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ARTICLE

# Rules and exceptions: A Tolerance Principle account of the possessive suffix in Northern East Cree

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**Abstract**

Debate around inflectional morphology in language acquisition has contrasted various rule- versus analogy-based approaches. This paper tests the rule-based Tolerance Principle (TP) against a new type of pattern in the acquisition of the possessive suffix *-im* in Northern East Cree. When possessed, each noun type either requires or disallows the suffix, which has a complex distribution throughout the lexicon. Using naturalistic video data from one adult and two children – Ani (2;01–4;03) and Daisy (3;08–5;10) – this paper presents two studies. Study 1 applies the TP to the input to extrapolate two possible sets of nested rules for *-im* and make predictions for child speech. Study 2 tests these predictions and finds that each child's production of possessives over time is largely consistent with the predictions of the TP. This paper finds the TP can account for the acquisition of the possessive suffix and discusses implications for language science and Cree language communities.

**Keywords:** Inflection; morphology; possession; rules; defaults

## Introduction

Inflectional morphology has provided pivotal testing ground for theoretical approaches to language processing and child language acquisition. One major debate has centered on the question of whether, or to what extent, inflectional forms are created by: 1) the application of morphological RULES and/or 2) via ANALOGY to stored forms (see, e.g., reviews from Ambridge & Lieven, 2011; Blom, 2018; Kapatsinski, 2018b; Ravid, 2019). This paper applies Yang's (2016, 2018) relatively recent TOLERANCE PRINCIPLE (TP) proposal – a heavily rule-based approach – to the L1 acquisition of the possessive suffix *-im* in Northern East Cree (NE CREE, ISO 639-3 code *crl*), an Indigenous Algonquian language spoken in Eeyou Istchee, Northern Québec, Canada.

This paper first lays out the theoretical background and details of the TP. It then explains notation conventions and the relevant grammatical workings of NE Cree possessive inflection, focusing on the distribution of the *-im* suffix. Next, this paper

presents research questions and describes the naturalistic data used for two studies. Study 1 applies the TP to child-directed speech to abstract two possible sets of nested rules for distributing *-im* and make predictions about child acquisition of the suffix. Study 2 analyzes speech data from two children of different age ranges to describe the acquisition of *-im* and evaluate the predictions from Study 1. Findings indicate that applying the TP to the input extrapolates rules grounded in well-motivated grammatical and phonological facets of the language, and that patterns in child speech are largely consistent with following these predicted rules. This paper concludes by discussing some implications of these findings for language science and Cree language communities.

## Theoretical background

Granlund, Kolak, Vihman, Engelmann, Lieven, Pine, Theakston, and Ambridge (2019) summarize the landscape of the debate over inflectional morphology, describing a continuum of approaches ranging from strictly rule-based to strictly analogy-based accounts (Figure 1). Between the poles of this continuum lie a variety of approaches allowing for the interaction of rules or rule-like patterns with abstractions influenced by properties such as frequency or similarity (particularly phonological) to other items.

For example, much of the English Past Tense Debate has revolved largely around whether past tense verbs are handled via primarily analogy-based (e.g., Bybee, 1995; Bybee & Slobin, 1982; McClelland & Patterson, 2002; Rumelhart & McClelland, 1985) or primarily rule-based mechanisms that distinguish between regular and irregular forms (e.g., Marcus, Pinker, Ullman, Hollander, Rosen, Xu & Clahsen, 1992; Pinker & Ullman, 2002; Prasada & Pinker, 1993). Studies of German inflection have also tested more analogy-based (e.g., Köpcke, 1998) versus more rule-based accounts (e.g., Clahsen, 1999; Clahsen, Rothweiler, Woest & Marcus, 1992) – see also the review from Korecky-Kröll and Dressler (2009), which includes several German-language sources. Rule-versus-analogy research has also considered inflectional morphology in Arabic (Albirini, 2015; Boudelaa & Gaskell, 2002; Ravid & Farah, 1999), Lithuanian (Savičiūtė, 2020; Savičiūtė, Ambridge & Pine, 2018), Japanese (Tatsumi & Pine, 2016), and Polish (Dąbrowska, 2004, 2006; Krajewski, Lieven & Theakston, 2012).

## The Tolerance Principle

Yang's (2016, 2018) TP model proposes a strongly rule-based account of the processing and acquisition of inflectional morphology. Some important tenets define and distinguish the TP from other approaches.

The TP contends that the processing of inflectional forms is mechanistic, with serial operations of symbolic rules applying to inputs to generate outputs. "Productive" rules are

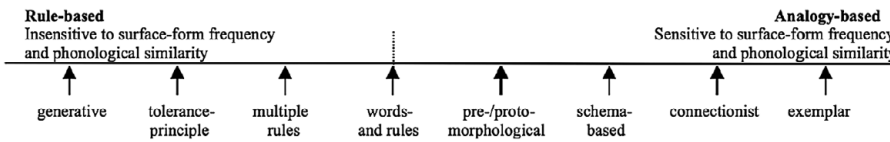


**Figure 1.** Granlund et al.'s (2019, p. 170) Continuum of Approaches to Inflectional Morphology
*Note*: Image screenshot taken from the source article.

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those which children can apply to novel inputs, such as noun stems, to generate inflectional forms. In this model, productivity is categorical – a rule is either productive or not. Yang argues for the principle of Maximize Productivity (2016, p. 72), which holds that children seek to maximize efficiency in language and will therefore pursue productive rules for inflection whenever and wherever possible.

As with other dual-route/mechanism approaches (e.g., Clahsen, 1999; Pinker & Ullman, 2002), the TP posits a categorical difference between regular and irregular inflectional forms. Regular forms are generated via rules while irregular forms are exceptions to rules that are stored and retrieved from the lexicon. In accordance with Maximize Productivity, children seek to minimize the storing of exceptions so that rules do the bulk of the work handling inflection. The TP also builds in a particular role for input frequency: irregular inflectional forms are stored in a ranked list determined by their relative frequency, going from most to least frequent types, and rankings change as experience with the input accrues over time.

According to the TP, the story of acquiring productive rules (e.g., the English plural *-s*) goes something like this. A child begins with no rules and starts looking for patterns to establish rules as she encounters inflectional forms in the input. As soon as possible, she postulates a rule across the set of noun types she has encountered (e.g., *dog* > *dog**s***, *cat* > *cat**s***, *kiss* > *kiss**es***) despite the fact that she encounters exceptions along the way (e.g., *child* > *child**ren***, *goose* > *g**ee**se*, *mouse* > *m**i**ce*). If the proportion of exceptions does not become too great, the rule holds as productive and can be applied to novel forms. But if the proportion of exceptions to a rule ever grows too large, the rule loses its productivity. As time passes and the child encounters plural forms of more noun types, she will either revive or revise the old rule, or she will extrapolate another rule. The cycle continues until a productive rule can finally withstand all of the exceptions the child has encountered, which have been lexicalized and stored alongside the rule in a list ranked by frequency in the input. (The token frequency of types is not a factor in extrapolating a rule, only in ordering the list of exceptions to it.) When the child needs to produce a plural form for a noun, she finds the necessary productive rule and checks the list of exceptions to the rule. If the noun is not listed as an exception, then the rule is applied.

One unique contribution of the TP is that Yang posits a mathematical formula (2016, p. 64) that determines when a rule (R) can be established as productive in the face of exceptions:

$$e \leq \theta N \text{ where } \theta N = N/\ln N$$

This formula states that R is productive across a set of items (N) if the number of attested exceptions to the rule (e) does not exceed a particular threshold (θN), which is defined as N divided by the natural logarithm of N.

As an illustration, suppose that a child seeking a productive rule for English noun plurals has encountered plural forms of 100 total noun types (N), noticed a pattern, and postulated an inflectional rule:

$R_{pl}$ = "To form a plural noun, add *-s* to the stem".

The TP formula states that $R_{pl}$ can tolerate 21.74 exceptions. If the child has encountered no more than 21.74 exceptions such as *child**ren*** and *g**ee**se*, then $R_{pl}$ is productive and applicable to novel noun types to create plural forms. As the child encounters plural forms

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of additional noun types in the input over time, as long as the proportion of exceptions never exceeds the threshold established by the TP – such as 37.74 exceptions for 200 total types and then 80.46 exceptions for 500 total types – then $R_{pl}$ will remain productive and applicable to novel noun types.

The TP also offers a path for inflectional morphology involving competing regular patterns. In accordance with Maximize Productivity, the TP applies recursively and allows for multiple rules (Yang, 2016, pp. 71–75). When a child cannot generalize a single rule across a set of N items, the TP states that she will divide N into subsets and look for rules that apply to individual subsets of items. Yang uses this recursive application of the TP to account for German noun plurals, where competing inflectional patterns present an acquisitional challenge (e.g., Clahsen, 1999; Clahsen et al., 1992; Köpcke, 1998; Laaha, Ravid, Korecky-Kröll, Laaha & Dressler, 2006). By subdividing German noun stems into classes defined by salient semantic (e.g., gender) and phonological characteristics (e.g., stems with reduced final syllables), Yang (2016, pp. 121–136) uses the TP to derive a set of six nested rules that apply serially to account for plural inflection. The last rule positions the plural suffix *-s* as the default, Elsewhere Condition – reminiscent of earlier dual-mechanism accounts analyzing *-s* as a "minority default" pattern (e.g., Clahsen et al., 1992).

As a relatively new account, the TP requires much further testing. In his original proposal, Yang (2016) applies the TP to account for various inflectional phenomena across a handful of languages. In addition to German noun plurals, this includes the English past tense and noun plurals, "Dative Sickness" in Icelandic, and inflectional gaps in English, Polish, Russian, and Spanish. Following these case studies, Pophristic and Schuler (2021) employ the TP to draw predictions about the productivity of noun suffixes in Serbian, although they do not actually test these predictions with child language data. Björnsdóttir (2021) applies the TP to generate and test predictions about the acquisition of noun inflection in Icelandic, using corpus and experimental data to argue that children follow patterns corresponding to productive and unproductive rules predicted by the TP.

The TP also faces challenges and criticism. Recent computer models of morphological learning have successfully applied the TP to sampled input and derived rules through recursive application (e.g., Belth, Payne, Beser, Kodner & Yang, 2021; Payne, Belth, Kodner & Yang, 2022), but Yang (2018, p. 8) himself admits it is not "clear how the brain actually implements something like the TP". Kapatsinski (2018a, 2018b) critiques the model along a number of fronts. He questions the cognitive realism of the TP, especially its reliance upon serial search; Yang's proposal for how the TP overcomes the problem of indirect negative evidence; the idea that rules are actually categorically (un)productive rather than on a cline of productivity; and situations where rules lose productivity despite not being overwhelmed by exceptions. Goldberg (2018, 2019) also critiques, for instance, the TP's reliance on lists rather than networks of associated forms; a lack of clarity about how the TP restricts the domain of rules; and the potential burden learners must bear in retaining regular forms to establish the sufficient conditions for productivity.

The present study provides an empirical test for the TP, following Yang's admonition to use the TP "until it breaks" (2018, p. 9). This paper applies the TP to an inflectional phenomenon in NE Cree, a member of a language family – indeed an entire continent of Indigenous languages – severely under-represented in child language acquisition research. Furthermore, this study examines a new kind of inflectional pattern for the TP. Rather than testing the model against putative "regular" and "irregular" patterns or

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against multiple competing inflectional patterns, this study considers how the TP may account for a single inflectional morpheme that presents a plus-or-minus proposition, where a given noun type either requires or disallows a particular suffix.

## Northern East Cree

NE Cree is a variety in the Cree-Innu-Naskapi (CIN) dialect complex within the Algonquian language family (MacKenzie, 1980). Along with Southern East Cree, NE Cree belongs to the East Cree grouping within CIN. Speakers also refer to East Cree as Iiyiyiuyimuwin, Iyiyuu-Ayimuwin, and Iinuu-Ayimuwin (see, e.g., Grand Council of the Crees, 2019; Neacappo, 2012). This article uses the term "Cree" because speakers commonly use it when signifying the language and themselves, and because existing published literature most frequently uses the term as well. Spoken in four communities in Northern Québec near James Bay, NE Cree has more than 5,000 first language speakers (Henke, 2020, pp. 9–11). This article considers data from one of these communities, the Cree Nation of Chisasibi.

Despite this relatively large number of first language speakers across all age groups, East Cree communities are nonetheless experiencing significant and rapid language shift, change, and loss under increasing pressure from English and French (see, e.g., Brittain & MacKenzie, 2010). Cree leadership, organizations, and individuals have been responding to this challenge along a variety of important fronts. The Grand Council of the Crees and the Council of the Cree Nation Government, for example, recently passed the Cree Language Act of Eeyou Istchee calling for more "Cree efforts to reclaim, revitalize, maintain and strengthen the Cree language" (2019, p. 5) and by establishing the Office of the Commissioner of the Cree Language. This is a crucial time for language science to help inform NE Cree language revitalization and reclamation efforts, including language nest and immersion programs.

