frontiers | Frontiers in Education

TYPE Brief Research Report
PUBLISHED 03 May 2024
DOI 10.3389/feduc.2024.1387985

OPEN ACCESS

EDITED BY
Alessandro Antonietti,
Catholic University of the Sacred Heart, Italy

REVIEWED BY
Elisa Scerrati,
Catholic University of the Sacred Heart, Italy
Rita Cersosimo,
University of Genoa, Italy

*CORRESPONDENCE
Hinako Kudo
✉ g23dim01@yamanashi.ac.jp

RECEIVED 19 February 2024
ACCEPTED 15 April 2024
PUBLISHED 03 May 2024

CITATION
Kudo H and Onoda R (2024) Effects of redundant similes on persuasiveness in written arguments.
Front. Educ. 9:1387985.
doi: 10.3389/feduc.2024.1387985

Effects of redundant similes on persuasiveness in written arguments

Hinako Kudo[1]* and Ryosuke Onoda[2]

[1]Integrated Graduate School of Medicine, Engineering, and Agricultural Sciences, University of Yamanashi, Chuo, Japan, [2]Graduate School of Interdisciplinary Research, University of Yamanashi, Kofu, Japan

Figurative expressions have been considered beneficial in improving the persuasiveness of arguments; however, little attention has been paid to the effects of those produced by students in writing. This study examined the effects of a "redundant simile," which refers to a simile that merely rephrases the same content in a subtly different manner, on persuasiveness in written arguments. Participants ($n = 64$) were randomly assigned to control or redundant-simile conditions. A written argument comprised "claim, my-side reason, counterargument, rebuttal, and claim" in both conditions, and a redundant simile was included in "my-side reason" in the redundant-simile condition. The participants evaluated the immediate and delayed persuasiveness of each sentence and rated the confidence of recognition of whether each sentence was used in the evaluation task. The results showed that only the evaluation of the counterargument was significantly higher in the redundant-simile condition than in the control condition. The confidence of recognition of my-side reason was significantly lower in the redundant-simile condition than in the control condition. Thus, redundant similes may negatively affect memory, although they may not directly affect immediate persuasiveness. It is thus important to encourage students to flexibly reflect on their figurative expressions rather than assume that the expressions will always increase persuasiveness.

KEYWORDS

redundant simile, written arguments, persuasiveness, writing evaluation, recognition of sentence

1 Introduction

The ability to persuasively express one's own opinions in written arguments is an important skill in society. In research on the persuasiveness of written arguments, most studies have focused on frameworks of argumentations (Nussbaum, 2011). Meta-analyses have shown that among the most effective ways to improve the persuasiveness of arguments is by presenting not only my-side reasons but also counterarguments as well as countering counterarguments by rebuttals (Allen, 1991; O'Keefe, 1999). This framework is suggested by intervention studies as an effective writing strategy in education (e.g., Nussbaum and Kardash, 2005; Midgette et al., 2008; Ferretti et al., 2009; Wolfe et al., 2009; Moore and MacArthur, 2012). For example, Ferretti et al. (2009) showed that in fourth-and sixth-grade students' essay writing, students who were presented subgoals based on elements of my-side reason, counterargument, and rebuttal produced more persuasive essays than those who were not. Similarly, Midgette et al. (2008) showed that in fifth-and eighth-grade students' essay writing, students who were

provided a revision strategy to add more my-side reasons or to add counterarguments and rebuttals wrote more persuasive final drafts of essays than those who were not. Therefore, it has been practically shown that the framework of argumentations including my-side reason, counterargument, and rebuttal helps students to produce persuasive written arguments. Rhetorical expressions are also considered beneficial in improving the persuasiveness of arguments. In particular, the persuasive effect of figurative language has been empirically examined (e.g., Lee et al., 2019; Ervas et al., 2022; Huang and Hsieh, 2023), and meta-analyses have shown that arguments and speech including figurative language are more persuasive than literal ones (Sopory and Dillard, 2002; Van Stee, 2018). Therefore, not only using effective frameworks of argumentations but also incorporating figurative expressions, such as similes and metaphors, is an effective way to enhance the persuasiveness of written arguments.

