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EXAMINING MAIN CLAUSE SIMILARITY AND FREQUENCY EFFECTS IN THE PRODUCTION OF TAGALOG RELATIVE CLAUSES

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Abstract
This study investigates two possible factors in the well-known subject preference in the acquisition and processing of relative clauses (RCs): (i) an effect of similarity between declarative and relative clauses and (ii) an effect of frequency of certain RC types. Two production experiments were conducted with adult and child speakers of Tagalog, a verb-initial language with a Philippine-type voice system. One experiment elicited declarative clauses and the other elicited relative clauses; both had two animacy conditions: animate-animate (animate agent and patient) and animate-inanimate (animate agent, inanimate patient). Experiment 1's results show a preference for patient voice in the animate-animate condition only. Experiment 2's results show a preference for the relativization of the agent in the animate-inanimate condition only. We suggest that the interplay of a patient voice preference in Tagalog with a general preference for the relativization of agents – the source of which remains undetermined – may explain these results.

Keywords: Tagalog, voice, relative clause
ISO 639-3 codes: tgl

1 Introduction
A large body of work on relative clauses (RCs) has shown that speakers of most languages studied to date privilege subject RCs (1), whose head corresponds to the subject argument in the embedded clause, over object RCs (2), whose head corresponds to the direct object in the embedded clause (e.g., Diessel & Tomasello 2005; Hsu et al. 2009; Zukowski 2009; see Lau & Tanaka 2021 for a review).

(1) *the dog that _ chased the cat* Subject RC
(2) *the cat that the dog chased _* Object RC

This asymmetry manifests in higher accuracy (and faster reaction/reading times) by speakers – children, adult native speakers, language learners, and clinical populations alike – in comprehending and producing subject RCs (1) compared to object RCs (2). Tagalog, an Austronesian language spoken in the Philippines, is not an exception (Bondoc et al. 2018; Tanaka et al. 2019; Pizarro-Guevara 2020; Pizarro-Guevara & Wagers 2020) (§2.2).

The exact source of this subject RC preference is a matter of some debate. Of the numerous potential explanations, we are concerned with what Tanaka et al. (2019) referred to as the Main Clause Hypothesis and the Frequency Hypothesis in their discussion of Tagalog. The former attributes the preference for the subject RC to its similarity to main clause patterns, while the latter explains the preference as due to the high frequency of particular types of RCs. Both accounts are built on a logic common to usage-based approaches:

child and adult speakers of any language hear certain patterns more frequently than others, and these common patterns become those that the language processor begins to expect (e.g., Ambridge et al. 2015).

In this paper, we investigate the viability of these approaches as explanations for adult and child speakers' production of declarative clauses and RCs in Tagalog. We offer evidence for an RC preference that cannot be explained by the Main Clause Hypothesis or the Frequency Hypothesis alone. That said, our results suggest that the Main Clause Hypothesis sheds light on how the speaker's voice preference changes depending on the animacy of arguments in declarative clauses, which also influences the RC preference.

In what follows, we begin by outlining the relevant properties of Tagalog, paying close attention to its voice system (§2.1) and RCs (§2.2). Section 2.3 briefly explains the Main Clause Hypothesis and Frequency Hypothesis in the context of Tagalog data and presents the research questions of the current study. Sections 3 and 4 describe the methodology and results of two experiments, one testing the production of declarative clauses and the other that of RCs. Section 5 offers a general discussion and conclusions.

2 Background

2.1 Tagalog voice system

Tagalog is an Austronesian language and one of the major languages spoken in the Philippines. Its word order is typically verb-initial. The ordering of the post-verbal elements is very flexible, inspiring an active debate on the canonical word order (e.g., Guilfoyle et al. 1992; Kroeger 1993; Aldridge 2002; Garcia et al. 2018; Bondoc & Schafer 2022). It has a Philippine-type voice system, in which verbal affixation cross-references the argument highlighted with the nominative marker *ang*, as exemplified in (3).[1]

(3) a. Intransitive pattern

T<um>akbo	***ang***	***lalake***.
<AV.PFV>run	NOM	man

'The man ran.'

b. Transitive pattern with agent voice

H<um>abol	*ng*	*babae*	***ang***	***lalake***.
<AV.PFV>chase	GEN	woman	NOM	man

'The man chased a/the woman.'

c. Transitive pattern with patient voice

H<in>abol	*ng*	*lalake*	***ang***	***babae***.
<PV.PFV>chase	GEN	man	NOM	woman

'A/the man chased the woman.'

In (3a) and (3b), the verb is marked by the infix *-um-*, and the agent *lalake* 'man' is marked by *ang*. In (3a), the intransitive subject is the only *ang*-marked argument. In (3b), a genitive marker *ng* /naŋ/ marks the patient. In (3c), the verb is marked by the infix *-in-*, the patient *babae* 'woman' is marked by *ang*, and the agent is marked by *ng*. Tagalog also has other sentence types in which other elements, including locatives, benefactives, and instrumentals, can be the nominative argument, which will not be discussed in this study.

[1] Following Pizarro-Guevara (2020) and Pizarro-Guevara & Wagers (2020), we use the terminology "voice" and "nominative" in an effort, albeit an imperfect one, to make our characterization of the relevant Tagalog properties as descriptive as possible. We acknowledge that this is not the only way to portray Tagalog syntax, and that the analysis of Tagalog (and more generally, Western Austronesian) syntax is subject to considerable debate, as reviewed by Chen & McDonnell (2019). Our intention is not to assume or ascribe to a particular analysis or to use our results to support one analysis over the other. Rather, we believe that the empirical results we present in this paper on how Tagalog speakers learn and use the language are interpretable and interesting regardless of the theories of the syntax of Tagalog.