## Notation Conventions

The first line in examples such as (1) gives a representation in East Cree Standard Roman Orthography. Long vowels are written with digraphs, such as <ii> to signify /i:/. The orthography generally corresponds to IPA, with some exceptions such as <y> for /j/, <ch> for /tʃ/, and <sh> for /ʃ/. When necessary, <h> graphemes are separated by a hyphen to prevent misinterpreting <sh> as [ʃ] or <shh> as [ʃ:].

(1) Oh, nuwich miywaashiyiu uyaayiu.
oh nuwich miywaashi-yiu u-yaayiu
INTJ very be.good$_{II}$-OBV.SG$_{IND}$ DEM.PXL-INAN.OBV.SG
'Oh, this is pretty.' (Adult, A1.06, 2;03, 22:07)

Remaining lines and abbreviations in examples follow the Leipzig Glossing Rules (Max Planck Institute for Evolutionary Anthropology, 2015). Exceptions are: AI+O (intransitive verb with an animate subject that takes an object); AN (animate); CJ (conjunct); DIM (diminutive); HES (hesitation); II (intransitive verb with an inanimate subject); INAN (inanimate); INTJ (interjection); OBV (obviative); PVB (preverb); and PXL (proximal). Indicated via subscript, verb class is signified with the verb stem, and the inflectional

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paradigm (traditionally called an "order" in Algonquian linguistics) is signified with the final verbal suffix. Parenthetical citations for video recordings as in (1) specify the codename of the speaker; the file number of the recording within the corpus; the age of the child speaker or of the child present during an adult utterance; and a timestamp within the recording.

## Relevant Grammatical Background

This section primarily synthesizes information from the two most extensive grammatical descriptions of NE Cree: 1) Collette's dissertation on morphology (2014), and 2) the online reference grammar through *eastcree.org* (Junker, Salt & Visitor, 2013). Although Algonquian languages are known for their so-called "polysynthetic" characteristics in verbal morphology, this paper focuses on the inflectional morphology of nouns.

As in other Algonquian languages, basic noun inflection in NE Cree hinges upon interacting grammatical categories of animacy, number, and obviation. Number in NE Cree involves a distinction between singular and plural, which also includes inclusive/exclusive marking for plural first persons. Obviation is an Algonquian distinction between third persons, where one third person within a span of syntax or discourse is designated proximate and all other third persons are designated obviative (see, e.g., Bloomfield, 1946). Animacy is most relevant for this paper, so no further explanation follows for number or obviation.

### *Animacy*

Each noun type in NE Cree is classified as grammatically ANIMATE or INANIMATE. This classification is arbitrary but very frequently contingent upon biological characteristics. For example, living creatures such as humans, animals, and some plants are generally classified as animate (2), while non-living things are generally inanimate (3).

(2) awaashish 'child', mishtikw 'tree', piyaashiish 'bird'

(3) aashukin 'bridge', misinihiikin 'book', wichii 'mountain'

From an acquisition perspective, the animacy designations for many noun types can be predicted easily and reliably, but some classifications seem especially arbitrary. For instance, the noun types in (4) are animate while the types in (5) are inanimate.

(4) piyichiis 'pants', tuuhwaan 'ball', utaahiimin 'strawberry'

(5) miinish 'berry', paahkihaakwaan 'chicken', pichiwiyaan 'shirt'

### *The NE Cree Noun Template*

NE Cree noun stems inflect along the morphological template summarized in Table 1. Possession entails the richest inflectional possibilities for nouns: the Clitic, Suffix 1, Suffix 2, and Suffix 3 positions are only used for possessive nouns.

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**Table 1.** NE Cree Noun Template: Affixal Positions and Inflectional Categories Marked

| Clitic | Base | Suffix 1 | Suffix 2 | Suffix 3 | Suffix 4 |
|---|---|---|---|---|---|
| Person (of PSR) | **Noun stem** | POSS | Obviation (of PSR) | Number (of PSR) | Animacy, Number, Obviation / Locative |

*Note.* This table adapts Collette (2014, p. 327). PSR = possessor. POSS = possession.

For example, the noun in (6) has morphemes in the Clitic, Suffix 1, Suffix 3, and Suffix 4 slots.

(6) chitiwaashishiimiwaauch
chit=awaashish-iim-iwaau-ch
2=child-POSS-NON1PL-AN.PL
'your (PL) children'

This paper focuses on the *-im* morpheme that appears at the Suffix 1 position in the template. The Clitic and Suffix 1 positions work together and furnish the most basic obligatory inflectional morphemes encoding possession: a clitic marks the person of the possessor, and when required, the suffix *-im* marks the possessive status of the noun stem.

### *The Clitic Position*

Every possessive noun requires a clitic to mark the person of the possessor (7–9). A possessive noun can bear only one clitic.

(7) nitiwaashishiim
**nit**=awaashish-iim
**1**=child-POSS
'**my** child'

(8) chitiwaashishiim
**chit**=awaashish-iim
**2**=child-POSS
'**your** child'

(9) utiwaashishiimh
**ut**=awaashish-iim-h
**3**=child-POSS-AN.OBV
'**her/his** child'

### *(In)alienable Possession*

The Clitic position plays a crucial role in (in)alienable possession: each noun type in NE Cree is either inalienably or alienably possessed.

INALIENABLE nouns always require a person clitic. These types belong to a general semantic class denoting body parts, kinship relations, and some close personal

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belongings. An inalienable noun without a specific possessor nonetheless needs a clitic (10–11).

(10) shtikwaan
*Ø=shtikwaan
*Ø=head
*'**a** head'

(11) mishtikwaan
**mi**=shtikwaan
**INDF**=head
'**a** head'

On the other hand, ALIENABLE noun types bear a clitic only when possessed (12–13) and belong to a generally open semantic class.

(12) misinihiikin
**Ø**=misinihiikin
**Ø**=book
'**a** book'

(13) chimisinihiikin
**ch**i=misinihiikin
**2**=book
'**your** book'

This paper does not aim to solve the problem of how children acquire the (in)alienable distinction, but some points are worth noting. Inalienable types largely belong to a restricted semantic class, whereas alienable types denote anything else. Morphology provides additional cues as to whether a noun type is (in)alienable. Children can look to contrasting forms in the input to identify clitics and stems (Henke, 2020), and children can contrast bare and inflected forms to build an inventory of alienable types. However, children must also overcome a lack of negative evidence in figuring out that inalienable nouns must have a clitic.

### Suffix 1: The Possessive Morpheme *-im*

This templatic position hosts the possessive suffix *-im* (and its phonologically conditioned allomorphs *-m*, *-um*, *-iim*), as in (14–15).

(14) nikaanichiim
ni=kaanichii-**m**
1=sweater-**POSS**
'my sweater'

(15) nitiwaashishiim
nit=awaashish-**iim**-ich
1=child-**POSS**-AN.PL
'my children'

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### *The Distribution of -im*

Here arrives the most important facet of NE Cree grammar for the present study: each noun type either requires or disallows *-im* when possessed, and the suffix has a complex distribution across noun types.

For example, the noun type *piyichiis* 'pants' requires *-im* when possessed (16–17), but the type *pichiwiyaan* 'shirt' disallows the suffix (18–19).

(16) nipiyichiisim
ni=piyichiis-im
1=pants-POSS
'my pants'

(17) nipiyichiis
ni=piyichiis-***Ø**
1=pants-***POSS**
'my pants'

(18) nipichiwiyaan
ni=pichiwiyaan
1=shirt
'my shirt'

(19) nipichiwiyaanim
ni=pichiwiyaan-***im**
1=shirt-***POSS**
'my shirt'

Each noun type is specified as [± *-im*], and some existing linguistic description has attempted to account for the distribution of *-im* throughout the adult lexicon. For example, Junker, MacKenzie, and Brittain (2012, pp. 25–26) offer a rule of thumb that inanimate noun types generally disallow *-im* while animate noun types may require it. Collette (2014) provides the most thorough and detailed accounting of *-im*, dedicating more than 40 pages to describing which categories of noun types require or disallow the suffix. He claims the distribution of *-im* interacts with a variety of semantic, (morpho) phonological, morphological, and lexical factors. For example, Collette observes that inalienable nouns disallow the suffix, while almost all English loanwords require it. He also contends that noun stems ending in segments /m, n, $k^w$/ generally disallow *-im* but that exceptions also exist, such as *waaskaahiikin* 'house' (20). For yet other kinds of noun types, Collette claims that *-im* is "aléatoirement distribué avec les autres items lexicaux" ('randomly distributed with other lexical items') (2014, p. 282).

(20) uwaaskaahiikinim
u=waaskaahiikin-**im**
3=house-**POSS**
'her/his house'

Of course, by examining patterns in the adult lexicon, Collette describes more of an end product for NE Cree. Children will have to start with the input to extrapolate patterns for discerning which noun types are [± *-im*].

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### *Summary: The Acquisitional Challenge*

Each noun type in NE Cree is classified as animate or inanimate as well as alienable or inalienable, and nouns inflect with templatic morphology. Children acquiring NE Cree must discover and acquire the necessary components of this morphological template. This includes the Clitic position and – most crucially for the present study – the Suffix 1 position where the morpheme *-im* appears. Children must uncover the existence and function of *-im*, and along the way, they must also realize that the suffix only appears with some possessed nouns and not others. Furthermore, they have to figure out that each noun type either requires or disallows *-im*. The possessive suffix *-im* presents a good test for the TP. Children must rely upon the input to extrapolate patterns for which noun types are [± *-im*]. In doing so, children must also overcome attested exceptions to generalize productive rules and extend them to novel noun types.

## RQs and the Data

This article presents two studies exploring how the TP may account for the acquisition of *-im*. Study 1 applies to the TP to the input, and Study 2 evaluates predictions from Study 1 with evidence from child speech. These studies investigate the following research questions:

RQ1: "How might the TP predict rules for *-im* from the input in the face of exceptions?"
RQ2: "How might child production adhere to the predictions from RQ1?"

All data come from the video corpus of the Chisasibi Child Language Acquisition Study (CCLAS, www.mun.ca/cclas/). The corpus contains about 60 total hours of naturalistic child and child-directed speech recorded in Chisasibi from 2004–2007. Strict privacy agreements with participating families prohibit sharing most of the corpus publicly, although some transcripts and audio files are available through PhonBank (phonbank.talkbank.org).

### *Participants*

Two children of different age ranges are represented in this study: Ani (2;01–4;03) and Daisy (3;08–5;10). Each child is being raised in Chisasibi with NE Cree as her L1 and the language of the home. The children have exposure to English, and English elements appear in their speech, but existing CCLAS studies demonstrate that the children have Cree-language grammars (Bryant, 2013; Henke, 2020).

As the closest available proxy for the input in NE Cree, the selected videos represent child-directed speech primarily from one adult, with occasional appearances from visitors and family members. This adult was the project coordinator for CCLAS, and she also recorded the videos. Her name is withheld here for privacy, but she was in her thirties at the time of recording, knows each of the children very well, and is a resident of Chisasibi who speaks NE Cree as her L1.

Recorded interactions between the adult and each child were in NE Cree, free flowing, and generally unstructured. Activities frequently include looking through picture books, playing out pretend scenarios, and spontaneously telling stories about real and imagined

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**Table 2.** Overview of the Sample

| Speaker | Age range | Videos | Length | Utterances | Total nouns |
|---|---|---|---|---|---|
| Adult | n/a | 50 | 32:04:16 | 21,470 | 443 (2601) |
| Ani | 2;01–4;03 | 18 | 11:48:35 | 6,489 | 133 (543) |
| Daisy | 3;08–5;10 | 21 | 13:30:17 | 8,611 | 357 (1420) |

*Notes.* Types (Tokens).

people and events. Each child was filmed in a home setting approximately every two weeks for an average of 45 minutes. Video recordings were processed using Phon (Rose, MacWhinney, Byrne, Hedlund, Maddocks, O'Brien, Wareham, Bamman, Magnitskaia & Zaller, 2006; Rose & MacWhinney, 2014), which included transcription and translations from L1 speakers of NE Cree as well as speech segmentation and morphological parsing from the CCLAS team. See Brittain, Dyck, Rose, and MacKenzie (2007) for further details on CCLAS history and methodology.

