

Making and revising pragmatic inferences during Chinese conversational dialogue reading

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Abstract. Pragmatic inference enables listeners to derive speakers' intended meanings beyond literal expressions. However, little is known about whether previously generated pragmatic inferences can be effectively revised when subsequent information conflicts with them. The present study investigated the dynamic processing of pragmatic inference revision using natural conversational materials. Participants completed a self-paced reading task with three conditions: Conversational Implicature revision (CI + revision), conversational implicature without revision (CI - revision), and no conversational implicature with no revision (C). Accuracy and response times were recorded to examine the effects of conflicting information on subsequent comprehension. The results showed that accuracy in the "CI + revision" condition was significantly lower than that in both "CI - condition" and "C" conditions, whereas the latter two conditions did not differ significantly. Moreover, response times in the CI + revision condition were significantly longer than those in the other two conditions, with no significant difference between them. These findings indicate that pragmatic inference revision increases processing difficulty, not because pragmatic inference itself imposes additional costs, but because previously established pragmatic interpretations must be reanalyzed when contradicted by subsequent information. The results suggest that pragmatic inferences remain partially activated after revision and continue to influence comprehension. This study extends previous research on conversational implicature by highlighting the dynamic updating processes involved in pragmatic meaning construction.

Keywords: pragmatic inference, revision, comprehension

1. Introduction

Verbal communication constitutes a fundamental component of human social interaction and is extensively embedded in various aspects of interpersonal exchanges. Its universality and foundational role have been demonstrated by numerous studies [1]. However, in daily communication, individuals do not always explicitly reveal their feelings, beliefs, or attitudes. Driven by specific communicative needs and intentions, speakers often deliberately construct utterances that contain semantic ambiguity or apparent contradictions, thereby enabling language to support multiple levels of interpretation. In such contexts, to accurately decode the intended meaning of an utterance, listeners must not only analyze its literal meaning but also infer the speaker's underlying communicative intention through reasoning processes [2, 3]. This listener-oriented

inferential process, known as pragmatic inference, involves integrating contextual information and individuals' background knowledge to derive the speaker's intended meaning, representing a crucial and complex cognitive activity in language communication. Conversational implicature is one of its most typical manifestations. According to Grice's Cooperative Principle [4], speakers may convey meanings indirectly by exploiting conversational maxims, requiring listeners to derive communicative intentions that are not explicitly encoded in the utterance. A growing body of experimental research has shown that pragmatic inference is dynamically constructed during online comprehension. Reaction-time studies have demonstrated measurable processing costs associated with conversational implicature and have raised questions about whether pragmatic meanings are generated automatically or computed according to contextual demands [5, 6]. Eye-tracking and ERP studies have further shown that pragmatic interpretation unfolds incrementally and is strongly influenced by contextual information [7, 8]. Neuroimaging studies additionally suggest that pragmatic inference depends on the coordinated involvement of language-related and non-language networks associated with semantic processing, executive control, and the representation of speakers' mental states [9-13].

Although considerable progress has been made in understanding how pragmatic inferences are generated, most previous research has focused on the initial derivation of pragmatic meanings, particularly scalar implicatures, whereas relatively less is known about what happens after a pragmatic interpretation has already been established. Studies using more natural conversational materials have begun to demonstrate that indirect meanings involve additional semantic integration and pragmatic processing. For example, Coulson and Lovett [14] found distinct ERP patterns when identical utterances were interpreted as indirect requests rather than literal statements. Similarly, indirect responses have been associated with enhanced N400 effects and later ERP components, suggesting increased semantic integration demands and subsequent pragmatic reanalysis [15-17]. These findings indicate that pragmatic comprehension involves not only the generation of an implicit interpretation but also its continuous integration with the evolving conversational context. In natural communication, however, an initially plausible pragmatic interpretation may later become inconsistent with newly available information. Successful comprehension in such situations requires listeners to detect the conflict, reconsider the previously established inference, and update their representation of the speaker's communicative intention. Whether an established pragmatic inference can be completely suppressed during this revision process remains unclear.