Tagalog is unlike other languages that are commonly studied in the field of language acquisition, or even other Western Austronesian languages like Indonesian (Gil 2008), in that in Tagalog, the voice that highlights the patient (i.e., patient voice) is more frequent than the voice that highlights the agent (i.e., agent voice). This is true in speech produced by children (Bautista 1983), adolescents (Ceña 1977), and adults (Bautista 1983); in child-directed speech (Garcia et al. 2019); and in texts (Cooreman et al. 1984). The patient voice preference extends beyond frequency: children have a better mastery of patient voice than agent voice in comprehension tasks (Tucker 1971; Segalowitz & Galang 1978; Garcia et al. 2019 & 2020; Garcia & Kidd 2020).

That said, the selection of voice is influenced by various factors, including animacy. According to Latrouite (2011), patient voice is accepted if the agent is less prominent than or equally prominent to the patient in terms of animacy, and rejected if the agent is more prominent than the patient in terms of animacy. Bondoc (2020) also reported a patient voice preference in adults for transitive sentences with two animate arguments. It is not clear how animacy influences the selection of voice in Tagalog child language, and no study has yet fully explored this matter. Segalowitz & Galang (1978) partially explored it when they tested children's comprehension of verb-initial sentences with an animate agent and animate patient and found a patient voice preference, but they did not include comprehension items involving an animate agent and inanimate patient. They also tested children's production using a sentence completion task and found that children were equally accurate producing agent voice and patient voice sentences involving an animate agent and inanimate patient; however, the production task did not include items involving an animate agent and animate patient. Moreover, the task elicited NP-initial sentences, making it impossible to identify whether animacy or word order influenced the children's voice preference. As discussed in §2.3, animacy is a factor that modulates RC preference, which is why we consider animacy effects in both our experiments.

2.2 Tagalog relative clauses

In the Tagalog voice system, the nominative argument is syntactically privileged, and it is the preferred target of relativization and other types of Ā-extraction. The examples in (4) show Tagalog head-initial RCs, in which the head noun is followed by a linker *ng* /ŋ/ and an RC.[2]

(4) a. Agent RC with agent voice

lalake=ng	*h<**um**>abol*	*ng*	*babae*
man=L	<AV.PFV>chase	GEN	woman

'man that chased a/the woman'

b. Agent RC with patient voice

? *lalake=ng*	*h<**in**>abol*	*ang*	*babae*
man=L	<PV.PFV>chase	NOM	woman

'man that chased the woman'

c. Patient RC with patient voice

babae=ng	*h<**in**>abol*	*ng*	*lalake*
woman=L	<PV.PFV>chase	GEN	man

'woman that a/the man chased'

d. Patient RC with agent voice

* *babae=ng*	*h<**um**>abol*	*ang*	*lalake*
woman=L	<AV.PFV>chase	NOM	man

'woman that the man chased'

[2] Tagalog also has head-final, head-internal, and headless RCs (e.g., Schachter & Otanes 1972; Aldridge 2003, 2004 & 2017; Law 2015 & 2016).

The relativization of the agent (agent RC) is usually followed by a verb with an agent voice affix and a genitive-marked co-argument (4a). The acceptability of the extraction of the agent out of a patient voice structure, as shown in (4b), is contested. While it is illicit according to many scholars (e.g., Keenan & Comrie 1977; Kroeger 1993; Aldridge 2002, 2012 & 2017; Rackowski & Richards 2005; Kaufman 2009; Law 2015 & 2016), others, including Pizarro-Guevara & Wagers (2020), who based their assertion on an acceptability judgment experiment, claim it is allowed (De Guzman 1995; Ceña & Nolasco 2011; Latrouite 2011; Ceña 2012; Hsieh 2020; Pizarro-Guevara 2020; Pizarro-Guevara & Wagers 2020). The relativization of the patient (patient RC) requires the patient voice pattern (4c): the relativization of the patient out of an agent voice structure is unequivocally illicit (4d).

Previous studies on different populations of Tagalog speakers have found that agent RCs are comprehended and produced more accurately than patient RCs. Bondoc et al. (2018) reported that adults with agrammatic aphasia comprehended agent RCs better than patient RCs. Furthermore, while these individuals were not successful in producing RCs, adult speakers without agrammatism showed an agent RC preference in production. Pizarro-Guevara & Wagers (2020) also found an agent RC preference among adult native speakers in a sentence reading experiment, where the participants were more sensitive to a plausibility mismatch with agent voice than with patient voice. Tanaka et al. (2019) found that Tagalog-acquiring children (4;9–5;9, mean 5;5) comprehended agent RCs better than patient RCs. In both Bondoc et al.'s (2018) and Tanaka et al.'s (2019) studies, all agents and patients were animate. In contrast, Pizarro-Guevara & Wagers (2020) made the agent animate and the patient inanimate in all items in order to manipulate plausibility. Therefore, we do not have a complete picture of how animacy influences RC preference, particularly in children's production of RCs.

2.3 The current study

The current study investigates whether the agent RC preference is found in adults' and children's production of Tagalog RCs.

One complication requires our attention before we move on. In this study, the term "agent RC preference" is used when the discussion pertains to Tagalog, instead of the more widely used "subject RC preference." This reformulation is not unproblematic, but it is necessary. In English and other languages, the head of an RC corresponds directly to the gap position, without the need for additional grammatical operations: the subject RC leaves a gap in the subject position of the dependent clause, and the object RC leaves a gap in the direct object position of the dependent clause. That is, the nominative and the accusative arguments are both accessible to relativization. In Tagalog, on the other hand, relativization is restricted to the nominative argument and is accompanied by corresponding changes in verb morphology and case marking, as described in §2.2 (with the possible exception of the one pattern in 4b). The comparison of the agent and patient RCs in Tagalog therefore is qualitatively different from the comparison of the subject and object RCs in English and other languages, and cannot be discussed on completely equal grounds.

That said, as Pizarro-Guevara & Wagers (2020) suggested, it is possible to discuss the agent RC preference as a subset of subject preference. This is the position we adopt, as with previous experimental studies on Tagalog (Bondoc et al. 2018; Tanaka et al. 2019; Pizarro-Guevara & Wagers 2020). A similar reconceptualization has been done in studies on syntactically ergative languages, which demonstrate the preference associated with a transitive subject (ergative argument) despite the morphosyntactic alignment system that privileges absolutive arguments (Polinsky et al. 2012; Clemens et al. 2015; Ono et al. 2021).

