OPTIMALITY THEORY IN LANGUAGE PRODUCTION: THE CHOICE BETWEEN DIRECT AND INVERSE IN ODAWA*

Kiel Christianson
Michigan State University

ABSTRACT

This paper proposes an analysis of variability in sentence production in the 'nonconfigurational' Algonquian language Odawa. In doing so, the role played by various hierarchies at work in the language is demonstrated, and it is shown how these hierarchies interact to explain the frequencies with which certain constructions occur in various contexts. In doing so, a version of Optimality Theory is employed, which, although technically 'non-standard', is consistent with recent work on language variation and variation in the evaluation function of the theory. As a result, several issues—both empirical and theoretical—are raised for future research.

1 INTRODUCTION

1.1 Odawa verb forms

Odawa, an Algonquian language spoken in the Great Lakes region, has an inventory of verb forms that includes two transitive, active forms: direct and inverse (passive, intransitive and 'unspecified subject' forms will not be discussed here[1]). The direct form is active and transitive, with the the-

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[1] Attendees of WSCLA 6 and readers of the version of this paper appearing in *UBCWPL* will notice that the exclusion of passives in the present paper represents a departure from the analysis presented in the earlier works. Reasons for this change will be elaborated in later sections.

matic agent as the syntactic subject and the thematic patient as the syntactic object. The same is true of the inverse (Aissen 1997, Richards 2000; but cf. Rhodes 1994). In a direct clause, the agent/subject is called the proximate argument and is morphologically unmarked, and the patient/object is marked with an obviative morpheme. In an inverse clause, the opposite occurs: The agent/subject is obviative (morphologically marked), and the patient/object is proximate (morphologically unmarked). Givón (1994) analyzes the direct-inverse verb form alternation and the associated obviation morphology as a grammaticization of discourse status, whereby the agent/subject is relatively more topical (hence unmarked) in the direct, and the patient/object is relatively more topical (and unmarked) in the inverse. (1) illustrates the direct form, and (2) the inverse.

(1) nini Ø-jiismabin-aa-n kwew-wan
man 3Subj-pinch-3DIRECT-ObjOBV woman-OBV
'the man is pinching the woman'

(2) niniw-wan Ø-jiismabin-igoo-n kwe
man-OBV 3Subj-pinch-3INVERSE-SubjOBV woman
'the man is pinching the woman'

1.2 Person Hierarchy

It is well known that the Person Hierarchy plays a crucial role in Algonquian languages in determining whether a direct or inverse verb form is used. The Person Hierarchy in Odawa (McGinnis 1995), along with many Algonquian languages (Déchaine 1999), is seen in (3).

(3) Person Hierarchy in Odawa

2nd person > 1st person > 3rd person Proximate > 3rd person Obviative

When the patient/object of a transitive clause is higher on the Person Hierarchy than the agent/subject, the inverse is used. This description is straightforward when the two arguments are 1st and 2nd, or 1st and 3rd, or 2nd and 3rd. However, when the two arguments are both 3rd persons, it is not at all obvious how one decides which argument should be proximate and which should be obviative, and thus which verb form must be used. In fact, as explained below, it makes sense to distinguish between a Person Hierarchy as in (3), and an Obviation Hierarchy, as defined in §4. This distinction is motivated by the pivotal role that obviation status plays in determining verb form, as we shall see.

A number of hierarchies come into play in making the decision as to which of two (or more) 3rd persons should be the proximate and which one(s) should be obviative, including those ranking animacy, discourse prominence, and thematic role (Aissen 1997, 1999a,b, 2001, Richards 2000). The remainder of this paper focuses on the hierarchies that determine the obviation status of 3rd person arguments and consequently determine verb choice in any given sentence. The organization of the paper is as follows: Section 2 summarizes the hierarchies for which evidence appears in the data presented in Section 3. Section 4 contains an Optimality Theoretic account of the data presented in Section 3, drawing heavily on the work of Aissen (1997, 1999a,b, 2001) and Bresnan and Deo (to appear). Section 5 poses further questions raised by the analysis, speculates on possible solutions, and highlights the methodological significance of the approach outlined here.

