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Mental simulation and language comprehension: The case of copredication

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Empirical evidence suggests that perceptual-motor simulations are often constitutively involved in language comprehension. Call this "the simulation view of language comprehension". This article applies the simulation view to illuminate the much-discussed phenomenon of copredication, where a noun permits multiple predications which seem to select different senses of the noun simultaneously. On the proposed account, the (in)felicitousness of a copredicational sentence is closely associated with the perceptual simulations that the language user deploys in comprehending the sentence.

KEYWORDS

copredication, language comprehension, oddness, polysemy, simulation

1 | INTRODUCTION

It has been argued that perceptual simulation plays a crucial role in understanding novel and poetic language. For instance, the comprehension of some metaphors arguably requires the construction of conscious mental imagery (Carston, 2010; Green, 2017). In relation to poetry, it is thought that perceptual simulation not only serves as a powerful effect, but also an efficient means for understanding and appreciation (Liu, 2023). Going beyond the domain of novel and poetic language, recent psycholinguistic literature, inspired by the work of cognitive linguists such as Leonard Talmy (1983, 1988) and Ronald Langacker (1987, 1991), suggests that

simulation is also important for comprehending ordinary, literal language, and that perceptual-motor simulations are often constitutively involved in language comprehension (e.g., Barsalou, 2008; Bergen, 2012, 2015; Zwaan, 2003, 2009). Call this "the simulation view of language comprehension."

This article provides a clear articulation of the view and illustrates its explanatory potential by relating it to the much-discussed issue of *copredication*. The latter refers to the linguistic phenomenon where a noun permits multiple predications which seem to simultaneously select different senses or denotations of the noun. For instance, the sentence "The book weighs two kilos but is very interesting" is an example of copredication. The word "book" seems to refer to both physical tome and informational content simultaneously, but the sentence nevertheless sounds fine. In contrast, a similarly constructed copredicational sentence such as "The chicken is delicious and chirpy" also involves two different senses of the noun (chicken-as-food vs. chicken-as-animal), but nevertheless sounds odd or infelicitous. It is common to treat words like "book" and "chicken" as polysemous where, in each case, different senses of the word share a single lexical entry. But while some copredicational constructions involving polysemous words result in oddness, others do not. What precisely explains this difference in felicitousness has generated much discussion (e.g., Collins, 2017; Löhr & Michel, 2022; Ortega-Andrés, 2022; Ortega-Andrés & Vicente, 2019; Quilty-Dunn, 2021; Vicente, 2021b). In this article, I argue that the simulation view of language comprehension can shed light on this linguistic phenomenon and improve on previous discussions of copredication. On the proposed view, the (in)felicitousness of a copredicational sentence is closely associated with the perceptual representations that the language user deploys in comprehending the sentence.

The structure of the article is as follows. Section 2 expounds the simulation view. Section 3 turns to the phenomenon of copredication. Section 4 explains how the simulation view can shed light on copredication. Section 5 elaborates on the explanatory virtues of a simulation-based account of copredication. Section 6 concludes the article.

2 | THE SIMULATION VIEW

The simulation view is defined as the thesis that perceptual-motor simulations are often *constitutively involved* in language comprehension. Simulation in this context refers to "the re-enactment of perceptual, motor, and introspective states acquired during experience with the world, body, and mind" (Barsalou, 2008, p. 618). According to the simulation view of language comprehension, mental simulations used in language comprehension involve re-activating patterns of brain activation associated with language users' interactions with the world. We can think of the latter patterns of brain activation as interconnected experiential traces laid down in our memory. Such traces reflect the interconnectedness or co-occurrence of things in the environment and can be retrieved and used in processing language.

There is abundant empirical evidence in support of the claim that simulation is often *involved* in language comprehension. For instance, experiments conducted by Rolf Zwaan and colleagues provided behavioural evidence that language users simulate various features of the objects described in language, including objects' orientations (Stanfield & Zwaan, 2001), shapes (Zwaan et al., 2002), spatial relations (Zwaan & Yaxley, 2003), motions (Zwaan et al., 2004), and colours (Richter & Zwaan, 2009). These experiments deployed the same methodology, where participants were first presented with linguistic materials for comprehension and then with pictures that either match or mismatch the objects mentioned in the linguistic materials.

For instance, for the sentence "The ranger saw the eagle in the sky" (Zwaan et al., 2002), a match picture would be a picture of an eagle with wings outspread, whereas a picture of an eagle with wings tucked in would be a mismatch. After being presented with the picture, participants were asked whether the pictured object had been mentioned in the prior sentence (Stanfield & Zwaan, 2001), or to name the pictured object (Zwaan et al., 2002). Responses were significantly faster in the match condition than the mismatch condition, suggesting that language users simulate the shape of the eagle during comprehension. The thought here is that in a match condition, what participants simulated and what they later saw in the picture were similar, and hence they were able to respond faster. In a mismatch condition, what participants simulated and what they saw were different, and hence it took longer to recognise the object or determine whether the object had been mentioned by the prior sentence.

What one simulates in comprehending a sentence depends on a number of factors. While the semantic contents of words determine what is simulated, grammatical features of a sentence can also modulate the simulation (Bergen, 2012, p. 118). For instance, research has shown that sentences in the progressive tense (e.g., "Jenny is opening the door") allow greater activation of a representation of the described event compared to sentences in the perfect tense (e.g., "Jenny has opened the door"), which prompt language-users to simulate the end state of an event (Bergen & Wheeler, 2010). Language users also tend to take an observer perspective when comprehending sentences in the third-person (e.g., "He is slicing a tomato"). In contrast, if the sentence uses the first-person and contextual information about "I" is kept to a minimum (e.g., "I am slicing a tomato"), language users tend to take a participant perspective, identifying themselves as the speaker (Brunyé et al., 2009).

