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Quotation marks and the processing of irony in English: evidence from a reading time study

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Abstract: Quotation marks are used for different purposes in language, one of which is to signal that something has to be interpreted in an ironic way, as in the utterance *What a “nice” day!* said on a rainy and cold day. The present contribution describes a reading time experiment in which we analyzed the processing and understanding of ironic written sentences with or without quotation marks and asked whether and how these marks affect the subjects’ reading of the sentences. Native speakers of English were exposed to two contexts and a subsequent target sentence. Semantically, context and target sentences were connected either ironically or literally or were entirely unrelated. Each of these three meaning conditions contained quotation marks or not. Within the target sentences, which were identical across the different conditions, we measured the reading time before the respective meaning (ironic, literal, unrelated) was revealed, at the phrase that made the scenario ironic, literal, or unrelated, and at the end of the sentence. Furthermore, having read the target sentence, subjects rated how well this sentence fit the preceding context, and the time they needed for their judgment was recorded as well. Results clearly show that quotation marks increase the processing burden first, independently of the meaning specification in a sentence, but then play a crucial and beneficial role in the processing and recognition of irony. We reflect upon these findings against the background of semantic and pragmatic theories of quotation.

Keywords: English; irony; quotation marks; reading time study

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1 Introduction

Language users sometimes state something even though they mean something different from what they said. Consider the examples in (1), all of which imply the contrary of what is literally expressed.

- (1) a. [On a rainy and cold day]
What a nice day!
 b. [When talking about a cheapskate]
He is so generous.
 c. [When standing in a tiny hotel room]
That room is spacious.

In the respective context, it becomes clear that the adjectives are not being used literally but have to be interpreted ironically, evoking an alternate meaning. Now consider the examples in (2).

- (2) a. [On a rainy and cold day]
What a “nice” day!
 b. [When talking about a cheapskate]
He is so “generous”.
 c. [When standing in a tiny hotel room]
That room is “spacious”.

The contexts and statements are the ones from (1) above, the only difference being that this time the word, the adjective, that is used with its non-literal meaning is enclosed by quotation marks (or quotes for short). Relying on such marks is indeed a common practice in language use, and this is where the current investigation comes into play. We aim at examining whether the absence/presence of quotes makes a difference for the reader, that is, whether and how readers benefit from these marks in ironic situations. Our findings will provide insights into the question of the semantic and pragmatic status of quotes. Specifically, we are interested in whether scare quotes are necessary to interpret a written sentence as ironic. Furthermore, we ask whether quotes are immediately processed as a signal of irony, thus supporting a semantic view, or later, at the end of the sentence, supporting a pragmatic implementation of quotes.

To answer these questions, we structured the article in the following way. In Section 2, the semantic and pragmatic aspects of the two central issues, quotes and irony, are discussed in some detail. We are first concerned with the functions and meaning of quotes more generally, before the focus shifts toward the specific interplay of quotes and irony. Section 3 analyzes different processing accounts

from the literature and outlines what is currently known in psycholinguistics about irony on the one hand, and quotes, on the other hand. It becomes clear that no concluding evidence on the role of quotes in the processing of irony is available, which leads us to the reading time experiment we conducted. Our study is presented in Section 4. Native speakers of English were exposed to different scenarios, in which the context and the following target sentence were related ironically or literally, or not at all. The target sentence did not differ across the three meaning specifications “ironic”, “literal”, and “unrelated”. Moreover, all sentences were tested in each of the aforementioned three meaning conditions either with or without quotes. We recorded the reading time at three different positions within the target sentence: before the meaning specification (ironic, literal, unrelated) became clear, when it became clear, and at the end of the target sentence. Having read the target sentence, subjects rated how well this sentence fitted the preceding context, and the time it took to give the rating was measured. The data enable us to draw broad conclusions about the processing benefits and/or burdens quotes bring along if they signal that a linguistic sequence is used with an alternative to what it normally implies. The results are discussed in Section 5 before we conclude in Section 6.

2 Semantics and pragmatics of quotation in ironic contexts

As has often been claimed in the literature, verbal irony, when compared to a direct rejection or insult, has a face-saving function, which is achieved through adding an aspect of wit in a conversational exchange (see, e.g., Dews and Winner 1999; Giora 1995). Dews et al. (1995: 297) state that “speakers choose irony over literal language in order to [...] soften the edge of an insult, to show themselves to be in control of their emotions, and to avoid damaging their relationship with the addressee”. In the current article, we investigate a specific subtype of ironic language, which is linked to the speaker’s reservation with respect to the semantic appropriateness of an expression. One way to indicate this reservation to the addressee is to use quotes.

2.1 Function and meaning of quotation marks

Quotation is a metalinguistic device used to talk about certain dimensions of language (see, e.g., Cappelen and Lepore 1997; Davidson 1979; Saka 1998). In quotational

constructions, expressions are mentioned rather than or in addition to being used denotationally. With an assertion like in (3a), for example, in contrast to (3b), the syllabic setup of the word *sofa* is described and the quotes around *sofa* indicate this use, which means reference is made to a linguistic dimension of the quoted expression (see, e.g., Quine 1981).

- (3) a. *“Sofa” has two syllables.*
 b. *A sofa is a piece of furniture.*

While the notion of quotation relates to a mental operation that enables us to “talk about language” (see Cappelen et al. 2019), quotes represent a material realization of this operation. As typographical means, they materialize as inverted commas by default, but also as italics, bold print, underlining, capitals and others, and are often encoded as air quotes in the gestural mode (see, e.g., Abbott 2003).

Quotes are a means employed to draw the addressee’s attention to the mentioning use of an expression. They have been analyzed as pragmatic markers, indicating a deviation from the standard, denotational use of an expression and giving rise to a non-stereotypical interpretation instead (see, e.g., Finkbeiner 2023; Gutzmann and Stei 2011; Härtl 2018; Klockow 1978). Besides pure quotation, as is illustrated in (3a) above, quotes are also used to signal scare quotation as in (4a), direct quotation, see (4b), and mixed quotation, (4c).

- (4) a. *Their “friend” brought about their downfall.*
 b. *“Something is wrong”, Alan whispered softly to his dolls.*
 c. *The coach declared that his team would “kick arse” today.*

A common definition of the meaning of quotes holds that quotations refer to the expression inside the quotes reflexively (see Ludwig and Ray 2017: 102). There is a debate in the literature about the status of quotes in the compositional structure of a quotation. In semantic analyses, quotes, or their meaning equivalent, are typically assumed to be an essential part of a quotational construction (see, e.g., Predelli 2003). In contrast, pragmatic approaches argue that contextual clues alone are sufficient to construe a quotational meaning, with no need to signal the quotation with a dedicated linguistic marker. Under such a view, quotes are claimed not to be a necessary ingredient in both the written and spoken mode (see, e.g., De Brabanter 2013, 2023; Schlechtweg and Härtl 2020; Washington 1992). This entails considering quotational constructions grammatical when used without quotes and not as being semantically ill-formed, see the example in (5b) below (Saka 1998: 118).

- (5) a. *“Cats” is a noun.*
 b. *Cats is a noun.*

While the reanalysis of a metalinguistic use of an expression may be comparatively effortless in cases like (5b), that is, in cases of pure quotation, it is an open question whether an analogous assumption can be made regarding scare quotation. Compare the scare-quotational example in (4a) above and notice the apparent loss of the ironic tone when the scare quotes are omitted, see (6).¹

(6) *Their friend brought about their downfall.*

On pragmatic accounts, quotes are simple punctuation devices and, as such, “are neither mentioning expressions nor parts of mentioning expressions” (Washington 1992: 591). Approaches of this sort imply that quotes are not “semantic” in the sense that their manifestation is not part of the compositional semantic representation of a quotational construction. As opposed to pragmatic accounts, proponents of a semantic analysis of quotes often claim the presence of quotes to have truth-conditional effects (see Predelli 2003; Simchen 1999). Here, the optionality of quotes can be explained with the quoted material’s semantic embedding, used to compute a mentioning reading of an expression on the fly (see Cappelen and Lepore 1999: 743). With the assumption that quotes are an essential part of a quotation’s semantic representation additional processing costs should be predicted for quotational constructions without quotes, as by omitting quotes a higher inferential load “will be passed onto the addressee” (Wang 2018: 119). Conversely, if quotes are present, they can be argued to ease processing as they explicate “the shift in syntactic and semantic properties effected on the quoted material” (García-Carpintero 2011: 110).

2.2 Irony as echoic mention

A common assumption in the literature on verbal irony is that an ironic utterance articulates an assertion which denotes an alternate of the expression’s literal descriptive content. Consider the example in (7), which, when uttered ironically, asserts that the bar in question is not buzzing with people, that is, an alternative to the expression’s literal meaning.

(7) [At a deserted late night bar]
This place is buzzing with people.

The non-literalness of the meaning of the expression is a central characteristic of ironic language (see, e.g., Sperber and Wilson 1981). From an assertion-oriented viewpoint, verbal irony has been described to involve a form of (indirect) negation

¹ We will come back to this aspect in Section 2.3.