### *The Sample*

This paper samples 50 total video recordings from the CCLAS corpus. This includes the entire 40-video sample used by Henke (2020) along with ten additional videos – three for Ani and seven for Daisy. To approximate the most detailed possible picture of the input in NE Cree, this study also includes child-directed speech from 11 videos involving the adult and a third child, Billy. Billy's speech is not examined in this study because he is older than the other two children, and his possessive production does not reveal as much about the acquisition of *-im*. Table 2 summarizes the characteristics of the sample.

Video selection involved a mix of convenience and purposive sampling. Videos were selected to capture the widest range of language development while also striving to represent each month of development per child. I attempt to sample one video recording per month for each child, although some gaps exist because either a recording was not available or not of high enough quality to permit analysis. This article uses the same coding procedures created and detailed by Henke (2020, pp. 63–72).

## Study 1: Applying the TP to the Input

Study 1 investigates RQ1 to determine which rule(s) the TP predicts from the input. Overall, the input contains 102 total noun types (853 tokens) that have tokens with NE Cree possessive inflection. The possessive tokens for these 102 noun types have a Zipfian distribution (Zipf, 1949), represented in Figure 2. 34/102 types (33.33 percent) occur in the input with just one possessive token. Table 25 in the Appendix (Supplementary Materials) lists all 102 noun types, ranked by their number of possessive tokens.

Table 3 represents the overall distribution of the suffix *-im*, where only 30/102 (29.41 percent) noun types are [+ *-im*], occurring with the suffix in possessive forms. The remaining 72 types (70.59 percent) are [– *-im*] and have possessive tokens without the morpheme.

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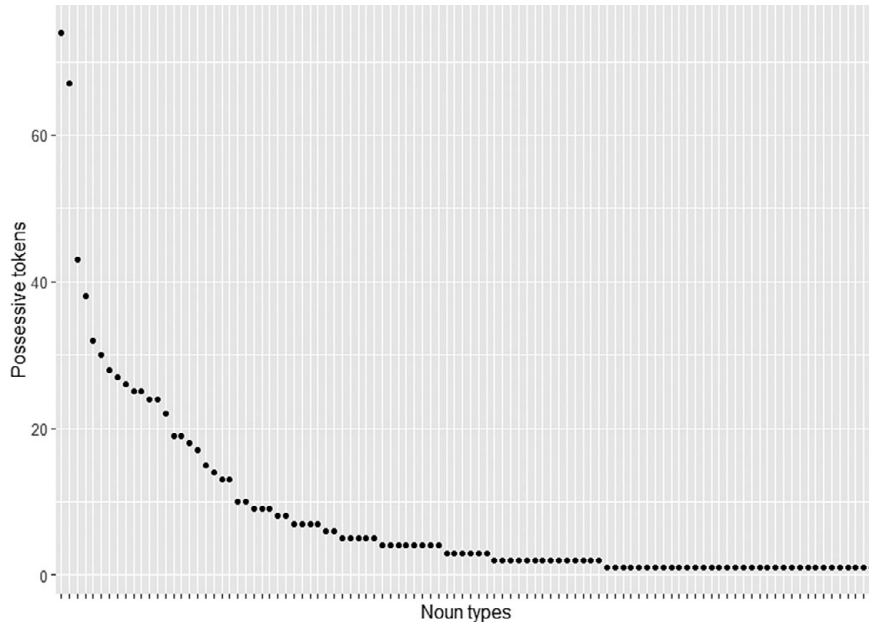


**Figure 2.** Total Possessive Tokens Per Noun Type

**Table 3.** Overall Distribution of *-im* in the Input

| | [+ *-im*] | [– *-im*] |
|---|---|---|
| Total noun types | 30 | 72 |

*Note.* [+ *-im*] indicates that a noun type requires the suffix *-im.* [– *-im*] indicates that a type disallows *-im.*

A challenge for the TP is whether it can predict a single productive rule for [± *-im*] from these 102 noun types in the input. The TP formula stipulates that for 102 attested types (N), a productive rule can tolerate 22.05 exceptions (θN). However, too many exceptions exist in either direction. If a child postulates a rule that possessive inflection requires [+ *-im*], there are 72 exceptions (e). If she instead posits that possessive inflection requires [– *-im*], there are 30 exceptions (e). The TP could not find just one productive rule for *-im* that handles all types from the input as a whole.

### *Approximating the Path of Encountering Noun Types*

Of course, a child will not encounter all 102 noun types in the input simultaneously. The TP asserts that a child will extrapolate a rule as soon as possible – say, after encountering just two or three different noun types used in possessive contexts – and she will then modify or discard the rule as her vocabulary grows.

Yang (2016, pp. 81–87) approximates the path along which a child encounters English verb types by ranking types using their token frequency in the input. The central idea is

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that a child will encounter more frequent types first, and she will encounter less frequent types later. She will extrapolate a rule from the most frequent types, and that rule will hold for subsequent types unless the threshold for exceptions is eventually exceeded.

This study adopts Yang's approach by ranking NE Cree noun types by their token frequency in the input, then applying the TP down the list, from most frequent to least frequent (using Table 25 in the Appendix, Supplementary Materials). The two most frequent noun types by possessive tokens are: *-kaawii* 'mother' (74 tokens) and *-iich* 'home' (67). Both types occur without the possessive suffix *-im*, and a child encountering these forms first could hypothesize an initial rule for possessive inflection, which simply captures the fact that all possessed nouns require a clitic.

$\mathbf{R_{clitic}}$ = "Add a clitic to the noun stem"

The next most frequent type used in possession is *wiichaawaakin* 'friend' (43 tokens), which also fits the rule. So far, $R_{clitic}$ has been attested across three types, with no exceptions, and will be tested against subsequent noun types that the child encounters.

To illustrate this application of the TP to the unfolding progression of 102 noun types from the input over time, Table 4 groups those noun types by their token frequencies in child-directed possessive forms. The groupings proceed from the most frequent types (50 or more possessive tokens) down to types that have just one possessive token. For each

**Table 4.** The Productivity of $R_{clitic}$ Over Time

| POSS tokens in the input | N | θN | e | Is $R_{clitic}$ productive? |
|---|---|---|---|---|
| ≥50 | 2 | — | 0 | Yes |
| ≥40 | 3 | — | 0 | Yes |
| ≥30 | 6 | 3.35 | 0 | Yes |
| ≥25 | 11 | 4.59 | 1 | Yes |
| ≥20 | 14 | 5.30 | 2 | Yes |
| ≥15 | 19 | 6.45 | 3 | Yes |
| ≥10 | 24 | 7.55 | 3 | Yes |
| ≥9 | 27 | 8.19 | 3 | Yes |
| ≥8 | 29 | 8.61 | 3 | Yes |
| ≥7 | 33 | 9.44 | 5 | Yes |
| ≥6 | 35 | 9.84 | 6 | Yes |
| ≥5 | 40 | 10.84 | 6 | Yes |
| ≥4 | 48 | 12.40 | 7 | Yes |
| ≥3 | 54 | 13.54 | 9 | Yes |
| ≥2 | 68 | 16.12 | 15 | Yes |
| 1 | 102 | 22.05 | 30 | No |

*Note.* POSS = possessive. N = total number of noun types. θN = number of exceptions that can be tolerated. e = number of exceptions attested.

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grouping, the rule $R_{clitic}$ is assessed against the number of attested exceptions. If the rule holds for a particular grouping, then it is applied to the next grouping.

The TP predicts that $R_{clitic}$ will stand as productive across every noun type that occurs at least twice in possessive form: for these 68 total types (N), 16.12 exceptions can be tolerated (θN), and just 15 are attested (e). The child can rely on $R_{clitic}$ as she proceeds through most of the distribution of noun types in Figure 2, memorizing just 15 exceptions along the way. All but two of these 15 exceptional types also occur with non-possessive tokens (Table 25, Appendix, Supplementary Materials), which provide contrasting forms highlighting the presence and function of *-im*.

As Table 4 shows, the TP predicts the productivity of $R_{clitic}$ will break when the child reaches the tail of the distribution in Figure 2. Once she encounters the noun types that occur with just one possessive token, the number of exceptions finally exceeds the allowable threshold: for 102 total noun types (N), 22.05 exceptions can be tolerated (θN), and 30 are attested (e). The child will discard $R_{clitic}$ as the lone productive rule she can rely upon for possessive inflection.

The TP also predicts that this is not a dead end: the principle of Maximize Productivity will compel a child to subdivide the total N into groups and apply the TP recursively to find productive rules that apply to subgroups of noun types. For the problem of German noun plurals, Yang (2016, pp. 121–136) subdivides noun stems by salient characteristics related to semantics and (morpho)phonology. A child acquiring NE Cree could also look toward similar, well-motivated domains to subdivide nouns.

## Subdividing Noun Types to Find Rules for *-im*

Each NE Cree noun type is classified along two semantic dimensions: (in)animate and (in)alienable. These two classifications pervade and affect all fundamental elements of NE Cree morphology and morphosyntax, so a child could look to these categories to subdivide noun types. In fact, the rule of thumb offered by Junker et al. (2012, pp. 25–26) hinges on animacy for determining the [± *-im*] specification of a given noun type. Table 5 tallies the 102 noun types from the input according to their animacy classification, and Table 6 classifies them according to alienability.

Which classification will a child look to first? Here the TP allows for two possible paths. She could seek the most FREQUENT pattern, which covers the largest subset of noun types. That would mean positing a rule that covers the 45 inanimate types in Table 5. Alternatively, she could seek the pattern that most CONSISTENTLY covers a subset of noun types. That would mean positing a rule for inalienable types in Table 6, where 37 occur without *-im* and zero occur with the suffix. Current TP proposals makes no claim about whether frequency or consistency provides a superior option (e.g., Payne et al., 2022), leaving room

**Table 5.** Distribution of *-im* in the Input by Animacy, per Noun Type

| Animacy classification of noun type | [+ *-im*] | [– *-im*] |
|---|---|---|
| Inanimate | 11 | 45 |
| Animate | 19 | 27 |

*Note.* [+ *-im*] indicates that the noun type occurs with the suffix *-im*. [– *-im*] indicates that the noun type does not occur with *-im*.

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**Table 6.** Distribution of *-im* in the Input by Alienability, per Noun Type

| Alienability classification of noun type | [+ *-im*] | [– *-im*] |
|---|---|---|
| Inalienable | 0 | 37 |
| Alienable | 30 | 35 |

*Note.* [+ *-im*] indicates that the noun type occurs with the suffix *-im*. [– *-im*] indicates that the noun type does not occur with *-im*.

for the possibility of variation between individual children in pursuing rules. The next two sections explore both possibilities in predicting the extrapolation of rules for *-im*.

### *Frequency: Animacy First*

The 102 types in the input used in possession are closely split between animacy categories: 56 types (54.90 percent) are inanimate and 46 (45.10 percent) are animate. This includes seven English noun types, which receive the same animacy classification as their Cree analogs: *aunt*, *bicycle*, *car*, *friend*, *mommy*, *sister*, and *Ski-Doo* are all animate.

Having subdivided the 102 noun types by animacy (Table 5), a child must then discern a rule for the distribution of *-im*. The TP predicts that if she relies upon the most frequent pattern, she will extrapolate a rule that accounts for the 45 [– *-im*] inanimate types:

$\mathbf{R_{inan}}$ = "If a noun type is inanimate, add a clitic to the noun stem".

This rule accords with Junker et al.'s (2012, pp. 25–26) rule of thumb that inanimate nouns generally disallow *-im*. For the 56 total inanimate types (N) in Table 5, the TP says a productive rule can tolerate 13.91 exceptions (θN). The 11 [+ *-im*] types (e) in Table 5 sit just below that threshold. Therefore, $R_{inan}$ stands as productive, and the 11 exceptions are stored against the rule.

The rule $R_{inan}$ leaves a child to account for 46 remaining animate noun types. For this N, the TP allows for 12.01 exceptions (θN). Too many exceptions are attested in either direction, whether it is 19 exceptions (e) for a [– *-im*] rule or 27 exceptions (e) for a [+ *-im*] rule. The TP predicts that the child will be forced to subdivide noun types again. Here she can turn to the other pervasive classification scheme for noun types: alienability.

### *Frequency: Alienability*

Table 7 tallies the distribution of *-im* across these animate noun types by whether each is inalienably or alienably possessed. English loanwords are categorically alienable, as *mommy* can be a bare stem but not its Cree analog *-kaawii* 'mother'.

Looking for a rule that covers the most frequent pattern in Table 7, the child will first extrapolate a rule for the 19 [+ *-im*] alienable nouns:

$R_{al}$ = "If a noun type is alienable, add a clitic and the suffix *-im* to the noun stem".

For 28 total alienable types (N), 8.40 exceptions can be tolerated (θN). The number of attested exceptions (e) is nine, so $R_{al}$ cannot be established as productive.