Proponents of the simulation view maintain that mental simulation is not just a "downstream effect" but plays a constitutive role in understanding language. This claim is also supported by empirical findings. For instance, the processing of nouns that describe concrete objects is associated with the ventral stream (i.e., the What pathway) in the visual cortex, whereas the processing of verbs that describes actions activates regions towards the frontal area of the brain including areas dedicated to motor control (Shapiro et al., 2005). The functional roles of these areas are evidenced by cases of double dissociation. Daniele et al. (1994) found that subjects with damage to the left frontal lobe—the area dedicated to motor control—showed impairment in producing and comprehending verbs but not nouns, whereas subjects with damage to the left temporal lobe, which is part of the What pathway, showed impairment in producing and comprehending nouns but not verbs (see also Damasio & Tranel, 1993).

Another way to see whether mental simulation is constitutive of language comprehension is to test whether or not the engagement of certain areas in the perceptual-motor systems in some task interferes with simultaneously processing language that allegedly engages the same areas. If there is interference, this suggests that mental simulation is not merely a downstream effect but is deployed in comprehending language. Kaschak et al.'s studies (Kaschak et al., 2005) showed that comprehension of motor language is slowed when language users are simultaneously engaged in motor perception of the same direction. In their experiments, participants were presented with visual stimuli of motions in one of the four directions: towards, away, up, or down, where the towards/away motions were displayed by black-and-white spirals and the up/down motions black-and-white horizontal bars. At the same time, participants listened to sentences and were asked to judge whether the sentences made sense or were grammatical. The sentences included ones describing motions either in the same direction as the visual display or the opposite direction. For instance, if the visual display is black-and-white spirals showing a towards motion, then the sentence "The dog is running towards you" describes an event that involved movement in the

same direction as the visual display, whereas the sentence "The horse is running away from you" describes the opposite direction. Results showed that participants judged slower when the sentence described the same direction as the concurrent visual display and faster when it described the opposite direction, suggesting that motion perception of a particular direction interferes with processing language that describes motion of the same direction. The task of processing motion perception in a particular direction means that the specific neurons engaged in motion perception of that direction are made less available for use in simulating the described motion of the same direction in comprehending the sentence, causing language processing to slow down.[1]

Overall, empirical data strongly suggest that the neural mechanisms deployed in perceptual-motor engagement with the world are also deployed in language comprehension. On the simulation view, we deploy perceptual-motor representations to understand language.

The simulation view, nevertheless, need not reject the idea that language comprehension involves abstract symbol manipulation. On the traditional picture, we use abstract symbols to think about the meanings of words and sentences. On the simulation picture, we use mental simulations to think about such meanings. But, it may just be that both types of representations are needed for language comprehension considered as a broad and comprehensive phenomenon (Dove, 2009). So, the simulation view need not commit to the claim that mental simulation is *necessary* or *sufficient* for all language processing (Bergen, 2012, 2015). Indeed, it is unclear that processing familiar language requires simulation, or that mental simulation is needed for processing language that describe abstract ideas. What proponents of the simulation view commit to—and ought to commit to—is a much more modest claim, namely, that in many situations, especially when we process language describing concrete objects, we understand language in part "by simulating in our minds what it would be like to experience the things that the language describes" (Bergen, 2012, p. 13). On this picture, mental simulation is responsible for certain aspects of normal language processing (p. 226).

In the rest of the article, I look into how the simulation view of language comprehension can shed light on the phenomenon of copredication.

3 | COPREDICATION

3.1 | The phenomenon

Copredication is a linguistic phenomenon where a noun permits multiple predications which seem to simultaneously select different senses or denotations of the noun. Copredication has generated much philosophical discussion. It has been used by theorists like Chomsky (2000) to argue against referential semantics and the idea that word meaning is a denotation stable across contexts (see also Collins, 2017; Pietroski, 2005; Vicente, 2021a). This discussion in turn led to various proposals aimed at explaining copredication as a topic in its own right (for recent

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[1]One might wonder why there is a mismatch advantage in Kaschak et al.'s (2005) study, but a match advantage in Zwaan et al.'s studies where responses were faster when the perceptual stimulus matched the content of the sentence. Responses are likely to depend on how the perceptual and linguistic materials are presented, that is, sequentially or simultaneously, and more importantly, whether or not the content of the linguistic material is *integratible* with the content of the perceptual stimuli (see Kaschak et al., 2005, pp. B86–B87). While the content of the sentence "The dog is running towards me" is integratible with a picture of a dog running in the direction of the viewer, such a sentence is hardly integratible with a picture of black-and-white spirals.

discussion, see Gotham, 2017; Liebesman & Magidor, 2017, 2019; Ortega-Andrés & Vicente, 2019; Vicente, 2021b; Löhr & Michel, 2022; Ortega-Andrés, 2022).

To illustrate the phenomenon, Let us consider a range of examples. Consider (1):

(1) a. The **book** weighs two kilos but is very interesting.
    b. **Lunch** was delicious and finished before 3 pm.

In (1a), as we already saw, the two predicates "weighs two kilos" and "is very interesting" seem to select different senses, that is, denotations, of the word "book"—*physical tome* and *informational content*. Similarly, in (1b), "lunch" seems to denote two different things. Intuitively, lunch-as-food was delicious, and lunch-as-event finished before 3 pm.

Examples like (1), where a single noun seem to simultaneously denote different types of entities, are abundant. Consider words for organisations such as "school":

(2) The **school**, which has been underfunded for years, caught fire yesterday.

In (2), "school" seems to refer to an institution in the relative clause and a building in the main clause.

Consider place names. In (3), intuitively it is London-as-population that is friendly and London-as-geographical-area that is polluted.

(3) **London** is friendly but polluted.

Consider also words for apertures. In (4), "window" seems to refer to window-as-glass in the first conjunct and window-as-opening in the second:

(4) The **window** was broken many times and had to be boarded up.