Within this narrow scope, we will consider two explanations for the RC preference mentioned in §1, following Tanaka et al. (2019): the Main Clause Hypothesis and the Frequency Hypothesis. Under the Main Clause Hypothesis, subject RCs are preferred due to their similarity to canonical main clause patterns. This is most classically demonstrated by Diessel & Tomasello (2005), who administered a sentence repetition task to children acquiring English (aged 4;3–4;9, mean 4;7) and German (aged 4;3–4;9, mean 4;5) to show that subject RCs were easier to repeat than object RCs. Their explanation was that subject RCs are favored because they most closely match the word order of regular, canonical declarative sentences. In English, for instance, a facilitation effect manifests in a link between the SVO word order of declarative clauses and the subject RCs, where the subject head is followed by the verb (perhaps with an intervening relativizer), and then the embedded object. Meanwhile, the object RCs deviate from the canonical pattern of declarative clauses, and this deviation causes strain on the language processor, resulting in reduced accuracy, increased

reaction time, and other errors. Similar arguments were put forth by Bever (1970), Slobin & Bever (1982), and MacDonald & Christiansen (2002).

Tanaka et al. (2019:619) extended this discussion to adapt it to Tagalog, predicting "an advantage for RCs that most resemble the language's canonical main clauses, whose properties may involve particular inflectional patterns rather than, or in addition to, word order." This adaptation is necessary and useful because, as illustrated in §2.1, Tagalog word order is very flexible and cannot be used to gauge canonicity. Moreover, the link between declarative clauses and RCs is tenuous at best in Tagalog with regard to word order: Tagalog is strongly verb-initial in declarative clauses, with the two arguments of transitive verbs following in any order, while the RCs follow a very different word order, with the head noun appearing first, followed by the verb (with a relativizer), and then the embedded NP. It is therefore expected that word order may not be as tightly linked to RC preference as Diessel & Tomasello (2005) claimed to be the case for English and German, while other aspects of language may be. Specifically, because patient voice is more frequent than agent voice in the Tagalog input for children, the Main Clause Hypothesis would predict a patient RC preference. Tanaka et al. (2019), however, found that this was not the case, based on children's comprehension data.

Under the Frequency Hypothesis, on the other hand, subject RCs are preferred due to the higher frequency of (particular types of) subject RCs compared to (particular types of) object RCs (e.g., Mak et al. 2002; Kidd et al. 2007). Kidd et al. (2007) showed that for English- and German-acquiring children, object RCs were more difficult than subject RCs only if the children were tested with animate-headed object RCs, which are infrequent in the input. When the children were tested with the most common types of object RCs – such as object RCs with inanimate heads – they performed equally well or even better with object RCs compared to subject RCs. Mak et al. (2002) also showed that Dutch-speaking adults did not exhibit any processing difference between subject and object RCs when the object was inanimate.

To consider this possibility in Tagalog, Tanaka et al. (2019) analyzed corpus data of child-directed speech (Marzan 2009). As shown in Table 1, animate-headed patient RCs were very rare: only three tokens were attested in a total of 82 RCs. They also observed a very strong relationship between the animacy of the head and the RC type: 23 out of 24 agent RCs had an animate head, and 55 out of 58 patient RCs had an inanimate head.

Table 1: *Frequency data on agent and patient RCs in child-directed Tagalog speech (data from Marzan 2009; table modified from Tanaka et al. 2019)*

	Head animacy	Agent RCs	Patient RCs	Row total
Reversible	Animate	3	3	6
Non-reversible	Animate	20	0	20
	Inanimate	1	55	56
Column total		24	58	82

Tanaka et al. (2019) tested Tagalog-acquiring children's comprehension of RCs involving animate agents and patients (a necessary control given the nature of their comprehension task) and showed an agent RC preference, which they explained by the distributional properties of RCs in Tagalog under the Frequency Hypothesis. However, a true test of the Frequency Hypothesis would require items with inanimate-headed patient RCs as well. Under the Frequency Hypothesis, the agent RC preference should disappear or even be reversed when compared with inanimate-headed patient RCs, much like what Kidd et al. (2007) observed for English- and German-acquiring children.

The current study follows on from Tanaka et al. 2019 to explore the effect of animacy on the (a)symmetry of RCs in production. In addition to a production experiment on RCs, we conduct a similar production experiment on declarative clauses to obtain baseline data of how animacy influences voice preference in declarative clauses. If the Main Clause Hypothesis, which posits that the similarity between declarative clauses and RCs influences RC performance, is borne out, this study's data from declarative clauses should shed light on animacy effects in RC production. Our research questions (RQs) are as follows:

RQ1. Which voice do adult and child speakers of Tagalog select in the production of main clauses when animacy is a factor?

RQ2. Do adult and child speakers of Tagalog show an asymmetry in the production of RCs?

RQ3. If so, to what extent does animacy interact with the asymmetry in RC preference?

We present results from two production experiments. In Experiment 1, we investigate adult and child Tagalog speakers' preference for voice using a picture-based elicited production task designed to elicit declarative transitive sentences. Based on Latrouite (2011), we predict that both adults and children will use voice differentially based on animacy conditions, preferring patient voice with animate agents and animate patients but dispreferring patient voice with animate agents and inanimate patients. This prediction is partially borne out by the experiment's results: when both agents and patients are animate, both adults and children use patient voice significantly more frequently than agent voice; when the agents are animate and patients are inanimate, the participants do not strongly disprefer patient voice, but patient voice preference is reduced, bringing the frequency of agent voice and patient voice to statistical parity. These results shaped our predictions for Experiment 2.