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**Table 7.** Distribution of *-im* in the Input by Alienability, per Animate Noun Type

| Alienability classification of noun type | [+ *-im*] | [– *-im*] |
|---|---|---|
| Inalienable | 0 | 18 |
| Alienable | 19 | 9 |

*Note.* [+ *-im*] indicates that the noun type occurs with the suffix *-im*. [– *-im*] indicates that the noun type does not occur with *-im*.

The TP predicts that the child will try the next most frequent pattern in Table 7, which would cover the 18 [– *-im*] inalienable types. She can extrapolate another rule:

$R_{in}$ = "If a noun type is inalienable, add a clitic to the noun stem".

This rule accords with Collette's (2014) observation that inalienable nouns disallow the suffix in the adult lexicon. For 18 total types (N), 6.23 exceptions could be tolerated (θN). The number of attested exceptions (e) is zero, so $R_{in}$ is indeed productive.

The child now faces the remaining 28 animate alienable noun types. Because no single rule stands as productive across them, she must subdivide again to find a pattern. Both major classifications for noun types have been exploited, so the child needs to find another cue.

### *Frequency: (Morpho)phonology*

For subdividing German noun types, Yang (2016) appeals to (morpho)phonological characteristics, such as whether the noun stem has a reduced final syllable or final schwa. The suffix *-im* attaches to the end of the noun stem, so a child could likewise look to stem-final phonology for salient patterns regarding [± *-im*]. Additionally, Collette (2014) argues that noun stems ending in segments /m, n, $k^w$/ generally disallow *-im*.

The present study supposes that a child could discern a pattern appealing to a well-motivated natural class and lump together stems ending in a nasal segment /m, n/ versus stems ending in any other segment. Table 8 sorts the remaining animate alienable noun types according to whether their final segment is a nasal consonant.

A child could extrapolate two complementary rules for possessive inflection:

$\mathbf{R_{nasal}}$ = "If a noun type is nasal final, add a clitic to the noun stem".

$\mathbf{R_{im}}$ = "Add a clitic and the suffix *-im* to the noun stem".

**Table 8.** Distribution of *-im* in the Input by Stem-final Segment, per Animate Alienable Noun Type

| Stem-final segment of noun type | [+ *-im*] | [– *-im*] |
|---|---|---|
| /n, m/ | 0 | 6 |
| any other segment | 19 | 3 |

*Note.* [+ *-im*] indicates that the noun type occurs with the suffix *-im*. [– *-im*] indicates that the noun type does not occur with *-im*.

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The rule $R_{nasal}$ covers six total types (N) with zero exceptions (e). The rule $R_{im}$ handles the remaining 22 types (N), where 7.12 exceptions could be tolerated (θN), and only three are attested (e). Both rules are established as productive, and the child has now accounted for all 102 noun types in the sampled input.

### *Frequency: Summary*

The TP predicts that a child looking toward frequency to subdivide noun types in the search for productive rules regarding *-im* will abstract four nested and mutually exclusive rules:

**$R_{inan}$** = "If a noun type is inanimate, add a clitic to the noun stem".

**$R_{in}$** = "If a noun type is inalienable, add a clitic to the noun stem".

**$R_{nasal}$** = "If a noun type is nasal final, add a clitic to the noun stem".

**$R_{im}$** = "Add a clitic and the suffix *-im* to the noun stem".

The first three rules are all [– *-im*], leaving $R_{im}$ as an elsewhere [+ *-im*] rule that handles any remaining type not subject to another rule or stored as an exception to one. These four rules cover all 102 noun types from the input, requiring the child to memorize 14 total exceptions along the way: 11 to be stored alongside $R_{inan}$ and three for $R_{im}$. This approach also predicts the order of discovery for the four rules. A child will uncover $R_{inan}$ first, followed by $R_{in}$, and then $R_{nasal}$ and $R_{im}$ together. However, frequency is just one of two possible path the TP allows in extrapolating rules. The next section explores the second path: consistency.

### *Consistency: Alienability First*

A child looking toward consistency for subdividing noun types will begin with the inalienable types in Table 6, where all 37 occur without *-im*. The TP predicts she will first derive this rule:

**$R_{in}$** = "If a noun type is inalienable, add a clitic to the noun stem".

This rule is the same as the one extrapolated under the path of frequency, although here it subsumes more noun types. $R_{in}$ leaves 65 alienable noun types (N) from Table 6, which do not permit a lone productive rule: only 15.57 exceptions can be tolerated (θN), and there are too many for either a [+ *-im*] rule (e = 30) or a [– *-im*] rule (e = 35). Once again, the child must subdivide noun types.

### *Consistency: Animacy*

If the child looks toward animacy next, she will discover the distribution represented in Table 9.

Any productive rule for inanimate types (N = 37) can survive only 10.25 exceptions (θN), but there are too many for either a [+ *-im*] rule (e = 11) or a [– *-im*] rule (e = 26). The same goes for animate types (N = 28), where the exceptions for either a [+ *-im*] rule

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**Table 9.** Distribution of *-im* in the Input by Animacy, per Alienable Noun Type

| Animacy classification of noun type | [+ *-im*] | [– *-im*] |
|---|---|---|
| Inanimate | 11 | 26 |
| Animate | 19 | 9 |

*Note.* [+ *-im*] indicates that the noun type occurs with the suffix *-im*. [– *-im*] indicates that the noun type does not occur with *-im*.

(e = 19) or a [– *-im*] rule (e = 9) exceed the allowable threshold of 8.40 (θN). This is the biggest predicted difference between the paths of frequency and consistency in searching for *-im* rules: animacy should be a dead end for a child seeking consistency.

### *Consistency: (Morpho)phonology*

Instead, the child may turn to stem-final phonology to find a rule. Table 10 classifies the remaining 65 alienable noun types by whether their stem ends in a nasal consonant.

Once again, the TP predicts that a child will arrive at a productive nasality-based rule and a productive elsewhere rule at the same time:

$\mathbf{R_{nasal}}$ = "If a noun type is nasal final, add a clitic to the noun stem".

$\mathbf{R_{im}}$ = "Add a clitic and the suffix *-im* to the noun stem".

The rule $R_{nasal}$ handles 34 types (N), where 9.64 exceptions can be tolerated (θN) and only four are attested (e). $R_{im}$ takes care of the remaining noun types (N = 31), where the five attested exceptions (e) sit below the threshold of 9.03 (θN). Both rules are the same as those discovered along the path of frequency, although each rule here subsumes a greater number of noun types.

### *Consistency: Summary*

The TP predicts that a child taking the path of consistency to subdivide noun types will extrapolate three nested and mutually exclusive rules:

$\mathbf{R_{in}}$ = "If a noun type is inalienable, add a clitic to the noun stem".

$\mathbf{R_{nasal}}$ = "If a noun type is nasal final, add a clitic to the noun stem".

$\mathbf{R_{im}}$ = "Add a clitic and the suffix *-im* to the noun stem".

**Table 10.** Distribution of *-im* in the Input by Stem-final Segment, per Alienable Noun Type

| Stem-final segment of noun type | [+ *-im*] | [– *-im*] |
|---|---|---|
| /n, m/ | 4 | 30 |
| any other segment | 26 | 5 |

*Note.* [+ *-im*] indicates that the noun type occurs with the suffix *-im*. [– *-im*] indicates that the noun type does not occur with *-im*.

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This set of rules requires the child to memorize nine total exceptions: four to be stored alongside $R_{nasal}$ and five for $R_{im}$. This approach also predicts the order of discovery, with $R_{in}$ first and then $R_{nasal}$ and $R_{im}$ together.

### *Summary and Predictions*

Study 1 analyzes all possessive nouns from the sampled input to answer RQ1: "How might the TP predict rules for *-im* from the input in the face of exceptions?"

The TP predicts that a child will begin by extrapolating a single productive rule for possessive inflection, $\mathbf{R_{clitic}}$. This rule will hold for some time, and the child may produce nouns inflected with *-im*, but these will be memorized irregular forms. Eventually, $R_{clitic}$ will be overwhelmed by exceptions. The child will then be forced to subdivide noun types to find patterns providing grounds for further productive rules. The TP permits recursive application along two possible paths for finding such rules.

The first path relies upon the FREQUENCY of inflectional patterns in accounting for subtypes of nouns. A child taking this path will eventually extrapolate four nested and mutually exclusive rules: first a rule sensitive to grammatical animacy ($\mathbf{R_{inan}}$), then a rule hinging on alienability ($\mathbf{R_{in}}$), and then both a rule based on stem-final phonology ($\mathbf{R_{nasal}}$) and an elsewhere rule ($\mathbf{R_{im}}$). Along the way, she must store 11 exceptions to $R_{inan}$ and three for $R_{im}$.

Alternatively, a child could take the path of CONSISTENCY. The TP predicts she will first derive $R_{in}$ and then $R_{nasal}$ and $R_{im}$ together. She will have to store four exceptions for $R_{nasal}$ and five for $R_{im}$. All three rules are the same as those predicted by the first path and are in the same order. However, along the path of consistency, each rule handles a larger number of noun types.

The TP does not assert that a child must take one path over another, but patterns in her production should indicate which path she has taken. If it is frequency, she should first evince the application of a rule sensitive to grammatical animacy. If it is consistency, she should first apply *-im* with a sensitivity to alienability, and at no time should she distribute *-im* in a manner sensitive to grammatical animacy. All rules predicted by the TP are mutually exclusive and involve two-way classifications (e.g., inalienable or alienable), so Study 2 tests sensitivity to such classifications by applying Fisher's exact test to the distribution of *-im*.

Several patterns could disconfirm the TP's predictions. For example, if a child shows no evidence of acquiring any particular rule for *-im* – if she simply produces forms found in the input – that would not support the TP. The TP would also be challenged if a child does not find any of the predicted rules, if she uncovers predicted rules in a different order, or if she instead seems to find alternative rules. Lastly, if a child takes the path of consistency but later shows a sensitivity to animacy in distributing *-im*, that would also go against the TP.

## Study 2: Evaluating the TP Using Child Speech

This study investigates RQ2 to explore how the findings and predictions from Study 1 bear out in possessive forms from two children: Ani and then Daisy.

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### Ani (age 2;01–4;03)

As the youngest child, Ani provides the best opportunity to see the emergence of *-im* but also relatively few relevant data points in her speech: she uses just 18 total noun types (34 tokens) with NE Cree possessive inflection. Table 26 in the Appendix (Supplementary Materials) breaks down Ani's production per age point, and the ensuing subsections trace her acquisition of *-im* across three stages.

#### *Stage 1: No Adult-like Possessive Inflection*

From age 2;01 through age 2;05, Ani uses demonstratives rather than nouns to signify possessees (Henke, 2019, 2020). For example, in (21) Ani uses the demonstrative *uu* 'this' to refer to a book instead of the noun *misinihiikin* 'book'.

(21) Niiyi uu.
niiyi uu
1 DEM.PXL
'This is mine.' (Ani, A1.08, 2;04, 29:53)

Ani begins to use nouns as possessees at age 2;07. However, she omits all adult-like possessive inflection (Henke, 2019, 2020). In (22), for instance, Ani produces a bare noun stem and omits the required morphology at the Clitic, Suffix 1, and Suffix 4 positions.

(22) Target: Dora upiyichiisimh
Dora u=piyichiis-im-h
Actual: Dora ***Ø**=piyichiis-***Ø**-***Ø**
name **3**=pants-**POSS**-**AN.OBV**
'Dora's pants' (Ani, A1.12, 2;07, 00:13)

Through age 3;05, any of Ani's adult-like [– *-im*] usage in Table 26 (Appendix, Supplementary Materials) is simply coincidental, with no indication that she has discovered the morpheme.

#### *Stage 2: Emergence of the Clitic Position but not -im*

Starting at 3;02, Ani begins to use the personal pronoun *niiyi* 'I, me, myself, mine' as a proto-clitic marker of possession. The pronoun *niiyi* bears very strong similarities in form and meaning to the more reduced first-person clitic *ni=* (Junker & MacKenzie, 2004). In fact, some (e.g., Collette, 2014) contend that the pronoun itself consists of the person clitic *ni=* with a bound root *-iyi* 'self'. In a pattern reminiscent of the filler elements reported in the acquisition of Navajo templatic morphology (Chee, 2017; Courtney & Saville-Troike, 2002; Saville-Troike, 1996), Ani places the pronoun before the noun stem, which corresponds to the Clitic position in the inflectional template (Table 1).

The first instance of this pattern occurs in (23). She does not use the suffix *-im*, which would be required if she had inflected the noun with the clitic.

(23) Target: nicarim
ni=car-im
1=car-POSS

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Actual: niiyi car
niiyi car
1 car
'my car' (Ani, A1.24, 3;02, 1:41)

Ani again uses the pronoun twice as a proto-clitic at age 3;05, referring each time to a balloon that is tied to her doll's leg, as in (24).