2 OTHER HIERARCHIES

2.1 Animacy Hierarchy (AH)

At least since Silverstein (1976), various hierarchies have been recognized as integral in determining case assignment, voice (active/passive), and direction (direct/inverse) in diverse languages. Rhodes (1994) discusses what Algonquinists call the Algonquian Agency Scale, detailed in (4) (Rhodes's (3)).

(4) Algonquian Agency Scale (AAS)

Part I: 2nd person > 1st person > 3rd person

Part II: Animates > Inanimates

Part III: High Topic Rank Animates > Low Topic Rank Animates

Rhodes notes that Algonquinists often consider the subparts of the AAS to constitute one unified scale; however, he continues, since "Part I is sensitive to verb agreement type [direct vs. inverse] and Parts II and III are not [this] constitutes a strong argument that at least Part I is a separate clause" (1994: 432).

I believe that Rhodes is correct in this assertion, but that we should carry it further. Specifically, if the analysis presented here is correct, all three subparts of the AAS are separate hierarchies. As we will see, evidence for this is that they in fact do affect verb type. Furthermore, an Obviation Hierarchy (OH) must also be included, where *Proximate* > *Obviative* (see §4). Additionally, Part II requires a more fine-grained division. Minkoff (2000, 2001) cites a great deal of research that strongly suggests a more radical articulation of the Animacy Hierarchy is warranted, as given in (5) (adapted from Minkoff 2001) (see also Silverstein 1976, Yamamoto 1999).

(5) Animacy Hierarchy (AH)

human nouns > animal nouns > (inanimate) concrete count nouns > (inanimate) concrete mass nouns > (inanimate) abstract count nouns > (inanimate) abstract mass nouns

In the analysis of Odawa production, we will see clear evidence for the *human > animal* portion of the above hierarchy. In Odawa, there are two grammatical genders, animate and inanimate, and a small number of notionally inanimate nouns (e.g., *mtig* 'tree') are grammatically animate. An interesting question, which will remain unaddressed here, is how *notionally animate* nouns and *grammatically animate* nouns rank with respect to each other and both notionally and grammatically inanimate nouns in the Animacy Hierarchy.

2.2 Thematic Hierarchy (TH)

A given NP's ranking on the Animacy Hierarchy is roughly parallel to the relevant semantic properties that make it compatible with one of the Thematic Proto-Roles as assigned by a given verb, in the sense of Dowty (1991). The higher the NP's rank on the Animacy Hierarchy, the more likely it will satisfy a verb's selection restrictions as proto-agent. Presumably, the first such property identified by Dowty (1991: 572)—volitional involvement in the event—is more characteristic of humans than animals. For example, humans can choose to bite someone; animals simply follow instinct. (The other properties listed by Dowty are all equally applicable to humans and animals.)

As such, we see a natural connection between the Animacy Hierarchy and the Thematic Hierarchy, proposed on independent grounds by, e.g., Fillmore (1968), Jackendoff (1972). The exact rankings and labels within the Thematic Hierarchy are controversial, but fortunately, the division shown in (6) is the one point that is generally agreed upon.

(6) Thematic Hierarchy (TH) (partial)

Agent > Patient

2.3 Relational Hierarchy (RH)

The Thematic Hierarchy in (6) tends to align with an independent hierarchy of grammatical functions, whereby subjects tend to display proto-agent properties and non-subjects tend to display proto-patient properties (Asudeh 2000, Ferreira 1994). The hierarchy of grammatical functions is termed the Relational Hierarchy in Aissen (1997) (see Aissen, 1999b for full references on this observation). This hierarchy can be thought of as corresponding to the relative structural 'height' of the argument NPs in a standard generative derivation.

(7) Relational Hierarchy (RH) (partial)

Subject > Object

2.4 Discourse Hierarchy (DH)

Finally, as discussed at length in Givón (1994) and many of the papers in that volume, a number of voice and direction-related phenomena appear cross-linguistically to relate directly to the discourse prominance of the NPs serving as arguments of a clause. Levelt (1989) spends some time trying to disentangle the effects of topicality from syntactic subjecthood in language production, and in doing so, he explores the strong correlation between topics and syntactic subjects on one hand and non-topics and syntactic objects on the other. Based on this cross-linguistic correspondence of subject to topic and object to non-topic (cf. Grimshaw and Samek-Lodovici 1998) a Discourse Hierarchy as in (8) can be posited.

