

Jed Sam Pizarro-Guevara¹ and Rowena Garcia^{2,3,4}

¹Department of Linguistics, University of Massachusetts, Amherst, Massachusetts, USA;
email: jpguevara@umass.edu

²Department of Linguistics, University of Potsdam, Potsdam, Germany

³Language Development Department, Max Planck Institute for Psycholinguistics, Nijmegen,
The Netherlands

⁴Department of Speech Pathology, University of the Philippines, Manila, Philippines

ANNUAL
REVIEWS **CONNECT**

www.annualreviews.org

- Download figures
- Navigate cited references
- Keyword search
- Explore related articles
- Share via email or social media

Annu. Rev. Linguist. 2024. 10:145–67

First published as a Review in Advance on
October 3, 2023

The *Annual Review of Linguistics* is online at
linguistics.annualreviews.org

<https://doi.org/10.1146/annurev-linguistics-031522-102844>

Copyright © 2024 by the author(s). This work is licensed under a Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See credit lines of images or other third-party material in this article for license information.



Keywords

Tagalog, Philippine languages, field psycholinguistics, agent-first, patient primacy

Abstract

Over the last decade, there has been a slow but steady accumulation of psycholinguistic research focusing on typologically diverse languages. In this review, we provide an overview of the psycholinguistic research on Philippine languages at the sentence level. We first discuss the grammatical features of these languages that figure prominently in existing research. We identify four linguistic domains that have received attention from language researchers and summarize the empirical terrain. We advance two claims that emerge across these different domains: (a) The agent-first pressure plays a central role in many of the findings, and (b) the generalization that the patient argument is the syntactically privileged argument cannot be reduced to frequency, but instead is an emergent phenomenon caused by the alignment of competing pressures toward an optimal candidate. We connect these language-specific claims to language-general theories of sentence processing.

1. INTRODUCTION

Much of what we know about sentence processing suffers from a lack of linguistic diversity, since the data come primarily from Western (and a handful of East Asian), educated, rich, and democratic language users (Henrich et al. 2010). In fact, around a decade ago, only 10 languages made up approximately 85% of the research on language processing (Anand et al. 2011). However, over the last decade, there has been a slow but steady accumulation of psycholinguistic research focusing on typologically diverse languages. This emerging subfield has been referred to as field psycholinguistics (Christianson & Cho 2009) or crosslinguistic psycholinguistics (Norcliffe et al. 2015), and its goal is to directly address the lack of linguistic diversity in the field by incorporating data from understudied languages.

In this review, we focus on psycholinguistic research on Philippine languages¹ at the sentence level. While there has also been some lexical processing and bilingualism research on Philippine languages, we do not cover it here. For example, Pizarro-Guevara (2017) and Cayado et al. (2023) used masked priming lexical decision tasks to investigate the representations of morphologically complex words when the root is obscured due to morphophonological processes in Cebuano and Tagalog, respectively. Barrios & Bernardo (2012) examined linguistic transfer by looking at how speakers of Cebuano and Chavacano, a Spanish-based creole spoken in the Philippines, acquire Tagalog's argument marking.

Philippine languages are important for sentential psycholinguists for the following reasons. First, most Philippine languages are verb-initial (Reid & Liao 2004), which means that information about argument structure, the selectional requirements that the predicate imposes, becomes available early on. This early availability could then help guide incremental structure building (Boland 1993, Trueswell et al. 1994). For example, in *Kaqchikel*, an unrelated language, there is evidence that verb-initial utterances offer a processing advantage in comprehension, relative to the more frequent subject-initial utterances (Koizumi et al. 2014). The researchers argued that having the verbal complex in initial position is advantageous for comprehenders because it allows for finer-grained predictions of the upcoming subject and object as a result of the person and number markings on the verb. In the same vein, one could argue that the initial position of the verbal complex in Philippine languages could also be leveraged by comprehenders in real time.

Second, the verb exhibits rich verbal morphology (i.e., the Philippine voice system). This piece of morphological information is intimately intertwined with how arguments are marked, how postverbal arguments are ordered, and which arguments are privileged syntactically (Chen & McDonnell 2019). These interactions make the verb a rich source of information, a nexus of linguistic cues, that can then be leveraged to further guide what to expect about upcoming linguistic material (Pizarro-Guevara & Wagers 2020).

Third, the more frequent structures are those where the patient/undergoer is the syntactically privileged argument (Cooreman et al. 1984, Garcia et al. 2019, Nagaya 2019, Tanaka et al. 2022), unlike in more familiar languages, where it is the agent. The prevalence of such structures has been referred to as “patient primacy” in the Philippine linguistics literature (Ceña 1977). Thus, these languages provide an ideal testing ground to investigate the extent to which sentence processing is mediated by linguistic experience with the ambient language and perhaps by more

¹While most of the languages spoken in the Philippine archipelago belong to the Austronesian language family, a number of non-Austronesian languages are spoken in the archipelago, including Spanish-based creole varieties, like Chavacano (Barrios & Bernardo 2012), and local Englishes (Gonzales 2017). Throughout, when we use the term Philippine languages, we refer to the Austronesian languages.

general principles, like agent preference in comprehension (Alday et al. 2014) or in event perception (Sapuppe & Flecken 2021) more generally, for example.

This review is organized as follows. Section 2 provides an overview of the grammatical features of Philippine languages that figure prominently in the psycholinguistics literature. Section 3 identifies linguistic domains that have received attention from researchers and provides the empirical terrain. Section 4 identifies certain commonalities that span these different domains. Section 5 concludes.

2. GRAMMATICAL FEATURES OF PHILIPPINE LANGUAGES

This section provides an overview of the grammatical features of Philippine languages that figure prominently in psycholinguistic research. To illustrate these features, we use Tagalog, an Austronesian language spoken by approximately 22.5 million native speakers (PSA 2021),² because much of the research has focused on Tagalog. We acknowledge that the other Philippine languages might not exhibit all of the features or might even have other features not discussed below.

2.1. Voice Morphology Cross-References the *ang*-Marked Argument

Many Philippine languages are head-initial, in which the predicate comes first in the clause (Reid & Liao 2004). For example, Tagalog allows predicates of any category type: verbal, nominal, adjectival, and prepositional (Richards 2009). Below, only verbal predicates are of interest. Tagalog verbs typically carry what is often called voice morphology.³ Voice morphology cross-references the argument in the clause that is marked with *ang* [aŋ], which may bear various thematic roles (e.g., agent, patient, location, benefactee).

Sentences 1a–c have the same event structure—a child, a piece of cloth, and a market are involved in a buying event—and the thematic roles assigned by the verb to its arguments remain constant throughout. The verb form changes and the argument markers covary with the verb. In example 1a, the verb exhibits agent voice (AV). The agent *bata* ‘child’ is marked with *ang*; the patient *tela* ‘cloth’, with *ng* [naŋ]; and the location *palengke* ‘market’, with *sa*. In example 1b, the verb exhibits patient voice (PV). The patient is now marked with *ang*; the agent, with *ng*; and the location, still with *sa*. In example 1c, the verb exhibits locative voice (LV). The location is now marked with *ang*; the remaining arguments, with *ng* (Table 1 summarizes argument marking by voice in Tagalog):⁴

- (1a) Bumili ang bata ng tela sa palengke
bought.AV child cloth market
‘The child bought cloth at the market’ [Agent voice]

²The estimate of the number of Tagalog speakers increases dramatically if speakers of other Philippine languages are included, since most of them are early sequential bilinguals. They learn the language of the region where they are from, and upon entry into the educational system, they learn Tagalog and English (Galang 1988, 2001). Even though the Philippine Constitution of 1987 declares Filipino to be the national language, the Tagalog/Filipino distinction is a nonissue for us. We treat Tagalog and Filipino as one and the same. Filipino is the standardized form of Tagalog that allows borrowings from other languages. For readers interested in the language ideologies surrounding the Tagalog/Filipino distinction, see Barrios (2014, appendix 2) for a historical overview of how Filipino, the national language, came to be.

³Voice has also been called focus or trigger in the literature, and it should not be conflated with the active–passive alternation in English and other more familiar languages (Foley 2008). For a review of the Philippine-type voice system, see Chen & McDonnell (2019).

⁴The abbreviations used in the examples throughout are as follows: AV, agent voice; LV, locative voice; PL, plural; PV, patient voice; RP, recent perfective; SG, singular; UV, undergoer voice.

Table 1 Argument marking by voice in Tagalog

	Agent	Patient	Location
Agent voice	<i>ang</i>	<i>ng</i>	<i>sa</i>
Patient voice	<i>ng</i>	<i>ang</i>	<i>sa</i>
Locative voice	<i>ng</i>	<i>ng</i>	<i>ang</i>

- (1b) Binili ng bata ang tela sa palengke
bought.pv child cloth market
‘The child bought the cloth at the market’ [Patient voice]
- (1c) Binilhan ng bata ng tela ang palengke
bought.lv child cloth market
‘The child bought (the) cloth at the market’ [Locative voice]
(Rackowski & Richards 2005)

We start with an overview of the voice system because this part of the grammar interacts with many other parts. For example, as discussed above, it interacts with argument marking, and as we discuss in Sections 2.3 and 2.4, respectively, it also interacts with the order of elements postverbally and with the eligibility to participate in filler-gap (or movement) dependencies. Note that some researchers sometimes collapse the non-AV voices and refer to this class as undergoer voice (UV). This terminology is particularly relevant in the various corpus studies peppered throughout Section 3.