(24) Target: niballoonim
ni=balloon-im
1=balloon-POSS
Actual: niiyi balloon
niiyi balloon
1 balloon
'my balloon' (Ani, A1.28, 3;05, 5:16)

At age 3;06, Ani first demonstrates adult-like clitic usage (Henke, 2019, 2020): once with the noun type *mischisin* 'shoe' and once with *pichiwiyaan* 'shirt' (25).

(25) Maanitaah nipichiwiyaan.
maani-taah ni=pichiwiyaan
DEM.DIST-LOC 1=shirt
'My shirt is over there.' (Ani, A1.30, 3;06, 15:15)

Both *mischisin* and *pichiwiyaan* are [– *-im*] noun types, but one crucial piece of evidence indicates that Ani has begun to apply clitics before she sees the suffix *-im* as a productive inflectional element: she has one error of omission with the type *shoe* (26). In this code-mixing construction, an adult would place *-im* after the English plural suffix (Collette, 2014, p. 303)

(26) Target: nishoesim
ni=shoe-s-**im**
Actual: ni=shoe-s-***Ø**
1=shoe-PL-POSS
'my shoes' (Ani, A1.30, 3;06, 21:45)

At this stage of her development, the data are sparse, but patterns are consistent with the TP's first prediction: a child will begin by extrapolating $R_{clitic}$ and produce possessive forms without discerning any productive pattern for *-im.* Unfortunately, a lack of data follows this recording session. Ani has no noun tokens with Cree possessive inflection at age 3;08 or 3;09, and the CCLAS corpus has no available recordings for her at 3;10 or 3;11. When her videos resume at age 4;00, Ani has entered a new stage in her acquisition of *-im.*

### *Stage 3: Adult-like Usage of -im*

Age 4;00 is the first point providing clear evidence that Ani has discovered *-im.* She applies [± *-im*] patterns in an adult-like fashion with no errors (Table 11).

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**Table 11.** Ani's Relevant Noun Tokens at Age 4;00, by Noun Type

| Type | Translation | [± *-im*] | Anim. | Alien. | Nas. | POSS tokens | All tokens |
|---|---|---|---|---|---|---|---|
| chair | — | + | Inan | Al | No | 3 | 4 |
| -iipit | tooth | – | Inan | In | No | 3 | 3 |
| bed | — | + | Inan | Al | No | 2 | 2 |
| Barbie | — | + | An | Al | No | 1 | 1 |
| purse | — | + | Inan | Al | No | 1 | 2 |

*Note.* POSS = possessive. + indicates that the noun type requires the suffix *-im*. – indicates that the noun type disallows *-im*. Anim = animacy. An = animate. Inan = inanimate. Alien = alienability. Al = alienable. In = inalienable. Nas. = nasal-final noun type.

Ani has adult-like application of [– *-im*] with one type: *-iipit* 'tooth' (27). She also applies [+ *-im*] correctly to four other types: *Barbie*, *bed*, *chair*, and *purse* (28).

(27) Nimui chiipit?
nimui ch=iipit
NEG 2=tooth
'Not your tooth?' (Ani, A1.35, 4;00, 19:59)

(28) Awaan aniyaayiu upurseim?
awaan ani-yaayiu u=purse-**im**
who DEM.DIST-INAN.OBV 3=purse-**POSS**
'Whose purse is that?' (Ani, A1.35, 4;00, 11:31)

Although she uses few noun types, Ani's production at age 4;00 is consistent with the TP's predictions. She has moved past the rule $R_{clitic}$, and found some principles for applying [± *-im*] patterns. Given the paucity of English borrowings in the sampled input, it is less likely that Ani has simply memorized possessive tokens such as *upurseim* 'her purse' and more likely that she has begun to use *-im* productively. The next question is whether Ani has relied upon frequency or consistency in subdividing noun types to search for rules. Ani's production is compatible with the TP's predictions for either route, but consistency provides a more plausible account.

If Ani has looked toward frequency, the TP predicts she will begin with the animacy-based rule $R_{inan}$. That would account for the noun type *-iipit* 'tooth' but require Ani to have memorized inanimate *bed*, *chair*, and *purse* as irregular exceptions that require *-im*. These three types are not attested in possessives within the sampled input (Table 25, Appendix, Supplementary Materials).

If Ani has looked toward consistency, the TP predicts she will rely upon alienability first to derive $R_{in}$. This rule accounts for the type *-iipit* 'tooth', but it raises the question of how Ani knows to apply *-im* to the remaining four types – *Barbie*, *bed*, *chair*, and *purse* – which are all alienable. The TP predicts that Ani will subdivide alienable types and land upon $R_{nasal}$ and $R_{im}$. Her production is indeed consistent with $R_{im}$, but because *Barbie*, *bed*, *chair*, and *purse* have oral stem-final segments, the data do not indicate whether Ani has found $R_{nasal}$.

Ani's final two recordings come at age 4;01 and 4;03. Her production involving *-im* is entirely adult-like across this period (Table 12). She uses six total types in possessives, and only *bed* was used previously. Once again, patterns are consistent with the TP's

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**Table 12.** Ani's Relevant Noun Tokens from Age 4;01–4;03, by Noun Type

| Type | Translation | [± *-im*] | Anim. | Alien. | Nas. | POSS tokens | All tokens |
|---|---|---|---|---|---|---|---|
| friend | — | + | An | Al | No | 4 | 7 |
| -iich | home | – | Inan | In | No | 4 | 4 |
| akuhp | coat | – | Inan | Al | No | 1 | 1 |
| *bed | — | + | Inan | Al | No | 1 | 1 |
| pencil | — | + | Inan | Al | No | 1 | 5 |
| scissor | — | + | Inan | Al | No | 1 | 3 |

*Note.* POSS = possessive. + indicates that the noun type requires the suffix *-im*. – indicates that the noun type disallows *-im*. Anim = animacy. An = animate. Inan = inanimate. Alien = alienability. Al = alienable. In = inalienable. Nas. = nasal-final noun type. * = type used previously by the child in POSS form.

predictions regarding either the path of frequency or consistency, although the latter provides the least encumbered explanation.

Ani's production in Table 12 is consistent with the TP's predictions for the path of frequency, where she will begin with $R_{inan}$. This rule accounts for *akuhp* 'coat' and *-iich* 'home' but requires her to have learned *pencil* and *scissors* as new [+ *-im*] exceptions (*bed* would have already been stored), even though they are unattested in possessive form within the sampled input. That leaves only the noun type *friend*, where Ani has correctly applied the [+ *-im*] pattern. This is consistent with the TP's prediction that Ani will eventually derive $R_{im}$. The path of frequency also predicts that Ani will extrapolate rules $R_{in}$ and $R_{nasal}$, but the data in Table 12 cannot indicate whether she has done so: the lone inalienable type is already handled by $R_{inan}$, and there are no nasal-final noun types to indicate if Ani has discovered $R_{nasal}$.

If Ani has looked toward consistency and begun with $R_{in}$, that rule handles *-iich* 'home'. There is no evidence that Ani goes against the TP's predictions and finds $R_{inan}$, because she adds *-im* to three of the four remaining inanimate types. The TP predicts Ani will next extrapolate $R_{nasal}$ and $R_{im}$. The lack of nasal final types in Table 12 makes it impossible to discern if she has indeed arrived at $R_{nasal}$, but her production is consistent with $R_{im}$. This rule handles all five remaining types, requiring Ani to learn *akuhp* 'coat' as the single exception. Because *akuhp* is the fifth-most frequent type in the input (Table 25, Appendix, Supplementary Materials), the TP predicts it would be learned among the exceptions to $R_{im}$.

### *Summary and Evaluation of Predictions*

The patterns in Ani's data are largely consistent with the TP's predictions, but because there are few relevant data points, this concord must be interpreted cautiously.

First, the TP predicts that Ani will begin with a single productive rule, $R_{clitic}$. From Stages 1 to 2, Ani indeed seems to discover and apply the clitic in possessive inflection before showing any awareness of the suffix *-im*.

Second, Ani's data are also consistent with the TP's predictions that she will eventually move beyond $R_{clitic}$. During Stage 3 of her development, Ani begins to use *-im* in producing adult-like possessive forms of types that are either infrequent or unattested in the input. This indicates she is unlikely to have simply memorized these types as exceptions to $R_{clitic}$.

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Third, Ani's production mostly fits the TP's predictions for following either the path of frequency or consistency in subdividing noun types and extrapolating rules. Her production in Tables 11–12 is compatible with beginning either with $R_{inan}$ or $R_{in}$ and then arriving at $R_{im}$. However, there is no clear indication whether she has also found $R_{nasal}$. The path of frequency represents the less plausible approach because it requires that Ani learn several exceptional types that occur infrequently or not at all in possessive form within the sampled input. On the other hand, if she looks toward consistency, she must memorize a single exceptional-but-frequent type.

No pattern within Ani's sample clearly disconfirms the TP's predictions. Ani does not appear to memorize all of her [+ *-im*] forms from the input. She does not seem to rely upon any rule that is not predicted by the TP – at least, no other rules are needed to account for her production. The data do not reveal whether Ani either fails to find $R_{nasal}$ or discovers it out of order, so there is no opportunity to falsify the TP on that count. Ani commits no errors of overgeneralization that could provide additional insight into her inductions about the distribution of *-im*. The compatibility with the TP found in Ani's sample thus must be taken cautiously: her production is consistent with the model's predictions but does not provide many opportunities to disconfirm the model either. Data from the older child, Daisy, provide more such opportunities and furnish a different kind of insight into the acquisition of *-im*.

## Daisy (age 3;08–5;10)

Across Daisy's sample, she uses 78 total noun types (359 tokens) with NE Cree possessive inflection. Table 27 in the Appendix (Supplementary Materials) represents Daisy's overall production per age point, and the ensuing subsections describe her acquisition of *-im* across five stages.

### *Stage 1: Beginning with $R_{clitic}$*

Daisy's entire possessive production from age 3;08–3;09 is represented in Table 28 in the Appendix (Supplementary Materials). At 3;08, she distributes *-im* correctly with ten total noun types. Only one is [+ *-im*], *piipii* 'baby' (29), which is the second-most frequent [+ *-im*] noun type in the input and thus predicted to be learned early as an exception to $R_{clitic}$. Thus, Daisy's distribution of *-im* in her first video accords with the TP's prediction that she will begin with $R_{clitic}$.

(29) upiipiimish-h
u=piipii-**m**-ish-h
3=baby-**POSS**-DIM-AN.OBV
'her little baby' (Daisy, B1.01, 3;08, 23:29)

Her production at age 3;09 largely is consistent with that single rule as well. Here she uses 12 total new noun types, and all are [– *-im*] except for one. This lone exception is *phone*, which does not occur in possessive form within the sampled input and is less likely than *piipii* 'baby' to be a memorized form. Daisy may be moving beyond $R_{clitic}$ at 3;09, but it is hard to tell from just one piece of evidence. No videos are available for age 3;10, and the next two age points provide much stronger indications that Daisy has discarded $R_{clitic}$.

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### Stage 2: The First Overregularizations of *-im*

From age 3;11 through 4;00, Daisy uses 27 total noun types with Cree possessive inflection (Table 29 in the Appendix, Supplementary Materials). 15 of these types did not occur with possessive inflection in Stage 1. This includes adult-like usage with six new [– *-im*] types and six new [+ *-im*] types.

Crucially, Daisy overregularizes *-im* with three new [– *-im*] noun types: *chiishtihiikin* 'needle', *utaapaanaaskw* 'vehicle', and *waapuyaan* 'blanket' (30). These errors are few in number and come after a period of all adult-like usage of *-im.* This "U-shaped" pattern indicates that Daisy has abstracted new grammatical patterns and overapplied them (Marcus et al., 1992).

(30) uwaapuyaan
Target: u=waapuyaan
Actual: u=waapuyaan-***im**
3=blanket-***POSS**
'her blanket' (Daisy, B1.04, 3;11, 51:57)

The increase of [+ *-im*] forms and her overregularizations of *-im* during Stage 2 are consistent with the TP's predictions that Daisy will move beyond $R_{clitic}$ and analyze the suffix as a productive inflectional element. Furthermore, she has correctly applied the pattern [+ *-im*] to *cake*, *homework*, *name*, and *sock*, which do not occur in the sampled input and are unlikely to be memorized exceptions to $R_{clitic}$. Daisy's production at Stage 2 indicates that she understands only some noun types occur with *-im* when possessed, and she applies [± *-im*] principles judiciously between subgroups of types. The primary question is whether Daisy has followed the TP's predictions in looking toward either frequency or consistency in subdividing nouns. The next two subsections explore each possibility.