(see Giora 1995). We consider the negated version of the semantic content of (7) to represent the descriptive content of the sentence (see Härtl and Bürger 2021). In contrast, discourse-based approaches view the notion of contextual inappropriateness of the expression as central in explaining the non-literality of ironic speech acts (see Attardo 2000; Dynel 2018).

A second element typically found in ironic utterances is of an expressive nature. It relates to the speaker's intention to produce an evaluative comment reflecting beliefs concerning an entity's value or significance, using criteria governed by a set of cultural standards (see, e.g., Wilson and Sperber 1992). The example in (7), for instance, does not only express that the bar is not buzzing with people, as, at the same time, the speaker articulates a negative evaluation of the corresponding denotatum such that the location is perhaps boring. The evaluative "undertone" expressed with an ironic utterance is typically negative, referred to as ironic criticism, but it can also be positive (ironic praise), as in *That is such a bad grade, Tom!* uttered after Tom received an A grade (see, e.g., Dews and Winner 1999; Kreuz and Link 2002). The default of verbal irony to involve negative attitudinal polarity has been explained by means of a normative bias² (see Kreuz and Glucksberg 1989), which describes people's general aspiration to fulfill social and cultural norms rather than defy them.

A prominent assumption, which we follow here, is that ironic utterances are manifested as an echo (see, e.g., Jorgensen et al. 1984; Wilson 2006). By manifesting the utterance as an echo, the speaker produces a moment of mockery, thus materializing the evaluative content involved in the ironic utterance. Verbal irony as a form of echoic language makes reference to state-of-affairs that are expected or desired based on mutually shared knowledge (see Gibbs and Colston 2007). An utterance can be used ironically by echoing a previous *explicit* remark, for example, *That is a healthy meal, Max!*, uttered after Max promised to cook something healthy, which, however, turns out to be unhealthy. Crucially, an ironic utterance – and we assume this to be equally frequent – can also echo *implicit* assumptions about general norms or standards. Consider the examples in (8).

- (8) a. [On a rainy day]
What lovely weather for a picnic!
 b. [In a tiny apartment]
This is a spacious place!

An utterance like in (8a), when used ironically, relies on shared ideals with respect to the weather conditions during a picnic. Similarly, (8b) relates to norms concerning living conditions and the right size of an apartment. It is commonly shared norms like these that make us understand out-of-the-blue irony in the

² See Wiślicki (2023) for a modal-semantic implementation of this notion.

appropriate sense and that, if successful, warrant the communicative effect intended by the speaker.³

2.3 Quotation marks as indicators of irony

Scare quotation is a metalinguistic device used to indicate that an expression is not being used in the way the producer of the utterance would personally use it. Consider the following examples.

- (9) a. *The “hotel” turned out to be a small Bed & Breakfast.*
 b. *The “beach” was a thin strip of black volcanic grit.*
 c. *Peter’s “theory” is difficult to understand.*
 (Finkbeiner 2015: 158)

In the examples in (9), the quotes signal the speaker’s reservation with respect to the semantic appropriateness of the expression in quotation marks (see Finkbeiner 2015; Meibauer 2007; Predelli 2003). The current study aims at this particular type of scare quotation, which we assume to give rise to an ironic reading of the expression in quotation marks. As a manifestation of the use of irony, see Section 2.2, the quotes are used here to indicate a non-literal reading and add distancing attitudinal content to the utterance, typically as an expression of a (negative) evaluation of the quoted material’s denotatum.⁴

A lexical materialization of this meaning of quotes is the modifier *so-called*, cf. *The so-called “hotel” turned out to be a small Bed & Breakfast* (see Finkbeiner 2015; Härtl 2018; Härtl and Seeliger 2019 for analyses). Observe that the meaning of *so-called* and the meaning of the quotes are underspecified so that the quotational construction can also adopt a non-ironic reading. This use is illustrated in the examples in (10).

- (10) a. *The company is going to spend a lot of money in support of so-called “cultural diversity”.*
 b. *Many politicians have blamed recent electoral trends on the rise of so-called “fake news”.*

3 Observe that the assumption that verbal irony relies on shared background knowledge can also be used to explain why ironic utterances in German often involve the modal particle *ja*, e.g., *Das ist ja ein schönes Wetter!* (‘that is PRT a lovely weather’, *What lovely weather!*) as *ja*, when used with its discourse function, refers the addressee to a proposition somehow retrievable from a shared common ground (see Zimmermann 2012).

4 The use of quotation to indicate verbal irony can be seen as a reflection of specific, irony-indicating intonational cues. For an empirical investigation of the relation between intonation and irony see, e.g., Bryant and Fox Tree (2002).

Quotational constructions of this type give rise to a certain vagueness and allow both a name-informing and a modalizing, distancing interpretation (see Härtl 2018). Notice, however, the critical difference between the examples in (9) and the ones in (10). While the quotational constructions in (10) may also be interpreted as attitudinally distancing, comparable to the examples in (9), only the quoted material in (9) is interpreted to be used non-literally.

Our understanding of the type of scare quotes illustrated in (9) as giving rise to verbal irony is compatible with Wiślicki (2023) approach, in which scare quotes are analyzed as deontic modals. According to the account, the meaning of scare quotation is based on salient norms and their use is driven by the fact that an expression is judged as being at odds with these norms. Wiślicki assumes that scare quotation is regulated by a subpart of grammar, that is, modality, which can operate metalinguistic mechanisms like quotation. Such a view entails that the interpretation of scare quotations emerges compositionally and is computed based on the conventionalized meanings of the expressions contained in the quotational construction. While we follow the assumption that scare quotation itself is derived compositionally, we believe that it is still an open question whether such a view also entails that scare quotes are semantically processed “on the fly” in a sentence or rather at later stages, when semantic representations are adjusted to match contextual and discourse conditions.

Wiślicki (2023) account remains neutral with respect to the problem of non-quotational irony, that is, ironic utterances used without quotes. A comparison between scare quotations with and without quotes reveals that the perception of non-quotational irony is highly context-dependent (in the written mode). While an example like in (6), repeated in (11a) below, may not be interpreted as ironic at all without the use of non-verbal markers such as intonation, in certain contexts, contextual information alone suffices to derive an ironic interpretation of an expression used without quotes. Consider the example in (11c), in which the adjective *generous* is likely to be interpreted non-literally in both its unquoted as well as its quoted use.

- (11)
- a. *Their friend brought about their downfall.*
 - b. *Their “friend” brought about their downfall.*
 - c. *The truly amazing amount of \$75 was donated to the earthquake victims by the generous/“generous” millionaire.*

The question is still unanswered to what extent non-quotational and quotational irony are treated differently in processing. The current study addresses this gap (i) by examining the online comprehension of an ironic expression used with and without quotes and (ii) later interpretational processes linked to the wrap-up of ironic and non-ironic utterances, respectively.

3 State of the art: processing accounts

3.1 Processing of verbal irony

The psycholinguistic literature on irony comprehension aims at understanding the cognitive mechanisms associated with figurative language, its acquisitional development as well as cognitive impairments affecting irony comprehension (Gibbs and Colston 2007). In most studies, ironic utterances are contrasted against utterances with literal meanings, focusing on a normative evaluation bias that ironic utterances exhibit (Kreuz and Glucksberg 1989) or on characterization of ironic language as a form of echoic mention (Jorgensen et al. 1984). More recent experimental studies connect the notion of echoic mention with the process of mindreading, i.e., the ability known as Theory of Mind (see, e.g., Spotorno and Noveck 2014). Such accounts entail that the echo, mentioned ironically by a speaker, requires understanding on the recipient's side that the speaker reproduces a representation of another representation. This is only possible if the recipient monitors and anticipates the speaker's intentions and beliefs (Ronderos et al. 2020).

The comprehension of irony is often assumed to progress in a stepwise manner and to rely on lexical information. Salient meanings are processed initially, and less salient meanings are inferred resulting from a mismatch with contextual information (Giora and Fein 1999). Results from ERP studies suggest that processing semantic information is costlier during irony comprehension, reflected in a more pronounced N400 amplitude or a P200/P600 pattern, which is interpreted to mirror early lexical-semantic integration difficulties followed by a reanalysis that irony as a form of negation entails (see, e.g., Regel 2009; Regel et al. 2011).

With a similar reasoning, Schwoebel et al. (2000) report on data from a reading time study, which shows that ironic sentences in irony-biasing contexts take longer to process than literal ones in literal-biasing contexts, thus suggesting that the literal meaning of an ironic utterance is co-activated before the intended meaning is computed. The findings support a staged model of irony processing, in which the literal meaning of an ironic utterance is obligatorily processed, see also Dews and Winner (1999). In contrast, in models which deny the distinction between literal and non-literal meaning in the comprehension of verbal irony, the processing effort needed to comprehend ironic and literal utterances is equivalent (see, e.g., Gibbs 1986).