Research on revision in sentence and discourse comprehension provides an important theoretical basis for addressing this question. Studies of garden-path sentences have shown that readers can reanalyze an initially incorrect interpretation when disambiguating information becomes available, but successful revision does not necessarily eliminate the original interpretation. Christianson et al. [18, 19] demonstrated that initial misinterpretations may remain partially activated even after syntactic reanalysis has been completed, providing important evidence for the good-enough processing account. Similar persistence has been reported in discourse-level revision. In misinformation correction, information that has explicitly been corrected may nevertheless continue to influence subsequent reasoning, a phenomenon known as the continued influence effect [20, 21]. Likewise, Potts et al. [22] found that predictive inferences could remain activated even after subsequent information rendered them incorrect. Later studies of predictive inference revision have also provided evidence that previously generated inferences may continue to influence subsequent processing [23, 24]. At the same time, other studies suggest that readers are capable of revising prior discourse representations under appropriate conditions [25, 26], and that information that becomes irrelevant to the current discourse can be suppressed [27, 28]. Gernsbacher et al. [28], in particular, proposed that comprehension involves the continuous enhancement of relevant information and suppression of information that becomes less relevant to the developing mental representation. Taken together, these findings suggest that revision is not a simple

process in which an old interpretation is deleted and replaced by a new one. Rather, old and revised representations may coexist temporarily, and successful comprehension may depend on the extent to which the earlier representation can be suppressed.

Despite extensive evidence for revision and lingering activation in syntactic processing, misinformation correction, and predictive inference, relatively little is known about whether the same mechanisms apply to pragmatic inference. This issue is particularly important because pragmatic meanings are not explicitly encoded in linguistic form but are constructed through the integration of contextual information, background knowledge, and assumptions about the speaker's communicative intentions. Once established, such inferences may become incorporated into the listener's discourse representation and may therefore continue to influence subsequent comprehension even when later information contradicts them. Accordingly, the present study addresses two main research questions. First, can a previously generated pragmatic inference be successfully revised when subsequent information is inconsistent with it, or does the original inference remain partially activated and continue to interfere with comprehension? Second, does pragmatic inference revision impose additional processing costs beyond those associated with pragmatic inference generation itself? More specifically, the study examines whether revision is associated with lower comprehension accuracy and longer response times, and whether these effects are specifically attributable to the revision process rather than to pragmatic inference *per se*.

To address these questions, the present study employed natural conversational materials and constructed three experimental conditions: "CI + revision", "CI - revision", and "C". In the "CI + revision" condition, the first response induced a conversational implicature, whereas the subsequent response contradicted that implicature and therefore required participants to revise their initial interpretation. In the "CI - revision" condition, the first response likewise induced a conversational implicature, but the subsequent response remained consistent with the inferred meaning and therefore required no revision. In the "C" condition, the first response did not induce a conversational implicature, and the subsequent information remained consistent with the preceding discourse. This three-condition design allows the processing cost associated with pragmatic inference generation to be distinguished from the additional cost associated with pragmatic inference revision. Specifically, a difference between the pragmatic inference without revision and no pragmatic inference conditions would indicate a cost associated with generating pragmatic meaning, whereas poorer performance in the pragmatic inference revision condition relative to both non-revision conditions would provide evidence that the major processing difficulty arises from revising an already established pragmatic interpretation. By directly comparing these three conditions, the present study aims to clarify how pragmatic meanings are maintained, suppressed, and updated during ongoing conversational comprehension.

2. Methods

2.1. Participants

A total of 40 participants were recruited for this experiment, all of whom were undergraduate or graduate students enrolled at universities in Beijing. After data screening, 37 participants were included in the final analysis (9 males, 28 females), with a mean age of 22.16 years (range: 18–26 years, $SD = 2.51$). All participants were right-handed, as assessed by the Edinburgh Handedness Inventory. They were healthy individuals with no history of language impairment, neurological disorders, brain injuries, or psychiatric disorders. All participants had normal or corrected-to-normal vision.

Participants reported daily reading durations ranging from 1 to 12 hours, with a mean reading time of 4.79 hours ($SD = 3.10$). Their self-rated social status ranged from level 2 to level 9, with a mean score of 5.65

(SD = 1.36). All participants voluntarily participated in the experiment and provided written informed consent prior to the experiment. They received monetary compensation upon completion of the study. None of the participants had previously taken part in experiments involving conversational implicature.

2.2. Materials

The present study also employed everyday conversations as experimental materials. Following previous studies on pragmatic inference involving conversational implicature generation [13, 29] and revision processes [30], the experimental stimuli were carefully constructed. Each dialogue consisted of three components, a brief contextual introduction, a question posed by the first speaker, and two responses provided by the second speaker. Within each set of dialogue materials, the combination of the context, the question, and the first response resulted in two possible situations: the generation of conversational implicature or the absence of conversational implicature. The second response was then designed to either be consistent or inconsistent with the previously generated conversational implicature. Accordingly, each dialogue set contained three experimental conditions: conversational implicature with revision (CI + Revision), conversational implicature without revision (CI – Revision), and no conversational implicature without revision (no CI, no revision) as the control condition (C).