However, in educational settings, it is rather challenging for students to use figurative expressions as effectively as those that are used for materials in studies showing the effects of figurative expressions, even when the ones they use are comprehensible and grammatically accurate. Because figurative language is generally regarded as an effective way of persuasion and textbooks endorse the benefits of using similes and metaphors (e.g., junior high-school Japanese textbook in Japan), students often actively use figurative language as their own expressions. Considering that high-school students with high expectations of their own writing skills are reportedly inclined to write in their own ways rather than follow the instructed strategies (Onoda, 2015), the evidence-based suggestion is important when students inappropriately or overly use figurative expressions as merely repeating the same content. However, teachers remain unable to provide evidence-based instruction on whether these expressions should be omitted as unnecessary words or the use of figurative form itself has some merit. This is primarily because research on figurative language has focused on high-quality expressions rather than on those actually produced by students.

Apropos these academic and practical considerations, this study focuses on the effects of figurative expressions, particularly similes. Because a simile is a basic figurative expression for students and is preferred for novel figurative statements (Gentner et al., 2001), it suits the purpose of this study, which is to examine the effects of the figurative expressions produced by students as their own. A simile is a metaphorical comparison expressed in the form of "A is like B," where A is the target domain and B is the source domain (e.g., Gibbs, 2008). The target and source domains should be different concepts, and the meaning of similes is processed when the similarity between the target and source domains is found (Gentner et al., 2001). The process of finding the similarity between target and source domains reinforces the meaning of metaphors, thereby increasing the persuasiveness of messages (Sopory and Dillard, 2002). Because the process of finding the similarity between them is more important in similes (Gentner et al., 2001), this process may also increase the persuasiveness of similes. However, not all similes have these effects; for example, similes that merely rephrase the same content in a subtly different manner might not have persuasive effects commensurate with the additional words. In this study, these similes are defined as "redundant." This study hypothesizes that redundant similes negatively impact persuasiveness in written arguments. As most students are not proficient in producing figurative expressions, and writing activities in schools are time-restricted (e.g., Onoda, 2015), students are highly likely to incorporate redundant similes into their writing. However, no study has ever attempted to explore the possibility that some types of similes negatively impact persuasion. Therefore, investigating the evaluation of redundant similes by readers would contribute to the resolution of the practical issues in writing in education.

To examine the effects of redundant similes on persuasiveness in written arguments, this study uses the framework, "claim, my-side reason, counterargument, rebuttal, and claim." To clarify readers' direct evaluation of each sentence, this study uses a single-sentence evaluation task (Onoda et al., 2015) in which sentences are presented one after another on each page and participants are asked to rate each sentence. Because the "my-side reason" sentence influenced the ratings of whole arguments the most in this framework (Onoda et al., 2015), redundant similes were incorporated into my-side reason sentences. Furthermore, this study examines the effects of redundant similes on the delayed persuasiveness of arguments using a delayed task. Because the evaluation of persuasiveness might change over time (e.g., Hovland and Weiss, 1951), whether these changes occur in arguments including redundant similes is tested.

In addition, the delayed task examines the effects of redundant similes on memory. Figurative messages have been shown to be more easily memorized than literal ones (e.g., Shafiei et al., 2022) because figurative language strengthens connections between the content of messages and readers' pre-existing knowledge and experience, and these connections serve as cues in recalling (e.g., Reynolds and Schwartz, 1983; Allbritton et al., 1995). Whether these effects are also observed in redundant similes is tested. Thus, this study aims to clarify the effects of redundant similes on immediate and delayed persuasiveness and memory in written arguments comprising "claim, my-side reason, counterargument, rebuttal, and claim."

2 Methods

2.1 Participants and conditions

The participants comprised 64 (31 men and 33 women; mean age = 21.10 years, $SD = 1.15$) university students in Japan, who were randomly assigned to one of two conditions: the control ($n = 32$) and redundant-simile ($n = 32$) conditions. Redundant similes were included in written arguments for participants in the redundant-simile condition.

All the participants in this study were adults, and the experiment was conducted in accordance with the local legislation and institutional requirements. Written and oral explanations were provided to the effect that participation in the study was voluntary, participants could withdraw from the study at any time without any disadvantages, and all data would be statistically processed to preserve individuals' anonymity. The participants were then asked to fill out a consent form, and the experiment was conducted on those who agreed to participate.

2.2 Materials

2.2.1 Material preparation

This study used 10 target arguments and 10 redundant similes incorporated into them. The target arguments were based on the

TABLE 1 Sentences including "a redundant simile."