Crucially, the pattern has been argued to be modulated through cueing by quotation marks (Regel 2009; Regel et al. 2011). As regards the conceptual prominence of different contents involved in ironic utterances, Härtl and Seeliger (2019)

report that non-literality of expressions involved in ironic utterances is at-issue “the most”, while the speaker’s attitude to evaluate a referent (negatively) is treated as at-issue the least. As concerns prosodic cues, ironic utterances have been shown to be accompanied by variations in fundamental frequency (F0) and duration compared to non-ironic utterances (Anolli et al. 2000; Cheang and Pell 2008; Rockwell 2000).

3.2 Processing of quotation marks

This section looks at research that has investigated whether and how language users process quotes. The first studies we consider here examined possible correlates of written quotes in spoken language. If quotes are pronounced, this indicates that they are processed in one way or another. In her first experimental step, Kasimir (2008) asked subjects to read out German sentences without quotes and the same sentences with quotes (see 12).

- (12) a. *Die Grüne Bundestagsabgeordnete Monika Knoche kritisiert, dass die Verordnung damit einem faktischen Verbot von Codein gleichkommt.*
 ‘The green deputy Monika Knoche criticises that therewith this bye-law amounts to a factual verdict on codeine.’
- b. *Die Grüne Bundestagsabgeordnete Monika Knoche kritisiert, dass die Verordnung damit einem „faktischen Verbot“ von Codein gleichkommt.*
 ‘The green deputy Monika Knoche criticises that therewith this bye-law amounts to a “factual verdict” on codeine.’
 (Kasimir 2008: 70)

Having collected the production data, the author tested in subsequent experiments whether one can hear quotes. Although Kasimir (2008) presents a small piece of evidence that quotes are expressed in and perceived from spoken language, the project suffers from several decisive shortcomings, such as very small sample sizes, the lack of an acoustic analysis, the lack of a statistical analysis, and the confusion of various types of quotation (see Schlechtweg and Härtl 2020 for a profound discussion). Apel et al. (2020) also analyzed whether speakers produce and/or perceive quotes in German by relying on speech from radio news. They argue that accentuation of the word between quotes as well as a prosodic cut before and after this word are indicators of quotes in spoken language. Although their study is more comprehensive in comparison to Kasimir (2008), it also lacks an acoustic and an adequate statistical analysis that are indispensable to make convincing statements about whether and how quotes are realized acoustically. While Kasimir’s (2008) and Apel et al.’s (2020) findings are of limited use, Schlechtweg and Härtl (2020) clearly

demonstrated for German that quotes, specifically those that have a name-informing function, are read out. Consider the examples in (13).

- (13) a. *Viele Mönche tragen die sogenannte Kutte täglich von morgens bis abends.*
 ‘Many monks wear the so-called robe everyday from morning to night.’
- b. *Viele Mönche tragen die sogenannte „Kutte“ täglich von morgens bis abends.*
 ‘Many monks wear the so-called “robe” everyday from morning to night.’

The authors considered different parts of an utterance, namely the syllable before the first quotes (Position 1, i.e., *te* of *sogenannte* in 13a–b), the syllable after the first quotes (Position 2, i.e., *Ku* of *Kutte* in 13a–b), the syllable before the second quotes (Position 3, i.e., *tte* of *Kutte* in 13a–b), and the syllable after the second quotes (Position 4, i.e., *täg* of *täglich* in 13a–b). With quotes, syllables and/or parts of the syllables became longer, had a higher maximum fundamental frequency, and/or showed a higher maximum intensity, and this primarily in Position 2, 3, and 4. Overall, Schlechtweg and Härtl’s (2020) findings illustrate that quotes play a role in language processing since they are produced.

On the basis of electrophysiological evidence, Regel (2009) investigated the role of written quotes in the interpretation of irony. She relied on sentences as those in (14).

- (14) a. Literal meaning and no quotes
Michaels Freundin hat sich neben vielen anderen Bewerbern an der Schauspielschule beworben. Nach mehrmaligem Vorsprechen erhält sie tatsächlich eine Zusage. Michael freut sich sehr für sie und sagt begeistert: Das ist ja großartig.
 ‘Michael’s girlfriend applied, as many other candidates, at the drama school. After several interviews, she really got accepted. Michael is very happy for her and states with enthusiasm: That’s great.’
- b. Literal meaning and quotes
Michaels Freundin hat sich neben vielen anderen Bewerbern an der Schauspielschule beworben. Nach mehrmaligem Vorsprechen erhält sie tatsächlich eine Zusage. Michael freut sich sehr für sie und sagt begeistert: Das ist ja „großartig“.
 ‘Michael’s girlfriend applied, as many other candidates, at the drama school. After several interviews, she really got accepted. Michael is very happy for her and states with enthusiasm: That’s “great”.’

c. Ironic meaning and no quotes

Am Wochenende wollte Michael noch schnell ein paar Sachen einkaufen. Als er im Supermarkt zur Kasse geht, ist dort eine lange Schlange wartender Leute. Verdrießlich stellt sich Michael an und meint: Das ist ja großartig.

‘Michael wanted to quickly buy some items at the weekend. When he moved to

the checkout in the supermarket, he saw a long line with people who were waiting. Not having an alternative, he lined up and said: That’s great.’

d. Ironic meaning and quotes

Am Wochenende wollte Michael noch schnell ein paar Sachen einkaufen. Als er im Supermarkt zur Kasse geht, ist dort eine lange Schlange wartender Leute. Verdrießlich stellt sich Michael an und meint: Das ist ja „großartig“.

‘Michael wanted to quickly buy some items at the weekend. When he moved to

the checkout in the supermarket, he saw a long line with people who were waiting. Not having an alternative, he lined up and said: That’s “great”.’

Based on her data, she concludes that quotes do not improve the interpretation of irony if the aforementioned conditions are used and suggests that a potential reason for this outcome might be that the function of quotes was lost. That is, since they occurred not only in ironic instances, where they are appropriate, but also in literal ones, where they are inappropriate, their impact on the processing of irony might have disappeared. As a consequence, another experiment was conducted without the condition illustrated in (14b) above. This time, an effect was detected. Overall, however, Regel’s (2009) work has shortcomings. First, in the revised experiment without the condition given in (14b), the design is not ideally balanced in our view, and we consider the complete design with all of the four conditions more promising since it might reveal informative interaction effects in that, for instance, quotes could trigger the opposite effects in ironic in comparison to literal scenarios. Second, placing the target word that either contained quotes or not at the end of the sentence is problematic. Doing so, it is impossible to disentangle immediate and delayed effects of quotes. Placing the quotes around a word that is *not* the final word of a sentence would have the advantage that one could separate the direct effects of quotes at the position where they appear from effects at the end of the sentence, where the sentence is interpreted as a whole. Third, the examples shown in (14) are also inadequate since different types of quotation are mixed up. The paragraphs not only contain scare quotation but also direct and/or mixed quotation. It becomes clear that the final sequence including the target word has been uttered by a person, which implies other types of quotation. This creates a whole bunch of related issues, such as the question why this directly quoted sequence is not embraced by

quotes, as one would expect.⁵ Taken together, we believe that the design of the studies was not ideal to investigate the topic of interest.

In sum, considering the processing of quotes in general and in ironic contexts in particular, we can say that there is clear evidence that quotes are produced (specifically if they have a name-informing function). The perception side, however, is still understudied and this is where the current project comes into play. Moreover, we still lack convincing evidence on the function quotes specifically have in ironic scenarios.

4 Methodology

The present experiment was a reading time study conducted with the software E-Prime 3.0 (Psychology Software Tools 2016) and aimed at investigating whether and how the presence of quotes supports the recognition of ironic contents. Participants read two context sentences first and one target sentence afterward. The target sentence was identical in all conditions but triggered a literal, ironic, or unrelated interpretation depending on the particular preceding context. Reading times were measured at different positions within the target sentence. Moreover, subjects rated how well the context and target sentence fitted together and the time for this decision was recorded as well.

4.1 Subjects

36 native speakers of English participated in the study (20 females, 16 males).⁶ Their mean age was 28.61 years (standard deviation = 6.26). They had an academic background, corrected or corrected-to-normal vision, and declared no speech disorder.

4.2 Materials

The test materials consisted of 60 sentences, each of which was used in the six conditions presented in (15), (16), and (17).

⁵ Even if this had been corrected, the question would have arisen which type of quotation marks were then needed around the target word *großartig* 'great', standard double marks or single ones as is more common if quotation marks occur within other quotation marks.

⁶ Two further subjects indicated only native-like – and not native – competence in English. Their data was not considered in the analysis.