For each dialogue set (three dialogue materials), all components—including the contextual introduction, the question, and the second response—were kept identical across conditions, with the exception of the first response, which served as the critical sentence determining whether conversational implicature was induced. Under this constraint, efforts were made to ensure that the sentences across conditions were matched as closely as possible in terms of length, word frequency, and syntactic structure. In addition, the gender distribution of characters and interpersonal relationships (e.g., supervisors, colleagues, and classmates) were balanced across materials, and different conversational scenarios were designed to minimize repetition.

First, the experimental materials were initially constructed by the researchers, resulting in a total of 80 dialogue sets. Subsequently, four native Chinese speakers were invited to evaluate and revise the materials with regard to their naturalness and conformity with the experimental design. After revision, the 80 dialogue sets were divided into six questionnaires, with each questionnaire containing 40 dialogues. A total of 90 participants were recruited for the norming study, and each participant was randomly assigned to complete one or two questionnaires. The norming study consisted of two main components. The first component focused on the first response in each dialogue. Participants were asked to evaluate the following aspects: (1) whether the response could generate a conversational implicature and whether they could infer the intended meaning; (2) the degree of confidence regarding the presence or absence of conversational implicature (rated on a 7-point scale).

Following the norming procedure, and based on previous research on pragmatic inference and criteria for material selection [15], a dialogue set was retained only if at least 80% of participants correctly interpreted all three experimental conditions within that set. Subsequently, 50 dialogue sets were selected based on their accuracy rates. Finally, three versions of experimental materials were generated according to a Latin square design, ensuring that each dialogue scenario appeared in only one version. Each version consisted of 100 dialogue materials, with 16-17 dialogues assigned to each experimental condition, alongside with 50 fillers. In addition, responses to the questions were balanced, with approximately half of the dialogues involving "yes" responses and the other half involving "no" responses.

2.3. Procedure

First, participants were asked to read and sign the informed consent form and complete the handedness questionnaire. Then, participants were engaged in a self-paced reading task. The experimental procedure was explained to the participants, who completed six practice trials. The materials used in the practice trials were different from those used in the formal experiment, ensuring that participants fully understood the experimental task before the experiment began.

During the formal critical experiment, participants encountered contextual introduction, the question posed by the first person, the first response posed by the second person, and the second response, subsequently. After the completion of the dialogue, a cue screen displaying "???" was presented to alert participants that the subsequent judgment task was about to begin. Then, participants were required to judge whether the second speaker's response to the first speaker's question constituted an affirmative or negative answer.

3. Results

3.1. Data analysis

Three participants whose overall comprehension accuracy fell below 80% were excluded, leaving 37 participants. For the response time analysis, we retained only trials with a correct response and discarded response times more than 3 SDs from a participant's own mean; 1,711 of 1,850 trials (92.5%) entered the final analysis. Accuracy was analysed over all 1,850 trials. Participant means for each measure were submitted to a one-way repeated-measures analysis of variance with condition as a within-participants factor. Mauchly's test indicated that sphericity was violated for both measures, so Greenhouse–Geisser corrected degrees of freedom are reported, and pairwise comparisons were Bonferroni corrected.