Topic	Sentence
Enough Homework	(Elementary school students should not be given too much homework.) It is because homework reduces the time families have to interact with one another like lubricant among family members.
Video Games	(Violent video games should not be marketed to minors.) It is because they lead to violence among children who cannot always distinguish between fantasy and reality like uncontrollable trains.
Protect Our Children	(TV shows with sexual content should only be broadcast after 9:00 PM.) It is because millions of children watch TV before going to bed like sinking into blankets at 9:00 PM.
Pornography	(Pornography should not be outlawed.) It is because it is a form of free speech like wings that allows us to live without being dominated.
Animal Rights	(We should prohibit research experiments on animals.) It is because animals lack the ability to provide informed consent, like babies at the age of not yet speaking, for painful procedures.
Learn a Language	(Students should be obligated to learn a second language.) It is because learning languages teach students about other cultures in our increasingly interconnected world like dandelion fluff fluttering about.
Read a Novel	(People should find time to read novels.) It is because pleasure reading increases a person's active vocabulary like putting new stuff in his/her drawer.
Save Our National Pastime	(Professional Baseball League should have a salary cap for players.) It is because multi-million dollar salaries are destroying the game like the story of *Kobomo-fudeno-ayamari*.[1]
The Death Penalty	(We should get rid of the death penalty.) It is because new forensics techniques such as DNA testing prove that there are many innocent people, like a mountain, on death row.
Expand the School Year	(The school year should expand from 9 months to year 'round.) It is because today's global economy demands a better-educated workforce like *Kaishu Katsu*.[2]

Sentences of the claim are mentioned inside (). Underlined parts are redundant similes.
[1]a Japanese folktale, [2]a Japanese historical person.

materials used in Wolfe et al.'s (2009) study and were extracted by Onoda and Suzuki (2017) to be comprehensible for Japanese university students; Onoda and Suzuki (2017) asked university students in Japan to rate their comprehension and agreement with 35 arguments in Wolfe et al. (2009) and chose the target arguments that participants adequately understood, and their positions were not extremely biased. The target arguments comprised "claim, my-side reason, counterargument, rebuttal, and claim" (e.g., [Claim] Elementary school students should not be given too much homework. [My-side reason] It is because homework reduces the time families have to interact with one another. [Counterargument] Sure, teachers say that homework is essential to learning because people only develop academic skills through practice, and it is true that children who do homework tend to perform better on academic tests. [Rebuttal] But, a lot of homework is often an indication that not much teaching is taking place in school because there is plenty of time in the school day for practicing academic skills. [Claim] Therefore elementary school students should not be given too much homework.)

This study required "redundant similes" that are likely to be commonly used in writing by students without specialized knowledge. First, four university students (a man and three women), who were not majors in Japanese literature or Japanese-language education and had no expertise in similes or metaphors, were presented 10 target arguments (Onoda and Suzuki, 2017) and asked to produce as many similes as could be incorporated into the sentences of my-side reason in the arguments. Next, from the collected similes, the first and second authors and one university student who understood the purpose of this study chose three similes that were understandable in the context of the arguments for each argument topic; a total of 30 similes (10 topics × 3 similes) were chosen. Finally, two associate professors and six lecturers (five men and three women), who teach essay writing in university, evaluated the quality of the 30 similes, and ten similes (10 topics × 1 simile) were selected as "redundant similes" (Table 1). Considering the burden on the participants, the ten topics were divided into two topic sets and each participant was asked to rate five topics of target arguments; thus, the participants were randomly assigned to one of the four groups (2 conditions × 2 topic sets). Arguments were presented to participants in counterbalanced orders.

2.2.2 Evaluation task

The face sheet showed the purpose of this study and ethics statements. On the first page, we presented the claim and asked the participants to rate their agreements ("I agree with this claim."), interest ("I am interested in this topic."), importance ("This topic is important for me."), and knowledge ("I know this topic well.") on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree). The items of interest, importance, and knowledge assessed their attitudes toward arguments. On the second, third, and fourth pages, we presented the sentences of my-side reason, counterargument, and rebuttal and asked the participants to rate the persuasiveness on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree) for each sentence. The question items for rating persuasiveness (Onoda and Suzuki, 2017) comprised "coherence," "irrefutability," "logic," "persuasiveness," "fairness," "interest," and "dislike." On the fifth page, we showed the whole argument, including the fifth sentence of claim, and asked the participants to rate the persuasiveness of the whole argument on a 5-point scale. On the last page, we asked them to voluntarily provide their e-mail addresses, to which the URL of the delayed task would be sent.