According to many theorists, sentences like (1)–(4) involve a specific type of polysemes called "inherent polysemes" or "logical polysemes" (e.g., Asher, 2011; Falkum & Vicente, 2015; Pustejovsky, 1995; Vicente, 2018). While coordination of the different senses of a logical polyseme does not result in oddness, such coordination often does when it comes to other polysemous nouns. Consider (5):

(5) a. *The **chicken** is delicious and chirpy.
    b. *The **newspaper** fired its editor and fell off the table. (Ortega-Andrés & Vicente, 2019).
    c. *The **oak** is nicely polished and blowing in the wind.

All the sentences in (5), in contrast to those in (1)–(4), are infelicitous. The relevant nouns—"chicken", "newspaper", and "oak"—are used in two senses simultaneously.

Let us call a sentence which contains multiple predications that *seem* to select different senses or meanings of a noun "copredicational sentence."[2] Defined this way, a copredicational sentence may or may not be felicitous. When a copredicational sentence is felicitous, we have

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[2]Some theorists deny that nouns like "book" in instances of copredication are used in different senses. So, copredicational sentences are defined as involving nouns that *seem* to be used in different senses simultaneously.

an instance of *copredication*. Let us call the noun with multiple predications in an instance of copredication "copredicative noun". Sentences in (1)–(4) are instances of copredication and contain copredicative nouns. Sentences in (5) are infelicitous copredicational sentences. The two sets of sentences, that is, (1)–(4) on the one hand and (5) on the other hand, have similar syntax. In both cases, the predicates in the sentence seem to select different denotations of the noun at issue. Yet they differ in felicitousness.

The contrast in felicitousness is particularly perplexing because with polysemous nouns like the ones above, the different senses are closely related and thought to share a single mental representation, where different senses prime each other and language users often do not immediately commit to a specific sense in neutral contexts (Frazier & Rayner, 1990; Pickering & Frisson, 2001; Klepousniotou & Baum, 2007; Klepousniotou et al., 2008; Brocher et al., 2016; see Quilty-Dunn, 2021 for a survey on the relevant empirical evidence). This contrasts with homonymy, where different meanings of a homonym (e.g., "bank") inhibit each other and are represented separately in the mental lexicon. Studies from Klepousniotou and colleagues have shown that what drives polysemy comprehension depends on how closely related the different senses of a polysemous word are. Metonymic polysemes (e.g., "chicken") including logical polysemes (e.g., "book") have closely-related senses and are processed more easily than metaphoric polysemes (e.g., "pig") where the senses are less related (Klepousniotou et al., 2008; Klepousniotou & Baum, 2007). The latter type of polysemes may be processed like homonyms where the different senses are separately represented (see Klein & Murphy, 2001, 2002).

On the assumption that *concepts* are *mental representations* that we use to understand meanings of words, we use distinct concepts to think about the meanings of a homonymous word, whereas with at least many polysemous words—metonymic polysemes, including logical polysemes—we use a single concept to think about the meaning of the word. What this means is that oddness in copredicational sentences with homonyms can simply be explained in terms of the distinct concepts involved in processing these sentences. Consider (6):

(6) a. *The **bank** raised its interest rate and was eroded.
    b. *The **match** was called off and struck against the package surface.

Words like "bank" and "match" are homonyms: The relevant meanings associated with the wordforms are intuitively unrelated. (6)-sentences are odd because the relevant noun picks out two distinct concepts. For instance, in processing (6a), we use one concept FINANCIAL-BANK when we engage in the thought that "the bank raised its interest rate" and a different one—RIVER-BANK—when we think that "the bank was eroded".

However, oddness in (5)-sentences, involving polysemous terms such as "chicken", "newspaper", and "oak", cannot be explained by appealing to distinctness in the concepts that we use in thinking about the meanings of these sentences. This is because the relevant senses are closely related, and existing empirical data suggest that such polysemous words have single representations (see Klepousniotou et al., 2008, appendix B on the ratings for sense-relatedness for "chicken" and "newspaper"). So, the contrast in felicitousness between (1)—(4) on the one hand and (5) on the other is *not* between instances of copredication and all other infelicitous copredicational sentences including those with homonyms, but is between instances of copredication and infelicitous copredicational senses which involve polysemous nouns with closely related senses that share a single representation. Just why there is a contrast in felicitousness when the relevant nouns involve

single lexical entries calls for an explanation. Various explanations have been proposed, to which we now turn.

3.2 | Approaches to copredication

One type of explanation, which I call "ontological explanations", focuses on spelling out the nature of the denotation of the noun in an instance of copredication. According to these explanations, copredicative nouns are in fact univocal and not used in different senses. Assuming that the word "book" refers to *book* out in the world, an ontological account would tell us what this thing *book* is such that we can simultaneously attribute the properties *weighs two kilos* and *being interesting* to it. Within this type of explanation, theorists have put forward different proposals. Concerning the word "book", it has been thought that it refers to: (i) a bare particular that can be conceived in different ways—as physical tome or as informational content (Asher, 2011); (ii) a mereological sum that consists of a physical part and a content part (Arapinis, 2013; Arapinis & Vieu, 2015; Gotham, 2017); or (iii) a physical book or an informational book according to context, where physical books and informational books can inherit properties from each other—a physical book, say, can inherit the property of *being interesting* from an informational book in virtue of being an instance of the latter (Liebesman & Magidor, 2017).

Each of these accounts nevertheless faces criticism (see Liebesman & Magidor, 2019; Ortega-Andrés, 2022; Vicente, 2021b; Viebahn, 2022). It may be that proponents of these ontological accounts can address the respective objections. Regardless, there seems to be something wrong-headed about ontological approaches in general. While ontological accounts can explain why copredicational sentences are felicitous or infelicitous, they do not tell us how we—the language users—interpret these sentences (Ortega-Andrés & Vicente, 2019). One might think that linguistic intuitions with respect to whether a sentence sounds odd or felicitous are subjective experiences or reactions on the part of language users, and that such a psychological phenomenon can be, and perhaps ought to be, explained in terms of underlying cognitive processing. For this reason, a psychological approach to copredication is arguably to be preferred. Such an approach is not primarily concerned with the denotations of copredicative nouns in instances of copredication, or with what kinds of entities words like "book" and "school" pick out in the world. It is primarily aimed at illuminating why some copredicational sentences are odd and others permissible. Such an account may also turn out to be compatible with some of the ontological accounts.