3.2. Response times

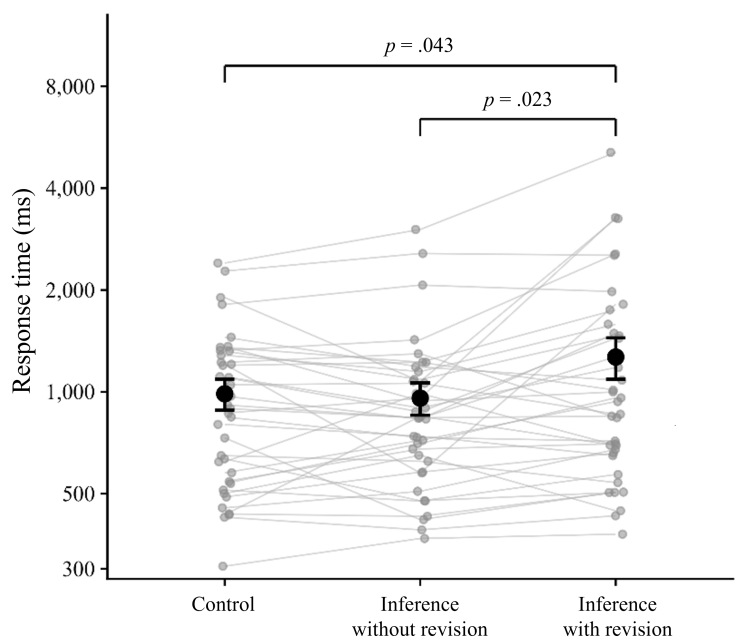


Figure 1. Response times by condition

Mean response times by condition are given in Table 1 and shown in Figure 1. Condition affected how quickly participants answered the comprehension question, $F(1.25, 45.11) = 6.76$, $p = .008$, $\eta_p^2 = .16$. Bonferroni-corrected comparisons (Table 2) showed that responses were 309 ms slower when the initial inference had to be revised than when an inference was drawn but not revised, $t(36) = 2.82$, $p = .023$, $d = 0.46$, and 281 ms slower than in the control condition, $t(36) = 2.57$, $p = .043$, $d = 0.42$. Drawing an inference did not itself slow responses: the unrevised-inference and control conditions did not differ, $t(36) = 0.65$, $p = 1.000$, $d = 0.11$.

Table 1. Mean response times and comprehension accuracy by condition

Condition	Response time (ms)		Accuracy (proportion)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
C (no inference, no revision)	987	517	.983	.032
CI – Revision (CI, without revision)	958	564	.969	.048
CI + Revision (CI, with revision)	1,267	992	.907	.077

Note. $N = 37$. Entries are means of participant means. Response times are based on correct trials after within-participant ± 3 *SD* trimming; accuracy is based on all trials.

Table 2. Bonferroni-corrected pairwise comparisons between conditions

Comparison	Mean difference	95% CI	<i>t</i> (36)	<i>p</i>	Cohen's <i>d</i>
Response time (ms)					
C vs. CI – Revision	28.7	[–82.7, 140.1]	0.65	1.000	0.11
C vs. CI + Revision	–280.6	[–554.7, –6.5]	–2.57	.043	–0.42
CI – Revision vs. CI + Revision	–309.2	[–584.6, –33.9]	–2.82	.023	–0.46
Accuracy (proportion)					
C vs. CI – Revision	.014	[–.006, .034]	1.78	.252	0.29
C vs. CI + Revision	.076	[.045, .107]	6.20	< .001	1.02
CI – Revision vs. CI + Revision	.062	[.027, .098]	4.39	< .001	0.72

Note. $N = 37$. A positive mean difference indicates a higher value for the first condition of the pair, that is, a slower response or a higher proportion correct. Confidence intervals are Bonferroni adjusted for three comparisons. Cohen's *d* is computed for paired samples.

3.3. Comprehension accuracy

Accuracy showed the same pattern (Figure 2), $F(1.49, 53.48) = 23.85$, $p < .001$, $\eta_p^2 = .40$. Participants answered the comprehension question correctly less often when the inference had to be revised than in the control condition, a difference of 7.6 percentage points, $t(36) = 6.20$, $p < .001$, $d = 1.02$, and less often than when the inference was drawn but not revised, a difference of 6.2 percentage points, $t(36) = 4.39$, $p < .001$, $d = 0.72$. The unrevised-inference and control conditions again did not differ, $t(36) = 1.78$, $p = .252$, $d = 0.29$.

Establishing an inference therefore carried no measurable processing cost, whereas revising one both slowed responses by roughly 300 ms and reduced comprehension accuracy by 6 to 8 percentage points. Because revision trials were simultaneously slower and less accurate, the response time difference cannot be attributed to a speed–accuracy trade-off.