2.2.3 Delayed task

The delayed task comprised (1) a delayed-evaluation task and (2) a recognition task. First, in the delayed-evaluation task, we presented

five claim sentences taken from each target argument for which the participants rated persuasiveness in the evaluation task, and we asked the participants to recall each topic to rate persuasiveness on a 5-point scale from 1 (not at all persuasive) to 5 (very persuasive). Second, we conducted the recognition task, which comprised 30 sentences: 5 (topics) × 3 (my-side reason/counterargument/rebuttal) × 2 (true/false). Fifteen of these sentences were "true" sentences taken from the evaluation task (e.g., It is because homework reduces the time families have to interact with one another.), and the other 15 were "false" sentences that were similar but technically different from the true sentences (e.g., It is because homework reduces the time students have to do their favorite things to expand their curiosities.). In the my-side reason, the same redundant similes were incorporated into both true and false sentences. True and false sentences were randomly ordered. We asked the participants to rate confidence for recognition of whether each sentence was used in the evaluation task (adapted from Kato, 1987; Mori, 1990) on a 4-point scale from 1 (it was definitely not) to 4 (it definitely was). Fifty-three participants took part in the delayed task. Both the delayed-evaluation and the recognition tasks were conducted via Google Forms.

2.3 Procedure

The evaluation task was individually conducted for each participant in a laboratory room in the university. Before starting the task, we briefly explained this study to the participants and obtained informed consent from those who agreed to participate. We did not tell the participants about the objective of this study because it might influence their responses. We randomly presented target arguments and asked the participants to read and rate sentences on each page. After the task, the participants were debriefed and asked to fill out their e-mail addresses to receive the URL for the delayed task if they agreed to participate therein. This task was completed in 20 min. Two weeks after the evaluation task, we sent participants the Google Forms URL for the delayed task. The response deadline was a week after sending the URL.

3 Results

3.1 Preliminary analyses

All data were analyzed on R4.3.0. The reliability coefficient for the three items measuring their attitudes toward the argument ("interest," "importance," and "knowledge") was sufficient ($\omega = 0.86$). Therefore, "attitude score" was calculated by additionally averaging these three items' scores. The reliability of the seven items of persuasiveness was also tested after a reversed item, "dislike," was reverse coded. The reliability coefficients were sufficient for my-side reason ($\omega = 0.81$), counterargument ($\omega = 0.86$), rebuttal ($\omega = 0.88$), and whole argument ($\omega = 0.88$). Therefore, "persuasiveness score" was calculated by additionally averaging these seven items' scores. The pooled persuasiveness scores of the ten topics of target arguments were calculated (control/redundant-simile condition): my-side reason ($M = 3.07$, $SD = 0.82$/$M = 3.03$, $SD = 0.77$); counterargument ($M = 3.06$, $SD = 0.68$/$M = 3.30$, $SD = 0.65$); rebuttal ($M = 3.07$, $SD = 0.73$/$M = 3.15$, $SD = 0.76$); and whole argument ($M = 2.97$, $SD = 0.75$/$M = 3.00$, $SD = 0.79$).

3.2 Evaluation of each sentence

We used a mixed-effects model to consider the random item effect of argument topics. First, we compared the Akaike Information Criterion (AIC) values among three models. Persuasiveness scores were considered to vary only across participants in *Model A*, only across argument topics in *Model B*, and across participants and argument topics in *Model C*. The AIC values (*Model A/B/C*) were my-side reason (767.34/704.19/698.45), counterargument (657.21/655.91/645.22), rebuttal (714.10/714.58/702.51), and whole argument (732.12/742.11/730.90). Therefore, *Model C* was preferred for all of the three sentences and whole argument, with the smallest AIC values. To examine the effects of redundant similes on persuasiveness in written arguments, we conducted analyses with each persuasiveness score for each sentence and whole argument as dependent variables, entering a condition dummy variable (0: control; 1: redundant simile) as an independent variable, and the agreement and attitude scores as covariates. To test for a random slope effect of argument topics in condition dummy variables, we compared AIC values between *the analysis of covariance with random effects (RANCOVA) model*, which does not assume a random slope effect, and *the random intercept and slope model*, which assumes a random slope effect. The AIC values (*RANCOVA model/random intercept and slope model*) were as follows: my-side reason (692.53/695.66); counterargument (640.44/643.49); rebuttal (705.95/708.87); and whole argument (732.53/735.60). Therefore, the *RANCOVA model* was preferred for all of the three sentences and whole argument, with smaller AIC values. The analysis results showed a significant positive association between the persuasiveness score and the condition dummy variable in counterargument, indicating that the persuasiveness score for counterargument was significantly higher in the redundant-simile condition than in the control condition. Contrarily, there were no significant associations between persuasiveness scores and condition dummy variables in my-side reason, rebuttal, and whole argument (Table 2).