The second type of explanation—"psychological explanations", which include the proposal put forward in this article—precisely focuses on what is going on in our heads when we process copredicational sentences (Liu, 2022; Löhr & Michel, 2022; Ortega-Andrés & Vicente, 2019). An influential psychological explanation is the activation package account proposed by Ortega-Andrés and Vicente (2019). The account draws on the idea that with many nouns, word meaning is a rich, complex informational or knowledge structure that reflects our typical understanding of the relevant domain. Using "school" as a case study, they contend that the different senses of the word are reflected in different aspects of its knowledge structure (Figure 1), and form an *activation package*, understood in the sense that all the elements in the knowledge structure are typically activated when encountering the word, and the senses activate each other. On this view, interpreting instances of copredication involves selecting senses from the activation package.
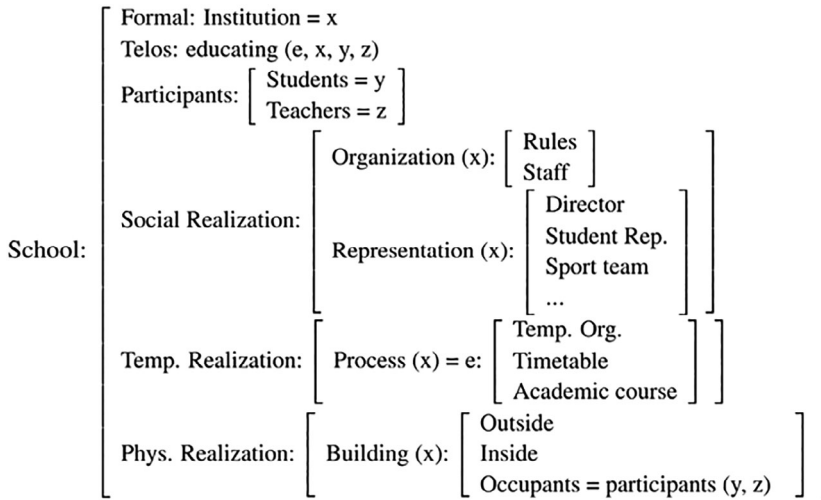
FIGURE 1 Knowledge structure of "school" (Ortega-Andrés & Vicente, 2019).

Consider (2) again:

(2) The **school**, which has been underfunded for years, caught fire yesterday.

On their view, upon encountering the word "school", the knowledge structure associated with schools is activated. The predicate "has been underfunded for years" in the relative clause selects the institution aspect of the knowledge structure. The predicate "caught fire" in the main clause selects the building aspect which is already activated.

While the proposal is intuitive, it unfortunately faces counterexamples. Compare the two sentences in (7):

(7) a. The **school** caught fire when celebrating students' graduation.
    b. *The **school** caught fire when visiting the museum.

(7b) sounds odder than (7a). However, the two copredicational sentences involve exactly the same senses—"caught fire" selects the building sense and "visiting the museum", like "celebrating students' graduation" in (7a), selects the participant sense. If (7a) is permissible because all the relevant senses form an activation package, (7b) ought to sound fine too. But it is clearly odd. So, the activation package account is unsatisfactory because it does not explain why copredicational sentences involving the same senses do not sound equally felicitous (for a detailed criticism of the activation package view, see Löhr & Michel, 2022).[3]

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[3]Building on Ortega-Andrés and Vicente's idea of "activation packages" and appealing to the predictive processing framework, Löhr and Michel (2022) propose a cognitive-computational model of copredication. The account uses the notion of predicative error to explain oddness in a copredicational sentence. A full discussion of the account, which would require us to explain the predicative processing framework, takes us beyond the scope of this article. However, it is worth noting that the account need not compete with the proposal put forward in this article. The latter approach may be particularly appealing to theorists who are sympathetic to the simulation view of language comprehension.

4 | SIMULATION AND COPREDICATION

4.1 | An outline

Building on previous work (Liu, 2022), I argue that the simulation view of language comprehension can shed light on the phenomenon of copredication, and in particular, why sentences like (1)–(4) are felicitous whereas those in (5) are infelicitous.

(1) a. The **book** weighs two kilos but is very interesting.
b. **Lunch** was delicious and finished before 3 pm.
(2) The **school**, which has been underfunded for years, caught fire yesterday.
(3) **London** is friendly but polluted.
(4) The **window** was broken many times and had to be boarded up.
(5) a. *The **chicken** is delicious and chirpy.
b. *The **newspaper** fired its editor and fell off the table.
c. *The **oak** is nicely polished and blowing in the wind.

Recall from Section 3.1 that the crux of the problem is that like copredicative nouns in (1)–(4), the polysemous nouns in (5) have single representations but do not permit copredication. When comprehending these sentences, the language user first accesses the concept corresponding to the noun being multiply predicated. Proponents of the activation package account hold a rich view of concepts, according to which a concept is a complex informational or knowledge structure activated when the relevant word is encountered. One can also adopt a thin view of concepts, on which concepts are *pointers* that point to memory locations where rich bodies of structured information—that is, the "conceptions" associated with the concepts—are stored (e.g., Quilty-Dunn, 2021). On both views, the interpretation of a specific sense of a word is a two-step procedure where the concept corresponding to the standing meaning of the word is first accessed before the occurrent sense of the word is either selected (on the rich view) or enriched (on the thin view) in context. Consider (8):

(8) The **school** visited the museum yesterday.