(8) Discourse Hierarchy (DH)

Topic > non-Topic

It should be noted that while the Discourse Hierarchy is identical in form to the others, it is different in certain ways. First, whereas a transitive clause cannot have two syntactic subjects or two syntactic (direct) objects, or two thematic agents or two thematic patients, contexts exist, at least in principle, where a sentence could contain two NPs, neither of which is more topical than the other. In this sense, then, the Discourse Hierarchy resembles the Animacy Hierarchy (since sentences can have two or more equally animate NPs).

2.5 Default alignment of hierarchies

The hierarchies described in §2.1-2.4 can be aligned as in (9). I will assume that this alignment is the default, such that syntactic subjects tend to be thematic agents, subject/agents tend to be topics, and subject/agent/topics tend to be more animate than patient/object/non-topics (Asudeh 2000, Ferreira 1994). The Obviation Hierarchy (*Proximate > Obviative*) is also included (and will be discussed further in §4).

(9) Default Alignment of Hierarchies (in no particular vertical order)

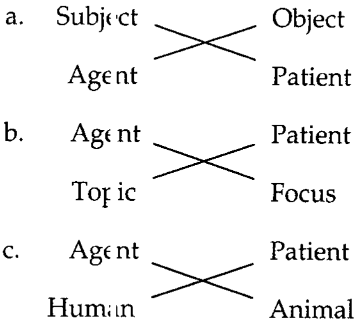
Proximate	>	Obviative	(Obviation Hierarchy, OH)
Subject	>	Object	(Relational Hierarchy, RH)
Agent	>	Patient	(Thematic Hierarchy, TH)
Topic	>	non-Topic	(Discourse Hierarchy, DH)
Human	>	less Human	(Animacy Hierarchy, AH)

(9) is not intended to be an exhaustive list of the relevant hierarchies. Some sort of Definiteness Hierarchy, for example, might also align tightly with the hierarchies here. I will focus only on the hierarchies in (9) for now, however.

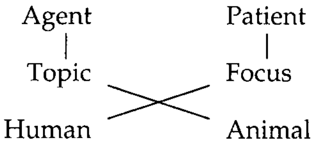
2.6 Obviation and the hierarchies

The basic idea I wish to explore here is that whether a given NP in a sentence is marked obviative or left as the unmarked proximate argument, and consequently whether the verb is realized as direct or inverse, depends upon the interaction of these hierarchies. The prototypical proximate argument will be human and have the syntactic, semantic, and discourse status of subject, agent, and topic, respectively (Aissen, 2001). The prototypical obviative argument will be less human than the proximate argument and have the syntactic, semantic, and discourse status of object, patient, and non-topic, respectively. The interesting question is: What happens to obviation status when some of these hierarchies are misaligned, represented schematically in (10)?

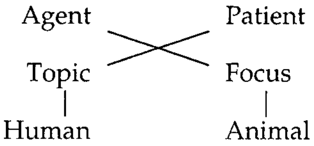
(10) Hierarchy misalignments



d.



e.



The question of what happens in cases like (10a-e) is of interest for two reasons. First, as discussed above in relation to Rhodes (1994), Algonquinists generally assume that only the Person Hierarchy—supplemented with obviation status information, as seen in (3)—affects verb form. In one respect, this is true—if the agent/subject of a transitive clause is lower on the Person Hierarchy than the patient/object, the verb form is obligatorily inverse (ignoring the problematic proximate-obviative split in 3rd person). However, we will see that other hierarchies also influence verb form, though not as reliably as the Person Hierarchy. In fact, since obviation status determines verb choice when two 3rd persons serve as arguments, the factors contributing to the obviation status of the NPs indirectly determine verb (and agreement) choice. Secondly, whereas using a direct form when the patient/object outranks the agent/subject on the Person Hierarchy results in an ungrammatical sentence, misaligning other hierarchies results in *gradient* preferences within and across speakers. Rhodes (1994) notes that in sentences with two 3rd person animates, verb form is optional, depending on discourse status, and is therefore arguably of little interest to formal linguistics. But with respect to language production, where speaker preference or felicity in context is an issue along with grammaticality, one of the largest unanswered questions in the field is the extent to which syntactic, semantic, and discourse factors influence the act of uttering a given sentence in a given context. As such, the interaction of these hierarchies appears to be at the center of the intersection between competence and performance.