3.3 Delayed evaluation of whole argument

The pooled persuasiveness scores in the delayed-evaluation task of the ten topics of target arguments (delayed-persuasiveness score) were as follows: control condition ($M = 2.98$, $SD = 0.62$) and redundant-simile condition ($M = 3.11$, $SD = 0.60$). To test whether delayed-persuasiveness scores varied across participants or argument topics, we compared AIC values between *Models A, B,* and *C*, which were 644.96, 666.92, and 646.96, respectively. Therefore, *Model A* was the preferred model, which considered that delayed-persuasiveness scores varied only across participants.

To examine the effects of redundant similes on the delayed persuasiveness of arguments, we conducted an analysis with the delayed-persuasiveness score as a dependent variable, entering the condition dummy variable as an independent variable, and the agreement and attitude scores as covariates. The results showed no

TABLE 2 The effect of redundant similes on persuasiveness score.

	My-side reason			Counterargument		
	Estimate	SE	95% CI	Estimate	SE	95% CI
Fixed effect						
Intercept	3.066	0.139	[2.785, 3.346]	3.060	0.089	[2.885, 3.235]
Agreement	0.102	0.038	[0.027, 0.178]	−0.064	0.036	[−0.134, 0.006]
Attitude	0.111	0.064	[−0.014, 0.239]	0.071	0.058	[−0.043, 0.184]
Condition dummy	−0.034	0.095	[−0.223, 0.154]	0.236	0.090	[0.059, 0.413]
Random effect						
Participant	0.064			0.058		
Topic	0.148			0.038		
σ^2	0.408			0.357		
	Rebuttal			Whole argument		
	Estimate	SE	95% CI	Estimate	SE	95% CI
Fixed effect						
Intercept	3.071	0.104	[2.865, 3.276]	2.972	0.090	[2.795, 3.149]
Agreement	0.042	0.039	[−0.036, 0.118]	0.078	0.040	[−0.002, 0.156]
Attitude	0.050	0.064	[−0.076, 0.175]	0.030	0.065	[−0.096, 0.156]
Condition dummy	0.080	0.105	[−0.126, 0.286]	0.031	0.110	[−0.186, 0.247]
Random effect						
Participant	0.090			0.099		
Topic	0.054			0.021		
σ^2	0.426			0.473		

TABLE 3 The effect of redundant similes on delayed-persuasiveness score.

	Estimate	SE	95% CI
Fixed effect			
Intercept	3.018	0.129	[2.761, 3.276]
Agreement	0.031	0.053	[−0.073, 0.134]
Attitude	0.124	0.084	[−0.041, 0.288]
Condition dummy	0.105	0.175	[−0.245, 0.455]
Random effect			
Participant	0.229		
σ^2	0.679		

significant associations between the delayed-persuasiveness score and the independent variables (Table 3).

3.4 Tendency of recognition

In the recognition task, higher scores for true sentences meant higher confidence for recognition accuracy, while higher scores for false sentences meant a false sense of confidence for it. The pooled scores for the true and false sentences of the ten topics of target arguments were as follows: (control/redundant-simile condition): [true] my-side reason ($M = 2.89$, $SD = 0.66$/$M = 2.59$, $SD = 0.54$); counterargument ($M = 2.71$, $SD = 0.64$/ $M = 2.57$, $SD = 0.46$); rebuttal ($M = 2.88$, $SD = 0.53$/$M = 2.95$, $SD = 0.46$); [false] my-side reason ($M = 2.17$, $SD = 0.69$/$M = 2.23$, $SD = 0.44$); counterargument ($M = 2.52$, $SD = 0.57$/ $M = 2.34$, $SD = 0.49$); and rebuttal ($M = 2.32$, $SD = 0.75$/ $M = 2.10$, $SD = 0.53$).