Experiment 2 uses a similar design as Experiment 1 to elicit RCs. We investigate whether the agent RC preference attested for the comprehension of Tagalog RCs (Bondoc et al. 2018; Tanaka et al. 2019; Pizarro-Guevara 2020; Pizarro-Guevara & Wagers 2020) exists for production as well. Under the Main Clause Hypothesis, we expect the preference from Experiment 1 to carry over to Experiment 2; however, unlike Tanaka et al. (2019), who predicted an across-the-board patient RC preference due to the predominance of patient voice in declarative clauses, we take a more nuanced position, in which the voice preference interacts with animacy. That is, based on the results from Experiment 1, the Main Clause Hypothesis would lead us to predict a patient RC preference when the agents and patients are both animate, and no preference when the RCs involve an animate agent and an inanimate patient. Under the Frequency Hypothesis, on the other hand, agent RCs should be produced with more accuracy than patient RCs when agents and patients are both animate; when the RCs involve an animate agent and inanimate patient, we expect equally good performance with agent and patient RCs or even a patient RC preference. These predictions are summarized in Table 2.

Table 2: *Summary of the predictions for Experiment 2 based on the Main Clause Hypothesis and Frequency Hypothesis*

	Main Clause Hypothesis	Frequency Hypothesis
Animate-animate	Patient RC preference	Agent RC preference
Animate-inanimate	No preference	No preference (or Patient RC preference)

3 Experiment 1: Elicited production of declarative clauses

3.1 Method

3.1.1 Participants

Nineteen children aged 4;11–5;9 (mean 5;5) and 17 adult speakers of Tagalog (age: range 18–80, mean 34;6) were recruited and tested in Tagalog-speaking regions in and around Manila, Philippines. As with most Filipinos, our participants had exposure to English (an official language of the Philippines), although their English proficiency varied, and in some cases, they had also been exposed to other Philippine languages. Our participant recruitment, however, targeted Tagalog speakers, and a language background survey was conducted to ensure that only Tagalog-dominant participants were included in the current study.

3.1.2 Materials and procedure

The experiment had two conditions: the animate-animate condition, in which the target scene involved an animate agent and an animate patient, and the animate-inanimate condition, in which the target scene involved an animate agent and an inanimate patient. Each condition included five items (animate-animate:

basaʔ 'wet/splash', *buhat* 'carry', *habol* 'chase', *tulak* 'push', *yakap* 'hug'; animate-inanimate: *basa* 'read', *kain* 'eat', *pitas* 'pick', *putol* 'cut', *sipa* 'kick'), generating a total of 10 experimental items.

Each item consisted of a context picture, presented with a prompt introducing the agent and the patient, followed by a target picture, which the participants were asked to describe. Figure 1 shows a sample item in the animate-animate condition, describing the event of a girl spraying water on a boy.

Figure 1: *Sample item for the verb basaʔ 'wet/splash' in the animate-animate condition in Experiment 1, in which both the agent and the patient are animate. The context picture (a), showing a boy and a girl, was followed by the target picture (b), showing the girl spraying water onto the boy. Participants were asked to describe what is happening in the target picture (b).*

a) Context picture b) Target picture

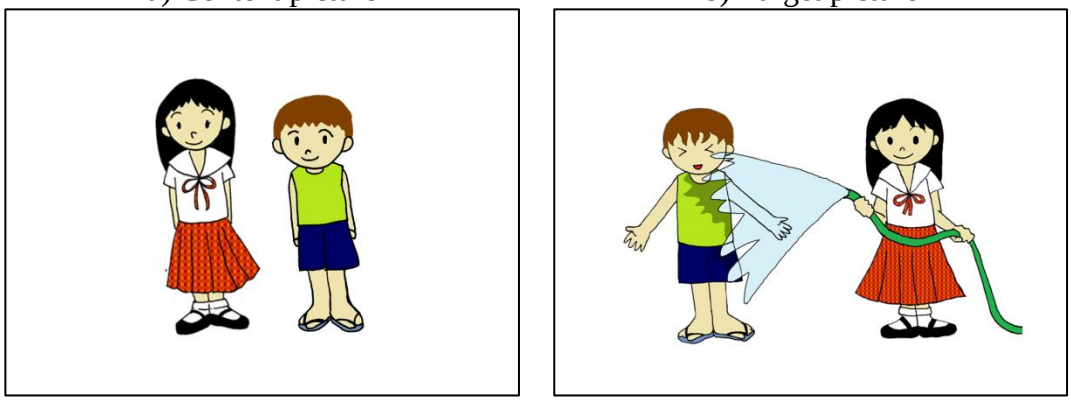
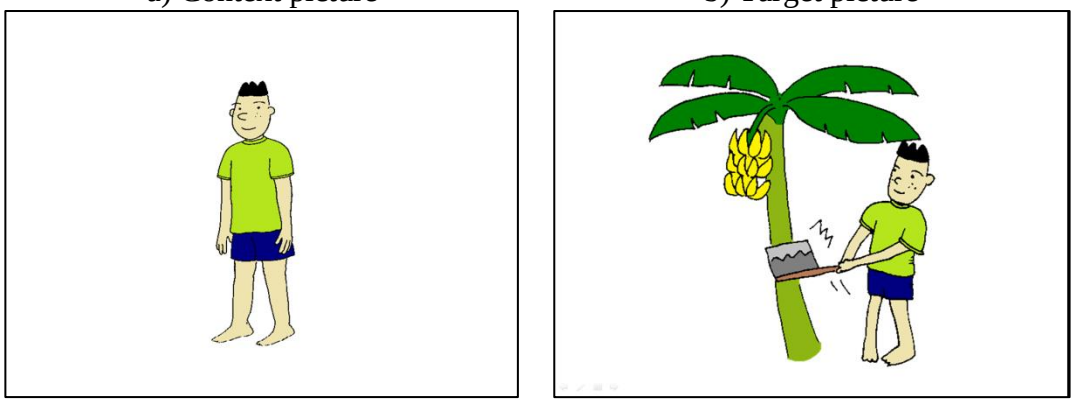


Figure 2 shows a sample item in the animate-inanimate condition, describing the event of a boy cutting a tree. In addition to animacy, definiteness was also manipulated to maximize the likelihood of the participants using one voice or the other. Animate agents were introduced in a context picture prior to the presentation of the target picture to make them definite, while inanimate patients were not previously introduced. This design has been reported to be an effective means to elicit agent voice in previous studies (Tanaka et al. 2014; Tanaka 2015).

