


ARTICLE

# Uncovering echoic mechanisms in verbal irony comprehension

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## Abstract

Whereas some studies suggest that ironic praise necessitates a longer processing time than ironic criticism, others posit that the two are processed at comparable speeds. We hypothesize that the presence of an echoic antecedent within the preceding context may at least partially account for these conflicting findings. To investigate this matter, we analyzed reading times and accuracy stemming from two types of contexts: echoic and non-echoic. Our results demonstrate that ironic criticism was judged to be more ironic in both echoic and non-echoic contexts, while ironic praise was rated as more ironic in an echoic context than in a non-echoic context. Additionally, echoing contexts facilitate the comprehension of ironic criticism, but cause ironic praise to be processed more slowly. There was also an observed asymmetry between the two forms of irony. Ironic criticism demonstrated high accuracy and was rated as more ironic than ironic praise. Furthermore, ironic criticism was read faster in an echoic context, whereas performance was similar in a non-echoic context for both types. These findings suggest that echoing context affects ironic criticism and ironic praise differently, implying that distinct mechanisms may be at work in understanding irony in echoic and non-echoic contexts.

**Keywords:** echoing; irony; language context; language processing; echoic mechanism

## 1. Introduction

Verbal irony typically involves expressing an attitude where the wording is opposite to the intended meaning. The listener must discern the disparity between what is said and what is meant. It has been suggested that ironic statements are more commonly positive statements of negative situations (e.g., saying ‘the café is so quiet’ during in a crowded and noisy café) than negative statements of positive situations (e.g., saying ‘the café is so noisy’ during in a tranquil café). Researchers have intended to explain this asymmetry and yielded mixed results, leaving the answer ambiguous. Some studies suggest that ironic criticism is easier to understand than ironic praise (Gibbs, 1986; Kreuz & Glucksberg, 1989), and the presence

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of explicit or implicit negative expectations helps to detect the non-literal meaning of ironic praise, as these expectations create a contrastive context that facilitates the recognition of irony (Kumon-Nakamura et al., 1995). However, Kreuz and Link's (2002) study contradicts these findings, stating that expectations about events do not affect the interpretation of ironic criticism and ironic praise. Furthermore, developmental studies have produced mixed results as well. For instance, Hancock et al.'s (2000) study demonstrated asymmetric effects, revealing that ironic criticisms were detected more frequently than ironic praises, while Filippova and Astington's (2010) study found no such disparity. Upon closer examination, it becomes evident that unlike Hancock et al.'s (2000) study, Filippova and Astington (2010) study did not employ echoic markers in ironic conditions. They seemingly adopted a broader definition of irony, assuming that such statements do not necessitate echoic markers. The observed discrepancy might be attributed to the diverse utilization of various contextual types of irony. This study aims to explore the comprehension of irony by manipulating contexts, both with and without echoic antecedents, employing an online experimental approach.

Echoic-interpretation theory posits that verbal irony is 'a variety of echoic interpretive use, in which the communicator dissociate herself from the opinion echoed with accompanying ridicule or scorn' (Wilson & Sperber, 1992: 75–76). The echoic theory argues that the speaker of irony is echoing a thought that can be attributed to a real or prototypical speaker while expressing a dissociative mocking, skeptical or contemptuous attitude to that thought (Wilson & Sperber, 2012). The echoic mention account contributed significantly to cognitive research on irony, as highlighted by a foundational study by Jorgensen et al. (1984). In their study, participants read brief scenarios that concluded with a sentence meant to be ironic. Some of these concluding sentences echoed a previously mentioned antecedent in the scenario, whereas others did not. Participants were then tested to see if they perceived the ironic intent of these final utterances. The findings indicated that participants were more likely to interpret sentences that echoed antecedents as being ironic more than those that did not, supporting the echoic theory of irony with initial empirical evidence.

According to echoic theory, ironic statements are more commonly used for criticism or complaints when a situation, event or performance fails to meet certain norm-based expectations, rather than for praise. The asymmetry of irony may be attributed to the general prevalence of positive norms and expectations (Sperber & Wilson, 1981). Thus, positive statements can evoke implicit positive expectations or norms. In contrast, negative statements about positive events necessitate explicit antecedents, since implicit negative expectations or norms are less commonly available to draw upon. This asymmetry between positive and negative forms of irony is referred to as the normative bias in irony. The norms in the current study refer to widely accepted social expectations about behavior, such as kindness, honesty and the appropriateness of certain actions in specific contexts. This theory illuminates why, when singers make frequent mistakes in a singing contest, one can ironically state 'this performance was a success'. However, ironically declaring 'this performance was a failure', when the singers perform beautifully and receive warm applause, is only appropriate if doubt or lack of confidence about the performance has been previously expressed.

Early research on the asymmetry of irony suggests that positive sarcastic statements are more likely to be understood than negative ones (Gibbs, 1986). While explicit antecedents may not be necessary for positive statements about negative events, negative statements about positive events may require explicit antecedents (Kreuz & Glucksberg, 1989). Additionally, when negative expectations are available, negative statements about positive situations can be used ironically (Kumon-Nakamura et al., 1995). However, Kreuz and Link (2002) reported contrasting findings, suggesting that expectations do not influence the interpretation of verbal irony. In their experiments, the reading times for ironic criticism and ironic praise did not differ when expectation types were manipulated. Furthermore, several recent developmental studies have presented cases of ironic praise without preceding negative concerns or expectations in positive contexts, which were quickly understood (Filippova & Astington, 2010; Pexman et al., 2005). For instance, in Filippova and Astington's (2010) experiment, the negative statement 'you sure are a crummy helper!' could be considered ironic praise if it echoes a previously expressed doubt or concern about the hearer's performance. Thus, if uttered in response to the hearer's self-critical remark 'I'm a bad kitchen helper', it would be a typical case of ironic praise. Conversely, if the statement is made in response to a positive event without concerns or doubts, it would better be categorized as banter. Notably, their experimental design did not incorporate echoic elements, which could potentially result in a faster processing time for ironic praise, as the cognitive load is reduced without the need to reconcile echoed expectations with the expressed statements.

In recent experimental literature, the generalized notion of irony has been applied to various phenomena, including cases of banter (e.g., (to someone who has just solved a difficult problem): 'Dumb bitch!') (Gibbs, 2000; Norrick, 2003; Partington, 2007; Pexman et al., 2005). In Leech's banter principle, banter has been described as 'in order to show solidarity to the hearer, say something which is (i) obviously untrue, and (ii) obviously impolite to the hearer (Leech, 1983: 149)'. Banter usually does not express a mocking, scornful or contemptuous attitude towards an echoed thought, and it does not show a normative bias (Wilson, 2017). The wide range of loosely related phenomena poses a challenge to cognitive science theories of irony (Gibbs & Colston, 2007). There may be different mechanisms involved in the understanding of the generalized category of irony (Wilson, 2017). Therefore, the mixed use of distinct contextual types of irony may be a significant factor contributing to the inconsistency observed in the current results. It is imperative for experimental research to confront this issue and offer clarification. While prior studies have individually explored the impact of negative contexts and positive contexts with or without echoic remarks, amalgamating these factors in a single study would be beneficial. Such an approach facilitates the examination of the cognitive mechanisms underlying these factors. The integration of these elements promises a more comprehensive understanding of irony.

This study aims to investigate the comprehension of irony by examining the role of echoic antecedents in preceding contexts. Following Wilson's (2017) definition and classification of verbal irony, our focus encompasses two types of unfamiliar irony: ironic criticism and ironic praise, along with their corresponding literal counterparts. In the course of our study, participants were assigned the task of responding to yes/no comprehension questions based on general details of the story, deliberately diverting attention from the explicit examination of the literal or ironic dimensions of the utterances.

## 2. Method

### 2.1. Participants

Thirty-eight native Chinese speakers of Mandarin participated in the experiment (19 female; mean age = 21.26 years, SD = 1.98, range = 18–28 years). All participants were right-handed, had normal or corrected-to-normal vision, and reported no language, hearing or neurological impairments. Data from three participants were excluded from the analysis due to low accuracy (lower than 80%). The sample size was calculated using G\*Power version 3.1.9.7 (Faul et al., 2009), which indicated that a minimum of 23 participants were required to achieve 80% power for detecting the effects of interest at an alpha level of 0.05. As the actual number of participants exceeded this requirement, statistical power was guaranteed. All participants provided informed consent and received compensation for their participation. The study was conducted in accordance with ethical guidelines and was approved by the ethics committee of Northeast Normal University.