3 NATURALISTIC PRODUCTION DATA

What is required to begin to understand the complex interactions of these hierarchies, and their effects on the choice and acceptability of verb form, is naturalistic linguistic data, collected under conditions which control for discourse and semantic variables such as topicality and animacy. Linguistic research on indigenous languages has generally utilized two sources of linguistic data: connected text (written or spoken stories, dialogues, etc.) and sentences elicited during descriptive and/or theoretical linguistic investigations. Connected text of the sort usually exploited in typological studies is characterized by stylistic variation and innovation, e.g., massive *pro*-drop conditioned by discourse structure and biases for certain word orders and verb forms. Sentences that are elicited for linguistic investigations, while indispensable in determining grammaticality judgments, are generally limited in number and can be criticized for failing to thoroughly mine the potential variability and productive processes of a language. Notably lacking are linguistic data elicited under controlled, experimental conditions. The importance of this sort of data is stressed by Keller (2000), who found that 'informal acceptability judgments' are inadequate for clarifying word order preferences (in German). Keller argues that these preferences are based not only on syntactic factors, but also pragmatic, semantic, and phonological factors. Accordingly, it is precisely this sort of experimentally collected data which are used in the analysis presented here. Before proceeding to this analysis, however, I will take a moment to describe the data elicitation methodology.

3.1 Methods

3.1.1 Participants

21 native speakers of Odawa (16 women and 5 men) took part in the experiment. All participants were between the ages of 35 and 80 and lived in the First Nations Reserve of Wikwemikong, Manitoulin Island, Ontario. All participants described themselves as native speakers of Odawa as established by the following criteria: 1) Odawa was the language they had used in the home when they were growing up. 2) Their first (and only) exposure to English growing up was at school or elsewhere outside of the home. 3) Odawa is their language of choice when speaking with others in the community who also speak the language. 4) All participants were deemed 'native speakers' by the native-speaker Odawa language teacher who conducted the interviews. Each participant was paid $20 Canadian for their participation, which usually lasted from 30 to 60 minutes.

3.1.2 Materials

Participants were shown 153 line drawings of various actions and depictions of everyday objects in certain spatial configurations. 33 of these drawings were of experimental interest, while the remaining 120 were fillers. The 33 drawings of interest depicted transitive actions for which a common verb occurs in the language (as determined with the help of native speakers). Three lists were developed in which descriptions of each of the 33 test drawings were elicited with one of three questions. These questions served as the three experimental conditions and are given in (11). Each condition occurred 11 times on each list, and rotated from list to list. The test drawings and their questions were randomized among the fillers within certain constraints: All but two test drawings were separated by at least one filler, usually two or more. The two that occurred sequentially (due to the author's mistake) did not appear to interact with one another in any significant way. Notice also that the three questions are parallel in terms of word order and verb type. The NPs in the AQ and PQ questions are last, unlike the English translations. The verb type is also the direct form in each question (conjunct agreement, due to the fact that they are used in wh-questions, see Truitner and Dunnigan 1972).

(11) a. Aniish e-zhiwebag zhinda? General Question (GQ)
what is-happening here
'what is happening here?'

b. Aniish e-nanikiid gwiizens? Agent Question (AQ)
what is-doing boy
'what is the boy doing?'

c. Aniish e-zhiwebizid kwezens? Patient Question (PQ)
what is-happening-to girl
'what is happening to the girl?'