#### The Path of Frequency

If Daisy has taken the path of frequency, the TP predicts she will first extrapolate the rule $R_{inan}$. This rule hinges upon two binary classifications – whether a noun type is animate or inanimate, and whether that type is [+ *-im*] or [– *-im*]. Table 13 presents a contingency table that breaks down Daisy's production of noun types in Stage 2 along these two lines.

If Daisy has indeed extrapolated $R_{inan}$, she should be less likely to apply a [+ *-im*] pattern to an inanimate noun type. A Fisher's exact test applied to Table 13 fails to reject the null hypothesis: there is no significant association between animacy and Daisy's distribution of *-im* ($p = 1.000$, OR = 1.20, Phi coefficient = 0.04). She has not taken the path of frequency.

**Table 13.** Daisy's Distribution of *-im* to Noun Types from Age 3;11–4;00, by Animacy

| | [+ *-im*] | [– *-im*] |
|---|---|---|
| Inanimate | 8 | 11 |
| Animate | 3 | 5 |

+ indicates that Daisy applies the suffix *-im* to a noun type, including any errors of commission. – indicates that she does not apply the suffix *-im* to a noun type.

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### *The Path of Consistency*

The TP allows Daisy to take the path of consistency instead, where she is predicted to look toward alienability first and extrapolate $R_{in}$. Table 14 lays out a contingency table for Daisy's distribution of *-im* across noun types based on alienability.

Daisy's production at Stage 2 would falsify the TP if she does not demonstrate any bias regarding alienability, because it would mean she has taken neither the path of frequency nor consistency. However, a Fisher's exact test on Table 14 reveals a significant association between alienability and Daisy's distribution of *-im* ($p < 0.001$, OR = 0, Phi coefficient = -0.69). These results are consistent with the TP's prediction for extrapolating $R_{in}$.

That leaves the 16 alienable types in Table 14. The TP predicts that Daisy will eventually be unable to find a lone productive rule accounting for alienable noun types and will be forced to subdivide those types and discover two additional, complementary rules: $R_{nasal}$ and $R_{im}$. To discern whether Daisy has taken this step, Table 15 tallies her distribution of *-im* by whether the stem for a noun type ends in a nasal consonant. A Fisher's exact test finds no significant association between stem-final nasality and how Daisy distributes *-im* ($p = 0.119$, OR = 0, Phi coefficient = -0.45). This indicates she has not yet discovered $R_{nasal}$.

However, the TP requires that Daisy subdivide noun types ONLY IF she cannot find a single rule to account for them. The predicted rule $R_{nasal}$ is in a complementary relationship with $R_{im}$, the elsewhere [+ *-im*] pattern. Perhaps Daisy has arrived at $R_{im}$ as a complement to $R_{in}$ without yet needing to subdivide alienable types and discover $R_{nasal}$. For the 16 alienable types (N) in Table 14, the TP says that 5.77 exceptions to $R_{im}$ could be tolerated (θN). Daisy produces just five [– *-im*] exceptions (e), which means she could hold $R_{im}$ as a productive rule while memorizing these exceptions: *mischisin* 'shoe', *nipaawin* 'bed', *piiywaashikin* 'sock', *wiichaawaakin* 'friend', and English loanword *room.* Aside from *room*, each of these exceptions appears in possessive form within the input (Table 25, Appendix, Supplementary Materials)

Altogether, the evidence at Stage 2 is consistent with predictions that Daisy will abandon $R_{clitic}$, subdivide noun types, and land upon $R_{in}$. She does seem to uncover

**Table 14.** Daisy's Distribution of *-im* to Noun Types from Age 3;11–4;00, by Alienability

| | [+ *-im*] | [– *-im*] |
|---|---|---|
| Inalienable | 0 | 11 |
| Alienable | 11 | 5 |

+ indicates that Daisy applies the suffix *-im* to a noun type, including any errors of commission. – indicates that she does not apply the suffix *-im* to a noun type.

**Table 15.** Daisy's Distribution of *-im* to Alienable Noun Types from Age 3;11–4;00, by Phonology

| Stem-final segment of noun type | [+ *-im*] | [– *-im*] |
|---|---|---|
| /n, m/ | 6 | 5 |
| any other segment | 5 | 0 |

+ indicates that Daisy applies the suffix *-im* to a noun type, including any errors of commission. – indicates that she does not apply the suffix *-im* to a noun type.

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$R_{im}$ without also finding $R_{nasal}$, which is not as consistent with the predictions from Study 1. On the other hand, though, Daisy would only discover $R_{nasal}$ if she were forced to subdivide alienable types. The TP predicts she will extrapolate $R_{im}$ as the elsewhere rule, and her production at Stage 2 accords with this expectation. In this context, her over-regularizations of *-im* make sense as well: she over-applies the elsewhere rule to three new noun types.

### *Opportunities to Falsify the TP*

Stage 2 grants two additional opportunities to disconfirm the TP's predictions. First, Daisy's production would disconfirm the TP if she begins with stem-final phonology rather than animacy or alienability in pursuing rules. Table 16 breaks down Daisy's entire production during Stage 2 according to how she distributes *-im* among the 27 noun types per their stem-final segment. A Fisher's exact test on Table 16 shows no significant association between stem-final nasality and Daisy's distribution of *-im* ($p = 1.000$, OR = 0.94, Phi coefficient = -0.02). Daisy does not take an unpredicted path and look to stem-final phonology first.

Second, the TP would be disconfirmed if Daisy turns toward animacy after alienability. To test this possibility, Table 17 breaks down Daisy's production of alienable noun types from Table 14 by their animacy classification. A Fisher's exact test applied to Table 17 finds no significant association between animacy and Daisy's distribution of *-im* to alienable noun types ($p = 1.000$, OR = 0.68, Phi coefficient = -0.08).

Overall, Daisy's production at Stage 2 largely fits the TP's predictions for the path of consistency. Even though Daisy appears to find $R_{im}$ before $R_{nasal}$, this does not necessarily contradict the expectations set forth by the TP, because Study 1 predicts the extrapolation of $R_{im}$ as the elsewhere rule.

**Table 16.** Daisy's Distribution of *-im* to Noun Types from Age 3;11–4;00, by Phonology

| Stem-final segment of noun type | [+ *-im*] | [– *-im*] |
|---|---|---|
| /n, m/ | 6 | 9 |
| any other segment | 5 | 7 |

+ indicates that Daisy applies the suffix *-im* to a noun type, including any errors of commission. – indicates that she does not apply the suffix *-im* to a noun type.

**Table 17.** Daisy's Distribution of *-im* to Alienable Noun Types from Age 3;11–4;00, by Animacy

| | [+ *-im*] | [– *-im*] |
|---|---|---|
| Inanimate | 8 | 4 |
| Animate | 3 | 1 |

+ indicates that Daisy applies the suffix *-im* to a noun type, including any errors of commission. – indicates that she does not apply the suffix *-im* to a noun type.

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### *Stage 3: The Discovery of $R_{nasal}$*

From age 4;01–4;06, Daisy commits no errors with *-im*. During this stage, she applies Cree possessive inflection to 26 total noun types (Table 30 in the Appendix, Supplementary Materials). 13 of these are new in possessive forms: eight new [– *-im*] types and five new [+ *-im*] types.

Daisy extrapolates $R_{in}$ during Stage 2, and Table 18 shows that she has not abandoned the rule: a Fisher's exact test reveals a significant association between alienability and Daisy's distribution of *-im* ($p = 0.007$, OR = 0, Phi coefficient = -0.57).

That leaves 11 alienable types, where the TP predicts $R_{im}$ can no longer hold as the lone productive rule. Among these 11 types (N), 4.59 total exceptions can be tolerated (θN), but six are attested (e). The TP expects that Daisy will have been forced to subdivide alienable types to find productive rules.

Under the path of consistency, Daisy is predicted to look toward stem-final phonology, and Table 19 provides the necessary breakdown of types. A Fisher's exact test on Table 19 finds a significant association between stem-final nasality and Daisy's distribution of the suffix *-im* ($p = 0.015$, OR = 0, Phi coefficient = -0.83). These results are consistent with the TP's prediction that Daisy will uncover $R_{nasal}$ after $R_{in}$.

Daisy can stick with $R_{im}$ to handle the remaining six noun types in Table 19. She would need to learn only one [– *-im*] exception, *astis* 'glove, mitten, sinew', which occurs four times in possessive form in the input (Table 25, Appendix, Supplementary Materials).

Altogether, during Stage 3, Daisy's distribution of *-im* can be interpreted as fitting with all three rules predicted by the TP under the path of consistency. She could apply these rules in the predicted order and end up having to memorize just one exception, which is attested in the sampled input. Stage 3 does not represent an end point in her acquisition of *-im*, though, and she soon seems to revise her rules.

### *Stage 4: The Return of Overregularization*

From age 4;07–4;11, Daisy once again makes errors in her distribution of *-im*, which indicates she is reanalyzing patterns. During this period, she uses 28 total noun types

**Table 18.** Daisy's Distribution of *-im* to Noun Types from Age 4;01–4;06, by Alienability

| | [+ *-im*] | [– *-im*] |
|---|---|---|
| Inalienable | 0 | 15 |
| Alienable | 5 | 6 |

+ indicates that Daisy applies the suffix *-im* to a noun type, including any errors of commission. – indicates that she does not apply the suffix *-im* to a noun type.

**Table 19.** Daisy's Distribution of *-im* to Alienable Noun Types from Age 4;01–4;06, by Phonology

| Stem-final segment of noun type | [+ *-im*] | [– *-im*] |
|---|---|---|
| /n, m/ | 0 | 5 |
| any other segment | 5 | 1 |

+ indicates that Daisy applies the suffix *-im* to a noun type, including any errors of commission. – indicates that she does not apply the suffix *-im* to a noun type.

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in possessives (Table 31 in the Appendix, Supplementary Materials). 11 of these types are new, and Daisy has adult-like production with two [– *-im*] types and six [+ *-im*] types.

Daisy's first rule, $R_{in}$, still holds as productive during this period of reanalysis: a Fisher's exact test on Table 20 shows a significant association between alienability and Daisy's distribution of *-im* ($p < 0.001$, OR = 0, Phi coefficient = -0.69)

However, patterns among her alienable types signal that Daisy has abandoned $R_{nasal}$. A Fisher's exact test on Table 21 reveals there is no longer a significant association between stem-final nasality and Daisy's distribution of *-im* ($p = 0.089$, OR = 0.08, Phi coefficient = -0.58).

Instead, Daisy has returned to relying on $R_{im}$ as the [+ *-im*] complement to $R_{in}$. Out of the 15 alienable types (N) in Table 20, 5.54 exceptions to $R_{im}$ could be tolerated (θN). Daisy is just below that threshold with five attested exceptions (e). She has used four of these exceptions at previous stages: *maatiwaakin* 'toy, game', *mischisin* 'shoe', *nipaawin* 'bed', and *wiichaawaakin* 'friend'. The remaining exception is the new noun type *dolly*, where Daisy has an error of omission. This single form is harder to account for under the TP, but, as the only error of omission in her entire sample, may not necessarily represent a systematic pattern.

Daisy's overgeneralizations during Stage 4 are also consistent with a two-rule system of $R_{in}$ and $R_{im}$. She has another two off-target tokens of *utaapaanaaskw* 'vehicle', an error present at Stage 2. Her other overgeneralizations occur with two new types, which also have nasal-final stems: *chiimaan* 'boat' and *shuushuwihkwaan* 'slide'. Her error with the former is particularly illuminating, because Daisy has seemingly just learned the Cree word *chiimaan* 'boat' from the adult (31).

(31) Aai miin iishinihkaataau chiimaan.

| aai | miin | iishinihkaataa-u | chiimaan |
|---|---|---|---|
| HES | again | be.named $_{II}$-INAN.SG$_{IND}$ | boat |

'Uh, it is also called a boat.' (Adult, B1.16, 4;07, 25:11)

Moments later, Daisy productively overgeneralizes the [+ *-im*] pattern to that noun type (32).

**Table 20.** Daisy's Distribution of *-im* to Noun Types from Age 4;07–4;11, by Alienability

| | [+ *-im*] | [– *-im*] |
|---|---|---|
| Inalienable | 0 | 13 |
| Alienable | 10 | 5 |

*Note.* + indicates that Daisy applies the suffix *-im* to a noun type, including any errors of commission. – indicates that she does not apply the suffix *-im* to a noun type, including any errors of omission.

**Table 21.** Daisy's Distribution of *-im* to Alienable Noun Types from Age 4;07–4;11, by Phonology

| Stem-final segment of noun type | [+ *-im*] | [– *-im*] |
|---|---|---|
| /n, m/ | 2 | 4 |
| any other segment | 8 | 1 |

*Note.* + indicates that Daisy applies the suffix *-im* to a noun type, including any errors of commission. – indicates that she does not apply the suffix *-im* to a noun type.

