21, p<.01).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1- False messages as true	—	.41**	.30**	.17**	.12*	.11	.04	.11	-.04	.08	-.08	.08	-.04	.03
2- True messages as true		—	.26**	.40**	.11*	.18**	.03	.10	.02	.06	-.04	.03	-.08	.03
3- Sharing false messages			—	.85**	.21**	.18**	-.06	.05	-.07	.21**	.12*	.15*	.09	-.01
4- Sharing true messages				—	.19**	.26**	-.04	.04	.01	.21**	.10	.05	.06	.02
5- Familiarity false messages					—	.46**	.01	.07	.07	.01	.18**	-.07.	.01	-.09
6- Familiarity true messages						—	.01	.12*	-.01	-.01	.22**	-.07	.01	-.09
7- Cognitive reflexivity							—	.14*	-.01	-.06	.07	-.06	.01	-.01
8- Ingroup identification								—	.07	.10	.24**	-.01	.03	.07
9- Conservative vs. Liberal									—	.18**	.04	-.48**	-.14*	.11
10- Free market vs. State										—	.13*	.03	.05	-.01
11- Metacognitive awareness											—	-.01	.01	.07
12- Religiosity												—	.12*	-.11
13- Evaluation condition													—	.50**
14- Metacognition condition														—

Note. *p<.05, **p<.01.

Table 2. Correlation matrix of the variables under study

Source: Own elaboration.

The presence of the illusory truth effect in the Costa Rican population

Table 3 shows that exposure to false messages in the familiarization phase was positively associated with judging these messages as true in the evaluation phase (β=.15, p<.05). This pattern was the same for prior exposure and judgments of true messages (β=.20, p=.01). The data show that people who rated both false (β=.21, p<.01) and true messages as true (β=.18, p<.01) were more likely to share false messages. Finally, table 4 shows that rating true messages as true was the only significant predictor of intention to share true messages (β=.40, p<.01).

Cognitive inoculation, illusory truth bias and the willingness to share messages

The results in table 3 indicate that bias was not reduced, as the associations between the experimental conditions –individual evaluation and metacognition (compared to the control group) – and accurate detection of false and true messages were not significant. However, table 4 shows that the willingness to share true messages increased compared to control participants when participants were asked to evaluate the messages in a reflective manner (β=.25, p<.05).

Effects of cognitive, psychosocial, and ideological covariates on illusory truth bias and intention to share messages

Table 3 shows that individuals who tend to identify with their in-group (β=.12, p<.05) and individuals with a pro-state ideology (β=.13, p<.05) were more likely to evaluate false messages as true. Conversely, individuals with higher metacognitive awareness were less affected by the illusory truth bias when evaluating false news (β=-.15, p<.05) and true messages (β=-.12, p<.05; table 1). On the other hand, table 4 shows that pro-government ideology (β=.18, p<.01) and higher metacognitive awareness (β=.12, p<.05) increased the willingness to share false messages. In addition, pro-state individuals were more likely to share true messages (β=.19, p<.01).

	Veracity evaluation									
	False messages as true					True messages as true				
Predictors	R^2	F gl	β	SE	95% IC	R^2	F gl	β	SE	95% IC
Modcl	.08	2.42** (10,297)				.06	1.87* (10,297)			
Familiarity false messages			.15*	.06	.03, .26					
Familiarity true messages								.20**	.06	.09, .33
Cognitive reflexivity			,05	.07	-.09, .20			.03	.07	-.11, .18
In-group identification			.12*	.06	.0, .21			.09	.06	-.03, .19
Conservative vs. Liberal			-.01	.09	-.20, .17			.02	.09	-.15, .21
Free Market vs. State			.13*	.08	.01, .34			.06	.08	-.09, .24
Metacognitive awareness			-.15*	.03	-.13, -.02			-.12*	.03	-.12, -.01
Religiosity			.09	.02	-.01,.08			.07	.02	-.02, .07
Evaluation condition			-.13	.14	-.41, .15			-.17	.14	-.45, .11
Metacognition condition			-.02	.14	-.30, .25			.04	.14	-.24, .33

Note: The reference group for the experimental conditions is the control group. Standardized regression coefficients are reported.