2.2. A Brief but Necessary Excursus: Subjecthood Is Not Unproblematic

The notion of subjecthood in Philippine languages is not uncontroversial, because there is a bifurcation of the syntactic properties that are crosslinguistically controlled by the argument referred to as the subject in more familiar languages. Some of these properties are controlled by the agent and others by the *ang*-marked argument. Kroeger (1993) details this bifurcation in Tagalog, and we summarize it in **Table 2**.

This bifurcation led to different views in terms of how grammatical relations (e.g., subject, object, indirect object) map onto thematic relations and, ultimately, to different views about the languages’ morphological alignment (e.g., nominative-accusative, ergative-absolutive, or even its own type). It is outside the scope of this review to provide a more detailed treatment of this topic. Throughout, we avoid using grammatical relations and frame findings in terms of thematic roles.

Table 2 Bifurcation of subject properties in Tagalog

Property	Agent argument	<i>ang</i> -marked argument
Obligatory element of the clause	No	Yes
Launches quantifier float	No	Yes
Controls optional agreement in adjectives and verbs	No	Yes
Addressee of imperatives	Yes	No
Can antecede a reflexive irrespective of marking	Yes	No
Targeted by control constructions	Yes	No

2.3. Word Order Is Relatively Free, but Interacts with Voice

The basic word order of Tagalog is verb-initial, but the postverbal order is relatively flexible (Schachter & Otanes 1983). This flexibility is demonstrated in examples 2a–f:

- | | | |
|------|--|------------------------------|
| (2a) | Nagbigay ng libro sa babae ang lalaki
gave.AV book woman man
'The man gave the woman a book' | [Verb-Theme-Recipient-Agent] |
| (2b) | Nagbigay ng libro ang lalaki sa babae | [Verb-Theme-Agent-Recipient] |
| (2c) | Nagbigay ang lalaki ng libro sa babae | [Verb-Agent-Theme-Recipient] |
| (2d) | Nagbigay ang lalaki sa babae ng libro | [Verb-Agent-Recipient-Theme] |
| (2e) | Nagbigay sa babae ang lalaki ng libro | [Verb-Recipient-Agent-Theme] |
| (2f) | Nagbigay sa babae ng libro ang lalaki | [Verb-Recipient-Theme-Agent] |
- (Schachter & Otanes 1983)

Some word orders are more natural than others, however. Researchers have identified various pressures that affect word order. Billings (2005) demonstrated that *ang*-marked arguments prefer to be clause-final (i.e., *ang*-last), while Aldridge (2004) showed that agents prefer to be immediately postverbal (i.e., agent-first). Kroeger (1993) identified three competing pressures: (a) *ang*-last; (b) agent-first; and (c) heavy NP shift, which is the tendency to have “heavier” elements follow “lighter” elements.

The following sentences exemplify how these pressures interact. When the verb has PV, the verb-agent-patient order in example 3a is reported to be more natural than the verb-patient-agent order in example 3b. Example 3a satisfies both agent-first and *ang*-last, holding heaviness constant, while example 3b violates both:

- | | | |
|------|--|----------------------|
| (3a) | Pinatay ng balyena ang pating
killed.pv whale shark
'The whale killed the shark' | [Verb-Agent-Patient] |
| (3b) | Pinatay ang pating ng balyena
killed.pv shark whale
'The whale killed the shark' | [Verb-Patient-Agent] |
- (Hsieh 2016)

When the verb has AV, the verb-agent-patient order in example 4a and the verb-patient-agent order in example 4b are equally natural, holding heaviness constant. Both word orders satisfy one pressure at the other's expense:

- | | | |
|------|--|----------------------|
| (4a) | Pumatay ang balyena ng pating
kill.AV whale shark
'The whale killed a shark' | [Verb-Agent-Patient] |
| (4b) | Pumatay ng pating ang balyena
kill.AV shark whale
'The whale killed a shark' | [Verb-Patient-Agent] |
- (Hsieh 2016)

Because of Tagalog's verb initiality and the interaction between voice and argument marking, speakers already have enough information to commit to a thematic role assignment of the first

noun even before encountering it. Whether and how they use these highly reliable cues are empirical questions. In Section 3.1, we discuss the strands of research that leverage this word order flexibility and voice's interaction with how arguments are marked. The first strand investigates the extent to which speakers use *ang* and *ng* to assign thematic relations to arguments in real time and the extent to which they adopt a word order strategy. The second strand investigates the extent to which speakers are sensitive to the competing pressures that affect postverbal word order.

2.4. Only *ang*-Marked Arguments Can Participate in Filler–Gap Dependencies

Voice interacts with filler–gap dependencies (FGDs), like relativization. This interaction has been called many names in the generative syntax literature, ranging from “subject-only restriction” (Keenan & Comrie 1977) to “absolutive restriction on $\bar{A}$ -extraction” (Aldridge 2008). The received generalization is as follows: The *ang*-marked argument is the only argument eligible to participate in FGDs (Aldridge 2017, Ceña 1979, Law 2016, Rackowski & Richards 2005, Schachter 1977). In other words, the filler—the argument that participates in FGDs—must match the argument cross-referenced by voice, as shown in examples 5a–d. When the verb has AV, the agent can be relativized but the patient cannot, as in examples 5a and 5b, respectively. When the verb has PV, the patient can be relativized but the agent cannot, as in examples 5c and 5d, respectively. For ease of exposition, we exemplify the generalization using AV and PV. This restriction on FGDs extends to the other voices in the language as well (Rackowski & Richards 2005):

- (5a) Iyon ang babae-ng bumili ng baro
that woman-that bought.av dress
'That's the woman who bought a dress' [AV; agent is relativized]
- (5b) *Iyon ang baro-ng bumili ang babae
that dress-that bought.av woman
Intended: That's the dress that the woman bought [AV; patient is relativized]
- (5c) Iyon ang baro-ng binili ng babae
that dress-that bought.pv woman
'That's the dress that the woman bought' [PV; patient is relativized]
- (5d) *Iyon ang babae-ng binili ang baro
that dress-that bought.pv woman
Intended: That's the woman who bought the dress [PV; agent is relativized]
(Schachter 1977)

In FGDs, because there is a one-to-one mapping between voice and the identity of the filler, voice could allow speakers to commit to an interpretation as early as the verb. Upon encountering the verb, comprehenders already have enough information to evaluate the thematic fit of the filler and to generate expectations about upcoming arguments. They have information about the event structure via the lexical semantics of the verb and the thematic role of the filler via the interaction between voice and FGD formation. In Section 3.3, we discuss whether and how voice is used to actively resolve FGDs.

2.5. Relative Clauses Also Exhibit Word Order Flexibility

Philippine languages are typologically rare (Dryer 2013) in that they allow the head noun to surface in a variety of positions with respect to a relative clause (RC) modifier. Tagalog demonstrates this flexibility in examples 6a–d (Aldridge 2017, Law 2016). The head noun may surface

before the RC, as in example 6a. It may also surface after the RC, as in example 6b. It may surface in a position that seems internal to the RC, as in example 6c. Finally, it may be null, as in example 6d:

- (6a) ang libro-ng binili ng babae
book-that bought.pv woman
'the book that the woman bought' [Head-initial RC]
- (6b) ang binili ng babae-ng libro
bought.pv woman-that book
'the book that the woman bought' [Head-final RC]
- (6c) ang binili-ng libro ng babae
bought.pv-that book woman
'the book that the woman bought' [Head-internal RC]
- (6d) ang binili ng babae
bought.pv woman
'what the woman bought' [Headless RC]
(Aldridge 2017)

Most research on RC processing has revolved around the question of whether RCs involving AV (agent-gap RCs) and RCs involving PV (patient-gap RCs) are processed differently. Many of these studies have focused only on head-initial RCs. Only a few have directly compared RC processing in head-initial and head-final configurations. In Section 3.4, we discuss when researchers have found differences between agent-gap and patient-gap RCs, and when such differences are attenuated or neutralized.

3. WHAT WE KNOW ABOUT PHILIPPINE SENTENCE PROCESSING

This section provides an overview of the different domains that have received some attention from researchers. Section 3.1 covers the research on simple declaratives, which, for present purposes, correspond to sentences that exhibit verb-initial word order. Section 3.2 discusses a particular subtype of simple declaratives that involve reflexive pronouns as coarguments. Section 3.3 focuses on FGDs, and Section 3.4 takes a closer look at a particular type of FGD, namely RCs.

3.1. Simple Declaratives

Tagalog is a verb-initial language that exhibits rich morphology and relatively free word order. The voice on the verb interacts with how the arguments are marked and how they are ordered. The first strand of research investigates the extent to which speakers use voice and argument marking (i.e., *ang* and *ng*) to assign thematic relations to arguments in real time and the extent to which they adopt a word order strategy (i.e., to assign the agent role to the first noun they encounter, irrespective of marking), which has been widely observed in children crosslinguistically (Chan et al. 2009). The second strand investigates the extent to which speakers are sensitive to the competing pressures that affect postverbal word order.