### 2.2. Materials and design

A total of 30 stories were generated, each designed to convey both ironic (ironic criticism and ironic praise) and literal meanings (literal praise and literal criticism). For each version of the story, two types of antecedents (echoic and non-echoic) were introduced, resulting in the creation of a comprehensive set of 240 stories. Each story comprised a preliminary context that encompassed an antecedent (echoic vs. non-echoic), an event outcome (positive vs. negative) and a target statement (positive vs. negative).

Five-sentence stories were constructed, with the initial two sentences introducing the characters and setting up the situation. To maintain perspective consistency, one character was consistently designated as ‘you’, who was always the addressee of the target sentence. The other character was identified solely by a Chinese surname and a given name, and these names did not provide information about gender, age, occupation, social class or personal relationships. The third sentence served as an antecedent for the target line. In instances where the target sentence conveyed a positive tone, the echoic antecedent was formulated to express the hearer’s hopeful expectation or prediction about the upcoming event. For clarification, envision a scenario where two colleagues anticipated visiting a tranquil café for reading and relaxation (by saying ‘Normally at this time, the café isn’t very crowded, making it a good spot for reading and relaxation.’). In such a context, the target utterance ‘the café is so quiet’, uttered upon discovering a crowded and noisy café, was likely to elicit ironic interpretations due to its contradiction of the facts and its echo of colleagues’ hopeful expectations.

In a similar vein, when the target sentence adopted a negative tone, the echoic antecedent was designed to convey the hearer’s concern or doubt about the impending event. Consider a scenario where one of the colleagues expressed concern about the café being crowded and noisy (by saying ‘You are concerned that the café might be too crowded for reading at this time, but Zhao Na thinks it’s worth taking a chance.’). In such an instance, the target utterance ‘the café is so noisy’, uttered upon discovering a quiet and ideal environment for reading, was likely to evoke ironic interpretations, as it echoed the colleagues’ pre-existing concern or doubt about the event. In summary, both echoic and non-echoic conditions involved specific expectations: in

the echoic condition, there were positive expectations for ironic criticism and negative expectations for ironic praise; conversely, in non-echoic conditions, there were negative expectations for ironic criticism and positive expectations for ironic praise. From the perspective of echoic theory, these examples illustrated how an ironic remark could convey a concept while simultaneously expressing a mocking, skeptical or contemptuous attitude towards it. In the fourth sentence, the outcome of the situation was unveiled, as seen in the café story, where the environment was quiet (yielding a positive outcome) or noisy (resulting in a negative outcome). An independent *t*-test had been conducted to test the length of the positive and negative outcomes (each punctuation mark takes up one word), showing that no significant difference was found ( $t(48) = -1.65, p = .106$ ). The last line featured a statement by one of the characters, manifesting as either positive (e.g., ‘the café is so quiet’) or negative (e.g., ‘the café is so noisy’) (see Table 1).

The last line of each story was the target sentence, which was eight characters long and followed a subject–verb–adjective structure, where the adjective consisted of two

**Table 1.** Examples of experimental stimuli (translated from Chinese)

‘At the café’
<b>Positive statement</b>
Sentence 1 to 2
It is a sunny day today.
You and your colleague Zhao Na are going to have coffee.
Sentence 3 – echoic remark manipulation
Echoic remark
Normally at this time, the café isn’t very crowded, making it a good spot for reading and relaxation.
Non-echoic remark
You are concerned that the café might be too crowded for reading at this time, but Zhao Na thinks it’s worth taking a chance.
Sentence 4 – outcome manipulation
Positive outcome
Upon entering the café, you discover only a few people are seated, making it perfect for reading.
Negative outcome
Upon entering the café, you find it completely packed, with ongoing chatter and laughter that make it impossible to focus on reading.
Sentence 5 – statement
Zhao Na says to you: ‘The café is so quiet.’
<b>Negative statement</b>
Sentence 1 to 2
It is a sunny day today.
You and your colleague Zhao Na are going to have coffee.
Sentence 3 – echoic remark manipulation
Echoic remark
You are concerned that the café might be too crowded for reading at this time, but Zhao Na thinks it’s worth taking a chance.
Non-echoic remark
Normally at this time, the café isn’t very crowded, making it a good spot for reading and relaxation.
Sentence 4 – outcome manipulation
Positive outcome
Upon entering the café, you discover only a few people are seated, making it perfect for reading.
Negative outcome
Upon entering the café, you find it completely packed, with ongoing chatter and laughter that make it impossible to focus on reading.
Sentence 5 – statement
Zhao Na says to you: ‘The café is so noisy.’

characters and determined the (non)literal interpretation. An irony rating was conducted prior to the online experiment to assess the perceived level of irony in each scenario. All materials underwent thorough checks by native Chinese speakers to eliminate words, idioms, semantics and syntax that could potentially hinder participants' comprehension.

To prevent participants from anticipating irony and to maintain their engagement throughout the experiment, a set of 240 fillers was created. These fillers were designed to match the positive and negative contexts used in the scenario items. Unlike the main materials, the fillers ended with mundane statements. Half of the fillers included direct speech, while the other half did not. This variation prevented participants from forming a predictable thinking pattern and kept them attentive to the content of each filler item. The rationale for including these fillers is based on the findings of Spertino and Noveck (2014), who reported that participants predicted the speakers' intentions based on the routinely presented material, ultimately reaching the same speed as literal readings. For instance, a reading task that routinely presents negative events followed by ironic remarks would be more conducive to speeded irony readings over the course of an experimental session than a reading task that lacks such reliable cues. By incorporating fillers that align with the positive and negative contexts, the expectation is that participants will remain engaged throughout the experimental session and not develop a biased reading strategy. This approach helps ensure that participants understand each item without preconceived notions and respond based on the specific cues provided within each scenario.

For each story, a yes/no comprehension question was formulated, focusing on general details and deliberately avoiding explicit reference to the concept of ironic versus literal meaning (e.g., Are you and Zhao Na going to have coffee on a rainy day?). The primary purpose of the questions was to ensure that participants attentively read the entire story. The correct response was designated as 'yes' for half of the questions and 'no' for the remaining half.

### 2.3. Material rating

To ensure that the strokes of words used in the experiment did not influence reading performance, we calculated stroke counts of 30 words and their counterparts. We used an independent *t*-test to compare the stroke counts between the two groups, which showed no significant differences between the two groups ( $t(58) = 1.68$ ,  $p > .05$ ). This suggests that the stroke counts of words did not affect reading performance. Additionally, to assess the familiarity of the words used as ironic statements, 30 undergraduates (20 female; mean age = 21.80 years, SD = 3.11, range = 19–32 years), who did not participate in the online study, were asked to rate 60 words on an 8-point scale based on their familiarity as ironic statements. The critical words were presented in isolation. The participants were asked to rate how often the word was used or heard being uttered ironically. The rating scale ranged from 1 (seldom or never used or heard being uttered ironically) to 8 (highly familiar ironic word). The results yielded an average rating of 4.15 ( $\pm 1.01$ ). This indicates that the words used in the study were less familiar as ironic statements compared to those in Filik et al.'s (2014) study, where familiar phrases received an average rating of 6.5 ( $\pm 0.39$ ), and unfamiliar phrases received an average rating of 2.69 ( $\pm 0.32$ ).

To assess the rationality of the experimental materials, an additional group of 50 undergraduates were invited to evaluate the materials (35 female; mean age = 21.27 years,  $SD = 1.93$ , range = 18–26 years). The material set comprised 480 scenarios, including 240 formal experimental materials and 240 fillers, resulting in 480 questions. Each question presented a scenario and provided four response options: a literal remark aligning with the facts stated in the discourse, an ironic remark that contradicts them, an interference evaluation that is related to the content of the text but not consistent with the context and an option indicating that none of the above options were appropriate. The order of the first three options was randomized for each question. We employed a Latin-square procedure to create eight experiment lists, each list comprising 30 critical scenarios and 30 filler items. We equally distributed the scenarios across different lists. Participants were randomly assigned to one of these lists and tasked with choosing the most suitable option for each scenario. We used the accuracy rate to evaluate participants' performance, considering scenarios with a correct answer rate above 80% as suitable for the formal experimental materials. This process led to the elimination of five stories, leaving 25 stories (200 scenarios) for the irony rating test. This selection process ensured that the experimental materials were appropriate for further analysis.