*p< 05. **p< 01

Table 3. Regression models for the veracity evaluation of false and true messages

Source: Own elaboration.

	Sharing intention									
	False messages					True messages				
Predictors	R^2	F gl	β	SE	95% IC	R^2	F gl	β	SE	95% IC
Modcl	.20	6.49** (11,297)				.24	8.06** (11,297)			
False messages as true			.21**	.06	.09, .33			-.01	.06	-.13, .10
True messages as true			.18**	.06	.06, .29			.40**	.06	.29, .51
Cognitive reflexivity			-.08	.07	-.24, .03			-.06	.07	-.21, .05
In-group identification			-.03	.05	-.13, .07			-.05	.05	-.14, .05
Conservative vs. Liberal			-.01	.09	-.18, .16			.03	.08	-.12, .21
Free Market vs. State			.18**	.08	.09, .40			.19**	.08	.12, .42
Metacognitive awareness			.12*	.03	.01, .11			.10	.03	-.003, .10
Religiosity			.10	.02	-.01,.08			.05	.02	-.02, .06
Evaluation condition			.24	.13	-.02, .50			.25*	.13	.001, .50
Metacognition condition			.08	.13	-.18, .34			.14	.13	-.11, .39

Note: The reference group for the experimental conditions is the control group. Standardized regression coefficients are reported.

*p< 05. **p<.01

Table 4. Regression models for the intention to share false and true messages

Source: Own elaboration.

DISCUSSION

This study addressed five research questions. We investigated whether the illusory truth effect is present in the Costa Rican population, separately for false and true messages (RQ1); how this cognitive bias influences the intention to share both types of messages (RQ2); the extent to which different cognitive inoculation mechanisms reduce the illusory truth bias and its effect on message sharing intention (RQ3); and how cognitive, psychosocial, and ideological factors influence the identification of false and true messages and the willingness to share them (RQ4 and RQ5).

To what extent is the illusory truth effect present in the Costa Rican population, separately for false and true messages? Our results show the presence of the illusory truth effect, both in the detection of false and true messages. As Henderson and colleagues (2022) point out, research on this phenomenon has predominantly focused on North American and European contexts. However, in order to make the science more representative and generalizable, it is essential to conduct research outside WEIRD countries (Western, *educated, industrialized, rich and democratic* countries). Remarkably, no empirical research on this topic has been published in Latin America, making this study a valuable contribution to understanding the cross-cultural scope of this heuristic.

How does bias toward illusory truth affect the intention to share false and true messages? We found that individuals who perceived both false and true messages as true were more likely to share false messages. Conversely, the perception of true messages as true was the only significant predictor of intention to share true messages. This is significant because most studies only examine the effect of false messages. Our results extend our knowledge of this effect by showing it for both false and true messages, which is essential for a better understanding of the phenomenon, (Fazio et al., 2019)

What effects do different cognitive inoculation conditions have on the bias towards the illusory truth and on the intention to share false and true messages? In contrast to previous research (Pennycook & Rand, 2019; Salovich & Rapp, 2020; Van der Linden & Roozenbeek, 2021), our results did not show a substantial reduction in bias, as there were no significant associations between the experimental conditions - individual judgment and metacognition (compared to the control group) - and accurate identification of false and true messages. Nevertheless, the novelty of this study is that it tests the effect of cognitive inoculation strategies on the effect of illusory truth. This is the first step between two lines of research (inoculation and the illusory truth effect) that are characterized by great heterogeneity in the tasks, measures, and indicators used to test their central hypothesis. Further research is needed to understand the absence of the effect in our data.