Figure 2: *Sample item for the verb putol 'cut' in the animate-inanimate condition in Experiment 1, in which the agent is animate and the patient is inanimate. The context picture (a), showing a boy, was followed by the target picture (b), showing the boy cutting a tree. Participants were asked to describe what is happening in the target picture (b).*

a) Context picture b) Target picture



Participants heard a prompt introducing the entities in the picture from left to right; however, the pictures were designed so that the same type of entity (e.g., boys, girls, inanimate patients) did not always appear on one side of the picture. The example in (5) shows the prompt for the context picture in Figure 1a.

(5) *May* *isa=ng* *babae* *at* *isa=ng* *lalake.*
EXIST one=L woman and one=L man[3]
'There are a girl and a boy.'

After the presentation of the context picture with a prompt, the target picture was presented with a prompt asking participants to describe the picture. The example in (6) shows the prompt for the target picture in Figure 1b.

(6) *Ano* *ang* *nang-ya~yari* *dito?*
what NOM AV-IPFV~happen here?
'What is happening here?'

The two conditions were presented in blocks. We created four lists, each containing 3 practice items and 10 test items, varying the order of the blocks as well as the order of stimuli within a block. Participants were randomly assigned to one of the lists.

3.2 Analysis

Participants' responses were audio-recorded and transcribed. They were further coded for the verbal morphology, case markers, and word order. Verbal morphology and case markers were used to determine which voice was selected by the participants. We are not reporting word order analyses in this paper.

3.3 Results

Four adult participants were excluded because they consistently produced RCs. Further, 15 child responses were excluded from subsequent analyses because of unintelligibility or a lack of response. Table 3 shows the breakdown of the remaining 130 adult responses and 183 child responses into agent voice, patient voice, and others (e.g., bare verbs, reciprocals).

Table 3: *Results of Experiment 1 by condition*

		Animate-Animate		Animate-Inanimate		Total	
		Token	%	Token	%	Token	%
Adults	Intransitive	1	1.5	0	0.0	1	0.8
	Agent voice	0	0.0	39	60.0	39	30.0
	Patient voice	58	89.2	24	36.9	82	63.1
	Other	6	9.2	2	3.1	8	6.2
	Total	65		65		130	
Children	Intransitive	3	3.3	0	0.0	3	1.6
	Agent voice	16	17.8	44	47.3	60	32.8
	Patient voice	62	68.9	48	51.6	110	60.1
	Other	9	10.0	1	1.1	10	5.5
	Total	90		93		183	

As Table 3 shows, adults predominantly produced patient voice patterns (89.2%) in the animate-animate condition. This distribution changes in the animate-inanimate condition: more than half of the responses are in agent voice (60.0%), and the frequency of patient voice was reduced to 36.9%, although a two-tailed binomial test comparing agent voice and patient voice indicated that the production of agent voice was not significantly above 50% (p = .08).

[3] The expressions for 'boy' and 'girl' in Tagalog are multimorphemic: *bata=ng lalake* 'child=L male' and *bata=ng babae* 'child=L female', respectively. In order to avoid simple responses of *bata* 'child', we used *lalake* 'man, male' and *babae* 'woman, female' in our prompts.

The children produced agent voice in 17.8% and patient voice in 68.9% of their responses in the animate-animate condition, showing a predominance of patient voice patterns. A two-tailed binomial test showed that the production of agent voice was significantly below 50% ($p < .001$). In the animate-inanimate condition, on the other hand, 47.3% of the responses were in agent voice and 51.6% of the responses were in patient voice. A two-tailed binomial test showed that the production of agent voice was not significantly above 50% in the animate-inanimate condition ($p = .75$), suggesting that the children, much like the adults, did not have a preference for either voice in this condition.

3.4 Discussion

The results demonstrate that Tagalog speakers, both adults and children, prefer patient voice in the animate-animate condition, and that this preference is weakened but not reversed in the animate-inanimate condition, bringing the frequency of use of agent voice into statistical parity with that of patient voice. These results will serve as the basis for our interpretation of the RC results in Experiment 2, as discussed in Section 2.3.

4 Experiment 2: Elicited production of relative clauses

4.1 Method

4.1.1 Participants

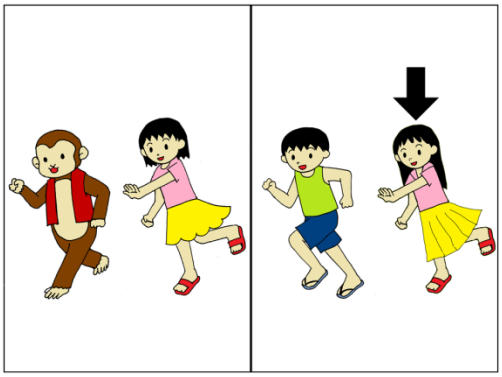
Twenty children (14 female, 6 male) aged 4;8–5;9 (mean 5;5) and 27 adults (age: mean 22;1, range 18–57, five participants did not provide age information) participated in this experiment. Their language backgrounds were similar to those of the participants in Experiment 1. A subset of the participants took part in both experiments.

4.1.2 Materials and procedure

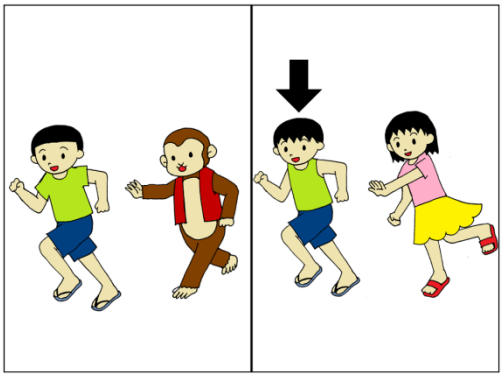
Following a methodology used in previous studies (e.g., Hsu et al. 2009; Zukowski 2009; Kim & O'Grady 2016), pictures and a brief auditory prompt were used to elicit RCs (Tanaka et al. 2016). The test items included five animate-animate items and five animate-inanimate items, using the same verbs as Experiment 1. Each animacy condition was crossed with two RC conditions: an agent RC condition and a patient RC condition. In total, we had 20 test items in addition to three practice items that involved adjectives and 10 intransitive items. Figure 3 presents sample test items for agent RCs and patient RCs in the animate-animate condition.