3.1.1. The *ang*-marked argument is typically not the agent. Garcia & Kidd (2022) recently collected and analyzed a cross-sectional spoken corpus from 20 child-guardian pairs, and they showed that UV (i.e., all the non-AV voices combined) is more frequent than AV in child-directed speech (AV = 31%; UV = 69%). These results corroborate earlier findings by Garcia et al. (2019) and Cooreman et al. (1984), which were based on a longitudinal spoken corpus (Marzan 2013) and

a written corpus, respectively. Sauppe et al. (2013) reported similar findings in picture descriptions (AV = 36%; PV = 64%), as did Tanaka et al. (2022) (AV = 30%; PV = 63%).

Interestingly, Garcia et al. (2021) found that around half of the verbs were not inflected for voice. This is ungrammatical but seems to be a characteristic of child-directed speech. Based on the context and marking on the nouns, 82% of utterances with uninflected verbs should have been marked by one of the UVs. This finding is also reflected in the speech of 2- to 4-year-olds (Garcia & Kidd 2022), who first produce mostly verbs that are not voice-marked. Once they start inflecting the verbs, they show more frequent use of UV than AV (AV = 39%; UV = 61%). Taken together, these findings demonstrate that the *ang*-marked argument is typically not the agent in the input received by children.

3.1.2. Children show a patient voice advantage in comprehension and production. Acquisition experiments on thematic role assignment have typically focused on identifying the types of cues children use, especially when these cues point to different thematic assignments. A few studies have investigated the extent to which Tagalog-speaking children use the interaction between voice on the verb and argument marking on the noun, and the extent to which they adopt a first-noun-as-agent strategy in comprehending simple transitive sentences.

Recent experiments show a PV advantage, where children performed in a more adultlike way when the verb had PV, compared with when it had AV. For example, Garcia et al. (2019) found that children were equally accurate in both orders when the verb had PV. When the verb had AV, children were more accurate when the agent was mentioned first. Furthermore, they showed longer listening times when the sentence they had heard and the picture in front of them showed a role reversal, compared with when the sentence and the picture had matched, in PV but not in AV. Taken together, these findings suggest that PV gives children an advantage in detecting mismatches to thematic assignments.

In an eye-tracking and picture selection task, 5- and 7-year-olds showed above-chance accuracy when the verb had PV, irrespective of the order of the arguments. Meanwhile, they were above chance in AV only when the agent was first (Garcia et al. 2020). Children's eye movements indicated that when the verb had PV, there was a high proportion of looks to the target picture, irrespective of word order. On the other hand, in AV, agent-initial sentences had a higher proportion of looks to the target picture, relative to agent-last sentences. These results indicate a PV advantage, showing that children can reliably use the information provided by voice and argument marking to assign thematic roles in PV. For AV, they seem to rely on a word order strategy, corroborating an earlier finding by Segalowitz & Galang (1978).

In terms of production, Garcia et al. (2018) and Garcia & Kidd (2020) provided a voice-marked verb prompt and asked 3-, 5-, and 7-year-olds to describe a picture. These studies show that children made more mistakes in marking the noun when given a verb with AV versus a verb with PV. Most of the errors of younger children were dropping one of the noun markers, while the older children showed noun-marking reversals: They switched the *ang* and the *ng* markers. These errors indicate that children might have been using the marking associated with PV as a default template, resulting in errors in AV.

3.1.3. Adults leverage the early availability of verb and argument markers in comprehension. Sauppe (2016) investigated the kinds of information that speakers use to predict upcoming arguments. They used a visual world eye-tracking paradigm and presented participants with a visual display containing the agent, the patient, and a distractor and a recording of a transitive sentence that manipulated the voice on the verb (AV, PV, and no voice using recent perfectives). For example, participants were presented with a visual display consisting of a frog, a fly, and a printer. They then heard the sentence *kakainin...* (literal: will eat.pv...). Upon hearing the verb,

participants directed their looks to the agent (i.e., the frog) irrespective of the voice manipulation, which the author interpreted as adult speakers using the lexical semantics of the verb to immediately assign thematic roles.

Using a picture selection task with eye tracking, Garcia et al. (2020) showed that, as soon as both the voice-marked verb and the first noun are available, adults assign thematic roles and correctly identify which of the two pictures in front of them (e.g., a pig pulling a cow or a cow pulling a pig) matches the sentence they heard. To get a finer-grained picture of whether it was sufficient to have only voice and the marking of the first NP to predict the upcoming first noun and its thematic role, Garcia et al. (2021) increased the distance between the argument marker and the first noun by adding a temporal adverb and adjective in between, and presented participants with a sentence that always matched the picture in front of them. The researchers examined whether participants look at the upcoming first noun even before it is mentioned. The results showed that participants predicted the upcoming argument noun in PV but not in AV. A similar advantage for PV has been found through different methodologies: self-paced listening (Garcia et al. 2019), self-paced reading with a truth value judgment task, self-paced reading with a memory load task, and rapid serial visual presentation (Bondoc 2020).

These results show how Tagalog speakers use the early availability of the verb, voice, and argument markers in comprehension. Moreover, these findings indicate a processing advantage of PV over AV that reflects the distribution of voice in the language.

3.1.4. Adults are sensitive to agent-first and *ang*-last pressures when determining postverbal word order. Hsieh (2016) presented participants with sentences that varied as to whether the verb had AV or PV and whether the two NPs that followed bore *ang-ng* or *ng-ang* marking. Participants were tasked with repeating the sentence and rating the naturalness of the sentences heard. Of particular interest are their naturalness ratings: Participants gave the highest ratings when the verb had PV, *ng* on NP1 and *ang* on NP2; the lowest ratings when the verb had PV, *ang* on NP1 and *ng* on NP2; and somewhere in between when the verb had AV. Framed differently, participants gave the highest ratings when the sentences satisfied both agent-first (which is signaled by the interaction between PV and *ng* on NP1) and *ang*-last; the lowest ratings when the sentences violated both pressures; and ratings somewhere in between when the sentences satisfied one at the expense of the other.

In a sentence completion task, Bondoc & Schafer (2022) investigated the order in which arguments appear when given the beginning of a sentence containing a verb with voice—AV, PV, and two others called benefactive and instrumental voices, where the benefactee and the instrument are *ang*-marked, respectively—and a visual display that depicted the arguments of the verb that was provided. For example, participants were supplied with. . .*niluto kani-kanina lang* ('. . .just cooked earlier'; literal: cooked.pv earlier just) and were shown a visual display consisting of a woman, a little girl, a pan, and spaghetti. They found that when participants were supplied with AV, about half of the time, the first NP participants produced was the agent; and the other half of the time, it was the patient. In UV (i.e., non-AV voices), the first NP was the agent at least 75% of the time. The second NP that participants produced was the *ang*-marked argument. These results replicate earlier findings by Garcia et al. (2018), who also used a sentence completion study with voice-marked verb prompts, and those by Bondoc et al. (2018), who used a picture description task. The same strong preference for agent-first in PV and flexible word order choice for AV were also observed in recent structural priming experiments (Garcia et al. 2023).

Sauppe et al. (2013) used a picture description task and found a similar yet slightly different distribution. They found that, overall, PV accounted for 64% of the descriptions, while AV accounted for 36%. When broken down by the order of arguments, in PV, 97% were agent-first

descriptions. Meanwhile, in AV, 85% were agent-last/*ang*-last. These findings suggest that speakers prefer to produce sentences that satisfy both agent-first and *ang*-last. They may have different weights, however.

3.2. Reflexive Dependencies

There are two strands of research in the domain of reflexive dependencies. The first strand investigates how voice interacts with argument marking and word order, akin to the type of research in the domain discussed above. Sentences 7a–d demonstrate this interaction:

- | | | |
|------|---|------------------------|
| (7a) | Nagkamot ang lalaki ng sarili niya
scratched.AV man self 3sg
‘The man scratched himself’ | [Verb-Agent-Reflexive] |
| (7b) | Nagkamot ng sarili niya ang lalaki
scratched.AV self 3sg man
‘The man scratched himself’ | [Verb-Reflexive-Agent] |
| (7c) | Kinamot ng lalaki ang sarili niya
scratched.pv man self 3sg
‘The man scratched himself’ | [Verb-Agent-Reflexive] |
| (7d) | Kinamot ang sarili niya ng lalaki
scratched.pv self 3sg man
‘The man scratched himself’
(Bondoc et al. 2019) | [Verb-Reflexive-Agent] |

The second strand examines whether comprehenders attend to potential antecedents that are not licensed by the grammar, that is, in configurations that are not compliant with Principle A of Binding Theory (Chomsky 1981).

3.2.1. Reflexives do not show themselves much in the input. Bondoc et al. (2019) conducted a corpus analysis of the distribution of reflexives in child-directed Tagalog using a longitudinal corpus (Marzan 2013). Unsurprisingly, reflexives are quite rare in the input—of the 39,210 adult utterances, only 33 (fewer than 1%) contained a reflexive. The authors observed that there was a strong preference to have the agent follow the verb and to have the reflexive, which is almost always *ang*-marked, in final position. Of the 33 utterances with a reflexive, 32 (97%) exhibited this pattern. These corpus findings are consistent with the prevalence of UV in simple declaratives and with the idea that postverbal word order is a product of the interaction between agent-first and *ang*-last (Kroeger 1993).