Of particular interest in the discussion that follows is that the 33 experimental items were actually divided into three subgroups: One with human agents and human patients (H-H, n=22), one with human agents and animal patients (H-A, n=5), and one with animal agents and human patients (A-H, n=6). The number in the H-A subcondition was unintentionally reduced from 6 to 5 due to an unfortunate omission. The motivation for including these subgroups of drawings was the intuitive suspicion on my part (as a non-native speaker of the language) that the relative animacy of the characters in the drawings could affect verb choice, despite the fact that two native Odawa speakers independently reported prior to data collection that it should not. As we shall see, however, native-speaker intuitions proved to be misleading in this instance.

3.1.3 Procedure

Each list of questions was administered to seven of the 21 participants, so each drawing was presented with each of the three questions an equal number of times. Participants saw any one drawing only once. All instructions, practice trials (generally eight in number), and elicitation questions were given in Odawa by a native speaker. The experimenter, a non-native speaker, was present at all times to monitor the administration of the questions and appropriateness of the responses, as well as the functioning of the recording equipment. Participants were instructed to respond as fully as possible by not eliding any NPs (all NPs can be elided in Odawa, given a rich enough context). Nevertheless, elisions were common, and it was deemed more important not to interrupt the speakers and experimental process than to insist that speakers conform to our instructions.

Data were collected under circumstances unique in psycholinguistics, but *de rigueur* in field linguistics: Most sessions took place around the kitchen tables in the homes of participants in Wikwemikong. All sessions were recorded on a Marantz PMD222 tape recorder with an external microphone. Due to the varied locations of the sessions, a great deal of background noise (dogs, babies, telephones, televisions, etc.) can be heard on the tapes. Fortunately, less than ten tokens had to be discarded as unintelligible. A native speaker who attended approximately one-half of the experimental sessions (but did not conduct the interviews) assisted the experimenter in transcribing the tapes at a later date.

3.2 Results

After discarding 10.5% of the descriptions of the experimental drawings for various reasons (unintelligibility, lack of an answer, wrong question asked), 620 tokens were transcribed and translated into English by the author and Genevieve Peltier, a native speaker of Odawa.[2] Table 1 lists the total number of responses in each of the animacy subgroups (H-H, H-A[3], A-

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[2] Responses to filler drawings—which depicted transitive, intransitive, ditransitive, and locative situations—have yet to be transcribed and analyzed. The total number of tokens exceeds 3,200.

[3] The extremely low number of observations in PQ:H-A condition is due to the prevalent use of the passive verb form in this condition. In Christianson (2001a,b) these passives were included in the analysis. As explained below, they were excluded from the present analysis.

H) in the three conditions (not including intransitive responses which, while interesting in their own right, will not be discussed further here).

Table 1: Number of responses and proportion of responses by verb type in each picture subgroup (H-H, H-A, A-H) in each condition (GQ, AQ, PQ)

	Direct			Inverse		
	H-H	H-A	A-H	H-H	H-A	A-H
GQ (n=)	75	24	22	2	0	15
%	**97**	**100**	**59**	**2**		**41**
AQ (n=)	98	21	35	0	0	1
%	**100**	**100**	**97**			**3**
PQ (n=)	27	5	5	6	0	26
%	**81**	**100**	**16**	**18**		**84**

4 ACCOUNTING FOR THE PRODUCTION DATA

4.1 Optimality Theory

The approach that I pursue here is within the framework of Optimality Theory (Prince and Smolensky 1993). Optimality Theory (OT) is a theory of grammar that takes markedness statements as the 'substance of grammars' (Kager 1999: 3). Markedness statements are realized in the grammars of languages as universal, violable output constraints, ranked differently with respect to each other from one language to another. Grammars differ only in their rankings of these universal constraints. For every possible INPUT, a mechanism of the grammar called the *Generator* (GEN) produces an infinite candidate set of possible OUTPUTS. EVAL, the evaluator function, compares all of the candidates in their individual satisfaction of the constraints. The candidate that is least 'offensive' to the constraints is chosen as the optimal candidate (cf. Kager 1999, Dekkers, van der Leeuw and van de Weijer 2000). As traditionally implemented, OT assumes that EVAL disqualifies candidates that violate higher-ranking constraints; the optimal candidate, though it may violate a number of constraints, violates lower-ranking ones than the non-optimal candidates, which are all disqualified as soon as they violate even one higher-ranking constraint. In this sense, traditional OT is a winner-take-all system: One candidate survives EVAL to be the single grammatical output.