Figure 3: *Sample items used to elicit an agent RC (a) and a patient RC (b) for the verb 'chase' in the animate-animate condition in Experiment 2*

a) Agent RC



b) Patient RC



As Figure 3 illustrates, participants saw a two-panel picture in which each panel depicted two characters engaged in an event involving two participants (in this example, chasing). In the case of the agent RC item in Figure 3a, participants heard either an agent voice prompt (7a) or a patient voice prompt (7b).

(7) a. Prompt in agent voice

H<um>a~habol	*ang*	*isa=ng*	*babae*	*ng*	*unggoy.*	
<AV>IPFV~chase	NOM	one=L	woman	GEN	monkey	
H<um>ahabol	*ang*	*isa*	*pa=ng*	*babae*	*ng*	*lalake.*
<AV>IPFV~chase	NOM	one	more=L	woman	GEN	man
Sino	*ang*	*may*	*arrow?*			
Who	NOM	EXIST	arrow			

'A girl is chasing a monkey. Another girl is chasing a boy. Who has the arrow?'

b. Prompt in patient voice

H<in>a~habol	*ng*	*isa=ng*	*babae*	*ang*	*unggoy.*	
<PV>IPFV~chase	GEN	one=L	woman	NOM	monkey	
H<in>a~habol	*ng*	*isa*	*pa=ng*	*babae*	*ang*	*lalake.*
<PV>IPFV~chase	GEN	one	more=L	woman	NOM	man
Sino	*ang*	*may*	*arrow?*			
Who	NOM	EXIST	arrow			

'A girl is chasing the monkey. Another girl is chasing the boy. Who has the arrow?'

The two prompt types were prepared because of the possibility of a priming effect that might influence participants' choice of RC pattern. We treated prompt type as a between-subject variable, so that one group of participants was given agent-voice prompts for all items, and the other group patient-voice prompts for all items.

After the prompt, an arrow appeared, accompanied by a beep and pointing to one of the characters or entities in the pictures – for example, one of the girls in Figure 3a or one of the boys in Figure 3b. Participants had to describe the relevant person or object to an experimenter who saw the same panel of pictures but could not see the arrow. In Figure 3a, the targeted response is the agent RC *ang babaeng humahabol ng lalake* 'the girl that is chasing the boy'. In Figure 3b, it is the patient RC *ang lalakeng hinahabol ng babae* 'the boy that the girl is chasing'. Because two characters of the same kind appear in both pictures, it would be uninformative to respond by saying 'the girl/boy' or 'the chaser'. Only a full RC provides the necessary information.

Test items were presented in two blocks, the first consisting of animate-animate RCs and the second consisting of animate-inanimate RCs. Within each block, animate RCs and patient RCs were pseudo-randomized.

4.2 Analysis

Participants' responses were audio-recorded and transcribed. A response was coded as a targeted pattern if the participants produced a structurally acceptable and semantically appropriate (head-initial, head-final, or headless) RC, barring minor errors. For Figure 3a, both (8a) and (8b) are examples of targeted responses. (8a) has a correct head, an agent voice verb, and a non-nominative coargument; (8b) includes a correct head, a patient voice verb, and a nominative coargument. The response in (8c), with a correct head, a patient voice verb, and a genitive coargument, is a grammatical RC but is coded as a reversal error, as it changes the meaning from the agent RC 'the girl that is chasing the boy' to a patient RC 'the girl that the boy is chasing'. The loci of errors in the examples are bolded.

(8) a. Targeted agent RC (correct head, agent voice, genitive coargument)

babae=ng	*h<um>a~habol*	*ng*	*lalake*
girl=L	<AV>IPFV~chase	GEN	boy

'girl [that _ is chasing the boy]'

b. Targeted agent RC (correct head, patient voice, nominative coargument)
babae=ng *h<in>a~habol* *ang* *lalake*
girl=L <PV>IPFV~chase NOM boy
'girl [that _ is chasing the boy]'

c. Reversal error (correct head, patient voice, genitive coargument)
babae=ng *h<**in**>a~habol* ***ng*** *lalake*
girl=L <PV>IPFV~chase GEN boy
'girl [that the boy is chasing _]'

For Figure 3b, the targeted response is (9a), which has a correct head, a patient voice verb, and a genitive coargument. An RC with an agent voice with a nominative coargument was marked as an error (9b), as this is unequivocally an illicit construction in Tagalog. The responses in (9c) and (9d) were considered reversal errors as they are semantically incongruent with the event.

(9) a. Targeted patient RC (correct head, patient voice, genitive coargument)
lalake=ng *h<in>a~habol* *ng* *babae*
boy=L <PV>IPFV~chase GEN girl
'boy [that the girl is chasing _]'

b. Ungrammatical patient RC (correct head, agent voice, nominative coargument)
lalake=ng *h<**um**>a~habol* ***ang*** *babae*
boy=L <AV>IPFV~chase NOM girl
'boy [that the girl is chasing _]'

c. Reversal error (correct head, agent voice, genitive coargument)
lalake=ng *h<**um**>a~habol* ***ng*** *babae*
boy=L <AV>IPFV~chase GEN girl
'boy [that _ is chasing the girl]'

d. Reversal error (correct head, patient voice, nominative coargument)
lalake=ng *h<**in**>a~habol* ***ang*** *babae*
boy=L <AV>IPFV~chase NOM girl
'boy [that _ is chasing the girl]'

Other non-targeted response types included head errors (RCs with a wrong head, such as 'the girl that the boy is chasing' instead of 'the boy that the girl is chasing'), missing coarguments (resulting in an uninformative RC), the use of resumption, the use of verb morphology that is neither agent nor patient voice, as well as various non-RC responses, including declarative clauses, genitive constructions (e.g., 'the girl's ball' instead of the 'ball that the girl kicked'), and miscellaneous other occasional constructions.