3.2.2. Reflexives behave like simple declaratives. Bondoc et al. (2019) also conducted a sentence production experiment to investigate the order in which arguments appear when given a verb with voice and a visual display involving a semantically transitive predicate performed either to oneself or to another person. For example, participants were given *binasa* [binasa?] (splashed.pv) and a visual display of a girl splashing herself or someone else with water. The participants’ task was to use the verb provided to produce a sentence that describes the visual display. They found that when adults were given PV and they produced a target sentence (i.e., one with a reflexive), they produced the verb-*ng* agent-*ang* reflexive order around 86% of the time and the alternative order around 4% of the time. When adults were given AV and they produced a target sentence, they produced the verb-*ang* agent-*ng* reflexive around 75% of the time and the alternative order around 15% of the time. Overall, children produced fewer target responses. When they did

produce a reflexive, it was qualitatively similar to the adults'. When given PV, they produced the verb-*ng* agent-*ang* reflexive order around 35% of the time and the alternative order around 9% of the time. When given AV, they produced the verb-*ang* agent-*ng* reflexive order around 25% of the time and the alternative order around 4% of the time.

The finding that in PV both children and adults overwhelmingly produce the verb-*ng* agent-*ang* reflexive order is consistent with how agent-first and *ang*-last interact. Both pressures are satisfied in the order above. At first blush, the finding that in AV both children and adults seem to prefer the verb-*ang* agent-*ng* reflexive order seems unexpected, given what we have seen thus far. We might expect there to be no preference in AV since either agent-first or *ang*-last is satisfied at the expense of the other. We conjecture that there is a preference for the verb-*ang* agent-*ng* reflexive because it in fact satisfies two pressures: agent-first and heavy-last. It could be that the reflexive is treated as heavier than a regular NP since it is a morphologically complex word involving the word for self and a pronoun. When viewed in this way, the second finding is also consistent with the idea that competing pressures govern postverbal word order, as discussed in Section 2.3.

3.2.3. Comprehenders momentarily consider grammatically illicit antecedents. Pizarro-Guevara & Dillon (2020) conducted a self-paced reading experiment using a number mismatch paradigm to examine the extent to which Tagalog comprehenders attend to the number features of potential antecedents that are not licensed by the grammar. They compared the reading times of sentences like that in example 8. The grammatically licit antecedent *mga dalaga* is plural, while the grammatically illicit antecedent was either the singular *tambay* or the plural *mga tambay*. The difference in how the reflexive is read, if any, when the illicit antecedent is singular or plural indexes the extent to which comprehenders attended to the number feature of the grammatically illicit antecedent. They had comprehension questions to determine how speakers ultimately interpreted said sentences:

- (8) Pinupuri ng mga dalaga na hinaharana ng (mga) tambay gabi-gabi ang
 praise.PV PL woman that serenade.PV PL loiterer nightly
 kanilang mga sarili. . .
 themselves
 'The women who the loiterer(s) serenade(s) every night praise themselves. . .'

Pizarro-Guevara & Dillon (2020) found that the ultimate interpretation of the reflexive, as indexed by their comprehension questions after the presentation of each sentence, was not influenced by the number features of the grammatically illicit antecedent. They interpreted this finding as being consistent with Principle A of Binding Theory (Chomsky 1981). When they considered the reading times at the reflexive, they found that the reflexive took a longer time to read when the grammatically illicit antecedent was singular compared with when it was plural. This observation suggests that speakers were attending to the features of the grammatically illicit antecedent momentarily, even when their ultimate interpretations did not.

Pizarro-Guevara et al. (2022) partially replicated these findings. In another self-paced reading study, they found that the number feature of the grammatically illicit antecedent had very little impact on the final interpretation of the reflexive. When they considered the participants' reading times, however, they found no evidence that participants were attending to the number features of the grammatically licit antecedent. While they had collected data from 104 participants, only 58 were left after adoption of the same exclusion criteria as in the earlier study. Their results were trending in the same direction as the effects found in the earlier study, which they conjectured was due to low power. This is consistent with recent research by Jäger et al. (2017), which suggests that the effect size of the predicted interference in reading measures is likely quite small and easily requires more than 100 participants to yield sufficient power to detect the effect.

3.3. Filler–Gap Dependencies

FGDs challenge comprehenders with incremental uncertainty. When confronted with uncertainty, comprehenders could wait until all the bottom-up information becomes available. Alternatively, they could actively construct dependencies even in the absence of disambiguating information. A wealth of evidence suggests that comprehenders do the latter: They actively posit a gap at each position that could potentially resolve the dependency (Frazier 1987, Frazier & Clifton 1987).

To date, only one study has investigated whether and how voice is used as a cue in FGD processing. Given the interaction between voice and FGD formation, as discussed in Section 2.4, Pizarro-Guevara & Wagers (2020) hypothesized that comprehenders would leverage this interaction to commit to an interpretation as early as the verb. They reasoned that, upon encountering the verb, comprehenders already have information about the event structure (via the lexical semantics of the verb) and the thematic role of the filler (via the interaction between voice and FGD formation). At this point, comprehenders should have enough information to evaluate the thematic fit of the filler.

Before proceeding, we note that even though RCs are a type of FGD, RCs are covered separately since the questions asked in that domain are related to but different from the questions of whether and how voice is used in real time. For RC processing, see Section 3.4.

3.3.1. Agent voice is a better cue for an agent gap than patient voice is for a patient gap.

The hypothesis presented above hinges on the assumption that the received generalization of the interaction between voice and FGD formation is robust. That is, the hypothesis assumes the following to be true:

$$(9a) \quad P(\text{gap}=\text{agent} \mid \text{voice}=\text{AV}) \sim 1$$

$$(9b) \quad P(\text{gap}=\text{patient} \mid \text{voice}=\text{PV}) \sim 1$$

Pizarro-Guevara & Wagers (2020) conducted a series of acceptability judgment studies to determine whether the hypothesis given above is tenable. They manipulated whether the verb exhibited AV or PV and whether the filler was cross-referenced by voice in three types of FGDs. Their design is akin to what is exemplified by sentences 5a–d. The authors operationalized the robustness of the received generalization by scaling how acceptable participants found a filler that was not cross-referenced by voice against how acceptable they found a filler that was. They found that the generalization was robust in AV but not in PV. When the verb exhibited AV, that was diagnostic that the filler was associated with an agent gap. Meanwhile, when the verb exhibited PV, the filler was not always associated with a patient gap. Some participants allowed the filler to be associated with the agent gap. This availability seems to be mediated by the type of FGD.

These findings are consistent with observations made by Ceña & Nolasco (2011, 2012) and by Tanaka (2016) and have been replicated and extended to the other voices (J.S. Pizarro-Guevara & M. Wagers, manuscript in preparation). A modification of the received generalization is as follows: The argument that participates in FGDs is the *ang*-marked argument, and for some speakers, agents may also participate in FGDs—even when not cross-referenced by voice (i.e., in UV).

3.3.2. What enhances the linkage between the filler and the gap? Voice does. To isolate the independent contribution of voice, Pizarro-Guevara & Wagers (2020) used the stops-making-sense (SMS) paradigm (Boland et al. 1995) and compared the time course of dependency formation when the verb exhibited voice versus when it did not. They leveraged the fact that some grammatical aspects in Tagalog do not have voice but, crucially, they exhibit comparable restrictions on FGDs. The authors compared the time course of dependency formation (*a*) when the verb exhibited AV and when the verb was in the iterative aspect and (*b*) when the verb exhibited PV and when

the verb was in the recent perfective aspect. They found that upon encountering the verb, participants were actively associating the filler with the gap. This association happened even before the participants had encountered the fully disambiguating coargument. Voice was recruited as an additional cue—in the form of either greater or earlier sensitivity to plausibility mismatches in AV or PV, respectively—to further strengthen the participants’ commitment to a correct interpretation.

In a different set of SMS experiments, Pizarro-Guevara & Wagers (2020) directly compared the time course of dependency formation when the verb had AV and when it had PV in three types of FGDs. They again replicated the finding that comprehenders actively associated the filler with the gap even before the disambiguating coargument. However, the way in which voice was used varied depending on whether it was AV or PV, and it also varied across different FGDs.

3.4. Relative Clauses

RC research has centered on the question of whether RCs involving agent gaps (agent-gap RCs), as in example 10a, and those involving patient gaps (patient-gap RCs), as in example 10b, are processed differently:

- | | | |
|-------|--|-------------------------------|
| (10a) | baboy na sumisipa ng kambing
pig that kicking.av goat
‘pig that is kicking a goat’ | [Head-initial agent-gap RC] |
| (10b) | baboy na sinisipa ng kambing
pig that kicking.pv goat
‘pig that the goat is kicking’
(Pizarro-Guevara 2020) | [Head-initial patient-gap RC] |

The main line of RC research is concerned with whether agent-gap RCs are easier to process than patient-gap RCs and, if so, how best to account for this asymmetry. A related line of research investigates the contexts in which this asymmetry is attenuated.

Before proceeding, we note that this line of research is akin to the RC-processing research in more familiar languages that has centered on the question of whether subject-gap RCs (SRCs) are easier to process than object-gap RCs (ORCs) (for a review, see Lau & Tanaka 2021). We say “akin” because, as discussed in Section 2.2, subjecthood in Philippine languages is not entirely unproblematic. That said, following Pizarro-Guevara & Wagers (2020) and Tanaka et al. (2022), we can reconceptualize the agent-gap advantage that we discuss below as a proper subset of the SRC advantage that we observe in more familiar languages. We mention this to allow readers familiar with the SRC-ORC literature to make typological comparisons.