To validate participants' perception of the stimuli in the experiments, an additional group of 30 undergraduates (21 female; mean age = 22.13 years,  $SD = 2.23$ , range = 19–28 years), not involved in the online experiments, were recruited. The same materials as those used in the rationality rating were presented to these participants, with response options removed. Participants rated the level of irony they perceived in the target utterance. A three-way interaction between antecedent, outcome and statement was observed, indicating that ironic praise received higher irony ratings in an echoic context than in a non-echoic context ( $M = 5.16 \pm 1.38$  and  $M = 4.85 \pm 1.59$ ;  $b = 0.31$ ,  $SE = 0.07$ ,  $t = 4.38$ ,  $p < .001$ ), whereas ironic criticism received similar ratings in both echoic and non-echoic contexts ( $M = 5.86 \pm 1.20$  and  $M = 5.74 \pm 1.24$ ;  $b = 0.12$ ,  $SE = 0.07$ ,  $t = 1.68$ ,  $p = .094$ ). Additionally, ironic criticism was rated more ironic than ironic praise in both echoic ( $M = 5.86 \pm 1.20$  and  $M = 5.16 \pm 1.38$ ;  $b = 0.70$ ,  $SE = 0.06$ ,  $t = 11.67$ ,  $p < .001$ ) and non-echoic contexts ( $M = 5.74 \pm 1.24$  and  $M = 4.85 \pm 1.59$ ;  $b = 0.89$ ,  $SE = 0.06$ ,  $t = 14.65$ ,  $p < .001$ ). These results offer supporting evidence that the stimuli used in the experiments were perceived as intended.

#### 2.4. Procedure

Participants were tested individually, during which they were seated in a soundproof lab. The experimental session was conducted using a laptop PC, with stimuli and instructions programmed and presented via E-Prime 2.0 software. The laptop screen had a refresh rate of 90 Hz and a screen resolution of  $1920 \times 1080$ . Before starting the test, participants underwent a training session consisting of eight filler-type scenarios to familiarize them with the experimental procedure.

At the start of the experimental session, participants were informed that they needed to understand the stories, as they would later perform a question-answer task. They were instructed to read the text as if they were the character referred to as 'you' in the stories. The critical materials and fillers were divided into eight blocks, with each containing two dummy trials to help participants get started. Each trial began with the

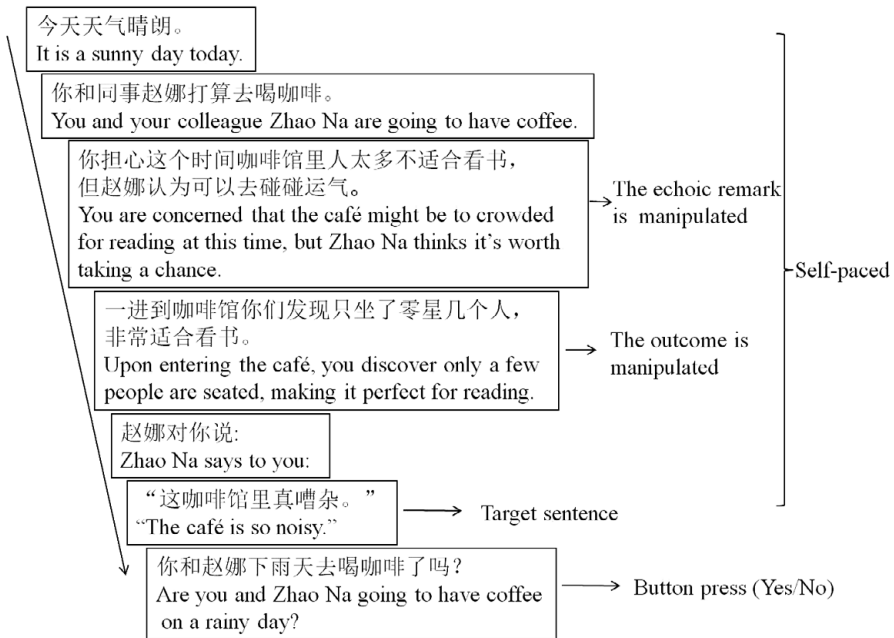


Figure 1. Experimental procedure.

presentation of a fixation cross for 500 ms, followed by the scenario presented line by line in a self-paced manner (see Figure 1). The response latencies of the target sentences were measured from the onset of the sentence to when the participants pressed the response key. At the end of the story, a comprehension question was presented, and the participant was required to answer the question by pressing the yes or no key described earlier. The accuracy was recorded. Response hands were counterbalanced across the participants. Trials concluded either after a participant's response or after 5 s. An 800 ms blank screen followed before the start of the next trial.

The text was presented at the center of the computer screen, left-justified in a white, 24-point font against a black background. Eight experiment lists were created using a Latin-square procedure, ensuring that each scenario was only presented once within each list. Consequently, each participant saw all the trials, including 200 critical materials and 200 fillers. Participants were explicitly instructed to read the scenarios naturally and focus on comprehension. In order to assess their understanding of the ironic content presented during the experiment, following the reading-time session, participants received the materials with the final comprehension questions removed. Their subsequent task was to rate, on a 7-point scale ranging from 1 (not at all ironic) to 7 (very ironic), the degree of irony perceived in the final statement of each story.

### 2.5. Data analysis

Our analysis involved a comparison of participants' reading times, accuracy and post-experiment irony ratings in processing ironic criticism, literal criticism, ironic



praise and literal praise, considering both echoic and non-echoic versions. Two scenarios have been envisaged with respect to the reading times associated with deriving ironic meaning: (1) The echoic account posits that an echoic antecedent typically conveys a concept while expressing a mocking, skeptical or contemptuous attitude towards it. Consequently, we hypothesized that, for ironic criticism, the presence of an echoic antecedent in the context would render the target more readily available, facilitating the processing of the target utterance itself. In the case of ironic praise, the role of echoic antecedents may manifest differently. Based on Wilson's (2017) proposal, ironic praise without an echoic antecedent involved in context would be comprehended more quickly. Therefore, we predicted that the absence of an explicit prior mention of a concern or negative expectation could facilitate the comprehension of the negative target utterance. (2) According to the echoic account, the understanding of ironic criticism and ironic praise exhibits the characteristic of normative bias. Specifically, positive statements about negative events can readily be employed ironically, whereas negative statements about positive events can be ironic only under special circumstances. In the current study, we posit that ironic criticism (e.g., 'the café is so quiet') would be comprehended more rapidly and effortlessly than ironic praise (e.g., 'the café is so noisy'). Concerning accuracy, we anticipated that echoic trials would yield higher accuracy than non-echoic trials, and ironic criticism would demonstrate higher accuracy than ironic praise.

Data exhibiting reading latencies beyond the mean  $\pm$  3 standard deviations were excluded (6.9% trials). Generalized linear mixed-effects models in R (R version 4.0.2) were performed to analyze the accuracy, and RT date and irony ratings were analyzed through linear mixed-effects models using the lme4 package (version 1.1-23, Bates et al., 2014) and lmerTest package (Kuznetsova et al., 2017). Two models were constructed: a model for the comprehension of literal and ironic utterances in both echoic and non-echoic contexts, where antecedent (echoic, non-echoic), outcome (positive, negative) and statement (positive, negative) were treated as fixed effects; and a model addressing the asymmetry between ironic criticism and ironic praise, where antecedent (echoic, non-echoic) and irony type (ironic criticism, ironic praise) were set as fixed effects. These two models included participants as random intercepts. In cases where the initial models failed to converge, we removed the least influential random slope until achieving convergence. The results reported are based on the best-fitting model that provided an adequate fit to the data. Parameter estimates were obtained using Restricted Maximum Likelihood (REML), and the full model, including both significant and non-significant fixed effects, was reported.