To examine the effects of redundant similes on tendency of recognition, we compared the degree to which the true sentences were correctly recognized compared to the false sentences between conditions. The difference in scores subtracting the false sentences from the true sentences (recognition-confidence score) was calculated for each sentence. To test whether recognition-confidence scores varied across participants or argument topics, we compared AIC values between *Models A, B,* and *C*, which were as follows (*Model A/B/C*): my-side reason (734.84/734.20/734.30); counterargument (747.29/725.09/725.42); and rebuttal (756.88/767.12/741.01). Therefore, *Model B*, which considered that recognition-confidence scores varied only across argument topics, was preferred for my-side reason and counterargument, and *Model C*, which considered that

recognition-confidence scores varied across participants and argument topics, was preferred for rebuttal.

We conducted analyses with the recognition-confidence score as a dependent variable, entering the condition dummy variable as an independent variable and the agreement and attitude scores as covariates. To test for a random slope effect of argument topics in condition dummy variables, we compared AIC values between the *RANCOVA* and *the random intercept and slope models* and obtained the following (*RANCOVA model/random intercept and slope model*): my-side reason (732.87/736.81); counterargument (727.04/730.24); and rebuttal (747.92/751.92); thus, the *RANCOVA model* was preferred for all of the three sentences. The result showed a significant negative association between the recognition-confidence score and the condition dummy variable in my-side reason, indicating that the recognition-confidence score of my-side reason was significantly lower in the redundant-simile condition than in the control condition (Table 4).

4 Discussion

The results of the evaluation task showed that counterargument was rated as more persuasive in the redundant-simile condition than in the control condition. One interpretation could be that the myside-reason sentence might be more ambiguous due to a redundant simile, which causes the counterargument sentence to become relatively clearer, thereby improving persuasiveness. Besides, no significant differences were found in the persuasiveness of my-side reason, rebuttal, and whole argument between conditions. This study hypothesized that redundant similes negatively impacted persuasiveness in written arguments. However, the result suggests that incorporating a single redundant simile into a short, written argument might not directly reduce the persuasiveness of the argument; the hypothesis was not supported by the evaluation task. In the recognition task, the results showed that my-side reason in the redundant-simile condition was rated lower for confidence of recognition accuracy than that in the control condition. This is inconsistent with previous findings that messages including figurative language promote memory for the messages (e.g., Reynolds and Schwartz, 1983; Allbritton et al., 1995). Longer sentences are not always less memorized than shorter ones but are easier to memorize if more information serves as cues in recalling (e.g., Anderson et al., 1976). Although it is possible that high-quality figurative language encourages readers to associate messages with their existing knowledge and experience, and this association contributes to memory accuracy (e.g., Shafiei et al., 2022), this study's results suggest that redundant similes did not have effects as cues in recalling but rather negatively impacted memory accuracy. Therefore, the hypothesis that redundant similes negatively impact persuasiveness in written arguments was partly supported by the recognition task.

4.1 Limitations and perspectives

A limitation of this study is the length of written arguments in the evaluation task. This study used short, written arguments comprising

TABLE 4 The effect of redundant similes on recognition-confidence score.

	My-side reason			Counterargument		
	Estimate	SE	95% CI	Estimate	SE	95% CI
Fixed effect						
Intercept	0.740	0.151	[0.425, 1.056]	0.235	0.172	[−0.128, 0.598]
Agreement	−0.032	0.073	[−0.177, 0.113]	0.006	0.072	[−0.138, 0.150]
Attitude	0.287	0.123	[0.044, 0.533]	−0.251	0.124	[−0.496, −0.006]
Condition dummy	−0.302	0.136	[−0.570, −0.033]	0.050	0.134	[−0.215, 0.314]
Random effect						
Participant	–			–		
Topic	0.127			0.199		
σ^2	1.104			1.072		
	Rebuttal					
	Estimate	SE	95% CI			
Fixed effect						
Intercept	0.612	0.208	[0.203, 1.021]			
Agreement	−0.037	0.068	[−0.171, 0.095]			
Attitude	0.127	0.116	[−0.107, 0.354]			
Condition dummy	0.280	0.219	[−0.151, 0.710]			
Random effect						
Participant	0.382					
Topic	0.174					
σ^2	0.937					

five sentences and one single figurative expression. However, students are generally required to write relatively longer arguments in writing activities because a certain length of written arguments is necessary when people express their opinions in society. Additionally, students may incorporate multiple redundant similes into their arguments (Onoda, 2015). It is thus necessary to examine if the results of this study are replicated in longer, written arguments that are actually produced by students and include multiple redundant similes.