(8) is naturally understood to mean that teachers and students at the school (i.e., school-as-participants) visited the museum yesterday. On the rich view of concepts, upon encountering the word "school", a rich knowledge structure associated with schools is activated. The predicate "visited the museum" requires an agential argument, and hence the participant sense of "school" is selected. On the thin view, the thinly construed concept SCHOOL is first deployed for language processing. Given that the concept gives access to a rich body of structured information, the language user can draw on their conceptual knowledge of school and their semantic knowledge of the meaning of the predicate to arrive at the interpretation that the noun "school" refers to participants in the school. In both cases, the specific sense of the word is determined as the result of the interaction between one's "conception" or encyclopaedic knowledge and semantic knowledge of other relevant parts of the sentence.

Now, perceptual-motor representations are part of the larger conception associated with a concept. According to the simulation view, perceptual-motor representations are often

constitutively involved in language comprehension, especially with respect to understanding language that describes concrete objects. With the simulation view in sight, the hypothesis that linguistic intuitions with respect to copredicational sentences have something to do with the simulations we construct in comprehending these sentences seems to be a reasonable one that is worth investigating. Given copredicational sentences involve multiple predications of a single noun phrase which often has concrete senses (e.g., book-as-tome, school-as-participant), *perceptual* simulation, rather than motor simulation, is likely to be what is at issue in comprehending these sentences.

Here is an outline of how the simulation view of language comprehension can illuminate the phenomenon of copredication. When comprehending a copredicational sentence, the language user aims to make sense of what the world is like as described by the sentence. Given the syntax of copredicational sentences, where in each case there is a single noun with multiple predications, the language user takes herself to be tracking a single *focal entity* corresponding to the subject of the sentence, whatever the focal entity turns out to be in the world. This involves deploying the relevant concept as well as associated conception, including perceptual simulations of the focal entity. When the predicate occurring later in a copredicational sentence demands the language user to construct a focal entity that is different from that constructed in comprehending earlier parts of the sentence, we get an instance of *conflicting focal entities*. Given the simulation view of language comprehension, conflicting focal entities often arise from *conflicting simulations*, that is, when we use perceptual simulations to comprehend a copredicational sentence, the predicate occurring later in the sentence demands the language user to simulate a focal entity that is different from that simulated in comprehending earlier parts of the sentence. Such a conflict may be *resolved*, for instance, by reconstructing a simulation of a new focal entity appropriate to both predicates. If conflicting simulations fail to be resolved, then oddness occurs. The primary focus of the proposal here concerns what gives rise to oddness in copredicational sentences and in turn what conditions need to be in place to render a copredicational sentence felicitous. So, on this proposal, oddness in copredicational sentences often arises from *unresolved conflicting simulations*.

Below, I elaborate on the above proposal. In Section 4.2, I introduce the notion of *focal entity* and clarify the idea of *conflicting simulation*. Using the latter notion, Section 4.3 puts forward the proposal that oddness in copredicational sentences often arises from *unresolved conflicting simulations*. Section 4.4 addresses a potential worry.

4.2 | Focal entity and conflicting simulations

On the simulation view, meaning construction is a dynamic and active process where language users simulate as they encounter different elements in a sentence, and such meaning construction often involves constructing simulations of a focal entity. The focal entity is often, though not always, indicated by the subject of the sentence, for example, "The *eagle* is in the sky" where the focal entity is an "eagle" (Zwaan & Madden, 2005). We can think of the focal entity as the thing—whatever it turns out to be in reality—that the language user takes herself to be tracking when understanding the sentence. It is possible that one takes oneself to be thinking about a single focal entity when the representation used to think about it in fact pick out distinct things in reality.

In the case of copredicational sentences, we can think of the focal entity as that which corresponds to the noun phrase and takes on multiple predications. When we comprehend a

copredicational sentence, we think of the focal entity as being attributed with different properties corresponding to the distinct predicates. On the simulation view, we use perceptual simulations, that is, we deploy perceptual representations, to think about the focal entity. But conflicts in simulation can occur if different predicates demand simulating different focal entities. Let "S" be a copredicational sentence and "u" be a language user. We can think of S as having multiple conjuncts corresponding to the predicates that seem to select different senses of the noun. I propose to understand the notion of *conflicting simulation* in the following way:

> For a copredicational sentence S and a language user *u*, S involves *conflicting simulations* for *u* if and only if the conjunct occurring later in S demands *u* to simulate a focal entity that is different from the focal entity associated with processing the earlier conjunct.

According to the definition above, *conflicting simulations* are understood as involving distinct focal entities associated with different conjuncts in a copredicational sentence. It is a feature of a copredicational sentence relative to a language user. What it precisely means for a conjunct to *demand* the language user to simulate a different focal entity calls for clarification. Consider (5a):

(5a) *The **chicken** is delicious and chirpy.

(5a) consists of two conjuncts:

(5a$_{-1}$) The **chicken** is delicious.
(5a$_{-2}$) The **chicken** is chirpy.

On the simulation view, what we simulate in comprehending a sentence crucially depends on our experiences with the relevant domain. A typical English speaker is likely to simulate chicken-as-meat in processing (5a$_{-1}$), for example, simulating a chicken fillet or chicken thigh, and to simulate chicken-as-animal in processing (5a$_{-2}$), for example, simulating a live feathery chicken. Now, when using perceptual simulations to comprehend the copredicational sentence (5a), the second conjunct seems to demand the language user to simulate a focal entity (i.e., "chicken-as-animal") that is different from the focal entity (i.e., "chicken-as-meat") constructed in processing the first conjunct. What kind of focal entity a conjunct demands the language user to simulate chiefly depends on the meaning of the conjunct and one's past experiences with the relevant things involved, and perhaps also general knowledge of what is likely to happen. For instance, the meaning of the second conjunct "the chicken is chirpy", one's experience of live chickens being chirpy, and general knowledge that chicken meat cannot be chirpy, make it clear that the focal entity at issue is "chicken-as-animal" not "chicken-as-meat", in which case, the sentence involves conflicting simulations.