### 3. Results

#### 3.1. Post-experiment irony ratings

After completing the reading-time portion of the experiment, participants received the materials with the final comprehension questions removed (see Table 2). The irony ratings analyses revealed three main fixed effects of antecedent, outcome and statement, revealing that echoic trials were rated as more ironic than non-echoic trials ( $M = 3.43 \pm 2.38$  and  $M = 3.34 \pm 1.56$ , respectively), positive outcome condition was rated less ironic compared with negative outcome condition ( $M = 2.59 \pm 1.32$  and  $M = 4.18 \pm 1.55$ , respectively), and positive statements were considered more ironic compared with negative statements ( $M = 3.64 \pm 1.04$  and  $M = 3.13 \pm 1.83$ ,

**Table 2.** Mean scores of norming task and post-experiment irony rating tests, mean reading times in ms and error rates (SD) presented separately for each condition

Condition		Norming	Post-test	Mean RT	Mean error rate
Echoic	Literal praise	1.44 (0.90)	1.07 (0.37)	845 (357)	0.043 (.06)
	Ironic criticism	5.86 (1.20)	6.11 (1.27)	902 (426)	0.081 (.09)
	Ironic praise	5.16 (1.38)	4.24 (1.86)	1050 (640)	0.091 (.08)
	Literal criticism	2.42 (1.69)	2.15 (1.74)	926 (478)	0.040 (.04)
Non-echoic	Literal praise	2.08 (1.47)	1.49 (1.18)	882 (410)	0.070 (.06)
	Ironic criticism	5.74 (1.24)	6.05 (1.35)	946 (525)	0.071 (.08)
	Ironic praise	4.85 (1.59)	3.79 (1.88)	975 (505)	0.105 (.11)
	Literal criticism	2.86 (1.83)	2.40 (1.84)	951 (479)	0.063 (.07)

respectively). A significant interaction between antecedent and outcome was observed, indicating that the negative outcome condition was rated as more ironic than positive outcome condition in both echoic ( $M = 4.13 \pm 1.51$  and  $M = 2.66 \pm 1.11$ ;  $b = -1.47$ ,  $SE = 0.07$ ,  $t = -21.79$ ,  $p < .001$ ) and non-echoic contexts ( $M = 4.23 \pm 1.59$  and  $M = 2.64 \pm 1.26$ ;  $b = -1.59$ ,  $SE = 0.07$ ,  $t = -23.49$ ,  $p < .001$ ). Furthermore, a significant interaction between antecedent and statement was found, suggesting that positive statements were rated as more ironic than negative statements in both echoic ( $M = 3.59 \pm 0.82$  and  $M = 3.20 \pm 1.80$ ;  $b = 0.40$ ,  $SE = 0.07$ ,  $t = 5.88$ ,  $p < .001$ ) and non-echoic conditions ( $M = 3.77 \pm 1.26$  and  $M = 3.10 \pm 1.86$ ;  $b = 0.68$ ,  $SE = 0.07$ ,  $t = 10.02$ ,  $p < .001$ ). Additionally, a significant interaction between outcome and statement was identified, indicating that in positive outcome condition, positive statements were rated as less ironic than negative statements ( $M = 1.28 \pm 0.77$  and  $M = 4.02 \pm 1.87$ ;  $b = -2.73$ ,  $SE = 0.07$ ,  $t = -40.43$ ,  $p < .001$ ), whereas in negative outcome condition, positive statements were rated as more ironic than negative statements ( $M = 6.08 \pm 1.31$  and  $M = 2.28 \pm 1.79$ ;  $b = 3.81$ ,  $SE = 0.07$ ,  $t = 56.33$ ,  $p < .001$ ).

More importantly, a three-way interaction between antecedent, outcome and statement was observed, suggesting that when participants read positive statements, the echoic condition was rated less ironic compared with the non-echoic condition in the positive outcome condition ( $M = 1.07 \pm 0.37$  ms and  $M = 1.49 \pm 1.18$ ;  $b = -0.42$ ,  $SE = 0.09$ ,  $t = -4.46$ ,  $p < .001$ ), whereas in the negative outcome condition, the difference was not significant ( $M = 6.11 \pm 1.27$  and  $M = 6.05 \pm 1.32$ ;  $b = 0.45$ ,  $SE = 0.10$ ,  $t = 0.58$ ,  $p = .564$ ). When participants read negative statements, the echoic trials were considered more ironic compared with non-echoic trials in the positive outcome condition ( $M = 4.24 \pm 1.86$  and  $M = 3.79 \pm 1.88$ ;  $b = 0.45$ ,  $SE = 0.10$ ,  $t = 4.62$ ,  $p < .001$ ), whereas this difference was not observed in the negative outcome condition ( $M = 2.15 \pm 1.74$  and  $M = 2.40 \pm 1.84$ ;  $b = -0.25$ ,  $SE = 0.10$ ,  $t = -2.64$ ,  $p = .008$ ).

The irony rating results for the asymmetry of ironic criticism and ironic praise revealed a main effect of irony type, suggesting that ironic criticism was rated as more ironic than ironic praise ( $M = 6.08 \pm 1.31$  and  $M = 4.02 \pm 1.87$ , respectively). Additionally, there was a significant interaction between antecedent and irony type, demonstrating an asymmetry between ironic criticism and ironic praise in both the echoic context ( $M = 6.11 \pm 1.27$  and  $M = 4.24 \pm 1.86$ ;  $b = 1.87$ ,  $SE = 0.09$ ,  $t = 21.74$ ,  $p < .001$ ) and the non-echoic context ( $M = 6.05 \pm 1.35$  and  $M = 3.79 \pm 1.88$ ;  $b = 2.26$ ,  $SE = 0.09$ ,  $t = 25.82$ ,  $p < .001$ ).

In sum, overall, ironic utterances were rated as more ironic than their literal counterparts. Ironic utterances in the echoic condition were considered more ironic

compared with those in the non-echoic condition. Furthermore, ironic criticism received higher ratings for irony compared with ironic praise.

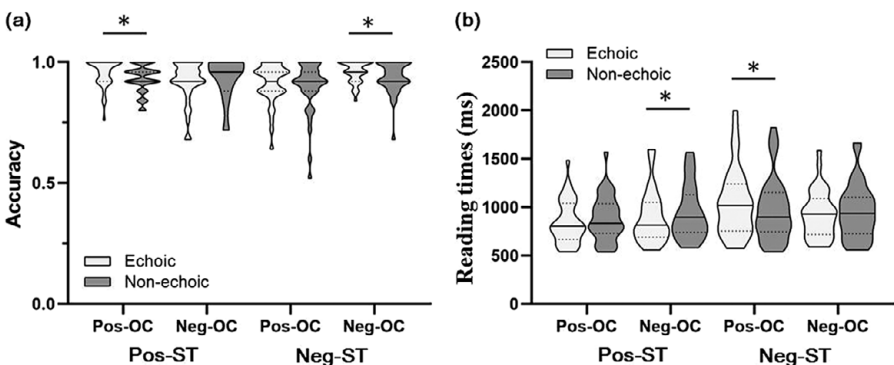
### 3.2. Accuracy results

Data were excluded in instances of no response, response times exceeding the response deadline (i.e., 5 s) or provision of a wrong answer. Table 3 and Figure 2(a) depict participants' accuracy in the literal and ironic utterance comprehension task. Three main fixed effects of antecedent, outcome and statement were identified, indicating that non-echoic trials exhibited lower accuracy than echoic trials ( $M = 0.92 \pm 0.08$  and  $M = 0.94 \pm 0.07$ , respectively), lower accuracy for positive outcome trials compared with negative outcome trials ( $M = 0.92 \pm 0.08$  and  $M = 0.94 \pm 0.07$ , respectively) and lower accuracy for negative statement trials compared with positive statement trials ( $M = 0.92 \pm 0.08$  and  $M = 0.93 \pm 0.07$ , respectively). A significant interaction between outcome and

**Table 3.** Best-fitting generalized linear mixed model for literal and ironic utterance comprehension accuracy

Effects	<i>b</i>	SE	Contrast	
			<i>Z</i>	<i>p</i>
Intercept	3.70	0.24	15.60	<.001***
Antecedent	-0.55	0.25	-2.21	.027*
Outcome	-0.77	0.24	-3.21	.001**
Statement	-1.16	0.23	-5.08	<.001***
Antecedent × Outcome	0.47	0.32	1.49	.136
Antecedent × Statement	0.46	0.30	1.53	.125
Outcome × Statement	1.74	0.32	5.39	<.001***
Antecedent × Outcome × Statement	-0.88	0.42	-2.07	.038*
Random effects				
Participants	.58	.76		

Note: Model formula for accuracy: Accuracy ~ antecedent × outcome × statement + (1|subject). SE = standard error. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .



**Figure 2.** Accuracy (a) and reading times (b) for the literal and ironic utterance comprehension split by statement (Pos-ST = positive statement, Neg-ST = negative statement) × outcome (Pos-OC = positive outcome, Neg-OC = negative outcome) × antecedent (echoic, non-echoic). The solid line indicates the median, and the dotted line reflects the quartiles (75% and 25%).

statement was also observed, indicating that during positive statement, accuracy was lower for negative outcome ( $M = 0.94 \pm 0.06$  and  $M = 0.92 \pm 0.08$ ;  $b = 0.54$ ,  $SE = 0.16$ ,  $z = 3.40$ ,  $p < .001$ ), whereas in negative statement, accuracy was lower for positive outcome ( $M = 0.95 \pm 0.06$  and  $M = 0.90 \pm 0.10$ ;  $b = -0.76$ ,  $SE = 0.14$ ,  $z = -5.36$ ,  $p < .001$ ).

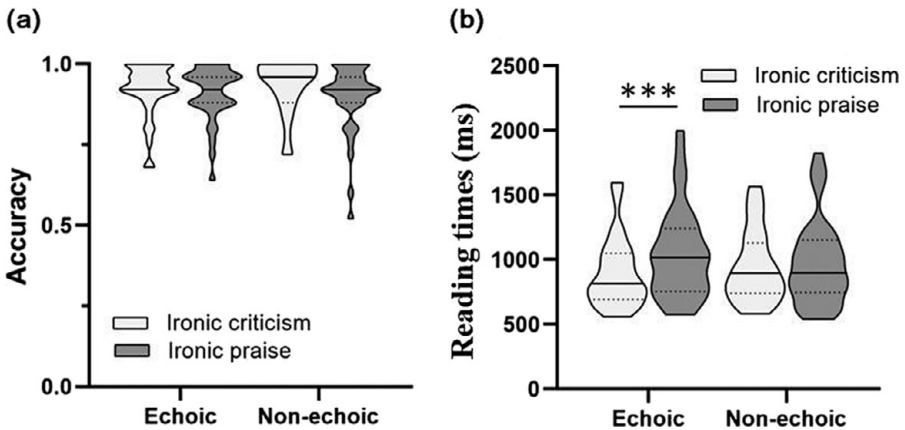
More importantly, a three-way interaction among antecedent, outcome and statement was identified, indicating that in positive statements, non-echoic trials exhibited lower accuracy compared with echoic trials in the positive outcome condition ( $M = 0.96 \pm 0.06$  and  $M = 0.93 \pm 0.06$ ;  $b = 0.55$ ,  $SE = 0.25$ ,  $z = 2.21$ ,  $p = .027$ ), whereas they demonstrated similar accuracy in the negative outcome condition ( $M = 0.92 \pm 0.09$  and  $M = 0.93 \pm 0.08$ ;  $b = 0.08$ ,  $SE = 0.20$ ,  $z = 0.40$ ,  $p = .691$ ). Conversely, in negative statements, non-echoic trials displayed lower accuracy compared with echoic trials in the negative outcome condition ( $M = 0.96 \pm 0.04$  and  $M = 0.94 \pm 0.07$ ;  $b = 0.50$ ,  $SE = 0.23$ ,  $z = 2.17$ ,  $p = .030$ ), while they exhibited similar accuracy in the positive outcome condition ( $M = 0.91 \pm 0.08$  and  $M = 0.89 \pm 0.11$ ;  $b = 0.09$ ,  $SE = 0.17$ ,  $z = 0.53$ ,  $p = .594$ ).

Table 4 and Figure 3(a) present the accuracy results concerning the asymmetric effect of ironic criticism and ironic praise. A main effect of irony type was observed, suggesting that ironic praise exhibited lower accuracy than ironic criticism ( $M = 0.90$

**Table 4.** Best-fitting generalized linear mixed model for asymmetry of ironic criticism and ironic praise accuracy

Effects	<i>b</i>	SE	Contrast	
			<i>Z</i>	<i>p</i>
Intercept	3.02	0.21	14.10	<.001***
Antecedent	-0.08	0.20	-0.38	.702
Irony type	-0.39	0.19	-2.12	.034*
Antecedent × Irony type	-0.02	0.26	-0.07	.943
Random effects				
Participants	.81	.90		

Note: Model formula for accuracy: Accuracy ~ antecedent × irony type + (1|subject). SE = standard error. \* $p < .05$ , \*\*\* $p < .001$ .



**Figure 3.** Accuracy (a) and reading times (b) for the asymmetry of ironic criticism and ironic praise split by antecedent (echoic, non-echoic) × irony type (ironic criticism, ironic praise). The solid line indicates the median, and the dotted line reflects the quartiles (75% and 25%).

$\pm 0.08$  and  $M = 0.92 \pm 0.10$ ;  $b = -0.39$ ,  $SE = 0.19$ ,  $z = -2.12$ ,  $p = .034$ ). No other main effects or interactions were found.

In sum, ironic utterances demonstrated lower accuracy compared with their literal counterparts. Echoic antecedents displayed higher accuracy in both literal and ironic utterance comprehension processes compared with non-echoic antecedents. Furthermore, ironic praise received lower accuracy compared with ironic criticism.

### 3.3. RTs results

The statistical analysis focused on the reading times of the target sentences (i.e., final sentences). Instances of incorrect responses and response times deviating by more than three standard deviations from an individual's mean value were treated as outliers and consequently excluded from the analysis. On average, 93% of trials were retained. To enhance data conformity, the reading times were log-transformed.

As presented in Table 5 and Figure 2(b), the results of reading times (RTs) in literal and ironic utterance comprehension revealed main fixed effects of antecedent, outcome and statement, indicating that RTs in echoic trials were faster than in non-echoic trials ( $M = 929 \pm 480$  ms and  $M = 938 \pm 475$  ms, respectively), slower in the positive outcome condition than in the negative outcome condition ( $M = 937 \pm 477$  ms and  $M = 931 \pm 478$  ms, respectively) and faster in positive statement trials than in negative statement trials ( $M = 893 \pm 526$  ms and  $M = 975 \pm 429$  ms, respectively). A significant interaction between antecedent and statement was observed, suggesting that in the echoic condition, positive statements were read faster than negative statements ( $M = 874 \pm 392$  ms and  $M = 988 \pm 559$  ms;  $b = -0.04$ ,  $SE = 0.01$ ,  $t = -7.40$ ,  $p < .001$ ). This pattern was also evident in the non-echoic condition, though to a lesser extent ( $M = 914 \pm 467$  ms and  $M = 963 \pm 492$  ms;  $b = -0.02$ ,  $SE = 0.01$ ,  $t = -3.92$ ,  $p < .001$ ). Furthermore, a significant interaction between outcome and statement indicated that when participants read positive statements, the positive outcome condition was processed faster than negative outcome condition ( $M = 864 \pm 383$  ms and  $M = 924 \pm 476$  ms;  $b = -0.02$ ,  $SE = 0.01$ ,  $t = -4.35$ ,  $p < .001$ ), whereas when they read negative statements, the negative outcome condition was processed faster than positive outcome condition ( $M = 939 \pm 479$  ms and  $M = 1103 \pm 479$  ms;  $b = 0.02$ ,  $SE = 0.01$ ,  $t = 4.46$ ,  $p < .001$ ).