3.4.1. The relative clause gap that corresponds to the agent is not the most frequent. In a preliminary corpus analysis of naturally occurring Tagalog conversations, Nagaya (2019) found that, overall, RCs involving undergoer gaps (i.e., non-agent-gap RCs) accounted for 65% of the RCs in the corpus. This finding echoes the general prevalence of UV in the language that we saw in Section 3.1 in simple declaratives (Cooreman et al. 1984, Garcia et al. 2021, Garcia & Kidd 2022). Nagaya also found that even though the language has four logical possibilities in terms of head placement, as discussed in Section 2.5, the most common type of RC is headless, accounting for around 80% of the RCs in the corpus. Among the headed RCs, approximately 15% of them were head-initial and around 5% were head-final.

Tanaka et al. (2022) also conducted a corpus analysis of the distribution of head-initial RCs in child-directed Tagalog using a longitudinal spoken corpus (Marzan 2013). They arrived at a similar conclusion: Patient-gap RCs are more frequent, accounting for around 71% of the head-initial RCs in the corpus.

3.4.2. Agent-gap relative clauses are easier to process than patient-gap relative clauses—at least when they are head-initial.

One of the core empirical findings in Tagalog RC research is that agent-gap RCs are easier to process than patient-gap RCs. For example, Pizarro-Guevara & Wagers (2021) used a picture selection task with confidence rating to compare how the different RCs are processed. They found that speakers were not only more accurate and confident but also faster at offering correct responses when encountering an agent-gap RC versus a patient-gap RC.

This core finding has been replicated in different Tagalog-speaking populations: other adults (Bondoc et al. 2018), children (Pizarro-Guevara 2014, Tanaka et al. 2019), and individuals with agrammatic aphasia (Bondoc et al. 2018). It is also cross-methodologically robust and has been found using elicited imitation (Bondoc et al. 2018), character selection (Bondoc et al. 2018, Pizarro-Guevara 2014), SMS tasks (Pizarro-Guevara & Wagers 2020), and self-paced reading (Bondoc & Kush 2023, Pizarro-Guevara & Dillon 2022).

Pizarro-Guevara (2020) offered another piece of evidence for an agent-gap RC preference by using how speakers process globally ambiguous RCs. They leveraged the fact that RCs with a recent perfective verb can be either globally ambiguous between an agent-gap RC and a patient-gap RC, as in example 11a, or unambiguously an agent-gap RC, as in example 11b. The crucial difference here is the marking on *kambing* ‘goat’:

- (11a) baboy na kakasipa lang ng kambing
 pig that kicked._{RP} just goat
 ‘pig that the goat just kicked’
 ‘pig that just kicked the goat’ [Globally ambiguous RC]
- (11b) baboy na kakasipa lang sa kambing
 pig that kicked._{RP} just goat
 ‘pig that just kicked a goat’ [Unambiguous SRC]
 (Pizarro-Guevara 2020)

When the RC was unambiguously an agent-gap RC (via the *sa* on the coargument), as in example 11b, participants offered mostly agent-gap interpretations, and they did so with high confidence. On the other hand, when the RC was globally ambiguous, as in example 11a, some participants offered patient-gap interpretations with some degree of confidence; however, many more offered agent-gap interpretations with high confidence.

3.4.3. The agent-gap preference may be attenuated, but its behavioral “footprint” lingers.

The core empirical insight above has been based primarily on head-initial RCs. As discussed in Section 2.5, Tagalog also allows for other head placements. Only a few studies have ventured beyond head-initial RCs. One such study is that by Pizarro-Guevara & Wagers (2021), who compared head-initial RCs, like those in examples 10a and 10b, and their head-final counterparts, like those in examples 12a and 12b. When the RC was head-initial, participants were not only more accurate and confident but also faster at giving correct responses in agent-gap interpretations than in patient-gap interpretations. However, when the RC was head-final, participants’ accuracy and confidence provided no evidence for an agent-gap preference. Nevertheless, participants were still faster at giving correct responses when the RC had an agent-gap interpretation versus a patient-gap interpretation. Pizarro-Guevara & Dillon (2022) obtained similar findings using self-paced reading:

- (12a) sumisipa ng kambing na baboy
 kicking._{AV} goat that pig
 ‘pig that is kicking a goat’ [Head-final agent-gap RC]

- (12b) sinisipa ng kambing na baboy
 kicking.pv goat that pig
 ‘pig that the goat is kicking’ [Head-final patient-gap RC]
 (Pizarro-Guevara & Wagers 2021)

The core empirical insight above has also been based primarily on RCs with referential nouns as coarguments, that is, where the noun inside the RC is a lexical noun. However, this is not representative of what RCs look like in the input—it is much more common to have pronominalized coarguments (Pizarro-Guevara 2014). Pizarro-Guevara (2020) investigated whether the agent-gap preference emerges when the coargument is pronominalized. They looked at both head-initial and head-final configurations, as in examples 13a–d. The pronominal coargument was licensed via context before the RC was introduced:

- (13a) buwaya na kumakagat sa kaniya
 crocodile that biting.av 3sg
 ‘crocodile that was biting him’ [Head-initial agent-gap RC]
- (13b) buwaya na kinakagat niya
 crocodile that biting.pv 3sg
 ‘crocodile that he was biting’ [Head-initial patient-gap RC]
- (13c) kumakagat sa kaniya na buwaya
 biting.av 3sg that crocodile
 ‘crocodile that was biting him’ [Head-final agent-gap RC]
- (13d) kinakagat niya na buwaya
 biting.pv 3sg that crocodile
 ‘crocodile that he was biting’ [Head-final patient-gap RC]
 (Pizarro-Guevara 2020)

Pizarro-Guevara (2020) found no evidence that participants were more accurate or confident in head-initial RCs than in head-final RCs, and no evidence that they were more accurate or confident in agent-gap interpretations than in patient-gap interpretations. Nevertheless, participants were still faster at giving correct responses when the RC had an agent-gap interpretation than a patient-gap interpretation. Together, these studies show that even when the agent-gap preference is attenuated, its behavioral footprint lingers.

4. DISCUSSION

In this section, we discuss two themes that emerge across the different domains discussed above. The first is that agent-first is a central organizing principle in Tagalog, as we see its influence in many parts of the language. The second is that the PV advantage found in simple declaratives may be better thought of as an emergent property when competing pressures, like those identified by Kroeger (1993), converge on an optimal candidate.

4.1. Agent-First Is a Central Organizing Principle in the Language

The agent-first pressure rears its head in many other parts of the language. Above, we saw how it is one of the ingredients for determining postverbal word order. We also saw that globally ambiguous head-initial RCs were interpreted as agent RCs more than as patient RCs (Pizarro-Guevara 2020). As we discuss in the next subsection, it is also one of the ingredients necessary to derive the PV advantage in simple declaratives.

We can also glean how central agent-first is from errors children made when comprehending head-initial RCs. For example, Tanaka et al. (2019) found that the most common type of error that 5- to 6-year-olds made was a thematic reversal when processing head-initial RCs. They found that children interpreted a patient-gap RC as an agent-gap head-initial RC three times more often than the other way around. In other words, when the head noun was a patient, children often interpreted it as an agent. Misinterpreting an agent head noun was less common. These findings are corroborated by an earlier study that found that the rate of reversals made by 4- to 9-year-olds was higher, on average, in patient-gap RCs than in agent-gap RCs (Pizarro-Guevara 2014). Similar reversal errors were also found when comprehending simple declaratives, as indicated by participants' accuracies in picture verification (Garcia et al. 2019) and picture selection (Garcia et al. 2020).

Another place where agent-first plays a central role is in the interaction between voice and FGD formation. Recall that the received generalization is that only arguments that are cross-referenced by voice (i.e., *ang*-marked NPs) are able to participate in FGDs, like relativization (Aldridge 2017, Ceña 1979, Law 2016, Rackowski & Richards 2005, Schachter 1977). However, as discussed in Section 3.3, Pizarro-Guevara & Wagers (2020) showed that this generalization needed to be revised. In a series of judgment studies involving three types of FGDs, they found that, for some speakers, it is possible for arguments that are not cross-referenced by voice to participate in FGDs—only when they are agents. These results are exemplified by the head-initial RCs in examples 14a–d:

- (14a) ang bantay na bumili ng basi
guard that bought.AV rice wine
'the guard that bought rice wine' [Agent head noun with AV; good]
- (14b) ang basi na binili ng bantay
rice wine that bought.PV guard
'the rice wine that the guard bought' [Patient head noun with PV; good]
- (14c) ang basi na bumili ang bantay
rice wine that bought.AV guard
Intended: the rice wine that the guard bought [Patient head noun with AV; bad]
- (14d) ang bantay na binili ang basi
guard that bought.PV rice wine
'the guard that bought the rice wine' [Agent head noun with PV; good for some]
(Ceña & Nolasco 2011)

By hypothesis, people who allow agents that are not cross-referenced by voice to participate in FGDs, as in example 14d, do so because it satisfies agent-first, even if the head noun does not match the voice on the verb. Perhaps what is more telling is that this permissiveness is not possible in head-final RCs.