Consider also how one might use simulations to comprehend (5b):

(5b) *The **newspaper** fired its editor and fell off the table.

In processing the first conjunct, the language user might simulate a person or a board room, but certainly not that of physical newspaper. The second conjunct, however, would demand the

language user to simulate a physical newspaper, in which case (5b) would involve conflicting simulations.

In contrast, consider (1a), which does not seem to involve conflicting simulations for most language users:

(1a) The **book** weighs two kilos but is very interesting.

(1a) consists of two conjuncts:

(1a$_{-1}$) The **book** weighs two kilos.
(1a$_{-2}$) The **book** is very interesting.

Intuitively, "book" refers to book-as-tome in (1a$_{-1}$) and book-as-content in (1a$_{-2}$). Note that book-as-content is realized in a book-as-tome. Our experiences of the realized are usually experiences of the realizers. Suppose I ask you what the best book you read last year was. Very likely, you will be conjuring up mental imagery of holding a book (i.e., book-as-tome). While book-as-tome and book-as-content are different things, perceptual simulations associated with the two can certainly be similar or identical—our mental imagery of book-as-content is just often mental imagery of book-as-tome. This suggests that if perceptual simulations are involved in processing sentences like (1a$_{-1}$) and (1a$_{-2}$), it would involve constructing simulations with the same focal entity, that is, "book-as-tome". In processing the copredicational sentence (1a), the second conjunct does not demand the language user to simulate a focal entity that is different from the focal entity associated with the first conjunct. (1a) thus does not involve conflicting simulations.

Consider also (4):

(4) The **window** was broken many times and had to be boarded up.

It may seem intuitive to think that "window" denotes window-as-glass in the first conjunct and window-as-opening in the second. But our experiences of window-as-glass and window-as-opening often coincide. In fact, we typically experience windows as complex, unified entities, that is, as framed openings in a wall or on a roof which contain panes of glass and can usually be opened or shut with a handle. So, it seems reasonable to think that (4) only involves one complex focal entity "window" and does not involve conflicting simulations.

4.3 | The proposal

We saw that infelicitous copredicational sentences such as (5a) and (5b) would involve conflicting simulations, whereas felicitous copredicational sentences such as (1a) and (4) would not. I propose that oddness in copredicational sentences is associated with *conflicting simulations*, and more precisely:

> For a copredicational sentence S and a language user u, if S involves conflicting simulations for u (i.e. if the conjunct occurring later in S demands u to simulate a focal entity that is different from the focal entity associated with processing the earlier conjunct) and where this conflict is not resolved, then S would sound odd to u.

> If S does not involve conflicting simulations for *u* or if an initial conflict is resolved, then S is likely to sound felicitous to *u*.

Underlying the proposal is the thought that given the syntax of copredicational sentences, language users expect there to be a single focal entity to which the predicates within the same copredicational sentence can apply, and, given the simulation view of language comprehension, they are likely to use perceptual simulations to think about that focal entity. But different conjuncts may demand simulating different focal entities. A clash in focal entities would generate oddness, unless the clash can be resolved. Two points pertaining to the above proposal nevertheless require clarification.

First, the proposal above only gives a sufficient condition for oddness in copredicational sentences. Put differently, instances of copredication, that is, copredicational sentences that sound felicitous, require a *lack* of unresolved conflicting simulations. The proposal is compatible with there being other sufficient conditions for oddness in copredicational sentences. Indeed, there may be multiple reasons as to why a language user has the linguistic intuition that a copredicational sentence sounds odd.[4] So, the proposal above only makes a modest claim, according to which, *in a wide range of cases*, oddness in copredicational sentences arises due to conflicting simulations. Given oddness is here understood as a subjective psychological phenomenon which can vary inter-personally and even intra-personally, we should not expect a unified account that gives necessary and sufficient conditions for oddness in copredicational sentences. Such an account is likely to oversimplify the otherwise intricate and complex matter of our linguistic intuitions.

The second point that requires clarification is that on this proposal, it is strictly speaking *unresolved* conflicting simulations that generate oddness in copredicational sentences. What this means is that a copredicational sentence might generate conflicting simulations that are *resolved* during processing. Proponents of the simulation view suggest that language processing can be thought of as a two-stage process (see Bergen, 2012, p. 139; Towsend & Bever, 2001).

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[4]For instance, some copredicational sentences are odd for pragmatic reasons. Consider the following sentence (see Vicente, 2021b, p. 350):

> *Brecht was tall but is still represented in many theatres in the world.

Presumably, the above sentence is odd because it is hard to come up with a scenario to make sense of the utterance. Nevertheless, it would not sound odd if uttered by a speaker, say, arguing against their interlocutor's claim that popular historical playwrights all had short statures.

In some cases, oddness due to pragmatic factors disappears after a slight alternation of wording. Consider the following pair of sentences:

> *The book is thought-provoking and yellowed with age.
> The book is thought-provoking but yellowed with age.

Intuitively, the second sentence sounds better than the first, but the two sentences only differ in the conjunction used. This again can be explained pragmatically. We would expect a speaker who attributes the properties of being thought-provoking and yellowed with age to a book to be conveying surprise or disappointment that an important book is showing signs of neglect. The second sentence fulfils this expectation by using the conjunction "but" to introduce a contrast. No such contrast is introduced by the conjunction "and" in the first sentence, which merely conjoins two predicates that attribute two seemingly unrelated features to the book, hence generating the intuition of infelicity. Oddness in sentences like the above is presumably not to be explained in terms of conflicting simulations.

The first stage involves incremental simulation where the language user builds up pieces of the sentence as they process its different parts. The second stage is the wrap-up stage where the language user may return to key parts of the incremental simulation and re-construct appropriate simulations. It may be possible that the incremental simulation stage generates conflicting simulations which then gets resolved in the wrap-up stage. Consider (7a):

(7a) The **school** caught fire when celebrating students' graduation.