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(32) uchiimaanim kaa ushihtaakiniwiwiyich

| | | | |
|---|---|---|---|
| Target: | u=chiimaan | kaa | ushiht-aakiniwi-wiyich |
| Actual: | u=chiimaan-***im** | kaa | ushiht-aakiniwi-wiyich |
| | 3=boat-***POSS** | PVB | $make_{AI+O}$-PASS-INAN.$OBV_{CJ}$ |

'… that his boat was made' (Daisy, B1.16, 4;07, 25:37)

### *More Opportunities to Falsify the TP*

Daisy's discarding of $R_{nasal}$ does not in itself disconfirm the TP, because the model predicts that rules can be abandoned when exceptions exceed the allowable threshold. However, the sampled input does not evince a clear point where $R_{nasal}$ could be overwhelmed by exceptions. The rule is predicted to be extrapolated within the tail of the Zipfian distribution in Figure 2, and the available input does not facilitate a more fine-grained look into how Daisy may be encountering less frequent noun types over time. Daisy's discarding of $R_{nasal}$ may well be the result of encountering new low-frequency noun types that overcome the established rule, but the available data do not clearly show this. The abandonment of $R_{nasal}$ without a clear motivation stands as a piece of counter-evidence against the TP's predictions.

Another potential falsification of the TP would come if Daisy turns to animacy after discarding $R_{nasal}$, because animacy should be a dead end after $R_{in}$. Table 22 breaks down her relevant noun production during Stage 4, and a Fisher's exact test reveals no significant association between animacy and Daisy's application of *-im* to alienable types ($p = 1.000$, $OR = 0.68$, Phi coefficient = -0.09). Daisy does not turn toward animacy after abandoning $R_{nasal}$.

Overall, during Stage 4, Daisy discards $R_{nasal}$ and her production is consistent with reverting to complementary rules $R_{in}$ and $R_{im}$. Her production of new noun types also exemplifies the pattern. She has two new inalienable types, *-shtikwaanipiiwii* 'hair' and *-spitun* 'arm', both of which she correctly produces without *-im*. She then applies [+ *-im*] to all nine remaining new types except *dolly*, which does not seem to be a systematically motivated omission of *-im*. The present study does not provide clear evidence motivating Daisy to abandon $R_{nasal}$ at Stage 4, but she revives the rule during the next stage.

## *Stage 5: Adult-like Distribution of -im*

From age 5;00–5;11, Daisy demonstrates all adult-like usage of the possessive suffix *-im*. Throughout this period, she uses 37 total noun types in her possessives (Table 32 in the Appendix, Supplementary Materials). 17 of these types are new, of which three are [– *-im*] and 14 are [+ *-im*].

**Table 22.** Daisy's Distribution of *-im* to Alienable Noun Types from Age 4;07–4;11, by Animacy

| | [+ *-im*] | [– *-im*] |
|---|---|---|
| Inanimate | 5 | 3 |
| Animate | 5 | 2 |

*Note.* + indicates that Daisy applies the suffix *-im* to a noun type, including any errors of commission. – indicates that she does not apply the suffix *-im* to a noun type.

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With only one new inalienable type, *-piiwii* 'fur, hair', Daisy holds on to the rule $R_{in}$ during Stage 5: a Fisher's exact test applied to Table 23 reveals she maintains a significant association between alienability and distributing *-im* ($p < 0.001$, OR = 0, Phi coefficient = -0.76)

Most importantly, patterns indicate that Daisy has revived the rule $R_{nasal}$ for alienable types. A Fisher's exact test applied to Table 24 demonstrates that there is once again a significant association between stem-final nasality and Daisy's distribution of *-im* ($p < 0.001$, OR = 0, Phi coefficient = -0.80).

The available input data do not provide enough detail to show exactly what may have changed between Stage 4 and Stage 5, but the end result is in line with what the TP predicts. During Stage 5, Daisy has three new nasal-final types, including the [+ *-im*] exception *shuwiyaan* 'money'. The other exception to $R_{nasal}$ in Table 24 is *chaakwaan* 'thing', which Daisy learned in Stage 2. Lastly, Daisy's production in Table 24 is also clearly in accordance with $R_{im}$, as she applies the [+ *-im*] pattern to all 17 noun types that are not subject to $R_{in}$ or $R_{nasal}$. 13 of these types are new and testify to her knowledge of $R_{im}$ as the elsewhere pattern.

### *Summary and Evaluation of Predictions*

Daisy acquires the possessive suffix *-im* across five stages, and throughout these stages, her distribution of *-im* is largely consistent with the predictions made in Study 1. Daisy's first available forms accord with having $R_{clitic}$ as her lone rule for possessive inflection. During Stage 2, Daisy produces an increasing number of [+ *-im*] noun types and also commits errors of overregularization with *-im*, indicating that she abandons $R_{clitic}$ in search of further rules. Here Daisy's production fits first with $R_{in}$, the initial rule predicted by the TP under the path of consistency. She also extrapolates the predicted elsewhere rule, $R_{im}$, as the complement to $R_{in}$. Daisy discerns the remaining rule, $R_{nasal}$ at Stage 3, where her usage is consistent with the complete set of three rules predicted by the TP. However, she abandons $R_{nasal}$ at Stage 4 and begins making errors distributing *-im*

**Table 23.** Daisy's Distribution of *-im* to Noun Types from Age 5;00–5;11, by Alienability

| | [+ *-im*] | [– *-im*] |
|---|---|---|
| Inalienable | 0 | 13 |
| Alienable | 19 | 5 |

*Note.* + indicates that Daisy applies the suffix *-im* to a noun type. – indicates that she does not apply the suffix *-im* to a noun type.

**Table 24.** Daisy's Distribution of *-im* to Alienable Noun Types from Age 5;00–5;11, by Phonology

| Stem-final segment of noun type | [+ *-im*] | [– *-im*] |
|---|---|---|
| /n, m/ | 2 | 5 |
| any other segment | 17 | 0 |

*Note.* + indicates that Daisy applies the suffix *-im* to a noun type, including any errors of commission. – indicates that she does not apply the suffix *-im* to a noun type.

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again. At Stage 5, which persists across her final seven recording sessions, Daisy's production again accords with all three rules predicted by the TP under the path of consistency.

Daisy's distribution of *-im* never clearly disconfirms the predictions made by the TP in Study 1. For example, she clearly does not simply memorize forms from the input, nor does she turn toward animacy after alienability. However, this does not mean that her data present no challenges to the TP model. The first challenge comes in Stage 2, when Daisy finds $R_{im}$ without $R_{nasal}$ at the same time. This does support the analysis of $R_{im}$ as the elsewhere rule, but the available input does not indicate that Daisy should find $R_{im}$ before $R_{nasal}$. The biggest problem for the TP model is that Daisy abandons $R_{nasal}$ during Stage 4 and returns to her previous set of two complementary rules. The TP does allow for such revisions in the face of dynamic input, but the available sample for this study does not portray a situation where exceptions overwhelm $R_{nasal}$. This likely indicates the limitations of the available data, but the possibility that the TP model falters here cannot be completely discounted.

## Conclusions and Contributions

This paper uses child and child-directed speech data from NE Cree to test a relatively new rule-based model of language processing and acquisition, the Tolerance Principle (Yang, 2016, 2018).

Study 1 examines 50 videos of input from one adult to answer RQ1: "How might the TP predict rules for *-im* from the input in the face of exceptions?". The TP predicts that children will begin with the lone rule $R_{clitic}$, which requires only a clitic for possessive inflection, and that they will simply memorize any [+ *-im*] noun types from the input as exceptions. As children encounter more noun types over time, they will have to abandon $R_{clitic}$, subdivide noun types, and extrapolate further rules to account for the distribution of *-im.* The TP allows for two potential paths to subdivide nouns – frequency or consistency – and each path leads to a set of nested rules. The path of frequency will begin with an animacy-based rule not found under the path of consistency, but then both paths will converge upon the same three rules. Two of these rules, $R_{in}$ and $R_{nasal}$, are motivated by basic and salient linguistic distinctions among noun types. The third rule, $R_{im}$, functions as a default, elsewhere pattern.

Study 2 analyzes video-recorded speech from two children to answer RQ2: "How might child production adhere to the predictions from RQ1?". Possessive forms from the youngest child, Ani, accord with the TP's prediction that she will begin with $R_{clitic}$ and later find further rules for distributing *-im.* Although no evidence clearly confirms that she has indeed acquired $R_{nasal}$, patterns from Ani are compatible with either the path of frequency or consistency. The latter would require her to learn just a single exception that is frequent in the input. Daisy's earliest possessive forms are also consistent with the prediction she will begin with $R_{clitic}$. Additionally, she largely follows the TP's predictions for the path of consistency – not frequency – where she begins with a rule based on alienability. She also finds $R_{im}$ as the predicted elsewhere [+ *-im*] rule. Her extrapolation of the third rule, $R_{nasal}$, does not go as smoothly as Study 1 predicts, but this may reflect the limitations of the dataset more than the theory. Daisy's eventual adult-like distribution of *-im* accords with the three nested rules predicted under the path of consistency. Patterns from neither child clearly disconfirm the TP. However, the small number of datapoints from Ani means her results must be interpreted cautiously, and Daisy's back-and-forth regarding $R_{nasal}$ does not have a clear motivation within the sampled input.

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The findings contribute to the long-running theoretical debate about inflectional morphology in language processing and acquisition. The present study has demonstrated that the TP, a heavily rule-based model, can offer testable predictions that largely hold for the L1 acquisition of one particular inflectional pattern in NE Cree. Furthermore, this study has tested the TP against a new kind of pattern. Whereas the TP has previously been applied to account for regular versus irregular inflection or for multiple competing inflectional affixes, this study shows that the TP can account for a phenomenon where an inflectional suffix is either required or disallowed by a given noun type. Finally, the present study has helped expand the typological purview of the debate by bringing in a hitherto under-represented language and language type.

Of course, these findings are also qualified by the limitations of the study, many of which highlight the important challenges of working with the kind of small corpora often associated with languages under-represented in L1 acquisition research. These limitations include smaller, less representative sample sizes involving relatively few participants, which furnish less rich and less dense pictures of the input and language development than are available for languages such as English. Furthermore, the CCLAS corpus has some gaps in available video data, where stretches of language development are not represented. Lastly, the corpus also entails some of the well-known limitations of naturalistic data: sometimes the data end up providing relatively few relevant data points, including limited numbers of types, tokens, and errors. Altogether these limitations mean that the results of the present study cannot be generalized too strongly or too far, but they still provide an important, informative, and much-needed look at child language acquisition.

The present study also offers potential contributions for East Cree language communities. For children still acquiring NE Cree as their L1, these findings could be used to help shape linguistically and culturally Cree-specific methodologies, tools, and resources for speech-language pathology and assessment (cf. Peltier, 2011). Findings could also help inform communities in their critical work to redress language shift and loss through language nest, immersion, and other educational programs. For example, the possessive suffix *-im* may be a particularly vulnerable facet of NE Cree morphosyntax. Anecdotal reports from Junker (2003, p. 11) and Collette (2014, p. 291), as well as from language consultants who have worked with the present author, indicate that many younger speakers have lost the intricacies of the suffix's distribution and now simply add the morpheme to all possessed nouns. That is, in the face of language shift, speakers have regularized the elsewhere [+ *-im*] pattern even though it occurs with a minority of noun types. This study highlights the importance of rich and varied language input in the acquisition of a marker such as *-im.* The noun types with the most frequent possessive tokens in the input are generally [– *-im*], and the more complex patterns in the suffix's distribution only unfold as less frequent noun types are used (i.e., in the tail of the Zipfian distribution from Figure 2). This may point to the importance of deliberately increasing exposure to lower-frequency words in language revitalization and reclamation programs, where learners likely have more limited input than in a typical L1 acquisition context (O'Grady, Heaton, Bulalang & King, 2021). As a more speculative contribution, perhaps the rules for *-im* unearthed along the path of consistency in the present study can be used to help older learners of NE Cree. Documentation of the full distribution of *-im* throughout the adult-level lexicon is not complete, but teaching learners the rules for *-im* from the input here could help them navigate the inflection of a variety of common and useful noun types – a potential idea for teachers to test.