- (15) a. Literal meaning and no quotes
 [Context]
Yesterday, a young woman won the jackpot of this month's lottery. She decided to donate ten million of the thirty million dollars to cancer research.
 [Target sentence]
We all hope that the generous lady uses the rest of the money to fulfill her own dreams.
- b. Literal meaning and quotes
 [Context]
Yesterday, a young woman won the jackpot of this month's lottery. She decided to donate ten million of the thirty million dollars to cancer research.
 [Target sentence]
We all hope that the "generous" lady uses the rest of the money to fulfill her own dreams.
- c. Ironic meaning and no quotes
 [Context]
Yesterday, a young woman won the jackpot of this month's lottery. She decided to donate sixteen cents of the thirty million dollars to cancer research.
 [Target sentence]
We all hope that the generous lady uses the rest of the money to fulfill her own dreams.
- d. Ironic meaning and quotes
 [Context]
Yesterday, a young woman won the jackpot of this month's lottery. She decided to donate sixteen cents of the thirty million dollars to cancer research.
 [Target sentence]
We all hope that the "generous" lady uses the rest of the money to fulfill her own dreams.
- e. Unrelated meaning and no quotes
 [Context]
Today, a small mouse damaged the engine of the Prime Minister's car. He decided to take the bicycle of his neighbor's grandson to the important summit.
 [Target sentence]
We all hope that the generous lady uses the rest of the money to fulfill her own dreams.
- f. Unrelated meaning and quotes
 [Context]

Today, a small mouse damaged the engine of the Prime Minister's car. He decided to take the bicycle of his neighbor's grandson to the important summit.

[Target sentence]

We all hope that the "generous" lady uses the rest of the money to fulfill her own dreams.

- (16) a. Literal meaning and no quotes

[Context]

A new trend for next summer was presented at this year's fashion week. All accessories were pink, blue, and green.

[Target sentence]

It remains to be seen whether the colorful style will be accepted among fashion lovers.

- b. Literal meaning and quotes

[Context]

A new trend for next summer was presented at this year's fashion week. All accessories were pink, blue, and green.

[Target sentence]

It remains to be seen whether the "colorful" style will be accepted among fashion lovers.

- c. Ironic meaning and no quotes

[Context]

A new trend for next summer was presented at this year's fashion week. All accessories were white, black, and gray.

[Target sentence]

It remains to be seen whether the colorful style will be accepted among fashion lovers.

- d. Ironic meaning and quotes

[Context]

A new trend for next summer was presented at this year's fashion week. All accessories were white, black, and gray.

[Target sentence]

It remains to be seen whether the "colorful" style will be accepted among fashion lovers.

- e. Unrelated meaning and no quotes

[Context]

At this year's Super Bowl, a new security system was used. Controls were twenty times faster than last year.

[Target sentence]

It remains to be seen whether the colorful style will be accepted among fashion lovers.

- f. Unrelated meaning and quotes

[Context]

At this year's Super Bowl, a new security system was used. Controls were twenty times faster than last year.

[Target sentence]

It remains to be seen whether the "colorful" style will be accepted among fashion lovers.

- (17) a. Literal meaning and no quotes

[Context]

On average, the sun shines ten hours a day in Cuba. This year, again, no rain during the entire season increased the number of tourists.

[Target sentence]

There is no doubt that the sunny island has been affected in a significant way.

- b. Literal meaning and quotes

[Context]

On average, the sun shines ten hours a day in Cuba. This year, again, no rain during the entire season increased the number of tourists.

[Target sentence]

There is no doubt that the "sunny" island has been affected in a significant way.

- c. Ironic meaning and no quotes

[Context]

On average, the sun shines ten hours a day in Cuba. This year, however, daily rain during the whole season decreased the number of tourists.

[Target sentence]

There is no doubt that the sunny island has been affected in a significant way.

- d. Ironic meaning and quotes

[Context]

On average, the sun shines ten hours a day in Cuba. This year, however, daily rain during the whole season decreased the number of tourists.

[Target sentence]

There is no doubt that the “sunny” island has been affected in a significant way.

- e. Unrelated meaning and no quotes

[Context]

On average, Dutchmen ride on their bicycle two and a half hours a day. This is partly due to the well-constructed cycle path network.

[Target sentence]

There is no doubt that the sunny island has been affected in a significant way.

- f. Unrelated meaning and quotes

[Context]

On average, Dutchmen ride on their bicycle two and a half hours a day. This is partly due to the well-constructed cycle path network.

[Target sentence]

There is no doubt that the “sunny” island has been affected in a significant way.

The target sentences were identical across the six conditions, the only difference being the absence ([15a], [15c], [15e]/[16a], [16c], [16e]/[17a], [17c], [17e]) and presence ([15b], [15d], [15f]/[16b], [16d], [16f]/[17b], [17d], [17f]) of quotes. Each item was tested in each meaning specification – literal, ironic, unrelated – both with and without quotes. The preceding context was always made up of two sentences and served to trigger one of the three meaning specifications in the target sentence. In (15a), (15b)/(16a), (16b)/(17a), (17b), the relation between the context and the target sentence was literal, in (15c), (15d)/(16c), (16d)/(17c), (17d) it was ironic, and in (15e), (15f)/(16e), (16f)/(17e), (17f) it was semantically unrelated. The length of the three different contexts – one for (15a), (15b)/(16a), (16b)/(17a), (17b), one for (15c), (15d)/(16c), (16d)/(17c), (17d), and one for (15e), (15f)/(16e), (16f)/(17e), (17f) – was held as constant as possible.

In all target sentences, an embedding clause was part of a matrix clause. More specifically, we subdivided the target sentences into three parts. First, the beginning was kept rather general. Examples are *It is now official that*, *It is clear that*, *It has been announced that*, or *It seems that*. Second, the target sequence within the target sentence followed, in which the quotes were either absent or present. The target sequence consisted of the word *the*, an adjective, and a noun. If quotes appeared within the target sentence, they embraced the adjective. Third, the target sentences ended by another general sequence that fitted to all of the three meaning variants.

The adjective within the target sequence was the decisive ingredient to uncover whether the sentence was supposed to be interpreted in a literal or ironic way. In the ironic cases, the context triggered the opposite meaning of the literal meaning of the adjectives. Quotes only appeared in the target sequence in the target sentence but not at any other position with the target sentence or the context.

4.3 Procedure

The experiment was conducted in a silent room and lasted for about 15 min. Subjects were seated approximately 40 cm away from a computer screen. The test materials appeared in black color on a white background on the screen. E-Prime 3.0 was used to build and conduct the experiment.

Each trial was structured in the following way. The two context sentences were shown on the computer screen at once. Once a subject had finished reading the context, the space bar was pressed to continue (the context reading time was recorded). Now, the first part of the target sentence appeared. Having read this part, subjects pressed the space bar again and the time they needed to read the first part of the target sentence was recorded. When the space bar had been pressed, the second part of the target sentence, namely the target sequence was shown. Having read this part, participants pressed the space bar and the time it took them to read the target sequence was measured. The third part of the sentence appeared, subjects read it, and pressed the space bar upon completion. The reading time was recorded again. After this button press, participants were asked to rate how well the context and the target sentence fitted together by using a scale from 1 (“Fits extremely well”) to 6 (“Fits extremely badly”). The time they needed to make the decision was measured as well. The procedure is summarized in Figure 1 relying on the example given in (15) above.

Overall, we used a total of 360 test cases (60 different contexts and test sentences \times 6 conditions listed in [15–17]); however, each subject was exposed to each example in only one of the six conditions and was thus exposed to a total of 60 examples (6 conditions \times 10 examples per condition) during the experiment. The 60 examples were randomized for each subject. Prior to the real experiment, all subjects took part in a test trial to get familiar with the procedure.

4.4 Hypotheses and questions

Our hypotheses and questions for the individual scenarios were as follows.

General issue:

Since the target sentences in each of the conditions given in (15), (16), and (17) were identical, we did not expect any difference across the conditions at Reading time 1.