**Table 5.** Best-fitting generalized linear mixed model for literal and ironic utterance comprehension RTs

Effects	<i>b</i>	SE	Contrast	
			<i>t</i>	<i>p</i>
Intercept	2.89	0.02	144.31	<.001***
Antecedent	0.01	0.01	2.00	.045*
Outcome	0.02	0.01	3.06	.002**
Statement	0.07	0.01	9.35	<.001***
Antecedent × Outcome	0.0002	0.01	0.02	.986
Antecedent × Statement	-0.03	0.01	-3.14	.002**
Outcome × Statement	-0.06	0.01	-5.85	<.001***
Antecedent × Outcome × Statement	0.03	0.01	2.02	.043*
Random effects				
Participants	.01	.11		

Note: Model formula for reaction times:  $RT \sim \text{antecedent} \times \text{outcome} \times \text{statement} + (1|\text{subject})$ . Reaction times were log-transformed. SE = standard error. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

Crucially, a three-way interaction among antecedent, outcome and statement was found, indicating that when participants read positive statements, echoic trials were elicited faster reactions compared with non-echoic trials in the positive outcome condition ( $M = 845 \pm 357$  ms and  $M = 882 \pm 409$  ms;  $b = -0.01$ ,  $SE = 0.01$ ,  $t = 2.00$ ,  $p = .045$ ), and this pattern also held true in the negative outcome condition ( $M = 902 \pm 426$  ms and  $M = 946 \pm 525$  ms;  $b = -0.01$ ,  $SE = 0.01$ ,  $t = -2.01$ ,  $p = .044$ ). However, when participants read negative statements, echoic trials resulted in slower reactions compared with non-echoic trials in the positive outcome condition ( $M = 1050 \pm 649$  ms and  $M = 975 \pm 505$  ms;  $b = 0.02$ ,  $SE = 0.01$ ,  $t = 2.43$ ,  $p = .015$ ), while in the negative outcome condition, the difference was not significant ( $M = 926 \pm 478$  ms and  $M = 951 \pm 479$  ms;  $b = -0.01$ ,  $SE = 0.01$ ,  $t = -1.61$ ,  $p = .108$ ).

Table 6 and Figure 3(b) present the RT results for the asymmetric effect of ironic criticism and praise. A main effect of irony type was observed, indicating that ironic criticism was read faster than ironic praise ( $M = 924 \pm 476$  ms and  $M = 1013 \pm 572$  ms, respectively). Additionally, a significant interaction between antecedent and irony type was identified, revealing that in the echoic context particularly, there was a larger asymmetry (148 ms) between ironic criticism and ironic praise ( $M = 902 \pm 426$  ms and  $M = 1050 \pm 640$  ms;  $b = -0.05$ ,  $SE = 0.01$ ,  $t = -6.08$ ,  $p < .001$ ), whereas the asymmetric effect was not significant in the non-echoic context (29 ms) ( $M = 946 \pm 525$  ms and  $M = 975 \pm 505$  ms;  $b = -0.01$ ,  $SE = 0.01$ ,  $t = -1.75$ ,  $p = .081$ ).

In sum, the reading times for ironic utterances were slower compared with their literal counterparts. The presence of an echoic antecedent facilitated the reading times of ironic criticism but resulted in delays in the performance of ironic praise. Notably, ironic criticism elicited faster reactions compared with ironic praise in the echoic condition only.

### 3.4. Correlation analysis

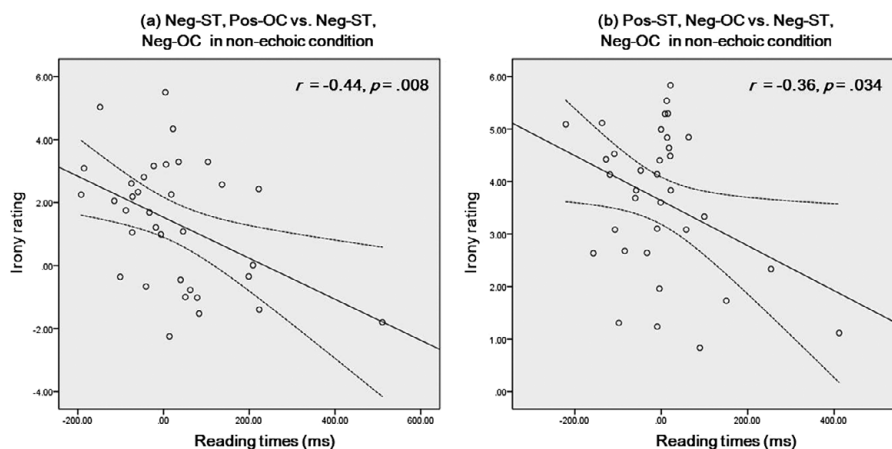
Pearson correlations were conducted across individual participants to investigate the relationship between participants' perceived irony ratings post-experiment and the reading times of the target sentences. Figure 4 depicts the correlations between irony rating scores and participants' reading times (ironic trials minus literal trials) in the non-echoic condition.

The irony rating negatively correlated with the reading time of negative statements with positive outcomes and negative statements with negative outcomes (see

**Table 6.** Best-fitting generalized linear mixed model for asymmetry of ironic criticism and ironic praise RTs

Effects	<i>b</i>	SE	Contrast	
			<i>t</i>	<i>p</i>
Intercept	2.92	0.02	136.79	<.001***
Antecedent	0.01	0.01	1.94	.052
Irony type	0.05	0.01	6.08	<.001***
Antecedent × Irony type	-0.03	0.01	-3.07	.002**
Random effects				
Participants	.01	.12		

Note: Model formula for reaction times:  $RT \sim \text{antecedent} \times \text{irony type} + (1|\text{subject})$ . Reaction times were log-transformed. SE = standard error. \*\* $p < .01$ , \*\*\* $p < .001$ .



**Figure 4.** Correlations of post-experiment irony rating scores and the reading times between Neg-ST, Pos-OC and Neg-ST, Neg-OC (a), Pos-ST, Neg-OC and Neg-ST, Neg-OC (b) in non-echoic condition.

Note: Neg-ST, Pos-OC = Negative statement with positive outcome, Neg-ST, Neg-OC = Negative statement with negative outcome, Pos-ST, Neg-OC = Positive statement with negative outcome.

Figure 4a), as well as positive statements with negative outcomes and negative statements with negative outcomes (see Figure 4b) in non-echoic utterances. This implies that as the differences in perceived irony decreased between ironic praise and literal criticism and between ironic criticism and literal criticism, the reading time differences in the corresponding conditions increased.

#### 4. Discussion

The present study investigated how an echoic or non-echoic context affects the comprehension of irony. This investigation involved the analysis of online reading times, accuracy and offline irony ratings. The findings substantiated our hypotheses, revealing that ironic criticism was judged to be more ironic in both echoic and non-echoic contexts, while ironic praise was rated as more ironic in an echoic context than in a non-echoic context. Additionally, echoing contexts facilitate the comprehension of ironic criticism, but cause ironic praise to be processed more slowly. There was also an observed asymmetry between the two forms of irony. Ironic criticism demonstrated high accuracy and was rated as more ironic than ironic praise. Furthermore, ironic criticism was read faster in echoic context, whereas performance was similar in non-echoic context for both types. Together with the correlation results, it is suggested that echoing contexts influence ironic criticism and ironic praise in distinct manners. Specifically, echoing contexts facilitate the interpretation of positive statements about negative outcomes as ironic, whereas they slow down the processing of negative statements about positive outcomes without exceeding the response time limits set by the study.

From the perspective of echoic account, the assertion that ‘echoing is essential to irony, and the more salient the echoic element is, the more likely the irony is to be perceived’ (Wilson, 2017: 208) guided the predictions tested in prior studies. Previous research supported this prediction by revealing that the presence of a

salient echoic antecedent can facilitate the comprehension of ironic criticisms (Gibbs, 1986; Jorgensen et al., 1984; Spotorno & Noveck, 2014). In alignment with these earlier findings, our study demonstrated that echoic antecedents enhance the comprehension of ironic criticism and eliminate the differences between ironic and literal reading times. This result suggests that an explicit previous mention of a thought in the context is conducive to the comprehension of irony. More specifically, an echoic antecedent may render the echoing involved in the target sentence more readily available, thereby facilitating the processing of the target utterance itself.