The statistical analysis was performed through R version 4.2.1 (R Core Team 2022) using the *lme4* (Bates et al. 2015), *lmerTest* (Kuznetsova et al. 2017), and *emmeans* (Lenth 2022) packages.

4.3 Results

We obtained a total of 540 responses from adults and 400 from children. Of these, 41 adult responses (7.59%) and 140 child responses (35.00%) were excluded because they were unintelligible or did not contain RCs. The accuracy results of the remaining responses are reported in Table 4. Adult participants produced targeted agent RCs 90.0% of the time (animate-animate: 83.5%, animate-inanimate: 96.2%) and targeted patient RCs 85.5% of the time (animate-animate: 87.9%, animate-inanimate: 83.1%). Child participants produced targeted agent RCs 62.8% of the time (animate-animate: 50.9%, animate-inanimate: 71.1%) and targeted patient RCs 48.9% of the time (animate-animate: 61.3%, animate-inanimate: 37.7%).

Table 4: *Accuracy rates (%) by group, RC type, and animacy in Experiment 2*[4]

		Animate-Animate		Animate-Inanimate		Overall
	RCs	Token	%	Token	%	%
Adults	Agent RC	101	83.5	125	96.2	90.0
	Patient RC	109	87.9	103	83.1	85.5
Children	Agent RCs	27	50.9	54	71.1	62.8
	Patient RCs	38	61.3	26	37.7	48.9

We determined the likelihood of producing targeted responses using a mixed effects logistic regression model with Group (adults, children), RCType (agent RC, patient RC), Animacy (animate-animate, animate-inanimate), and Prompt (agent voice prompt, patient voice prompt) as predictors. All predictors were sum-coded so that children, patient RCs, animate-inanimate, and patient voice prompt are mapped onto the negative coefficients. The model also included all interactions among Group, RCType, and Animacy, as well as an interaction between RCType and Prompt. The random effect structure included by-participant and by-item varying intercepts. The output of the model is reported in Table 5.

Table 5: *Summary of a logistic mixed effects model of the results of Experiment 2*

	Estimate	*SE*	*z* value	*p* value	
(Intercept)	1.68	0.34	4.95	< .001	***
Group	1.45	0.31	4.69	< .001	***
RCType	0.48	0.14	3.48	< .001	***
Animacy	−0.22	0.13	−1.64	.10	
Prompt	−0.12	0.32	−0.38	.71	
Group:RCType	0.06	0.12	0.52	.60	
Group:Animacy	−0.19	0.12	−1.55	.12	
RCType:Animacy	−0.67	0.14	−4.91	< .001	***
RCType:Prompt	0.55	0.14	4.07	< .001	***
Group:RCType:Animacy	−0.01	0.13	−0.05	.96	

The model shows a reliable effect of Group (logit coefficient: +1.45, SE = 0.31, z = 4.69, p < .001), suggesting that adults had significantly more correct responses than children. There was also a reliable effect of RCType (logit coefficient: +0.48, SE = 0.14, z = 3.48, p < .001), indicating that the targeted responses were produced significantly more frequently in the agent RC condition than in the patient RC condition overall. There was a significant interaction between RCType and Animacy (logit coefficient: −0.67, SE = 0.14, z = −4.91, p < .001), suggesting that the agent RC preference was significantly different between the two animacy conditions. Estimated marginal means show that the difference between RC types was significant in the animate-inanimate condition for both adults (p < .001) and children (p < .001), but was not significant for either group in the animate-animate condition (adults: p = .60; children: p = .32). The interaction between RCType and Prompt was also significant (logit coefficient: +0.55, SE = 0.14, z = 4.07, p < .001), suggesting that Prompt had a varying influence on RCType.

4.4 Discussion

These results show that both adults and children produced agent RCs more accurately than patient RCs, demonstrating an overall agent RC preference. A closer look at animacy effects revealed that the agent RC preference was significant in the animate-inanimate condition, in which the RC involved an animate agent

[4] As explained in §4.2, the relativization of the agent out of patient voice, corresponding to the pattern in (8b), was considered a targeted response. This is supported by adults' use of this pattern: 18 of the 101 targeted agent relative clauses (17.82%) in the animate-animate condition and 7 out of 125 (5.60%) in the animate-inanimate condition were of this type. Children also produced this pattern, but more frequently than adults: 18 out of 27 (66.67%) targeted agent relative clauses in the animate-animate condition and 17 out of 54 (31.48%) in the animate-inanimate condition.

and inanimate patient, but not in the animate-animate condition, in which the agent and patient were both animate.

How do these findings fit into the Main Clause Hypothesis and Frequency Hypothesis? Recall that Experiment 1 found a strong patient voice preference in the animate-animate condition, and no preference for either voice in the animate-inanimate condition. The Main Clause Hypothesis would predict that a preference for voice in declarative clauses would carry over to RCs. The Frequency Hypothesis, on the other hand, would predict an agent RC preference in the animate-animate condition but no preference in the animate-inanimate condition. The predictions under each hypothesis and the results from the current study are summarized in Table 6.

Table 6: *Summary of the results from Experiment 2 in comparison with predictions based on the Main Clause Hypothesis and Frequency Hypothesis*

	Current study	Main Clause Hypothesis	Frequency Hypothesis
Animate-animate	No preference	Patient RC preference	Agent RC preference
Animate-inanimate	Agent RC preference	No preference	No preference (or Patient RC preference)

As Table 6 indicates, the results of the current study do not match the predictions generated by either hypothesis. Crucially, the finding of an agent RC preference in the animate-inanimate condition when the two hypotheses do not anticipate any preference suggests that there is an additional force behind the agent RC preference that cannot be fully accounted for by either hypothesis.