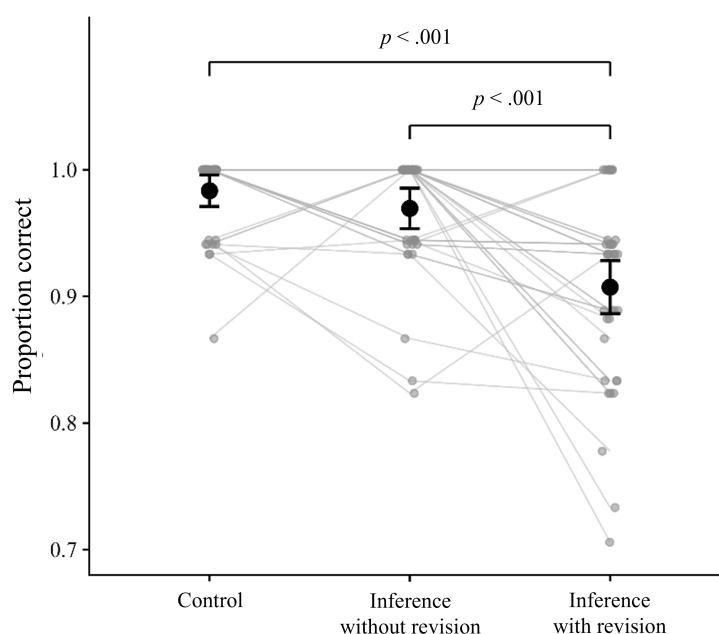


Figure 2. Comprehension accuracy by condition

4. Discussion

The present study employed naturalistic conversational materials and manipulated three experimental conditions, conversational implicature revision, conversational implicature without revision, and no conversational implicature with no revision, to investigate how previously generated pragmatic inferences are processed when confronted with subsequent conflicting information. The results showed that: (1) comprehension accuracy in the conversational implicature revision condition was significantly lower than that in both the conversational implicature maintenance condition and the no conversational implicature with no revision condition, whereas no significant difference was observed between the latter two conditions; (2) response times in the conversational implicature revision condition were significantly longer than those in the other two conditions, while the conversational implicature maintenance condition and the no conversational implicature without revision condition did not differ significantly. These findings indicate that revising a pragmatic inference substantially increases processing difficulty during language comprehension. Importantly, this difficulty does not arise from pragmatic inference itself, but rather from the reanalysis process triggered by inconsistency between an established pragmatic inference and subsequent information.

Pragmatic inferences remain continuously activated after formation and cannot be fully suppressed by subsequent information. The present study found that when subsequent information contradicted a previously established pragmatic inference, participants' comprehension accuracy significantly decreased. This suggests that although listeners are able to detect conflicts between their prior interpretation and newly presented contextual information, such detection does not necessarily result in the immediate elimination of the initial pragmatic inference. In other words, once an implicit meaning is derived from a conversational context, it may enter a relatively stable representational state and continue to influence subsequent information processing. This finding is consistent with previous research on information revision and inference revision. Johnson and Seifert [20, 21], in their studies on misinformation correction, demonstrated that even after individuals receive accurate information and recognize that the original information is incorrect, the initial misinformation may continue to influence subsequent reasoning. This phenomenon, known as the continued influence effect,

suggests that revision during comprehension is not simply a process of replacing old information with new information; rather, it involves both suppression of the previous representation and construction of a new representation. The present study extends this phenomenon to the domain of pragmatic inference, demonstrating that not only explicit factual information but also contextually derived implicit communicative meanings may remain partially activated after revision. A similar pattern has been observed in garden-path sentence research. Christianson et al. [18, 19] found that even after readers successfully resolve syntactic ambiguity, the initially generated misinterpretation may continue to affect subsequent comprehension, resulting in the coexistence of incorrect and correct interpretations. This finding supports the good-enough processing account, which proposes that initial interpretations generated during language comprehension are not completely eliminated after conflict detection but may coexist with revised interpretations. The present finding that comprehension accuracy decreased under the pragmatic inference revision condition further suggests that such dual representation is not limited to syntactic ambiguity resolution but also extends to higher-level pragmatic meaning construction. Furthermore, Potts et al. [22] demonstrated that when subsequent text conflicts with previously generated predictive inferences, the initial inference may remain activated. Consistent with this finding, the present study suggests that pragmatic inference, as a higher-level context-dependent reasoning process, is highly adaptive but its generated interpretation does not disappear immediately when new information becomes available. Instead, it continues to participate in meaning processing for a certain period of time.