Literal meaning:

(15a), (16a), and (17a) are the default case, in which a literal interpretation without quotes is given. In the rating, the target sentence of this condition should be considered to “fit very well” to the preceding context. Further, no processing

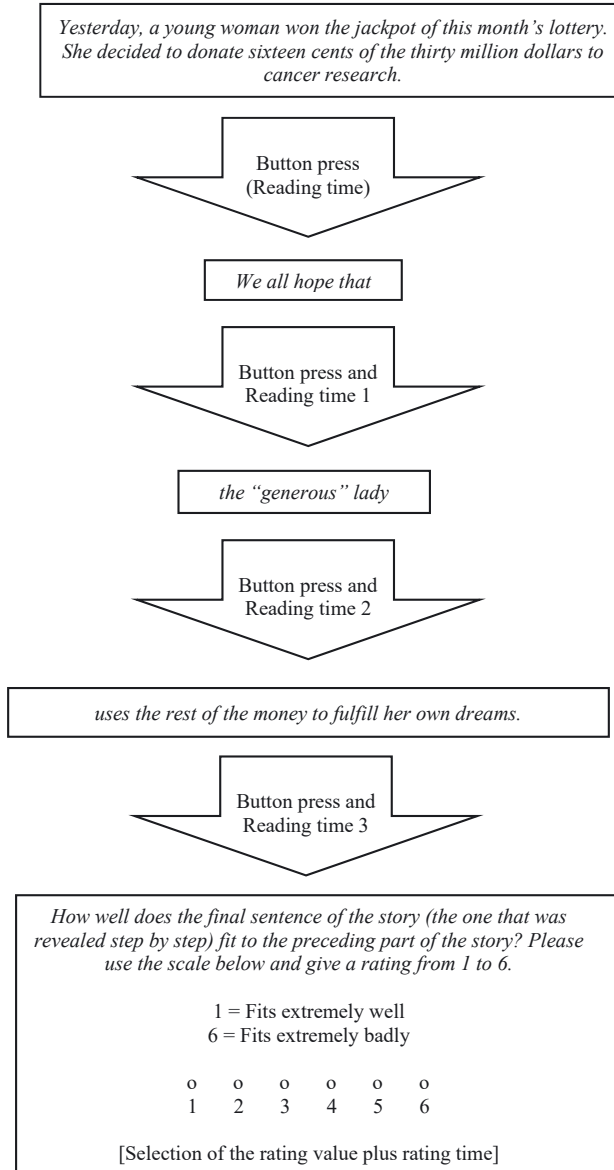


Figure 1: Trial structure of the reading time experiment.

burdens should be reflected in the reading times at the critical phrase and sentence-finally, nor in the rating times. (15b), (16b), and (17b) are identical to (15a), (16a), and (17a), respectively, with the exception that quotes are now present in the

target sentence. The presence of quotes in a literal scenario is inappropriate and should lead to a more negative rating. We also expected longer rating times since subjects should have difficulties in accepting the combination of a literal meaning and quotes. Further, quotes should lead to inhibition and create a processing burden, in comparison to (15a), (16a), and (17a), mirrored in the reading latencies, and we needed to find out where precisely the delay appears in order to support either a semantic or a pragmatic view towards quotation. If Reading time 2 indicates an inhibition, this would support a semantic implementation of quotes. If Reading time 3 shows the inhibition, this would indicate that the full context is decisive and would therefore support a pragmatic approach.

Ironic meaning:

For (15c), (16c), and (17c) and (15d), (16d), and (17d), we hypothesized the opposite pattern, that is, quotes should facilitate the processing and acceptability of irony, expressed, first of all, in better ratings and shorter rating times in (15d), (16d), and (17d) compared to (15c), (16c), and (17c). Second, quotes should lead to facilitation when subjects are exposed to ironic sentences, and we intended to answer the decisive question of where the facilitation occurs. An effect at Reading time 2 would be in favor of a semantic viewpoint since quotes were truth-conditionally relevant. Sentence-final facilitation, however, would support a pragmatic account in the sense that broader contextual information is indispensable to accommodate the ironic content of the sentence.

Unrelated meaning:

The conditions exemplified in (15e), (16e), and (17e) and (15f), (16f), and (17f) served as a semantic baseline, where no differences in latencies and ratings were expected.

4.5 Statistical analysis and modeling

From the 2,160 individual cases (36 subjects \times 60 cases per subject), 72 (3.33 percent) were excluded from all further analyses since they were associated with context reading times lower than 4 s and it was assumed that at least 4 s are necessary to read and understand the context. The subsequent analyses were performed with the statistical software R (R Core Team 2021) and the respective and mentioned packages.

Separate analyses were conducted for the five response variables *READING TIME 1*, *READING TIME 2*, *READING TIME 3*, *RATING TIME*, and *RATING*. The explanatory variables were *QUOTES* (yes, no) and *MEANING* (ironic, literal, unrelated). In the first step of the four analyses of *READING TIME 1*, *READING TIME 2*, *READING TIME 3*, and *RATING TIME*, we considered all values plus and minus 2.5 standard deviations from the overall mean to be

extreme values and removed these from the datasets (see, e.g., Loewen and Plonsky 2016: 134). Doing so, we discarded 2.78 (READING TIME 1), 2.83 (READING TIME 2), 1.63 (READING TIME 3), and 1.77 percent (RATING TIME) of the data. Second, the five response variables were visually/descriptively inspected. Third, the four continuous response variables READING TIME 1, READING TIME 2, READING TIME 3, and RATING TIME were log transformed (to the base 10) (see, e.g., Winter 2020: 91).

Fourth, linear mixed effects models were calculated for the four continuous variables using the `lmer` function of the `lme4` package (Bates et al. 2015) and the `lmerTest` package (Kuznetsova et al. 2017) in R.⁷ The two variables of interest, QUOTES and MEANING, as well as their interaction, were entered as fixed effects into the model. Random intercepts for SUBJECT and ITEM as well as random slopes for both QUOTES and MEANING by both SUBJECT and ITEM were also part of the initial maximal model. We started the model fitting process with this maximal model (fit by maximum likelihood; see, e.g., Field et al. 2012: 879; *t* tests use Satterthwaite's method). Even though both random intercepts and slopes are desirable in models (see, e.g., Winter 2020: 235), complex random effects structures may be problematic and should be reduced under specific circumstances (see, e.g., Barr et al. 2013; Cohen and Kang 2018; Matuschek et al. 2017; Martin Schweinberger p.c.). For each of the four continuous response variables, the final model on which our interpretations were based was the one closest to the above-named maximal model for which no convergence issues were detected in R. To ensure that these issues did not occur, we used the `lmer` function of the `lme4` package. The final model for each of the four continuous response variables contained the fixed effects QUOTES, MEANING, their interaction, and the random intercepts for SUBJECT and ITEM. The specific random slopes included in each of the four models, if any, are specified in the respective subsections (see Section 4.6).

While relying on linear mixed effects models during the analysis of the continuous response variables, we fitted a cumulative link mixed model (with Laplace approximation; see, e.g., Finch et al. 2014) to examine the factor-transformed response variable RATING (see, e.g., Winter 2020: 213), using the `clmm` function of the `ordinal` package (Christensen 2019). Here, the fixed effects QUOTES and MEANING as well as their interaction and the random intercepts for SUBJECT and ITEM were part of the model; random slopes were not integrated (see, e.g., Finch et al. 2014; Kenett and Salini 2011).

Fifth, having fitted the models, planned pairwise comparisons were conducted relying on the Tukey test and the `lsmeans` function of the `lsmeans` package (Lenth 2016) in R. This subsequent step is documented in the literature for different

7 The tidyverse package was also used during the analyses (Wickham et al. 2019).

types of regression analyses, including logistic/ordinal regression (see, e.g., Kim and Yoon 2020; Montrul et al. 2019).⁸

4.6 Results

In the following, we present the results of the five response variables in different sections.

4.6.1 READING TIME 1

In this section, the results of the analysis of *READING TIME 1* are presented. The variable refers to the time needed to read the first piece of the target sentence, specifically the portion *We all hope that* in Example (15) above. The descriptive analysis is given in Figure 2.

The final mixed effects model was the one containing the two fixed effects *QUOTES* and *MEANING*, their interaction, and the random intercepts for *SUBJECT* and *ITEM*. The results of the model are given in Tables 1 and 2.

The analysis of *READING TIME 1* does not reveal significant differences (see Table 2; ignoring the intercept). In other words, as long as there are no differences in the target sentences across the conditions, the reading times remain similar (see also Figure 2). Since the portion of the target sentence in focus here was identical in all of the six conditions, a difference between any of the groups was not expected. On the basis of this successful baseline, we can proceed to the other response variables.

4.6.2 READING TIME 2

This section refers to the results of the analysis of *READING TIME 2*, which is the time subjects needed to read the second part of the target sentence, specifically the portion *the “generous” lady* in Example (15) above. The descriptive analysis is given in Figure 3.

The final mixed effects model was the one containing the two fixed effects *QUOTES* and *MEANING*, their interaction, the random intercepts for *SUBJECT* and *ITEM*, and the random slope for *MEANING* by *SUBJECT*. The results of the model are given in Tables 3 and

⁸ In one case, doing Tukey comparisons caused convergence issues and we therefore decided to select the next appropriate linear mixed effect model, for which no convergence issues were signaled during any step of the analysis.