Language users might have different linguistic intuitions with respect to whether or not (7a) is felicitous. The differences here may be due to differences in simulation in comprehending (7a). Consider the following type of language users who use perceptual simulations to comprehend (7a). In processing the first part of the sentence, the language user deploys the perceptual representation of a building. But the second predicate "celebrating students' graduation" would demand the language user to deploy the perceptual representation of a group of people. At this stage of processing, the sentence involves conflicting simulations for the language user. However, this initial conflict generated in the incremental stage may be resolved in the wrap-up stage, such that the language user may be prompted to reconstruct a coherent visual scene with a single but complex focal entity, for example, "part" of this focal entity (i.e., "the building part") is "on fire" and "part" of it (i.e., "the people part") is "celebrating".

In contrast, (7b) involves conflicting simulations that cannot be resolved in the same way as (7a):

(7b) *The **school** caught fire when visiting the museum.

Unlike (7a), (7b) involves two salient locations, that is, school and museum. We typically experience schools as unified wholes where the parts—for example, building, teachers, and students—are spatially coincident rather than occupying different spatial locations. While we can naturally simulate a single but complex focal entity in processing (7a), we cannot simulate a single focal entity corresponding to the word "school" to feature in our mental simulation in comprehending (7b). So it is no surprise that (7b) sounds odder than (7a). One might think that a school building at one location and a group of students and staff at another location comprise a single complex entity with parts that are spatially non-overlapping. But such a complex entity is construed in an ad hoc way. Simulations of focal entities are supposed to reflect our perceptual experiences of the world around us. We just do not experience such an ad hoc entity as a single unified thing.

4.4 | A potential objection

Given the aforesaid account, one might question why we need simulations at all to explain copredication or the lack thereof. One might think that we can use non-perceptual, conceptual representations to think of a focal entity, and oddness in copredicational senses occurs when we make clear distinctions with respect to the focal entities associated with the different conjuncts. One might, for instance, insist that (5b) is odd but not (1a), not because there is a conflict in simulations in one but not the other, but because we make a clear distinction between chicken-as-animal and chicken-as-food, whereas we do not ordinarily distinguish between book-as-tome and book-as-content.

(1a) The **book** weighs two kilos but is very interesting.
(5a) The **chicken** is delicious and chirpy.

It is unclear that in ordinary contexts, we do not distinguish between book-as-tome and book-as-content, but it certainly seems true that such a distinction is undetected or non-salient when we process sentences like (1a). In contrast, the distinction between chicken-as-meat and chicken-as-animal is salient when processing (5a). Just why this is the case still calls for an explanation.

The simulation view of language comprehension offers an explanation. The reason we make a clear distinction between two kinds of "chicken" when comprehending (5a) but not two kinds of "book" when comprehending (1a) is that chicken-as-meat and chicken-as-animal are associated with different perceptual representations—in (5a) the predicate occurs later demands the subject to simulate an object that is different from that associated with the first conjunct, whereas we do not associate book-as-tome and book-as-content with different perceptual representations—(1a) does not involve conflicting simulations. While book-as-tome and book-as-content are different things, their perceptual representations can be identical (see Liu, 2022). In putting forward their activation package account, Ortega-Andrés and Vicente (2019) note that the different senses of a copredicative noun that form an activation package tend to stand in realisation relations, for example, a book-as-content is realised in a book-as-tome, a school-as-institution has physical realisations, and so on. Given that things that stand in realisation relations tend to have the same perceptual simulations, it is thus no surprise, on this simulation-based proposal, that words with senses that stand in realisation relations tend to allow copredication.

It is also important to emphasise that the above account proceeds from the working assumption that mental simulation contributes to language comprehension and that we often deploy perceptual representations to think about the meanings of sentences. Given the empirical evidence presented in Section 2, this is indeed a reasonable assumption to adopt.

In Section 5, I delve further into some explanatory virtues of this simulation-based account of copredication.

5 | EXPLANATORY VIRTUES

5.1 | Individual differences in linguistic judgements

There are likely to be differences with respect to our judgements about whether or not a certain copredicational sentence sounds odd. Thinking of language processing as involving simulation allows us to account for *individual differences* in linguistic judgements. Individual differences may be reflected in language users' engagement with the wrap-up simulation stage and idiosyncrasies associated with what gets built into the mental simulation of the focal entity. For instance, in processing (7a), if the initial conflicting simulations are not resolved in the wrap-up simulation stage, then the language user is likely to judge the sentence to be odd. Alternatively, a language user might process the sentence in a way that does not even generate conflicting simulations in the incremental simulation stage. The word "school" might trigger perceptual simulation of a typical school with multiple "parts" including "the building part" and "the participant part".

(7a) The **school** caught fire when celebrating students' graduation.

Differences in linguistic judgements of oddness may also reflect differences in experience, which are manifested in differences in the simulations used when processing copredicational sentences. Consider (9):

(9) The **fish** is delicious and rainbow-coloured.

Just as "chicken" is polysemous between an animal sense and a meat sense, arguably "fish" is also. For a language user who is used to fish-as-meat being presented as skinned fillets divorced from its original animal form, much in the same way as chicken-as-meat and lamb-as-meat are consumed in English-speaking countries, (9) is likely to sound odd given that it involves conflicting simulations. In contrast, if the language user regularly handles fish-as-animal as a whole when cooking and consuming fish-as-meat, it is unlikely that (9) would be judged as odd.

5.2 | Influences from pragmatic factors

So far, we have been considering copredicational sentences in isolation from any specific contexts. When sentences are introduced with particular scenarios, they may not come out as odd. Consider (5a) again:

(5a) The **chicken** is delicious and chirpy.