Pragmatic inference revision increases online processing demands and reflects a complex reanalysis process. The present study further demonstrated that response times in the pragmatic inference revision condition were significantly longer than those in both the pragmatic inference maintenance condition and the no pragmatic inference without revision condition. This indicates that when an initially generated pragmatic inference conflicts with subsequent information, additional cognitive resources are required to adjust the interpretation. These findings suggest that pragmatic inference revision is not merely a process of detecting an error but involves multiple sequential processing stages. First, individuals must detect inconsistency between incoming information and the existing situation model. Second, they need to suppress the previously established pragmatic interpretation. Finally, they must reconstruct a meaning representation that is compatible with the updated context. Therefore, compared with conditions in which pragmatic interpretations remain consistent, revision conditions require additional executive control and working memory resources. Previous ERP studies provide neural evidence supporting this interpretation. Research on indirect expression comprehension has shown that indirect responses typically elicit enhanced N400 effects, reflecting increased difficulty in semantic integration. Meanwhile, sustained positive shifts or late negative components appearing at sentence-final or critical positions may reflect later pragmatic reanalysis and cognitive control processes [15-17]. Although the present study relied on behavioral measures, the response time results further demonstrate that when pragmatic inferences require reevaluation, the comprehension system needs additional time to complete integration. Moreover, the present study found no significant difference between the pragmatic inference maintenance condition and the no pragmatic inference without revision condition. This result is theoretically important because it indicates that pragmatic inference itself does not necessarily impose additional processing costs. Whether pragmatic inference requires extra cognitive resources has been debated in previous research. Some studies have argued that pragmatic inference constitutes an additional computational process and therefore increases processing demands [5]. In contrast, other studies have suggested that pragmatic meanings can be generated rapidly in highly supportive contexts without substantially increasing processing burden [6]. The current findings support the latter view, suggesting that when no conflict occurs, pragmatic inferences can be efficiently integrated and processed similarly to ordinary

semantic comprehension. The increased processing cost primarily arises from the conflict and revision process after the pragmatic meaning has already been established.

Taken together, the present findings support a dynamic updating model of language comprehension. Language comprehension is not a linear process in which old information is continuously replaced by new information; rather, it involves ongoing evaluation, adjustment, and integration based on existing interpretations. Once listeners generate pragmatic inferences from conversational contexts, these inferences become important components of their current situation models. When subsequent information is consistent with these inferences, comprehension proceeds smoothly. However, when new information contradicts previously established inferences, the comprehension system must reactivate mechanisms for interpretation adjustment. This view is consistent with the structure building framework of discourse comprehension. Gernsbacher et al. [28] proposed that individuals continuously construct and update mental representations during comprehension. When new information conflicts with the current structure, existing representations need to be weakened or suppressed. However, suppression is not always completely effective, particularly when previous information has achieved a high level of activation or carries strong predictive value. Under such circumstances, earlier representations may continue to influence subsequent processing. The present study further demonstrates that pragmatic inferences exhibit similar characteristics. Compared with directly presented information, pragmatic inferences are implicit meanings derived through contextual reasoning. Nevertheless, because they are constructed based on speakers' intentions, contextual knowledge, and communicative goals, they can form psychologically real representations. When subsequent information requires these representations to be rejected, the comprehension system must expend additional cognitive effort to achieve updating.

Previous experimental studies on conversational implicature have primarily focused on whether pragmatic inferences occur and how pragmatic meanings are generated, with particular emphasis on scalar implicature processing [3, 5]. In contrast, relatively little attention has been paid to how established pragmatic meanings are processed when subsequent information contradicts these inferences. By introducing a pragmatic inference revision condition, the present study extends research on pragmatic comprehension from meaning generation to meaning updating. The results demonstrate that pragmatic inference revision not only reduces comprehension accuracy but also prolongs processing time, indicating that once pragmatic meanings are established, they cannot simply be replaced by newly presented information. Instead, they require complex processes involving conflict detection, suppression, and re-integration.

Therefore, the present study expands existing theories of conversational implicature processing by demonstrating that pragmatic inference involves not only an initial meaning derivation stage but also subsequent monitoring and revision stages. Future research may combine ERP, eye-tracking, or neuroimaging approaches to further investigate the temporal dynamics of pragmatic inference revision and to examine how working memory, inhibitory control, and individual differences in language ability modulate this process.

5. Conclusion

This study demonstrates that pragmatic inference revision is a cognitively demanding and dynamic process in natural language comprehension. Although listeners are able to update their interpretations when encountering conflicting information, previously established pragmatic inferences remain partially activated and continue to affect subsequent processing. The findings indicate that pragmatic comprehension involves not only the generation of implicit meanings but also ongoing monitoring, conflict detection, suppression of outdated representations, and construction of revised interpretations. By revealing the persistence of pragmatic

representations and the cognitive demands involved in their revision, this study extends previous research on conversational implicatures from focusing solely on how meanings are generated to exploring how meanings are dynamically updated. These findings provide new theoretical and empirical evidence for understanding the mechanisms underlying language comprehension in natural communication.

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