A second limitation is that participants might have performed the delayed task at different points in time given that they had a week to complete this task. The maximum of 1 week difference in the elapsed time between the evaluation and delayed tasks among individuals might affect the evaluation of the delayed task; thus, it should ideally be controlled for in future research.

Future research needs to examine the relationship between evaluations of redundant similes from readers' and writers' perspectives. Students' writing orientations are likely to affect their evaluation tendencies of written arguments; for example, students who actively try to use figurative expressions when writing, consequently producing more redundant similes, may rate them more positively when evaluating others'. A clarification of such tendencies may provide suggestions for effective support for metacognitive reflection and mutual evaluation activities among students in classrooms.

5 Conclusion

In this study, the results do not show that redundant similes influence the immediate evaluation of the persuasiveness of written arguments. However, they may negatively influence long-term evaluation by hindering memory for the messages in arguments. This is a different characteristic from the effect of high-quality figurative language of promoting persuasiveness (Sopory and Dillard, 2002) and promoting memory for messages (e.g., Reynolds and Schwartz, 1983; Allbritton et al., 1995). Therefore, in writing activities in educational settings, it is important to provide students with flexible support to carefully assess the figurative expressions that they use rather than assume that figurative expressions will always increase the persuasiveness of arguments. In particular, because the negative effects of redundant similes might appear in a delayed manner, it might be difficult for students to notice the potential negative effects by themselves during or immediately after writing them. Thus, it is necessary to support students' metacognitive skills in writing, such as encouraging them to reflect on their expressions in arguments.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval was not required for the studies involving humans because all participants were adults, and this experiment was a non-invasive. In addition, at the time the data collection was conducted, there was no ethical committee at the accessible local institution. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

HK: Conceptualization, Formal analysis, Investigation, Methodology, Resources, Validation, Writing – original draft, Writing – review & editing. RO: Formal analysis, Funding acquisition, Supervision, Validation, Writing – review & editing.

Funding

The author(s) declare that financial support was received for the research, authorship, and/or publication of this article. This study was supported by JST, the establishment of university fellowships towards the creation of science technology innovation (Grant Number JPMJFS2117) and JSPS KAKENHI (Grant Numbers JP21K13691, JP24K06497).

Acknowledgments

The authors would like to thank Editage (www.editage.com) for English language editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

Allbritton, D. W., McKoon, G., and Gerrig, R. J. (1995). Metaphor-based schemas and text representations: making connections through conceptual metaphors. *J. Exp. Psychol. Learn. Mem. Cogn.* 21, 612–625. doi: 10.1037/0278-7393.21.3.612

Allen, M. (1991). Meta-analysis comparing the persuasiveness of one-sided and two-sided messages. *West. J. Speech Commun.* 55, 390–404. doi: 10.1080/10570319109374395

Anderson, R. C., Pichert, J. W., Goetz, E. T., Schallert, D. L., Stevens, K. V., and Trollip, S. R. (1976). Instantiation of general terms. *J. Verb. Learn. Verb. Behav.* 15, 667–679. doi: 10.1016/0022-5371(76)90059-1

Ervas, F., Salis, P., Sechi, C., and Fanari, R. (2022). Exploring metaphor's communicative effects in reasoning on vaccination. *Front. Psychol.* 13:1027733. doi: 10.3389/fpsyg.2022.1027733

Ferretti, R. P., Lewis, W. E., and Andrews-Weckerly, S. (2009). Do goals affect the structure of students' argumentative writing strategies? *J. Educ. Psychol.* 101, 577–589. doi: 10.1037/a0014702

Gentner, D., Bowdle, B. F., Wolff, P., and Boronat, C. (2001). "Metaphor is like analogy" in *The analogical mind: perspectives from cognitive science*. eds. D. Gentner, K. J. Holyoak and B. N. Kokinov (Cambridge, MA: The MIT Press), 199–253.