Previous research on how echoing affects irony comprehension has predominantly focused on ironic criticism, leaving a gap in the examination of ironic praise. The present study addresses this lacuna, contributing behavioral reading time evidence on how echoing influences the understanding of ironic praise. Unlike ironic criticism, we found that echoic antecedents extended the reading times for ironic praise compared with non-echoic antecedents. In other words, a negative statement preceded by a positive outcome with a non-echoic remark facilitated the comprehension of the utterance. This result aligns with a distinctive feature of irony known as normative bias, assuming that irony is commonly used to criticize or complain when a situation, event or performance falls short of norm-based expectations. The use of irony for praise is considered less common and occurs only in special circumstances. Consequently, a negative statement about a positive outcome is more likely to be perceived as ironic when doubt or concern was expressed previously. On the contrary, a positive statement about a negative outcome was judged similarly whether or not an echoing antecedent was present (Wilson, 2013, 2017). The irony rating results in the current study support these predictions, indicating that ironic criticism is judged to be more ironic in both echoic and non-echoic contexts, signifying that ironic criticism is easier to understand and perceived as more ironic compared with ironic praise. In contrast, ironic praise was rated as more ironic in an echoic context than in a non-echoic context. Furthermore, correlation analysis revealed that as the difference in perceived irony decreased between ironic criticism and its literal counterpart, the reading time difference increased. This implies that a lower level of perceived irony requires greater processing efforts on the part of participants, as they need to rely on a broader context to comprehend ironic utterances.

The question arises as to whether a negative statement about a positive outcome event in a non-echoic context can be considered irony. According to the echoic account, although this type of utterance presents a statement that is clearly opposite of the intended meaning, it lacks any echoing of prior thoughts, beliefs, or previously mentioned concerns or doubts. Therefore, it might be better analyzed as banter, which could be processed more quickly (Wilson, 2017). The reading time results in the current study provide experimental evidence supporting this claim. We observed a significant reading time difference between ironic criticism and ironic praise in an echoic context, while they exhibited a similar performance in a non-echoic context. This implies that ironic praise in a non-echoic context was comprehended faster and does not exhibit normative bias characteristics. These findings align with a developmental study by Filippova and Astington (2010), which reported a similar performance of ironic criticism and ironic praise, possibly due to the absence of echoic antecedents in their experimental design. A comparable observation can be made about Pexman et al.'s (2005) 'ironic compliment' examples, such as saying 'You look



terrible!' to a person who looks stunning. In this case, if the hearer has previously expressed concern about not looking good that day, it could be interpreted as typical ironic praise. However, without the presence of such echoic antecedents, it would be better considered a case of banter.

In the same vein, banter is often categorized as ironic praise in experimental studies (Gibbs, 2000; Pexman et al., 2005). Gibbs (2000) notes that, within the banter expressions in his dataset, there were notably more negative statements (e.g., (to someone who has just solved a difficult problem): Dumb bitch!) employed to convey a positive meaning than positive statements used to convey a negative meaning. Essentially, these banter expressions lack normative bias. In such instances, if the speaker responds ironically to someone's previously expressed doubts or suspicions, it is plausible to consider the negative statement as a form of typical ironic praise. While there is no evidence suggesting that examples like this are echoic, the frequent occurrence of such negative statements in Gibbs' corpus may suggest the involvement of different mechanisms (Wilson, 2017). Consequently, the broad operational definitions of irony employed in experimental research may not adequately capture significant variations in the underlying mechanisms at play. The present experiment highlights the importance of considering the presence or absence of echoic antecedents and discerning between different forms of irony to comprehend the underlying cognitive processes and addresses inconsistencies in the literature.

The observed asymmetry in the comprehension and interpretation of ironic statements, where ironic criticism is more readily perceived than ironic praise, has been documented in existing literature (Kreuz & Glucksberg, 1989; Kumon-Nakamura et al., 1995; Sperber & Wilson, 1981). Various explanations have been put forward to elucidate this phenomenon. One explanation is rooted in normative expectations, as our norms are often positively coded and involve positive expressions in negative situations, such as offering sympathy or understanding during challenging circumstances. When these implicit expectations are contravened, positive statements echoing positive norms are more likely to be perceived as ironic. In contrast, negative statements do not necessarily align with these expectations and can only be construed as ironic in certain situations, particularly when they explicitly or implicitly echo incorrect predictions or expectations (Kreuz & Glucksberg, 1989; Kumon-Nakamura et al., 1995).

Another explanation stems from the negativity effect, suggesting that individuals tend to attribute greater significance to negative information compared with positive information (Kanouse, 1971). This negativity bias may arise from vigilance (Wegner & Vallacher, 1977), wherein individuals are more attuned to negative information due to its potential signaling of dangers or threats. Consequently, individuals may be more inclined to comment on negative events in a distinctive manner to highlight their importance. Experimental studies on ironic praise have substantiated the role of explicit negativity in fostering asymmetric perceptions and impressions of irony (Bruntsch & Ruch, 2017; Caillies et al., 2019; Gibbs, 1986; Matthews et al., 2006; Pexman & Olineck, 2002). When a statement contains explicit negativity, such as 'You are a horrible driver!', it amplifies the perception of irony and reinforces the asymmetry between ironic praise and criticism. These explanations highlight the impact of normative expectations and the differential processing of negative and positive information in shaping the comprehension and interpretation of ironic statements. The observed asymmetry in the perception of

ironic criticism and praise can be attributed to a combination of normative expectations and cognitive biases.

The findings of this study, illustrating longer reading times for ironic praise compared with ironic criticism in an echoic context, are consistent with prior literature and provide support to the notion that understanding ironic praise necessitates more cognitive effort. Both ironic criticism and ironic praise in an echoic condition exhibit the characteristic of normative bias. This result suggests that the echoing mechanism plays a major role in understanding irony. The echoic theory provides an explanation for the observed asymmetry in irony comprehension, suggesting that the prevalence of positive norms and expectations in society generally leads to the frequent use of positive statements to express irony in response to negative events. However, for negative statements about positive events to be used ironically, there should be previously expressed concerns about these positive events in the context. This perspective aligns with traditional pragmatic theories that propose the primary function of irony is to convey negative or derogatory feelings or evaluations. The asymmetry observed in counterfactual statements used ironically reflects the general tendency to conform to negative attitudes.

Our findings, which demonstrate similar reading times for ironic praise and ironic criticism in non-echoic contexts, suggest that alternative cognitive processes may be at play when participants interpret negative statements about positive events without any preceding echoic cues. In such cases, there is no identifiable thought that the speaker can be understood as ironically echoing. Therefore, the answer to the paper's introductory question appears to be affirmative. It is typically more natural and expected to use positive assertions, such as 'the café is so quiet', to convey irony when, in reality, the café is quite noisy. Conversely, using negative statements such as 'this café is so noisy' to express irony when the café is actually very quiet may appear less common. There are two scenarios, one being that there must have been some manifest doubt or concern that the café might be noisy. In such a case, it is considered irony. Otherwise, it is better considered an instance of banter. Thus, the results of the study affirm that irony can be predominantly expressed through positive assertions, indicating the prevailing normative bias and the tendency to rely on positive norms and expectations when employing irony.

Contextual differences, specifically the presence or absence of an echoic remark, may influence expectations and integration costs during irony processing. A positive context with an echoic remark can activate predictions about potential ironic comments, while positive contexts without an echoic remark may not provide anticipatory irony cues. The findings of the current study differ from those of Kreuz and Link's (2002), who concluded that expectations about events do not influence the interpretation of ironic criticism and ironic praise. In contrast, our study identified a significant distinction between ironic praise with and without an echoic antecedent in terms of reading times. The reasons for the differing results may be that, in contrast to Kreuz and Link's materials where expectational cues are introduced in the densely packed first sentence, potentially diluting their prominence and increasing cognitive load, our experiment strategically positions these cues in the third sentence, enhancing their salience and memorability without additional narrative distractions, thus facilitating clearer and more effective processing of ironic intent. These results provide some support for the echoic account, which posits that for irony to be successful in negative statements about positive events, there must be a manifestation of doubt or suspicion regarding a person's helpfulness, appearance, truthfulness, etc.