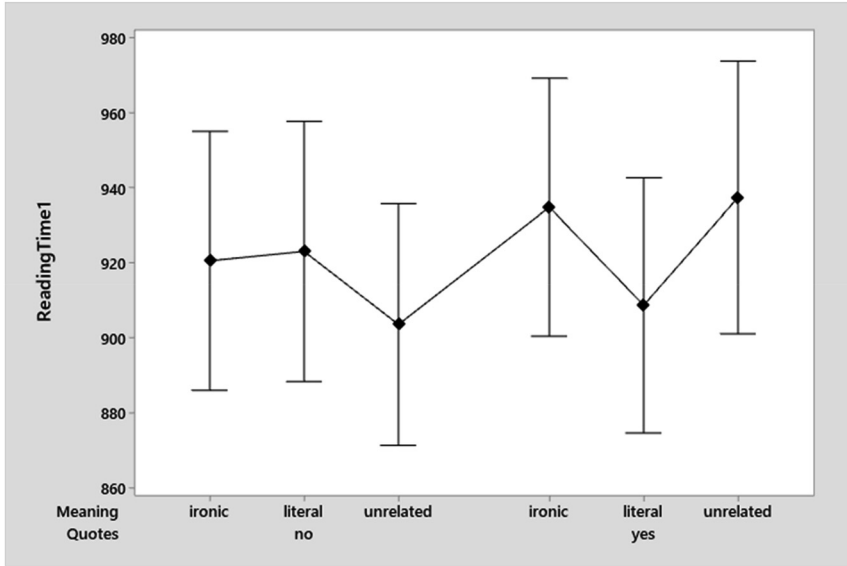


Figure 2: Error bars READING TIME 1 (95% confidence intervals). Raw reading times without statistical outliers. The diamond symbols represent the means. The graphs were created in Minitab (Minitab 2019).

Table 1: Random effects statistics of the mixed-effects model of READING TIME 1.

	Variance	Standard deviation
ITEM (intercept)	0.002533	0.05033
SUBJECT (intercept)	0.006829	0.08264
Residual	0.012797	0.11312

Table 2: Fixed effects statistics of the mixed-effects model of READING TIME 1.

	Estimate	Std. error	df	t value	Pr(> t)
(Intercept)	2.938e+00	1.643e-02	6.534e+01	178.882	<2e-16***
Quotesyes	8.524e-03	8.658e-03	1.936e+03	0.985	0.325
Meaningliteral	2.654e-03	8.698e-03	1.936e+03	0.305	0.760
Meaningunrelated	-2.997e-03	8.748e-03	1.936e+03	-0.343	0.732
Quotesyes:Meaningliteral	-1.681e-02	1.230e-02	1.936e+03	-1.366	0.172
Quotes yes:Meaningunrelated	1.867e-03	1.231e-02	1.936e+03	0.152	0.879

4. Since the model indicates significant values, we present the results of the pairwise comparisons in Table 5.

The analysis of *READING TIME 2* demonstrates that, upon their appearance, quotes create a processing burden and lead to significantly longer reading times across the board and independently from the meaning specification. This becomes evident, for instance, in the descriptive analysis in Figure 3 and in the pairwise comparisons “NQ – Q”, “(NQ + I) – (Q + I)”, “(NQ + L) – (Q + L)”, and “(NQ + U) – (Q + U)” given in Table 5.

4.6.3 *READING TIME 3*

The current section reflects upon the results of the analysis of *READING TIME 3*, which is the time subjects needed to read the third part of the target sentence, specifically the portion *uses the rest of the money to fulfill her own dreams* in Example (15) above. The descriptive analysis is given in Figure 4.

The final mixed effects model was the one containing the two fixed effects *QUOTES* and *MEANING*, their interaction, the random intercepts for *SUBJECT* and *ITEM*, and the random slopes for *MEANING* by *SUBJECT* and *ITEM*. The results of the model are

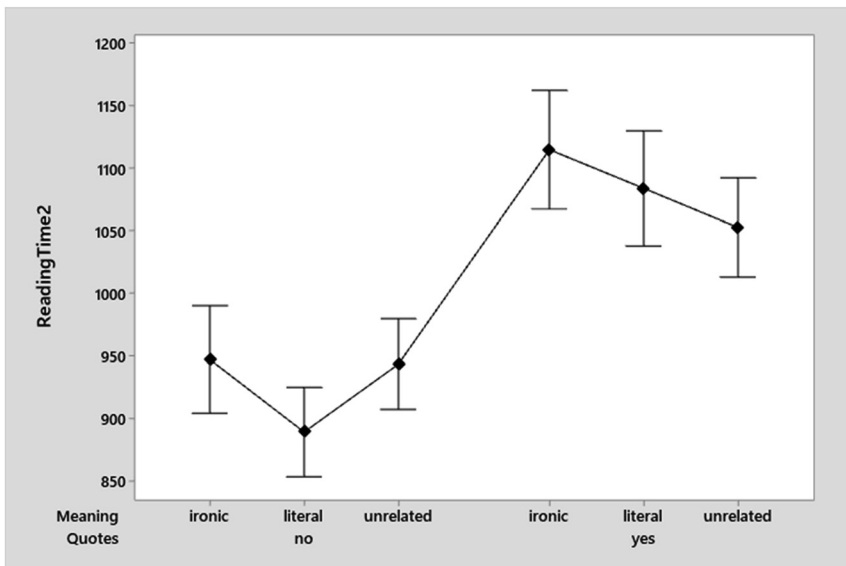


Figure 3: Error bars *READING TIME 2* (95% confidence intervals). Raw reading times without statistical outliers. The diamond symbols represent the means.

Table 3: Random effects statistics of the mixed-effects model of READING TIME 2.

	Variance	Standard deviation	Corr
ITEM (intercept)	0.0010310	0.03211	
SUBJECT (intercept)	0.0119187	0.10917	
SUBJECT (meaningliteral)	0.0001450	0.01204	−0.99
SUBJECT (meaningunrelated)	0.0009984	0.03160	−0.70 0.58
Residual	0.0149073	0.12210	

Table 4: Fixed effects statistics of the mixed-effects model of READING TIME 2.

	Estimate	Std. error	df	t value	Pr(> t)
(Intercept)	2.942e+00	1.980e−02	4.395e+01	148.577	<2e−16***
Quotesyes	7.839e−02	9.416e−03	1.901e+03	8.325	<2e−16***
Meaningliteral	−2.138e−02	9.543e−03	5.454e+02	−2.240	0.0255*
Meaningunrelated	5.469e−03	1.073e−02	9.444e+01	0.510	0.6114
Quotesyes:Meaningliteral	4.322e−03	1.332e−02	1.901e+03	0.324	0.7456
Quotesyes:Meaningunrelated	−2.743e−02	1.330e−02	1.909e+03	−2.062	0.0394*

Table 5: Pairwise comparisons READING TIME 2 (Tukey adjusted).

Contrast	Estimate	SE	df	t ratio	p value
NQ − Q	−0.0707	0.00544	1882	−12.987	<0.0001
(NQ + I) − (Q + I)	−0.07839	0.00943	1878.6	−8.315	<0.0001
(NQ + L) − (Q + L)	−0.08271	0.00944	1884.4	−8.766	<0.0001
(NQ + U) − (Q + U)	−0.05096	0.00941	1886.5	−5.413	<0.0001
(NQ + I) − (NQ + L)	0.02138	0.00956	118.8	2.236	0.2294
(Q + I) − (Q + L)	0.01706	0.00973	125.7	1.753	0.5000
(Q + I) − (NQ + L)	0.09977	0.00963	121.7	10.363	<0.0001
(NQ + I) − (Q + L)	−0.06133	0.00967	122.9	−6.343	<0.0001

Abbreviations: NQ, no quotes; Q, quotes; I, ironic; L, literal; U, unrelated.

given in Tables 6 and 7. Since the model indicates significant values, we present the results of the pairwise comparisons in Table 8.

In comparison to READING TIME 2, the picture for READING TIME 3 is clearly different. First, as Figure 4 shows, ironic content is processed more quickly with than without quotes and literal content is processed less quickly with than without quotes. In the unrelated conditions, as expected, there is no difference between the quoted and

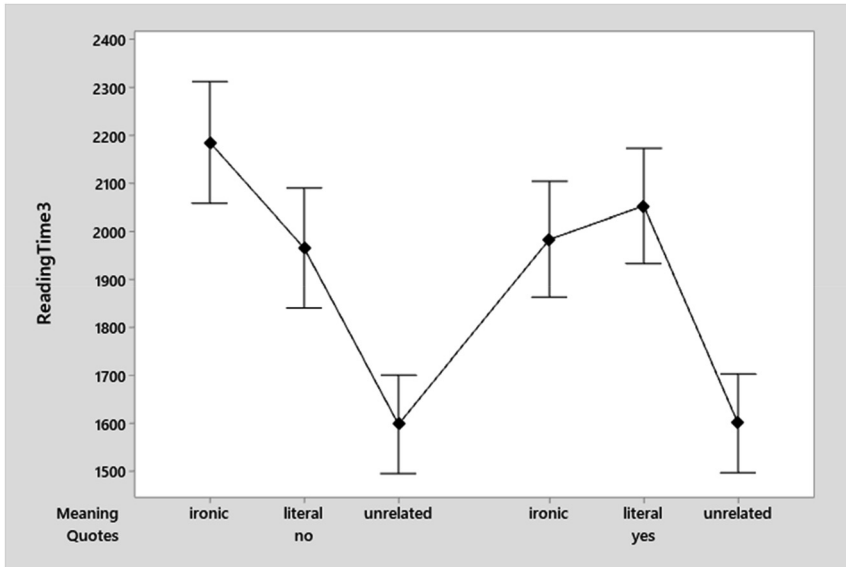


Figure 4: Error bars READING TIME 3 (95% confidence intervals). Raw reading times without statistical outliers. The diamond symbols represent the means.

non-quoted versions of the sentence. Second, the second line of Table 7 indicates that the difference between ironic content without quotes (=Intercept) and ironic content with quotes (=Quotesyes) is significant ($\Pr(>|t|) = 0.00385^{**}$). This is confirmed in the Tukey comparison “(NQ + I) – (Q + I)” (p value = 0.0449) in Table 8. Third, while ironic content without quotes is read significantly more slowly than literal content without quotes (see $\Pr(>|t|) = 0.00135^{**}$ in line “Meaningliteral” in Table 7 and $p = 0.0180$ in the pairwise comparison “(NQ + I) – (NQ + L)” in Table 8), ironic content with quotes is not read significantly more slowly than literal content without quotes (see $p = 0.9920$ in pairwise comparison “(Q + I) – (NQ + L)” in Table 8). Put differently, irony does not create a processing burden in comparison to the default condition (literal without quotes) only if it is highlighted via quotes (see also Figure 4).