Encouraging people to reflect on their messages increased their willingness to pass on true messages. Further research is needed to assess the magnitude of these findings, including replication, sample variation, and predictor variables. Nonetheless, they represent a significant contribution to the previously under-researched socio-cognitive study of the propensity to share true and false messages in the context of illusory truth bias. While previous research has shown that simple interventions that make people think about the accuracy of the information they receive can reduce the spread of misinformation and reduce self-reported willingness to share false news (Fazio, 2020; Pennycook et al., 2021), our results additionally show that these types of interventions can also influence the decision to share correct information. This suggests a central cognitive mechanism for sharing information regardless of content.

What influence do cognitive reflexivity and metacognitive awareness have on the identification of false and true messages and the intention to share them? Consistent with previous research (Ekert et al., 2022; Kaufman et al., 2022; Pennycook & Rand, 2019), our results suggest that individuals with higher metacognitive awareness were less affected by the illusory truth bias when evaluating both false and true messages. Moreover, this awareness reduced their willingness to pass on false messages. As this is the first time that metacognitive awareness has been implicated in misinformation, further research is needed to understand its impact.

What is the influence of in-group identification, political ideology and religiosity on the identification of false and true messages and the intention to pass it on? People who identify with their own group were more likely to believe false messages to be true. This tendency was noted by Oyserman and Dawson (2021) and may be related to the tendency to accept information from members of one's own group as true without engaging in reflective processing to evaluate it. The effects of in-group identification have been reported previously, but empirical evidence is still lacking and further research is needed.

A pro-state ideology increased the likelihood of believing false messages to be true and increased the propensity to pass on false information. Remarkably, individuals with a pro-state ideology were also more determined to spread true messages. Several studies have noted the influence of ideology on the acceptance of misinformation. They suggest that individuals with strong ideological schemas are more likely to engage in these behaviors, as affiliation with a particular ideology reduces the likelihood of critically evaluating the truthfulness of a message (Bronstein et al., 2019; Ecker et al., 2022). Although most of these findings have focused on conservative ideologies, they are not necessarily limited to this group.

As a potential improvement to our study, we note that recruiting a voluntary and intentional sample did not allow us to generalize our findings to broader populations. It is essential to repeat this study, not only in Costa Rica, but also in other Latin American countries and to explore this phenomenon with more diverse samples outside the university context.

Cognitive inoculation strategies could not mitigate the effect of illusory truth distortion. We cannot speculate at this stage as to why this was not the case, as there is no previous research to draw on. Further research is therefore needed. The illusory truth effect is one of several cognitive biases that influence how people select, process and respond to information. Several studies have found that other biases such as confirmation and disconfirmation also influence the cognitive processing of falsehoods (Beck, 2019; Winter et al., 2016). Future research can investigate how different biases interact when people evaluate and pass on false and true information, and how the cognitive inoculation mechanisms investigated in the present study could counteract the influence of multiple biases.

Finally, our findings have important implications for the development of educational programs to mitigate the effects of misinformation. Many efforts to curb the spread of misinformation rely too heavily on critical thinking and information literacy. Our data suggest that other variables, such as psychosocial and ideological factors, should be considered in the context of certain cognitive phenomena, such as illusory truth bias.

CONCLUSION

The study confirms the existence of the effect of illusory truth among Costa Rican university students and highlights the importance of cross-cultural research to make scientific findings more representative and generalizable. Specifically, people who perceive both false and true messages as true are more likely to pass on false messages. However, perceiving true messages as true is the only significant predictor of intention to share true messages, demonstrating the effect of illusory truth for both false and true information. Contrary to expectations, cognitive inoculation mechanisms did not significantly reduce illusory truth bias or its effect on intention to share message. However, higher metacognitive awareness appears to attenuate bias. In addition, identification with one's group and political ideology have a significant impact on the perception of false and true messages and the willingness to share it. Educational programs designed to mitigate the effects of misinformation should consider a broader range of variables beyond traditional critical thinking and information literacy skills.

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