Much like in head-initial RCs, head-final RCs where the head noun corresponds to the argument cross-referenced by voice are accepted, as in examples 15a and 15b. Also as in head-initial RCs, head-final RCs with a patient head noun but an AV-marked verb are categorically bad, as in example 15c. However, unlike in head-initial RCs, head-final RCs with an agent head noun and a PV-marked verb are also categorically bad, as in example 15d. This is true even for those who accept example 14d. One explanation for this pattern is that an agent head noun with a PV verb is no longer acceptable in head-final RCs because it does not satisfy the

agent-first pressure:

- (15a) ang bumili ng basi na bantay
bought.AV rice wine that guard
'guard that bought rice wine' [Agent head noun with AV; good]
- (15b) ang binili ng bantay na basi
bought.PV guard that rice wine
'rice wine that the guard bought' [Patient head noun with PV; good]
- (15c) ang bumili ang bantay na basi
bought.AV guard that rice wine
Intended: rice wine that the guard bought [Patient head noun with AV; bad]
- (15d) ang binili ang basi na bantay
bought.PV rice wine that guard
Intended: guard that bought the rice wine [Agent head noun with PV; bad]
(Ceña & Nolasco 2011)

These observations were previously made by Ceña & Nolasco (2011, 2012) in the descriptive literature. In a series of judgment studies, J.S. Pizarro-Guevara & M. Wagers (manuscript in preparation) replicated the acceptability of dependencies like example 14d and the unacceptability of dependencies like example 15d. We take these data as evidence of how central agent-first is in Tagalog relativization.

Agent-first is a pressure that is not unique to Tagalog. In fact, it can be observed crosslinguistically in both child and adult languages, including Äiwoo (Sauppe et al. 2022), Basque (Erdocia et al. 2009), English (Ferreira 2003, MacWhinney et al. 1984), French (Sinclair & Bronckart 1972), German (Haupt et al. 2008), Hebrew (Frankel et al. 1980), Hindi (Bickel et al. 2015), Hungarian (MacWhinney et al. 1985), Mandarin (Huang et al. 2013, Wang et al. 2009), Ojibwe (Hammerly et al. 2022), Spanish (Gattei et al. 2015), and Turkish (Demiral et al. 2008). These studies suggest that the agent-first preference is a crosslinguistically robust pressure in sentence processing. The main motivation for this preference is proposed to be an economy principle in processing: The parser prefers the "simplest" interpretation compatible with a role-ambiguous noun (Bornkessel & Schlesewsky 2006). Under this view, positing an agent interpretation to the first NP encountered is "simpler" because a patient argument presupposes that there is an agent argument. The reverse is not true, however. This hypothesis is in the same vein as the thematic dependency hierarchy proposed by Primus (1999), wherein the agent is considered as a thematically independent role and the patient as a thematically dependent role. It is also congruent with the view espoused by Hawkins (2014): Agent-initial structures have a processing advantage because the thematically independent role is accessible when the dependent role is being processed, thereby resulting in a full interpretation.

4.2. The Patient Voice Advantage Is Best Thought of as an Emergent Property When Competing Pressures Align

In the comprehension and production of simple declaratives, researchers have found a PV (or UV, more generally) advantage, which has also been referred to as "patient primacy" (Ceña 1977) in the Philippine linguistic literature. This advantage has manifested behaviorally in many ways. First, children detected mismatches to thematic assignments when the verb had PV, irrespective of word order. When the verb had AV, they did so only when it was agent-first (Garcia et al. 2019). Second, children's anticipatory looks to a target picture were high when the verb had PV, irrespective of

word order. When the verb had AV, agent-initial sentences elicited higher anticipatory looks to a target picture, relative to agent-last sentences (Garcia et al. 2020). Third, when given a PV verb, children were more accurate in their picture descriptions, compared with when they were given an AV verb (Garcia et al. 2018). And finally, given a voice-marked verb and the marker of the NP, adults and older children predicted the upcoming noun when the verb had PV, but not when it had AV (Garcia et al. 2021).

What underlies this advantage? A straightforward hypothesis is that it boils down to frequency. There is something intuitively appealing about this idea. After all, corpus analyses have consistently shown that UV is much more frequent than AV. We saw that this is the case in simple declaratives, when the *ang*-marked argument is typically not the agent (Cooreman et al. 1984; Garcia & Kidd 2022; Garcia et al. 2019, 2021). We also saw it in reflexive dependencies, where it is much more common to have the reflexive be *ang*-marked, implicating a UV-marked verb (Bondoc et al. 2018). Under this hypothesis, Tagalog speakers are better at producing and comprehending sentences involving PV/UV, irrespective of word order, because they are frequent in the input and, therefore, speakers have had more practice with these sentence types—in the same spirit as Vasilyeva et al. (2006) and Kline & Demuth (2010). However, if we reduce the advantage simply to frequency effects, we miss a secondary generalization: When the verb had AV, participants always performed better in the agent-initial sentences.

We take this often-overlooked generalization as part of the starting point of the PV advantage and present a different hypothesis. We reconceptualize the PV advantage not as a monolithic phenomenon but rather as a product of interactions. We hypothesize that the PV advantage is an emergent property when competing pressures like those identified by Kroeger (1993) (e.g., agent-first, *ang*-last, and heaviness) converge on an optimal candidate. We saw in Section 3.1.4 that speakers are, at the very least, sensitive to these pressures when determining postverbal word order. Under this hypothesis, we could think of the PV advantage as akin to a highly constraining context, where *ang*-last and agent-first are in alignment. This highly constraining context can then lead to sharper predictions—in the same spirit as Kamide et al. (2003)—which might explain why children were able to detect thematic assignment mismatches, or why they had higher proportions of anticipatory looks to a target picture when the verb had PV. We could think of the advantage of agent-initial sentences when the verb had AV as one type of information being prioritized over another type. Following Bondoc & Schafer (2022), we can construe agent-first as reflecting semantic information (i.e., what these authors call “agentivity”) and *ang*-last as reflecting morphosyntactic information (i.e., what they call “pivotality”). Viewed this way, we can think of the advantage of agent-initial sentences as semantic information being prioritized over morphosyntactic information.

We can also view the distribution of PV/UV in corpora as a consequence of when these competing pressures align. In other words, UV is more frequent because these are configurations where both pressures are satisfied. To be maximally explicit, we are not claiming that frequency does not have any effect in how simple declaratives are processed. What we are claiming is that the PV advantage is simply not reducible to frequency effects but rather is best thought of as a property that emerges when different pressures converge.

Our hypothesis is amenable to the more general claim about the connection between production and comprehension espoused by MacDonald (2013), the Production-Distribution-Comprehension account (PDC). The PDC identifies three principles involved in production:

- Easy first: Speakers utter words that are easy to produce.
- Plan reuse: They reuse structures that they have already encountered.
- Reduce interference: They avoid utterances where elements interfere with one another.

These pressures skew the distributional patterns that are then used by comprehenders in comprehension.

Under the PDC, we can think of the PV advantage in the following way. Tagalog speakers prefer word orders where the agent is uttered first because they are typically animate, are conceptually prominent, and are therefore easy to retrieve from memory. We conjecture that Tagalog speakers might be discouraged from producing arguments in the order *ang*-NP *ng*-NP because this can be ambiguous.⁵ Consequently, many productions of Tagalog speakers may contain sentences of the shape PV *ng*-agent *ang*-patient. This shape then gets reused when describing transitive actions, and becomes reflected in the prevalence of PV/UV in the various corpora cited above. The statistical regularities are then learned by comprehenders in a way that influences their comprehension. This could be why adults and children are able to use more reliably the information on the verb and the argument markers in PV.

5. CONCLUSION

While this review is titled “Philippine Psycholinguistics,” we acknowledge that this is in fact too generous a title when all we have shown, given the scope we have defined, is what we know about sentence processing in Tagalog. We advance two ideas. First, agent-first, a crosslinguistically robust parsing preference, is also operational in Tagalog, and it rears its head in many parts of the language. Second, what has been referred to as patient primacy in the Philippine linguistics literature is best thought of not as a monolith but rather as an emergent property of independently motivated pressures.

A natural direction for future research would be to look at other Philippine languages: To what extent are the results reported here Tagalog-specific? To what extent are they a general property of Philippine languages? Another natural direction is to look at other verb-initial languages. To date, there has been very little exploration of the commonalities between how different verb-initial languages are processed. As we saw above, the Tagalog verb is a central figure in many of the investigations above, as its rich morphological system is intricately connected with many other parts of the language. Looking at other verb-initial languages where the verb is not a nexus of linguistic cues would be important: To what extent are the results above a general property of verb-initial languages? To what extent are they mediated by Tagalog’s rich morphological system?

Leveraging the distinctive properties of understudied languages like Tagalog benefits psycholinguistics as a field because it allows us to ask more nuanced questions—whether something is specific to a given language or a characteristic of a group of languages that share certain properties. More importantly, it allows us language researchers to better evaluate the empirical coverage of our proposals. A serious concern, briefly mentioned at the beginning of this review, is that many of these proposals are based on a very narrow slice of the world’s linguistic diversity. A natural question to ask is the extent to which our theories capture something about how humans process language, and the extent to which they are colored by our undersampling. Only by testing their predictions on understudied languages, especially those with properties that are not as well characterized in the literature, can we get closer to understanding language and its use.