Yet, such an agent RC preference – predicted by neither the Main Clause Hypothesis nor the Frequency Hypothesis – does not manifest in the animate-animate condition. One way to interpret this pattern is that it does in fact show the effect of main clause similarity predicted by the Main Clause Hypothesis *in addition to* an agent RC preference. In the animate-animate condition of the current experiment, we see no statistical difference between agent and patient RCs. On the surface, it looks like there is no preference for either type of RC. However, recall that in the same condition of Experiment 1, both adults and children do show a preference for patient voice in declarative clauses. This strong preference is not present in Experiment 2, indicating that when compared to the baseline of declarative clauses, agent voice RCs gain greatly in preference. In the animate-inanimate condition, on the other hand, the patient voice preference is not strong, and thus only the agent RC preference manifests in this condition.

In sum, there is evidence for an agent RC preference beyond what can be predicted by the Main Clause Hypothesis or the Frequency Hypothesis, but there is also evidence that similarity to main clauses, as put forward in the Main Clause Hypothesis, does have some impact on RC preference. We were, however, unable to find evidence that supports the Frequency Hypothesis, contra Tanaka et al. (2019).

The remaining question is the source of this agent RC preference. While we do not have data to determine the source, one possibility is that a general, perhaps universal, agent prominence contributed to the agent RC preference. Some psycholinguists have argued that the prominence of agents in understanding and describing events is cross-linguistically common (e.g., Kemmerer 2012; Cohn & Paczynski 2013). In Tagalog, Garcia et al. (2018, 2019, & 2020) and Garcia & Kidd (2020) showed that children prefer agent-before-patient word order. Sauppe and colleagues also reported agent prominence in adult native speakers' production and comprehension based on eye-tracking data: participants fixated more on the agent than the patient before they produced a sentence (Sauppe et al. 2013) and upon hearing the verb (Sauppe 2016) regardless of voice. It is possible that agent RCs are easier than patient RCs because the agent role is preferentially assigned to the first NP.

That said, as described in §2.1, Segalowitz & Galang (1978) reported no voice preference in children's comprehension or production when the test involved NP-first sentences. While their study was not on RCs, this finding suggests that agent prominence does not always lead to an agent-first preference (Garcia et al. 2019). However, agent prominence may also influence the production of RCs beyond just the linear order. According to O'Grady (2011: 21), "[t]he ease with which the processor establishes an aboutness relationship is proportional to the semantic prominence of the relativized element within the relative clause." Thus, in the current study, agent RCs might have been easier than patient RCs for the participants to produce because of the semantic prominence of the agent head.

5 General discussion and conclusions

This study presented two experiments investigating Tagalog-speaking adults' and children's production of declarative clauses and RCs. Previous studies such as those by Bondoc et al. (2018), Tanaka et al. (2019), Pizarro-Guevara (2020), and Pizarro-Guevara & Wagers (2020) have consistently found an agent RC preference in comprehension by children, comprehension by individuals with agrammatic aphasia, and comprehension and production by healthy adults. The current study provides production data from adults and children to complement these previous studies, with a design that allows us to look more closely into the role of animacy, and to consider which RC preference may or may not be explained by the patterns in declarative clauses.

Experiment 1 on the production of declarative clauses demonstrated that adult and child speakers of Tagalog strongly preferred to produce patient voice rather than agent voice when the agent and patient were both animate, but this preference diminished when the patient was inanimate. We manipulated only animacy to influence the selection of voice, and other factors certainly should be investigated experimentally in future research. However, Experiment 1 gave us a baseline that helps us interpret the results of Experiment 2 on the production of RCs. Experiment 2 found no significant difference between agent and patient RCs when the agent and patient were both animate, but both adults and children produced targeted agent RCs more frequently than patient RCs when the agent was animate and the patient was inanimate. We discussed these results based on two interpretations of the agent RC preference, in response to Tanaka et al. 2019.

The first is the Main Clause Hypothesis, which explains such a preference based on similarity to the structure of the main clause. With this hypothesis, Tanaka et al. (2019) made a prediction based on an assumption of an across-the-board preference for patient RCs. In contrast, in the current study, the results from Experiment 1 gave us a more nuanced picture of how participants choose voice in Tagalog depending on different animacy configurations. The Main Clause Hypothesis would predict the preferences found for declarative clauses in Experiment 1 to carry over to RCs in Experiment 2, which was not the case.

The second, the Frequency Hypothesis, explains the preference based on the distributional properties of agent and patient RCs when head animacy is taken into consideration. In Tagalog (and many other languages), there is a strong association between animate heads with agent RCs and inanimate heads with patient RCs, and animate-headed patient RCs are very rare. Under the Frequency Hypothesis, this association is why we find an agent RC preference when we test participants with animate-headed RCs, and the preference should diminish in a test with more common, inanimate-headed patient RCs. This prediction also was not borne out in Experiment 2, in which inanimate heads did not boost adults' or children's production of patient RCs.

Both hypotheses predict no preference when the agent is animate and the patient is inanimate, yet this was the very condition in which we observed an agent RC preference, leading us to conclude that an agent RC preference exists that cannot be explained by either the Main Clause Hypothesis or the Frequency Hypothesis.

At the same time, however, we proposed that this agent RC preference counteracts the patient voice preference predicted under the Main Clause Hypothesis, resulting in the lack of agent RC preference in the condition where agent and patient were both animate, where patient voice is preferred in declarative clauses.

Our conclusion, therefore, is that the subject RC preference that is so ubiquitously observed in so many languages manifests itself as an agent RC preference in Tagalog. The source of this preference remains open to debate, and we do not have the data to make claims about it. But what we *can* say is that the source cannot be explained by the Frequency Hypothesis, and that while the Main Clause Hypothesis explains the results to some extent, there is an agent RC preference that cannot be explained by either hypothesis.

List of Abbreviations

3SG 3rd person singular
AV agent voice
GEN genitive
IPFV imperfective
EXIST existential
L linker
NOM nominative
OBL oblique

PFV perfective
PV patient voice

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