As a final note, the TP tells a workable story for the L1 acquisition of *-im*, but that may not be the only story. Other models of inflectional morphology may offer workable accounts for *-im* as well. Potential contenders could come from the areas of Granlund et al.'s (2019, p. 170) continuum that allow for multiple inflectional rules (e.g., Albright & Hayes, 2003) or multiple schemas (e.g., Bybee, 1995; Stephany & Voeikova, 2009). For instance, perhaps children construct schemas for *-im* that hinge on semantic (i.e., animacy or alienability) and phonological features (i.e., stem-final nasality) shared by noun types, and then they extend these schemas to new noun types. Testing additional models of morphology is beyond the scope of the present paper, although I have furnished data in the Appendix (Supplementary Materials) that allows others to explore such possibilities. Furthermore, the present study cannot discount nor quell critiques of the TP model, especially about its mechanistic nature and reliance on serial search, and whether it is cognitively realistic. These are all matters for future research. For now, though, the present study has taken up Yang's suggestion for the TP: "Use it until it breaks" (2018, p. 9) – and the test case of *-im* did not clearly break the model.

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## References

**Albirini, A.** (2015). Factors affecting the acquisition of plural morphology in Jordanian Arabic. *Journal of Child Language*, **42**, 734–762.

**Albright, A.**, & **Hayes, B.** (2003). Rules vs. Analogy in English past tenses: A computational/experimental study. *Cognition*, **90**(2), 119–161.

**Ambridge, B.**, & **Lieven, E. V. M.** (2011). *Child language acquisition: Contrasting theoretical approaches*. Cambridge University Press.

**Belth, C.**, **Payne, S.**, **Beser, D.**, **Kodner, J.**, & **Yang, C.** (2021). The greedy and recursive search for morphological productivity. *ArXiv Preprint ArXiv:2105.05790*. https://arxiv.org/abs/2105.05790

**Björnsdóttir, S. M.** (2021). Productivity and the acquisition of gender. *Journal of Child Language*, 1–26.

**Blom, E.** (2018). Morphological Theory and First Language Acquisition. In J. Audring & F. Masini (Eds.), *The Oxford Handbook of Morphological Theory* (pp. 511–521). Oxford University Press.

**Bloomfield, L.** (1946). Algonquian. *Linguistic Structures of Native America*, **6**, 85–129.

**Boudelaa, S.**, & **Gaskell, M. G.** (2002). A re-examination of the default system for Arabic plurals. *Language and Cognitive Processes*, **17**(3), 321–343.

**Brittain, J.**, **Dyck, C.**, **Rose, Y.**, & **MacKenzie, M.** (2007). The Chisasibi Child Language Acquisition Study (CCLAS): A progress report. In H. C. Wolfart (Ed.), *Papers of the 38th Algonquian Conference* (pp. 1–17). University of Manitoba.

**Brittain, J.**, & **MacKenzie, M.** (2010). The Future of Cree. In E. Faries, M. MacKenzie, J. Brittain, L. Morris, S. Demers, M.-O. Junker, E. Chiskamish, N. Dostaler, & S. Runnels (Eds.), *Research Report: Cree School Board Language of Instruction Evaluation* (pp. 1–13). Cree School Board of Quebec.

**Bryant, K. D.** (2013). *The development of segmental phonology in a mixed language environment: A case study from Northern East Cree* [MA thesis]. Memorial University of Newfoundland.

**Bybee, J. L.** (1995). Regular morphology and the lexicon. *Language and Cognitive Processes*, **10**(5), 425–455.

**Bybee, J. L.**, & **Slobin, D. I.** (1982). Rules and schemas in the development and use of the English past tense. *Language*, **58**(2), 265–289.

**Chee, M. R.** (2017). *A longitudinal cross-sectional study on the acquisition of Navajo verbs in children aged 4 years through 11 years* [PhD dissertation]. University of New Mexico.

**Clahsen, H.** (1999). Lexical entries and rules of language: A multidisciplinary study of German inflection. *Behavioral and Brain Sciences*, **22**(6), 991–1013.

**Clahsen, H.**, **Rothweiler, M.**, **Woest, A.**, & **Marcus, G. F.** (1992). Regular and irregular inflection in the acquisition of German noun plurals. *Cognition*, **45**(3), 225–255.

**Collette, V.** (2014). *Description de la morphologie grammaticale du cri de l'Est (dialecte du Nord, Whapmagoostui)* [PhD dissertation]. Université Laval.

**Courtney, E. H.**, & **Saville-Troike, M.** (2002). Learning to construct verbs in Navajo and Quechua. *Journal of Child Language*, **29**(3), 623–654.

**Dąbrowska, E.** (2004). Rules or schemas? Evidence from Polish. *Language and Cognitive Processes*, **19**(29), 225–271.

**Dąbrowska, E.** (2006). Low-level schemas or general rules? The role of diminutives in the acquisition of Polish case inflections. *Language Sciences*, **28**(1), 120–135.

**Goldberg, A. E.** (2018). The sufficiency principle hyperinflates the price of productivity. *Linguistic Approaches to Bilingualism*, **8**(6), 727–731.

**Goldberg, A. E.** (2019). *Explain me this: Creativity, competition, and the partial productivity of constructions*. Princeton University Press.

**Grand Council of the Crees**. (2019). *Cree Nation Government Bill 1: An Act respecting the Cree language of Eeyou Istchee.* https://www.cngov.ca/wp-content/uploads/2019/09/cng-cree-language-act-final-sep-17-19.pdf

**Granlund, S.**, **Kolak, J.**, **Vihman, V.**, **Engelmann, F.**, **Lieven, E. V. M.**, **Pine, J. M.**, **Theakston, A. L.**, & **Ambridge, B.** (2019). Language-general and language-specific phenomena in the acquisition of inflectional noun morphology: A cross-linguistic elicited-production study of Polish, Finnish and Estonian. *Journal of Memory and Language*, **107**, 169–194.

**Henke, R. E.** (2019). The development of possession in the L1 acquisition of Northern East Cree. *Journal of Child Language*, **46**, 980–997.

**Henke, R. E.** (2020). *The first language acquisition of nominal inflection in Northern East Cree: Possessives and nouns* [PhD dissertation]. University of Hawai'i at Mānoa.

**Junker, M.-O.** (2003). East Cree dependent nouns and disjoint reference. *Algonquian & Iroquoian Linguistics*, **28**(1), 11–13.

**Junker, M.-O.**, & **MacKenzie, M.** (2004). Southern East Cree pronouns. In H. C. Wolfart (Ed.), *Papers of the 35th Algonquian Conference* (pp. 187–205). University of Manitoba.

**Junker, M.-O.**, **MacKenzie, M.**, & **Brittain, J.** (2012). *Comparative structures of East Cree and English.* http://eastcree.org/pdf/Cree_English_Structure_2012.pdf

**Junker, M.-O.**, **Salt, L.**, & **Visitor, F.** (2013). The Interactive East Cree Reference Grammar. *The Interactive East Cree Reference Grammar*. https://www.eastcree.org/cree/en/grammar/

**Kapatsinski, V.** (2018a). On the intolerance of the Tolerance Principle. *Linguistic Approaches to Bilingualism*, **8**(6), 738–742.

**Kapatsinski, V.** (2018b). Words versus rules (storage versus online production/processing) in morphology. In *Oxford Research Encyclopedia of Linguistics* (pp. 1–19). Oxford University Press.

**Köpcke, K.-M.** (1998). The acquisition of plural marking in English and German revisited: Schemata versus rules. *Journal of Child Language*, **25**, 293–319.

**Korecky-Kröll, K.**, & **Dressler, W. U.** (2009). The acquisition of number and case in Austrian German nouns. In U. Stephany & M. D. Voeikova (Eds.), *Development of nominal inflection in first language acquisition: A cross-linguistic perspective* (pp. 265–302). Mouton de Gruyter.

**Krajewski, G.**, **Lieven, E. V. M.**, & **Theakston, A. L.** (2012). Productivity of a Polish child's inflectional noun morphology: A naturalistic study. *Morphology*, **22**(1), 9–34.

**Laaha, S.**, **Ravid, D.**, **Korecky-Kröll, K.**, **Laaha, G.**, & **Dressler, W. U.** (2006). Early noun plurals in German: Regularity, productivity or default? *Journal of Child Language*, **33**, 271–302.

**MacKenzie, M. E.** (1980). *Towards a dialectology of Cree-Montagnais-Naskapi* [PhD dissertation]. University of Toronto.

**Marcus, G. F.**, **Pinker, S.**, **Ullman, M.**, **Hollander, M.**, **Rosen, T. J.**, **Xu, F.**, & **Clahsen, H.** (1992). Overregularization in language acquisition. *Monographs of the Society for Research in Child Development*, **57**(4), i–178.

**Max Planck Institute for Evolutionary Anthropology**. (2015). *The Leipzig Glossing Rules: Conventions for interlinear morpheme-by-morpheme glosses*. https://www.eva.mpg.de/lingua/resources/glossing-rules.php

**McClelland, J. L.**, & **Patterson, K.** (2002). Rules or connections in past-tense inflections: What does the evidence rule out? *Trends in Cognitive Sciences*, **6**(11), 465–472.

**Neacappo, M.** (2012). *"Land talk" in Iiyiyiuyimuwin (Eastern James Bay Cree)* [MA thesis]. Carleton University.

**O'Grady, W.**, **Heaton, R.**, **Bulalang, S.**, & **King, J.** (2021). The role of input in language revitalization: The case of lexical development. *Language Documentation & Conservation*, **15**, 433–457.

**Payne, S.**, **Belth, C.**, **Kodner, J.**, & **Yang, C.** (2022). *Searching for morphological productivity*. Linguistic Society of America 2022 Annual Meeting, Washington, D.C.

**Peltier, S.** (2011). Providing culturally sensitive and linguistically appropriate services: An insider construct. *Canadian Journal of Speech-Language Pathology & Audiology*, **35**(2), 126–134.

**Pinker, S.**, & **Ullman, M. T.** (2002). The past and future of the past tense. *Trends in Cognitive Sciences*, **6**(11), 456–463.

**Pophristic, S.**, & **Schuler, K.** (2021). The role of gender in the acquisition of the Serbian case system. *Proceedings of the Linguistic Society of America*, **6**(1), 896–905.

**Prasada, S.**, & **Pinker, S.** (1993). Generalisation of regular and irregular morphological patterns. *Language and Cognitive Processes*, **8**(1), 1–56.

**Ravid, D.** (2019). First-language acquisition of morphology. In *Oxford Research Encyclopedia of Linguistics* (pp. 1–38). Oxford University Press.

**Ravid, D.**, & **Farah, R.** (1999). Learning about noun plurals in early Palestinian Arabic. *First Language*, **19**, 187–206.

**Rose, Y.**, & **MacWhinney, B.** (2014). The PhonBank Project: Data and software-assisted methods for the study of phonology and phonological development. In J. Durand, U. Gut, & G. Kristoffersen (Eds.), *The Oxford handbook of corpus phonology* (pp. 308–401). Oxford University Press.

**Rose, Y.**, **MacWhinney, B.**, **Byrne, R.**, **Hedlund, G.**, **Maddocks, K.**, **O'Brien, P.**, & **Wareham, T.** (2006). Introducing Phon: A software solution for the study of phonological acquisition. In D. Bamman, T. Magnitskaia, & C. Zaller (Eds.), *Proceedings of the 30th Annual Boston University Conference on Language Development* (pp. 489–500). Cascadilla Press.

**Rumelhart, D. E.**, & **McClelland, J. L.** (1985). *On learning the past tenses of English verbs* (ICS Report 8507; pp. 1–40). Institute for Cognitive Science.

**Savičiūtė, E.** (2020). *Testing generativist and constructivist accounts of morphological development using complex noun morphology* [PhD dissertation]. University of Liverpool.

**Savičiūtė, E.**, **Ambridge, B.**, & **Pine, J. M.** (2018). The roles of word-form frequency and phonological neighbourhood density in the acquisition of Lithuanian noun morphology. *Journal of Child Language*, **45**(3), 641–672.

**Saville-Troike, M.** (1996). Development of the inflected verb in Navajo child language. In E. Jelinek, S. Midgette, K. Rice, & L. Saxon (Eds.), *Athabaskan Language Studies: Essays in Honor of Robert W. Young* (pp. 137–192). University of New Mexico Press.

**Stephany, U.**, & **Voeikova, M. D.** (2009). *Development of nominal inflection in first language acquisition: A cross-linguistic perspective*. Mouton de Gruyter.

**Tatsumi, T.**, & **Pine, J. M.** (2016). Comparing generativist and constructivist accounts of the use of the past tense form in early child Japanese. *Journal of Child Language*, **43**(6), 1365–1384.

**Yang, C.** (2016). *The price of linguistic productivity: How children learn to break the rules of language*. MIT press.

**Yang, C.** (2018). *A user's guide to the tolerance principle*. https://ling.auf.net/lingbuzz/004146

**Zipf, G. K.** (1949). *Human behavior and the principle of least effort: An introduction to human ecology*. Addison-Wesley.

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