⁵Possession in Tagalog is constructed as follows: possessor *ng* possessum. The *ng* that is flanked by the possessor and the possessum is the same nominal marking used for the other argument that is not marked with *ang*. Thus, a string such as *kinain ang keyk ng bata* can be temporally ambiguous. One interpretation is that the child ate the cake, where *ang keyk* and *ng bata* are separate arguments. Another potential interpretation is that someone ate the child’s cake, where *ang keyk* and *ng bata* form a constituent and are different subparts of a complex argument. While these are prosodified differently in spoken productions, no such disambiguating cue is available in written productions.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

ACKNOWLEDGMENTS

J.S.P.G.'s work was supported by a National Science Foundation Social, Behavioral, and Economic Sciences Postdoctoral Research Fellowship (grant 2204112). R.G.'s work was supported as part of the C07 project in the SFB 1287 at the University of Potsdam, funded by the Deutsche Forschungsgemeinschaft (German Research Foundation) (project 317633480).

LITERATURE CITED

- Alday PM, Schlesewsky M, Bornkessel-Schlesewsky I. 2014. Towards a computational model of actor-based language comprehension. *Neuroinformatics* 12(1):143–79
- Aldridge E. 2004. Internally headed relative clauses in Austronesian languages. *Lang. Linguist.* 5(1):99–129
- Aldridge E. 2008. Phase-based account of extraction in Indonesian. *Lingua* 118(10):1440–69
- Aldridge E. 2017. Internally and externally headed relative clauses in Tagalog. *Glossa* 2(1):41
- Anand P, Chung S, Wagers M. 2011. Widening the net: challenges for gathering linguistic data in the digital age. In *SBE 2020: Future Research in the Social, Behavioral and Economic Sciences*, Position Pap. 121. Washington, DC: Natl. Sci. Found. <https://people.ucsc.edu/schung/anandchungwagers.pdf>
- Barrios AL, Bernardo ABI. 2012. The acquisition of case marking by L1 Chabacano and L1 Cebuano learners of L2 Filipino: influence of actancy structure on transfer. *Lang. Linguist.* 13(3):499–521
- Barrios J. 2014. *Tagalog for Beginners: An Introduction to Filipino, the National Language of the Philippines*. North Clarendon, VT: Tuttle
- Bickel B, Witzlack-Makarevich A, Choudhary KK, Schlesewsky M, Bornkessel-Schlesewsky I. 2015. The neurophysiology of language processing shapes the evolution of grammar: evidence from case marking. *PLOS ONE* 10(8):e0132819
- Billings LA. 2005. Ordering clitics and postverbal R-expressions in Tagalog: a unified analysis? In *Verb First: On the Syntax of Verb-Initial Languages*, ed. A Carnie, H Harley, S Dooley, pp. 303–40. Amsterdam: Benjamins
- Boland J. 1993. The role of verb argument structure in sentence processing: distinguishing between syntactic and semantic effects. *J. Psycholinguist. Res.* 22:133–52
- Boland JE, Tanenhaus MK, Garnsey SM, Carlson GN. 1995. Verb argument structure in parsing and interpretation: evidence from *wh*-questions. *J. Mem. Lang.* 34(6):774–806
- Bondoc IP. 2020. *Probabilistic and predictive parsing in Tagalog voice alternations*. PhD Thesis, Univ. Hawaii Mānoa, Honolulu
- Bondoc IP, Deen K, Or EM, Hemedes MC. 2019. Reflexives in adult and child Tagalog. In *Proceedings of the 43rd Boston University Conference on Language Development*, ed. MM Brown, B Dailey, pp. 82–93. Somerville, MA: Cascadilla
- Bondoc IP, Kush D. 2023. *Animacy effects in Tagalog relative clause processing*. Poster presented at 36th Annual Conference on Human Sentence Processing, Pittsburgh, PA, March 9–11
- Bondoc IP, O'Grady W, Deen K, Tanaka N. 2018. Agrammatism in Tagalog: voice and relativisation. *Aphasiology* 32(5):598–617
- Bondoc IP, Schafer A. 2022. Differential effects of agency, animacy, and syntactic prominence on production and comprehension: evidence from a verb-initial language. *Can. J. Exp. Psychol.* 76(4):302–26
- Bornkessel I, Schlesewsky M. 2006. The extended argument dependency model: a neurocognitive approach to sentence comprehension across languages. *Psychol. Rev.* 113(4):787–821
- Cayado DKT, Wray S, Stockall L. 2023. Does linear position matter for morphological processing? Evidence from a Tagalog masked priming experiment. *Lang. Cogn. Neurosci.* 38(8):1167–82
- Ceña RM. 1977. *Patient primacy in Tagalog*. Paper presented at 52nd Annual Meeting of the Linguistic Society of America, Chicago, Dec. 28–30
- Ceña RM. 1979. Tagalog counterexamples to the Accessibility Hierarchy. *Stud. Philipp. Linguist.* 3(1):119–24

- Ceña RM, Nolasco RMD. 2011. *Gramatikang Filipino: Balangkas*. Quezon City, Philipp.: Univ. Philipp. Press
- Ceña RM, Nolasco RMD. 2012. *Sintaks ng Filipino*. Manila: Natl. Comm. Cult. Arts
- Chan A, Lieven E, Tomasello M. 2009. Children's understanding of the agent-patient relations in the transitive construction: cross-linguistic comparisons between Cantonese, German, and English. *Cogn. Linguist.* 20(2):267–300
- Chen V, McDonnell B. 2019. Western Austronesian voice. *Annu. Rev. Linguist.* 5:173–95
- Chomsky N. 1981. *Lectures on Government and Binding*. Dordrecht, Neth.: Foris
- Christianson K, Cho HY. 2009. Interpreting null pronouns (*pro*) in isolated sentences. *Lingua* 119(7):989–1008
- Cooreman A, Fox BA, Givón T. 1984. The discourse definition of ergativity. *Stud. Lang.* 8(1):1–34
- Demiral SB, Schlesewsky M, Bornkessel-Schlesewsky I. 2008. On the universality of language comprehension strategies: evidence from Turkish. *Cognition* 106(1):484–500
- Dryer MS. 2013. Order of relative clause and noun. In *The World Atlas of Language Structures Online*, ed. MS Dryer, M Haspelmath. <https://doi.org/10.5281/zenodo.7385533>
- Erdocia K, Laka I, Mestres-Missé A, Rodriguez-Fornells A. 2009. Syntactic complexity and ambiguity resolution in a free word order language: behavioral and electrophysiological evidences from Basque. *Bruin Lang.* 109(1):1–17
- Ferreira F. 2003. The misinterpretation of noncanonical sentences. *Cogn. Psychol.* 47(2):164–203
- Foley WA. 2008. The place of Philippine languages in a typology of voice systems. In *Voice and Grammatical Relations in Austronesian Languages*, ed. PK Austin, S Musgrave, pp. 22–44. Stanford, CA: Cent. Study Lang. Inf.
- Frankel DG, Amir M, Frenkel E, Arbel T. 1980. A developmental study of the role of word order in comprehending Hebrew. *J. Exp. Child Psychol.* 29(1):23–35
- Frazier L. 1987. Syntactic processing: evidence from Dutch. *Nat. Lang. Linguist. Theory* 5(4):519–59
- Frazier L, Clifton C. 1987. Successive cyclicity in the grammar and the parser. *Lang. Cogn. Process.* 4(2):93–126
- Galang R. 1988. The language situation of Filipino Americans. In *Language Diversity, Problem or Resource?*, ed. SL McKay, SC Wong, pp. 229–51. Cambridge, MA: Newbury House
- Galang R. 2001. Language of instruction in the Philippines in the 20th century: policies, orientations, and future directions. In *Journey of One Hundred Years: Reflections on the Centennial of Philippine Independence*, ed. CM Brainard, EF Litton, pp. 97–117. Santa Monica, CA: Philipp. Am. Women Writ. Art.
- Garcia R, Dery JE, Roeser J, Höhle B. 2018. Word order preferences of Tagalog-speaking adults and children. *First Lang.* 38:617–40
- Garcia R, Garrido Rodriguez G, Kidd E. 2021. Developmental effects in the online use of morphosyntactic cues in sentence processing: evidence from Tagalog. *Cognition* 216:104859
- Garcia R, Kidd E. 2020. The acquisition of the Tagalog symmetrical voice system: evidence from structural priming. *Lang. Learn. Dev.* 16(4):399–425
- Garcia R, Kidd E. 2022. Acquiring verb-argument structure in Tagalog: a multivariate corpus analysis of caregiver and child speech. *Linguistics* 60(6):1855–906
- Garcia R, Roeser J, Höhle B. 2019. Thematic role assignment in the L1 acquisition of Tagalog: use of word order and morphosyntactic markers. *Lang. Acquis.* 26(3):235–61
- Garcia R, Roeser J, Höhle B. 2020. Children's online use of word order and morphosyntactic markers in Tagalog thematic role assignment: an eye-tracking study. *J. Child Lang.* 47(3):533–55
- Garcia R, Roeser J, Kidd E. 2023. Finding your voice: Voice-specific effects in Tagalog reveal the limits of word order priming. *Cognition* 236:105424
- Gattei CA, Dickey MW, Wainelboim AJ, Paris L. 2015. The thematic hierarchy in sentence comprehension: a study on the interaction between verb class and word order in Spanish. *Q. J. Exp. Psychol.* 68(10):1981–2007
- Gonzales WDW. 2017. Philippine Englishes. *Asian Engl.* 19(1):79–95
- Hammerly C, Staub A, Dillon B. 2022. Person-based prominence guides incremental interpretation: evidence from obviation in Ojibwe. *Cognition* 225:105122
- Haupt FS, Schlesewsky M, Roehm D, Friederici AD, Bornkessel-Schlesewsky I. 2008. The status of subject-object reanalyses in the language comprehension architecture. *J. Mem. Lang.* 59(1):54–96
- Hawkins JA. 2014. *Cross-Linguistic Variation and Efficiency*. Oxford, UK: Oxford Univ. Press