4.6.4 RATING TIME

In this section, we look at the analysis of RATING TIME, the time subjects needed to make their rating on the scale from 1 to 6. The descriptive analysis is given in Figure 5.

The final mixed effects model was the one containing the two fixed effects QUOTES and MEANING, their interaction, the random intercepts for SUBJECT and ITEM, and the random slopes for MEANING by SUBJECT and QUOTES by ITEM. The results of the model are

Table 6: Random effects statistics of the mixed-effects model of READING TIME 3.

	Variance	Standard deviation	Corr
ITEM (intercept)	0.0128612	0.11341	
ITEM (meaningliteral)	0.0010104	0.03179	-0.12
ITEM (meaningunrelated)	0.0079195	0.08899	-0.08 0.55
SUBJECT (intercept)	0.0147374	0.12140	
SUBJECT (meaningliteral)	0.0002107	0.01451	-0.22
SUBJECT (meaningunrelate)	0.0071096	0.08432	-0.14 0.82
Residual	0.0297796	0.17257	

Table 7: Fixed effects statistics of the mixed-effects model of READING TIME 3.

	Estimate	Std. error	df	t value	Pr(> t)
(Intercept)	3.27318	0.02666	72.78132	122.792	<2e-16***
Quotesyes	-0.03818	0.01320	1786.57815	-2.894	0.00385**
Meaningliteral	-0.04644	0.01402	85.34796	-3.313	0.00135**
Meaningunrelated	-0.14834	0.02247	80.49316	-6.602	4e-09***
Quotesyes:Meaningliteral	0.07037	0.01875	1785.92348	3.754	0.00018***
Quotesyes:Meaning unrelated	0.03789	0.01868	1782.84821	2.029	0.04265*

Table 8: Pairwise comparisons READING TIME 3 (Tukey adjusted).

Contrast	Estimate	SE	df	t ratio	p value
NQ – Q	0.00209	0.00765	1797	0.274	0.7842
(NQ + I) – (Q + I)	0.038182	0.0132	1795.4	2.891	0.0449
(NQ + L) – (Q + L)	-0.032192	0.0133	1799.0	-2.417	0.1509
(NQ + U) – (Q + U)	0.000294	0.0132	1787.3	0.022	1.000
(NQ + I) – (NQ + L)	0.046439	0.0142	93.8	3.276	0.0180
(Q + I) – (Q + L)	-0.023935	0.0143	96.9	-1.673	0.5529
(Q + I) – (NQ + L)	0.008257	0.0142	94.1	0.582	0.9920
(NQ + I) – (Q + L)	0.014247	0.0143	95.9	0.998	0.9176

given in Tables 9 and 10. Since the model indicates significant values, we present the results of the pairwise comparisons in Table 11.

The final analysis of the response variable RATING TIME further supports the pattern revealed for READING TIME 3. That is, first, subjects made their judgments more

quickly for ironic sentences if they contained quotes compared to if these marks were absent, even though this difference was not significant (see Figure 5; line of “Quotesyes” in Table 10; Tukey comparison in Table 11). The opposite picture emerged for the literal cases, and here with a significant difference. No difference was detected in the baseline. Second, and similar to the analysis of *READING TIME 3*, ironic content without quotes was rated significantly more slowly than literal content without quotes, but ironic content with quotes was not rated significantly more slowly than literal content without quotes (see Table 11).

4.6.5 RATING

This section considers the results of the analysis of *RATING*. The descriptive analysis is given in Figures 6 and 7.

The results of the cumulative link mixed model are given in Tables 12 and 13. Since the model indicates significant values, we present the results of the pairwise comparisons in Table 14.

The rating clearly confirms and even strengthens our previous findings: While ironic sentences are considered to fit significantly better to the preceding context with than without quotes, literal ones are considered to fit significantly less to the

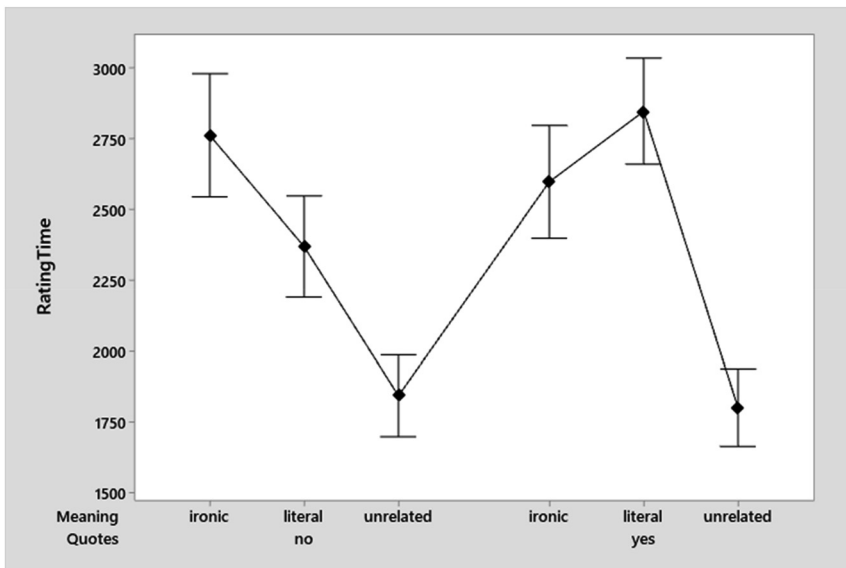


Figure 5: Error bars *RATING TIME* (95% confidence intervals). Raw rating times without statistical outliers. The diamond symbols represent the means.

Table 9: Random effects statistics of the mixed-effects model of RATING TIME.

	Variance	Standard deviation	Corr
ITEM (intercept)	0.001636	0.04044	
ITEM (quotesyes)	0.003324	0.05765	-0.62
SUBJECT (intercept)	0.017804	0.13343	
SUBJECT (meaningliteral)	0.002538	0.05038	-0.46
SUBJECT (meaningunrelate)	0.010916	0.10448	-0.57 0.05
Residual	0.052581	0.22931	

Table 10: Fixed effects statistics of the mixed-effects model of RATING TIME.

	Estimate	Std. error	df	t value	Pr(> t)
(Intercept)	3.35296	0.02604	48.51293	128.753	<2e-16***
Quotesyes	-0.02724	0.01908	260.87618	-1.428	0.154429
Meaningliteral	-0.06678	0.01950	94.60102	-3.425	0.000912***
Meaningunrelated	-0.17101	0.02480	63.84202	-6.896	2.87e-09***
Quotesyes:Meaningliteral	0.12121	0.02489	1842.40321	4.870	1.21e-06***
Quotesyes:Meaningunrelated	0.01937	0.02485	1843.92413	0.779	0.435796

Table 11: Pairwise comparisons RATING TIME (Tukey adjusted).