Without such identifiable thoughts to echo ironically, ironic interpretation becomes challenging.

The findings of the current experiment suggest that the echoic theory is applicable to the Chinese context. Our results provide evidence for the theory's notion that irony often serves to criticize or express dissatisfaction when outcomes fail to meet expectations. Notably, negative statements were perceived as more ironic when negative expectations were expressed rather than positive ones. Additionally, our findings indicate that ironic criticism is processed more quickly than ironic praise, which could reflect the more straightforward cognitive processing involved in recognizing criticism compared to praise in an echoic context. This is consistent with the theory's emphasis on the asymmetry between ironic criticism and ironic praise. Thus, the principles of echoic theory appear to translate effectively to the Chinese use of irony. This alignment suggests that, while cultural nuances undoubtedly influence the expression and interpretation of irony, the underlying cognitive processes involved in irony comprehension appear to be broadly applicable. While this experiment focused on analyzing entire target utterances, future investigations could delve into whether the critical words within an ironic statement yield similar results to those observed in this study. Examining the effects at the word level could provide further insights into the processing mechanisms involved in irony comprehension.

## 5. Conclusion

The present study aimed to investigate the impact of an echoic or non-echoic context on irony comprehension. The results of the experiment revealed that ironic criticism was judged to be more ironic in both echoic and non-echoic contexts, while ironic praise was rated as more ironic in an echoic context than in a non-echoic context. Additionally, echoing contexts facilitate the comprehension of ironic criticism, but cause ironic praise to be processed more slowly. There was also an observed asymmetry between the two forms of irony. Ironic criticism demonstrated high accuracy and was rated as more ironic than ironic praise. Furthermore, ironic criticism was read faster in echoic context, whereas performance was similar in non-echoic context for both types. These findings suggest that the echoing context affects ironic criticism and ironic praise differently. Specifically, the echoing context facilitates the comprehension of positive statements about negative outcomes as ironic but makes negative statements about positive outcomes be processed more slowly and perceived as more ironic.

**Data availability statement.** Data and code are available in the OSF repository at <https://osf.io/vce4d/>.

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**Competing interest.** The authors declare none.

**Ethical approval.** All procedures in the present study were authorized by the Ethics Committee of Northeast Normal University.

## References

- Bates, D., Maechler, M., Bolker, B., & Walker, S. (2014). lme4: Linear mixed-effects models using Eigen and S4. R package version 1, 1–7. <http://arxiv.org/abs/1406.5823>
- Bruntsch, R., & Ruch, W. (2017). The role of humor-related traits and broad personality dimensions in irony use. *Personality and Individual Differences*, 112, 139–143. <https://doi.org/10.1016/j.paid.2017.03.004>
- Caillies, S., Gobin, P., Obert, A., Terrien, S., Coutté, A., Iakimova, G., & Besche-Richard, C. (2019). Asymmetry of affect in verbal irony understanding: What about the N400 and P600 components? *Journal of Neurolinguistics*, 51, 268–277. <https://doi.org/10.1016/j.jneuroling.2019.04.004>
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41(4), 1149–1160. <https://doi.org/10.3758/BRM.41.4.1149>
- Filik, R., Leuthold, H., Wallington, K., & Page, J. (2014). Testing theories of irony processing using eye-tracking and ERPs. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 40(3), 811–828. <https://doi.org/10.1037/a0035658>
- Filippova, E., & Astington, J. W. (2010). Children's understanding of social-cognitive and social-communicative aspects of discourse irony. *Child Development*, 81, 913–928. <https://doi.org/10.1111/j.1467-8624.2010.01442.x>
- Gibbs, R. W. (1986). On the psycholinguistics of sarcasm. *Journal of Experimental Psychology: General*, 115, 3–15. <https://doi.org/10.1037/0096-3445.115.1.3>
- Gibbs, R. W. (2000). Irony in talk among friends. *Metaphor and Symbol*, 15(1–2), 5–27. <https://doi.org/10.1080/10926488.2000.9678862>
- Gibbs, R. W., & Colston, H. L. (Eds.) (2007). *Irony in language and thought: A cognitive science reader*. Erlbaum.
- Hancock, J., Dunham, P., & Purdy, K. (2000). Children's comprehension of critical and complimentary forms of verbal irony. *Journal of Cognition and Development*, 1, 227–248. <https://doi.org/10.1207/S15327647JCD010204>
- Jorgensen, J., Miller, G., & Sperber, D. (1984). Test of the mention theory of irony. *Journal of Experimental Psychology: General*, 113, 112–120. <https://doi.org/10.1037/0096-3445.113.1.112>
- Kanouse, D. E. (1971). *Language, labeling and attribution*. General Learning Press.
- Kreuz, R. J., & Glucksberg, S. (1989). How to be sarcastic: The echoic reminder theory of verbal irony. *Journal of Experimental Psychology: General*, 118, 374–386. <https://doi.org/10.1037/0096-3445.118.4.374>
- Kreuz, R. J., & Link, K. E. (2002). Asymmetries in the use of verbal irony. *Journal of Language and Social Psychology*, 21(2), 127–143. <https://doi.org/10.1177/02627X02021002002>
- Kumon-Nakamura, S., Glucksberg, S., & Brown, M. (1995). How about another piece of pie: The allusional pretense theory of verbal irony. *Journal of Experimental Psychology: General*, 124, 3–21. <https://doi.org/10.1037/0096-3445.124.1.3>
- Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. (2017). lmerTest package: Tests in linear mixed effects models. *Journal of Statistical Software*, 82(13), 1–26. <https://doi.org/10.18637/jss.v082.i13>
- Leech, G. (1983). *Principles of pragmatics*. Longman.
- Matthews, J. K., Hancock, J. T., & Dunham, P. J. (2006). The roles of politeness and humor in the asymmetry of affect in verbal irony. *Discourse Processes*, 41(1), 3–24. [https://doi.org/10.1207/s15326950dp4101\\_2](https://doi.org/10.1207/s15326950dp4101_2)
- Norricks, N. (2003). Issues in conversational joking. *Journal of Pragmatics*, 35, 1333–1359. [https://doi.org/10.1016/S0378-2166\(02\)00180-7](https://doi.org/10.1016/S0378-2166(02)00180-7)
- Partington, A. (2007). Irony and reversal of evaluation. *Journal of Pragmatics*, 39, 1547–1569. <https://doi.org/10.1016/j.pragma.2007.04.009>
- Pexman, P., Glenwright, M., Krol, A., & James, T. (2005). An acquired taste: Children's perceptions of humor and teasing in verbal irony. *Discourse Process*, 40, 259–288. [https://doi.org/10.1207/s15326950dp4003\\_5](https://doi.org/10.1207/s15326950dp4003_5)
- Pexman, P. M., & Olinek, K. M. (2002). Does sarcasm always sting? Investigating the impact of ironic insults and ironic compliments. *Discourse Processes*, 33(3), 199–217. [https://doi.org/10.1207/S15326950DP3303\\_1](https://doi.org/10.1207/S15326950DP3303_1)
- Sperber, D., & Wilson, D. (1981). Irony and the use-mention distinction. In P. Cole (Ed.), *Radical pragmatics* (pp. 295–318). Academic Press.
- Spotorno, N., & Noveck, I. A. (2014). When is irony effortful? *Journal of Experimental Psychology General*, 143(4), 1–17. <https://doi.org/10.1037/a0036630>

- Wegner, D. M., & Vallacher, R. R. (1977). *Implicit psychology: An introduction to social cognition*. Oxford University Press.
- Wilson, D. (2013). Irony comprehension: A developmental perspective. *Journal of Pragmatics*, 59, 40–56. <https://doi.org/10.1016/j.pragma.2012.09.016>
- Wilson, D. (2017). Irony, hyperbole, jokes and banter. In J. Blochowiak, C. Grisot, S. Durrleman, & C. Laenzlinger (Eds.), *Formal models in the study of language* (pp. 201–219). Springer.
- Wilson, D., & Sperber, D. (1992). On verbal irony. *Lingua*, 87, 53–76.
- Wilson, D., & Sperber, D. (2012). *Meaning and relevance*. Cambridge University Press, Cambridge.

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