Suppose (5a) occurs in the following text:

> There is a mysterious human-like talking monster living in the woods. He goes to the village and hunts chicken for food at night. Tonight, the monster is very lucky to find the gate to Mr. Jones' chicken shed unlocked. He opens the shed door and grabs a feathery chirpy chicken. As he takes his first bite of the plump chicken, he exclaims: "This chicken is so delicious and chirpy."

In this case, a sentence like (5a) is not odd. The difference in linguistic judgements about oddness between considering (5a) when taking pragmatic factors into account and considering (5a) in isolation can be accounted for by the simulation view of language comprehension. On the latter view, comprehending a scenario like the one above is likely to involve using perceptual representations to make sense of the scenario. As the reader proceeds with the plot, she can use the already deployed perceptual simulation of live chickens to make sense of (5a) to construe a coherent scenario. In contrast, when comprehending (5a) in isolation, the specific simulations triggered depends on the language user's prior experiences of the things involved—we usually have perceptual experiences of chicken-as-animal as being delicious, not chicken-as-animal. Pragmatic factors about a given scenario can prompt the simulation of a specific focal entity (e.g., "chicken-as-animal") and suppress that of another (e.g., "chicken-as-meat"), and allow the language user in a given narrative to make sense via mental simulation of an otherwise odd sentence.

5.3 | Anaphoric binding

The simulation view of language comprehension can also shed light on anaphoric binding. Consider (10):

(10) He opened the **door** and walked through **it**.

It may seem intuitive to think that "door" denotes door-as-leaf in the first conjunct whereas the pronoun "it" denotes door-as-opening. In cases of anaphoric binding, what the pronominal phrase denotes seems to be different from what is denoted by the antecedent noun phrase. In the literature, it is common to assume that a successful account of copredication should also explain cases of anaphoric binding.

The simulation-based account is put forward as an explanation of copredication, and it can also be extended to account for instances of anaphoric binding. The felicitousness of (10) can be explained in a similar way to that of (4)—"The window was broken many times and had to be boarded up". Our experiences of door leaves and door openings often coincide. In processing (10), one can simply simulate a single focal entity that undergoes different "states", that is, "being opened" and then "being walked through". It is also worth noting, as we already saw in Section 2, that sentences in the progressive tense allow greater simulation of the described event compared to sentences in the perfect tense, which prompts language users to simulate the end state of an event. In (10), the first part of the sentence—"He opened the door"— is in the past tense, which indicates that the action has completed. It is plausible that in processing this part of the sentence, one simply simulates the end state of the action, that is, "an opened door" as opposed to just the "door leaf" itself. In this case, the focal entity is a single entity, that is, "door opening", which the agent also walks through.

6 | CONCLUSION

We saw that on the simulation view, perceptual-motor representations are often constitutively involved in language comprehension. The main goal of the article has been to illustrate the explanatory potential of the simulation view by applying it to the much-debated issue of copredication. I have argued that the view can shed light on the question of why some copredicational sentences involving polysemous nouns with single representations result in oddness and others do not. Emerging from the discussion is the suggestion that oddness in copredicational sentences often arises from unresolved conflicting simulations where different conjuncts in a copredicational sentence demand the simulation of different focal entities. The dynamic picture of language comprehension that the simulation view offers also illuminates a number of issues concerning copredication, including different linguistic intuitions regarding the felicitousness of a copredicational sentence due to individual differences and influences from contextual information, as well as how simulation can help explain anaphoric binding. Insofar as the simulation view can shed light on the phenomenon of copredication, the explanatory pay-off lends support to the simulation view of language comprehension in the relevant cases, that is, making linguistic judgements about the felicitousness of copredicational sentences.

One important lesson that emerges from the discussion about copredication is that *zeugmatic oddness*—where a sentence is rendered odd because a word is used in different

meanings or senses—may be a gerrymandered phenomenon. In some cases, zeugmatic sentences involve different meanings of a homonym. Oddness in these cases is explained in terms of the distinct mental representations or concepts involved in processing the sentence. In other cases, zeugmatic sentences involve different senses of a polyseme, for example, "chicken", "newspaper", "oak", where the different senses share a single representation. Oddness in many of these cases can be explained, as proposed in this article, by appealing to the idea of conflicting simulation. So, different cognitive mechanisms can give rise to zeugmatic oddness.

The simulation-based account of copredication also makes headway for empirically testing how language users process copredicational sentences. The account put forward in this article suggests that "simulation-friendly" sentences, for example sentences in (1)–(4), are easier to process than "simulation-unfriendly sentences", for example sentences in (5). Future experiments can use examples of copredicational sentences in this article and in the general literature as stimuli to test this hypothesis.[5] In such experiments, participants would be presented with different copredicational sentences one after another and asked to submit a response once they have made sense of each sentence as best as they can. According to the hypothesis, participants will have shorter reaction times in trials of simulation-friendly sentences than in those of simulation-unfriendly sentences. The theoretical discussion in this article thus has the potential to form the impetus for empirical research on the topic.

Taking a step back from the specific issue concerning our linguistic intuitions about copredicational sentences, the rich conception of language comprehension that the simulation view entails naturally leads one to wonder about the effectiveness of communication. On such a view, there could be dramatic differences in meaning across individuals insofar as we go from experiences to words on the speaker's side and then from words to experiences on the listener's side (Bergen, 2012, p. 173). While communication in general may go more or less smoothly given our shared experiences, difficulties can occur when there are drastic differences in the experiences of language users. This was illustrated by examples such as "The fish is delicious and rainbow-coloured" and "The chicken is chirpy and delicious", which may be judged as felicitous or infelicitous depending on one's experiences with respect to how the relevant animals are consumed. Paying attention to such differences is valuable and can raise awareness in language users, which in turn may lead to improved strategies in bringing about effective communication.

DATA AVAILABILITY STATEMENT
There are no data available.

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[5]I owe this helpful suggestion to a reviewer of this article.

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