Contrast	Estimate	SE	df	t ratio	p value
NQ – Q	-0.0196	0.0127	58.7	-1.544	0.1279
(NQ + I) – (Q + I)	0.02724	0.0192	293.0	1.422	0.7138
(NQ + L) – (Q + L)	-0.09396	0.0192	295.6	-4.891	<0.0001
(NQ + U) – (Q + U)	0.00788	0.0192	293.3	0.411	0.9985
(NQ + I) – (NQ + L)	0.06678	0.0197	100.9	3.392	0.0124
(Q + I) – (Q + L)	-0.05443	0.0197	101.0	-2.763	0.0719
(Q + I) – (NQ + L)	0.03953	0.0210	102.5	1.879	0.4207
(NQ + I) – (Q + L)	-0.02719	0.0212	104.7	-1.283	0.7936

preceding context with than without quotes (see Figures 6 and 7; Table 14). Note also, however, that both ironic and literal sentences – both with and without quotes – are overall acceptable, as expressed in the fact that they were rated lower/better than 3.5 (see Figure 6), which was the midpoint of the scale. The

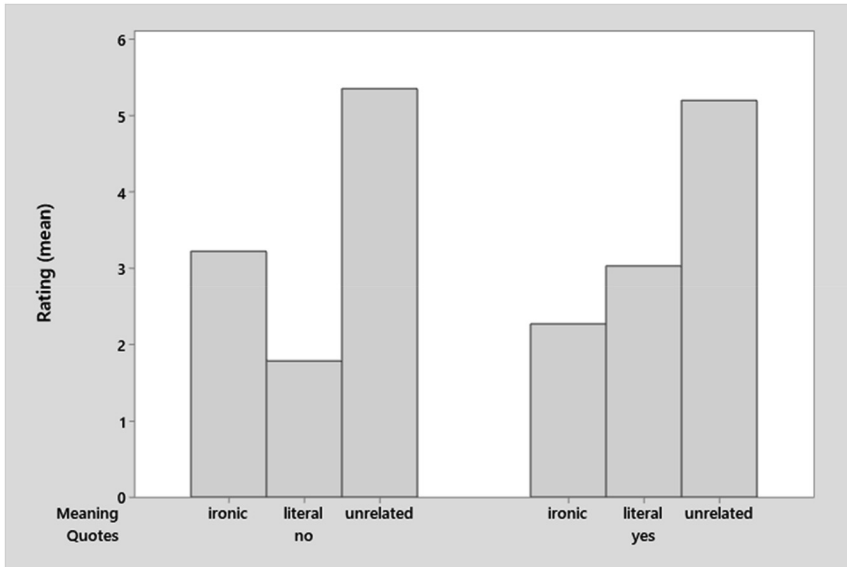


Figure 6: Rating overview (mean values).

baseline, the two unrelated conditions, do not show a significant difference with and without quotes (see Figures 6 and 7; Table 14).

5 Summary and discussion

The present reading time experiment tested whether and how quotes affect the processing and recognition of ironic content in English. We investigated the reading time at three different positions within the target sentences – before the quotes occurred, when they appeared, and sentence-finally –, how well the target sentences fit to the preceding contexts in the eyes of our subjects, and how much time they needed to make their decision. Before the critical portion of the target sentences, that is, as long as there were no linguistic differences between the conditions, no significant reading time differences were detected. This paved the ground for our following comparisons, our baseline worked, and further analyses were justified. Considering the four remaining response variables, we made two distinct observations. On the one hand, quotes significantly impede processing at their direct occurrence across the board and independently of the meaning relation between the target sentence and the preceding context. On the other hand, quotes significantly

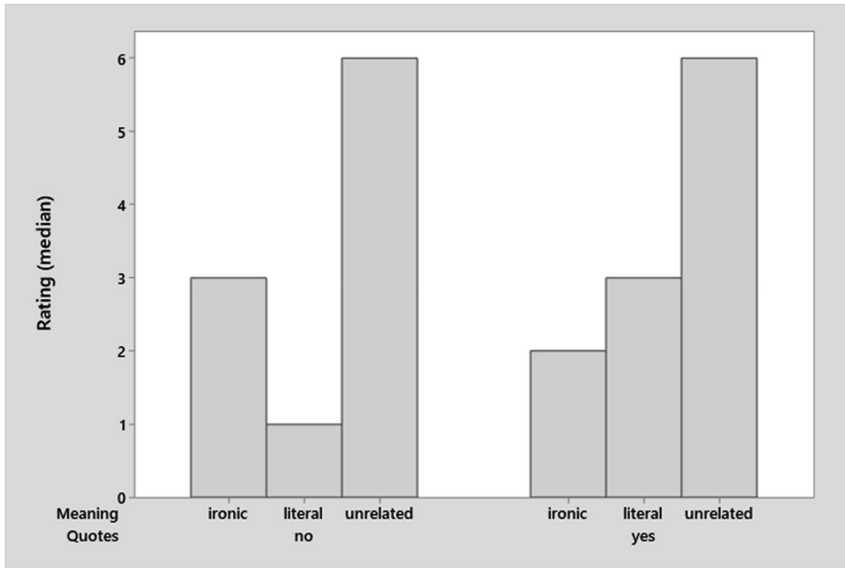


Figure 7: Rating overview (median values).

Table 12: Random effects statistics of the cumulative link mixed model of RATING.

	Variance	Standard deviation
ITEM (intercept)	0.1133	0.3366
SUBJECT (intercept)	0.1884	0.4341

Table 13: Fixed effects statistics of the cumulative link mixed model of RATING.

	Estimate	Std. error	z value	Pr(> z)
Quotesyes	-0.9521	0.1387	-6.864	6.71e-12***
Meaningliteral	-1.6314	0.1483	-11.004	<2e-16***
Meaningunrelated	2.7350	0.1678	16.299	<2e-16***
Quotesyes:Meaningliteral	2.4165	0.2046	11.809	<2e-16***
Quotesyes:Meaningunrelated	0.7278	0.2258	3.223	0.00127**

facilitate the processing and the recognition of irony when this appears in a sentence-final position.

Our study improved an earlier study on a similar topic by Regel (2009) in several dimensions and we believe that it is therefore more conclusive than Regel's

Table 14: Pairwise comparisons RATING (Tukey adjusted).

Contrast	Estimate	SE	df	z ratio	p value
NQ – Q	–0.096	0.0891	Inf	–1.078	0.2812
(NQ + I) – (Q + I)	0.952	0.139	Inf	6.864	<0.0001
(NQ + L) – (Q + L)	–1.464	0.147	Inf	–9.981	<0.0001
(NQ + U) – (Q + U)	0.224	0.179	Inf	1.256	0.8086
(NQ + I) – (NQ + L)	1.631	0.148	Inf	11.004	<0.0001
(Q + I) – (Q + L)	–0.785	0.137	Inf	–5.721	<0.0001
(Q + I) – (NQ + L)	0.679	0.147	Inf	4.627	0.0001
(NQ + I) – (Q + L)	0.167	0.135	Inf	1.240	0.8172

experiment. Crucially, and in opposition to her study, our well-balanced test was designed in a manner that enabled us to differentiate between immediate and delayed effects of quotes, which gives us, in turn, insights into the question whether quotes are implemented semantically or pragmatically. Moreover, we relied on test materials in which different types of quotation and quotes were not conflated. The present investigation, a recognition experiment, therefore aligns with previous evidence from Schlechtweg and Härtl (2020), which shows that quotes are produced and play a role in language processing.

The results are in line with the by now established idea that quotes signal a non-stereotypical interpretation or a deviation from the standard denotation of a word. Recognizing irony is facilitated in the presence of quotes.⁹ So, quotes support the detection of a non-default, specifically ironic, meaning of an item. Equally consistent with this conception is the data of the literally used cases with quotes, which are associated with longer (reading) times sentence-finally and in the rating, in comparison to literal content without quotes. Here, quotes inhibit the processing since there is no departure from the standard interpretation of the word in quotes and, hence, they do not simply appear to be superfluous but even inaccurate.

An intriguing question introduced earlier is whether quotes belong, in a compositional way, to the semantic structure of a sentence or whether they are pragmatic in nature and can be used optionally. A first hint to an answer can be

⁹ The finding that reading times are shorter at the end of the target sentences in ironic scenarios containing quotes than in ironic scenarios without quotes can be interpreted to support a model of verbal irony in which the non-literal meaning of an ironic utterance is accessed directly only if scare quotes are present, cf. Section 3.1. Also, our finding that rating and reading times (at position 3) for ironic utterances with quotes did not differ from the times for literal utterances without quotes point into that direction. However, as modeling verbal irony is not our focus, we leave this aspect to future research.

found in the finding that quotes facilitate reading times in ironic scenarios at the end of the target sentences but not “on the fly”, i.e., not immediately at the critical phrases. We take this finding to reflect that scare quotes are not a constituent part of the semantic, truth-conditional representation of an ironic utterance but are used at later, pragmatically determined time windows in the comprehension of verbal irony. In addition, as we see in the rating data, although ironic instances without quotes and literal ones with quotes were considered to fit to the preceding context worse than ironic cases with and literal ones without quotes, even the untypical conditions (irony without quotes and literal meaning with quotes) were overall rated better than the midpoint (3.5) on the scale from 1 to 6. Put differently, these cases are apparently less appropriate but still acceptable and, crucially, show far better ratings than the unrelated conditions, which were judged as highly unacceptable. Therefore, we believe that our findings lend more support for the view that quotes are pragmatic in nature (see Section 2.1), that is, they are preferably used – as shown by the better ratings of ironic instances with quotes in comparison to the ironic ones without quotes – and speed up the detection of irony, but it does not seem that they are obligatory to determine the correct interpretation in the presence of the respective context.

6 Conclusion

In the present work, we examined whether quotes facilitate the recognition of ironic content and, if so, when exactly the facilitative effect occurs. It was shown that quotes play a role in language processing: While they create a processing burden upon their appearance and independently from the context, they finally clearly help language users to recognize and integrate an ironic interpretation.

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