- Henrich J, Heine SJ, Norenzayan A. 2010. The weirdest people in the world? *Behav. Brain Sci.* 33(2/3):61–135
- Hsieh H. 2016. Prosodic indicators of phrase structure in Tagalog transitive sentences. In *Proceedings of the 23rd Annual Meeting of the Austronesian Formal Linguistics Association*, ed. H Nomoto, T Miyauchi, A Shiohara, pp. 111–22. Canberra: Asia-Pac. Linguist.
- Huang YT, Zheng X, Meng X, Snedeker J. 2013. Children's assignment of grammatical roles in the online processing of Mandarin passive sentences. *J. Mem. Lang.* 69(4):589–606
- Jäger LA, Engelmann F, Vasishth S. 2017. Similarity-based interference in sentence comprehension: literature review and Bayesian meta-analysis. *J. Mem. Lang.* 94:313–39
- Kamide Y, Altmann GT, Haywood SL. 2003. The time-course of prediction in incremental sentence processing: evidence from anticipatory eye movements. *J. Mem. Lang.* 49(1):133–56
- Keenan E, Comrie B. 1977. Noun phrase accessibility and universal grammar. *Linguist. Inq.* 8(1):63–99
- Kline M, Demuth K. 2010. Factors facilitating implicit learning: the case of the Sesotho passive. *Lang. Acquis.* 17(4):220–34
- Koizumi M, Yasugi Y, Tamaoka K, Kiyama S, Kim J, et al. 2014. On the (non)universality of the preference for subject-object word order in sentence comprehension: a sentence-processing study in Kaqchikel Maya. *Language* 90(3):722–36
- Kroeger P. 1993. *Phrase Structure and Grammatical Relations in Tagalog*. Stanford, CA: Cent. Study Lang. Inf.
- Lau E, Tanaka N. 2021. The subject advantage in relative clauses: a review. *Glossa* 6(1):34
- Law P. 2016. The syntax of Tagalog relative clauses. *Linguistics* 54(4):717–68
- MacDonald MC. 2013. How language production shapes language form and comprehension. *Front. Psychol.* 4:226
- MacWhinney B, Bates E, Kliegl R. 1984. Cue validity and sentence interpretation in English, German, and Italian. *J. Verbal Learn. Verbal Behav.* 23(2):127–50
- MacWhinney B, Pléh C, Bates E. 1985. The development of sentence interpretation in Hungarian. *Cogn. Psychol.* 17(2):178–209
- Marzan JB. 2013. *Spoken language patterns of selected Filipino toddlers and pre-school children*. PhD Thesis, Univ. Philipp. Diliman, Quezon City, Philipp.
- Nagaya N. 2019. *Relativization in Tagalog conversation: a typological perspective*. Paper presented at 13th Conference of the Association for Linguistic Typology, Pavia, Italy, Sept. 4–6
- Norcliffe E, Harris AC, Jaeger TF. 2015. Cross-linguistic psycholinguistics and its critical role in theory development: early beginnings and recent advances. *Lang. Cogn. Neurosci.* 30(9):1009–32
- PSA (Philipp. Stat. Auth.). 2021. *Philippines in figures*. Summ. Stat., PSA, Quezon City, Philipp.
- Pizarro-Guevara JS. 2014. *The acquisition of Tagalog relative clauses: a comprehension study*. MA Thesis, Calif. State Univ., Long Beach
- Pizarro-Guevara JS. 2017. *An auditory masked priming study of nasal substitution in Cebuano*. Paper presented at 2017 Linguistic Institute Morphological Typology and Linguistic Cognition Workshop, Lexington, KY, July 22
- Pizarro-Guevara JS. 2020. *When human universal meets language specific*. PhD Thesis, Univ. Calif., Santa Cruz
- Pizarro-Guevara JS, Dillon B. 2020. What Tagalog can teach us: the influence of word order in reflexive processing. In *Proceedings of the 28th Meeting of the Austronesian Formal Linguistics Association*, ed. T Clark, J Dussere, C Ting, pp. 138–56. London, Can.: Univ. West. Ontario Press
- Pizarro-Guevara JS, Dillon B. 2022. *When the SRC/ORC asymmetry emerges and breaks down in Tagalog relative clauses*. Talk presented at 35th Annual Conference on Human Sentence Processing, Santa Cruz, CA, March 24–26
- Pizarro-Guevara JS, Huerto G, Dillon B. 2022. *Interference effects in Tagalog reflexive processing*. Talk presented at 35th Annual Conference on Human Sentence Processing, Santa Cruz, CA, March 24–26
- Pizarro-Guevara JS, Wagers M. 2020. The predictive value of Tagalog voice morphology in filler-gap dependency formation. *Front. Psychol.* 11:517
- Pizarro-Guevara JS, Wagers M. 2021. (A)symmetries in Tagalog relative clause processing. In *Proceedings of the 27th Meeting of the Austronesian Formal Linguistics Association*, ed. H Hsieh, K New, pp. 113–28. London, Can.: Univ. West. Ontario Press
- Primus B. 1999. *Cases and Thematic Roles: Ergative, Accusative and Active*. Tübingen, Ger.: Niemeyer

- Rackowski A, Richards N. 2005. Phase edge and extraction: a Tagalog case study. *Linguist. Inq.* 36(4):565–99
- Reid L, Liao HC. 2004. A brief syntactic typology of Philippine languages. *Lang. Linguist.* 5(2):433–90
- Richards N. 2009. The Tagalog copula. In *Proceedings of the 16th Annual Meeting of the Austronesian Formal Linguistics Association*, ed. S Chung, D Finer, I Paul, E Potsdam, pp. 181–95. Canberra: Asia-Pac. Linguist.
- Sauppe S. 2016. Verbal semantics drives early anticipatory eye movements during the comprehension of verb-initial sentences. *Front. Psychol.* 7:95
- Sauppe S, Flecken M. 2021. Speaking for seeing: Sentence structure guides visual event apprehension. *Cognition* 206:104516
- Sauppe S, Näss Å, Roversi G, Meyer M, Bornkessel-Schleswesky I, Bickel B. 2022. *The agent bias in comprehension is robust in an OVS language, at least for human referents: evidence from Árwoo (Solomon Islands)*. Paper presented at 35th Annual Conference on Human Sentence Processing, Santa Cruz, CA, March 24–26
- Sauppe S, Norcliffe E, Konopka AE, Van Valin RD Jr., Levinson SC. 2013. Dependencies first: eye tracking evidence from sentence production in Tagalog. *Proc. Annu. Meet. Cogn. Sci. Soc.* 35:1265–70
- Schachter P. 1977. Reference-related and role-related properties of subjects. In *Syntax and Semantics*, Vol. 8: *Grammatical Relations*, ed. P Cole, pp. 279–306. New York: Academic
- Schachter P, Otanes FT. 1983. *Tagalog Reference Grammar*. Berkeley: Univ. Calif. Press
- Segalowitz NS, Galang RG. 1978. Agent–patient word-order preference in the acquisition of Tagalog. *J. Child Lang.* 5(1):47–64
- Sinclair H, Bronckart JP. 1972. S.V.O. a linguistic universal? A study in developmental psycholinguistics. *J. Exp. Child Psychol.* 14(3):329–48
- Tanaka N. 2016. *An asymmetry in the acquisition of Tagalog relative clauses*. PhD Thesis, Univ. Hawaii Mānoa, Honolulu
- Tanaka N, Bondoc I, Deen K. 2022. Examining main clause similarity and frequency effects in the production of Tagalog relative clauses. *J. Southeast Asian Linguist. Soc.* 15(2):70–86
- Tanaka N, O’Grady W, Deen K, Bondoc IP. 2019. An asymmetry in the acquisition of relative clauses: evidence from Tagalog. *First Lang.* 39(6):618–32
- Trueswell JC, Tanenhaus MK, Garnsey SM. 1994. Semantic influences on parsing: use of thematic role information in syntactic ambiguity resolution. *J. Mem. Lang.* 33(3):285–318
- Vasilyeva M, Huttenlocher J, Waterfall H. 2006. Effects of language intervention on syntactic skill levels in preschoolers. *Dev. Psychol.* 42(1):164–74
- Wang L, Schlesewsky M, Bickel B, Bornkessel-Schlesewsky I. 2009. Exploring the nature of the ‘subject’-preference: evidence from the online comprehension of simple sentences in Mandarin Chinese. *Lang. Cogn. Process.* 24(7/8):1180–226