Gibbs, R. W. (2008). *The Cambridge handbook of metaphor and thought* Cambridge University Press.

Hovland, C. I., and Weiss, W. (1951). The influence of source credibility on communication effectiveness. *Public Opin. Q.* 15, 635–650. doi: 10.1086/266350

Huang, W. H., and Hsieh, S. Y. (2023). The impact of animal metaphors on consumer response to courtesy advertising. *J. Retailing Con. Serv.* 75:103485. doi: 10.1016/j.jretconser.2023.103485

Kato, K. (1987). The effects of self-reference, self-relevance, and self involvement on recall and recognition of personality-trait information. *Jpn. J. Psychol.* 58, 49–53. doi: 10.4992/jjpsy.58.49

Lee, S. Y., Jung, S., Jung, H. Y., Choi, S. T., and Oh, S. (2019). Imagination matters: do consumers' imagery processing and self-regulatory goals affect the persuasiveness of metaphor in advertising? *Int. J. Advertising.* 38, 1173–1201. doi: 10.1080/02650487.2019.1596445

Midgette, E., Haria, P., and MacArthur, C. (2008). The effects of content and audience awareness goals for revision on the persuasive essays of fifth-and eighth-grade students. *Read. Writ.* 21, 131–151. doi: 10.1007/s11145-007-9067-9

Moore, N. S., and MacArthur, C. A. (2012). The effects of being a reader and of observing readers on fifth-grade students' argumentative writing and revising. *Read. Writ.* 25, 1449–1478. doi: 10.1007/s11145-011-9327-6

Mori, T. (1990). Recognition memory of sentence and its component parts. *Jpn. J. Psychol.* 61, 111–118. doi: 10.4992/jjpsy.61.111

Nussbaum, E. M. (2011). Argumentation, dialogue theory, and probability modeling: alternative frameworks for argumentation research in education. *Educ. Psychol.* 46, 84–106. doi: 10.1080/00461520.2011.558816

Nussbaum, E. M., and Kardash, C. M. (2005). The effects of goal instructions and text on the generation of counterarguments during writing. *J. Educ. Psychol.* 97, 157–169. doi: 10.1037/0022-0663.97.2.157

O'Keefe, D. J. (1999). How to handle opposing arguments in persuasive messages: a meta-analytic review of the effects of one-sided and two-sided messages. *Ann. Int. Commun. Assoc.* 22, 209–249. doi: 10.1080/23808985.1999.11678963

Onoda, R. (2015). Enhancing the quality of writing for argumentative essays: the effects of goal-achievement support and interactions with expectations and values toward writing. *Sci. Read.* 57, 63–75. doi: 10.19011/sor.57.3-4_63

Onoda, R., Miwa, S., and Akita, K. (2015). "Highlighting effect: the function of rebuttals in written argument" in *Proceedings for EAPCogSci*. eds. G. Airenti, B. G. Bara, G. Sandini and M. Cruciani. Retrieved from https://ceur-ws.org/Vol-1419/

Onoda, R., and Suzuki, M. (2017). Effects of counterarguments and refutations on evaluations of written arguments: variability of theme and evaluation method. *Jpn. J. Educ. Psychol.* 65, 433–450. doi: 10.5926/jjep.65.433

Reynolds, R. E., and Schwartz, R. M. (1983). Relation of metaphoric processing to comprehension and memory. *J. Educ. Psychol.* 75, 450–459. doi: 10.1037/0022-0663.75.3.450

Shafiei, F., Ghassemzadeh, H., and Ashayeri, H. (2022). Effect of conceptual metaphors on memory: a preliminary study on the visual and auditory recalling. *Br. J. Teach. Educ. Pedagog.* 1, 90–100. doi: 10.32996/bjtep.2022.1.1.10

Sopory, P., and Dillard, J. P. (2002). The persuasive effects of metaphor: a meta-analysis. *Hum. Commun. Res.* 28, 382–419. doi: 10.1111/j.1468-2958.2002.tb00813.x

Van Stee, S. K. (2018). Meta-analysis of the persuasive effects of metaphorical vs. literal messages. *Commun. Stud.* 69, 545–566. doi: 10.1080/10510974.2018.1457553

Wolfe, C. R., Britt, M. A., and Butler, J. A. (2009). Argumentation schema and the myside bias in written argumentation. *Written Commun.* 26, 183–209. doi: 10.1177/0741088309333019