4.2 OT in language processing

OT was originally developed as a means of handling certain thorny facts of phonology within a unified theoretical framework. As stressed by Uriagereka (2000), phonology is an intricate input-output system, in which the grammar provides an underlying representation requiring an optimal Phonological Form (PF) matrix in order to encode the representation. There is currently considerable debate as to whether OT is suitable for syntax. However, OT, as a sort of input-output filter, does seem promising in accounting for aspects of language processing, another input/output system. Therefore, I would like to propose the optimality theoretic model of language *production* in (12).

(12) Model of language production in a nonconfigurational language

a. INPUT: N, V, N (the three required open-class lexical items required to express a transitive action), which include sufficient semantic features to place the NPs within the Animacy and Thematic Hierarchies. The NPs are also tagged with the feature [topic] or [non-topic/focus] (cf. Kiss, 1995), according to context, so that they can be placed in the Discourse Hierarchy (cf. Broekhuis and Dekkers, 2000). Following Sells (2001), I assume that the input does not contain any markers of 'direction' (direct or inverse morphology), only the above information, used to rank each NP in the various hierarchies.

b. GEN: Generates a candidate set consisting of sets of features consistent with both direct and inverse constructions containing the lexical items (i.e., these two forms are members of the same candidate set).[4] The candidates, then, are licit, grammati-

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[4] The production data collected so far points also to two classes of intransitives in Odawa, one of which often contains detransitivizing morphemes. These intransitives were used to express notionally transitive actions, and occurred most often in the AQ condition, paralleling the use of the direct form. The second class of intransitives were used to respond in the GQ and PQ conditions, paralleling the use of the passive form. An example of the first class of intransitive is given in (i), and of the second class in (ii). In the interest of space, and since, like the passives, it is not clear that these one-argument constructions belong in the same candidate set as the two-argument direct and inverse, the present analysis will not include any intransitives (or passives). See Section 4.0 for further discussion of the passive.

(i) jiismabin-ige gwiizens
pinch-detrans boy
'the boy is pinching'

cal constructions, with the prominence information encoded in (i) realized morphologically, including the verbal morphology.

c. OUTPUTS of GEN: Though fully specified morphologically, the syntax of Odawa allows the output candidates to remain underspecified with respect to linear order, which should also be determined by constraint satisfaction.[5]

d. EVAL: Evaluates the candidates against the constraints, which are derived from the harmonic alignment of the Animacy, Thematic, Relational, and Discourse Hierarchies and ranked by the grammar of Odawa (see Aissen 1997, 1999a,b, 2001).

e. The candidate that incurs the least cost (in a manner detailed in §4.2.2) is the *preferred* one, as measured by its more frequent production within and across speakers. However, other less preferred candidates may also be produced by some speakers in some contexts.

It is important to stress that this model is one that need only operate at the production interface, and as such fits into the grammar as an input-output system, which is where many generative syntacticians (cf. Uriagereka 1998) believe OT holds the most promise; however, it need not operate solely at the production interface. Broekhuis and Dekkers (2000) outline an argument for combining OT and Chomsky's Minimalist Program (1995). Furthermore, it is at these input-output interfaces where one would expect the sort of variation—within and across speakers—mentioned in (12e). In §4.3 I present the basic analysis of Odawa production, and in §4.5 I will address one way of handling the variation that (12e) allows for.

(ii) shkaadize nini
be.angry nini
'the man is angry'

[5] I abstract away from linear order in the present work, as Odawa allows for such a degree of ordering flexibility that including it here would become unwieldy. See Christianson 2002 for a full discussion of linearization in Odawa within an OT framework, and Keller 2000 for a discussion of OT approaches to linearization in German, and the references there regarding linearization and OT in general.

4.3 Odawa sentence production as constraint satisfaction

4.3.1 Constraint set

The constraint set relevant to the analysis is composed of constraints derived from the harmonic alignment (Prince and Smolensky 1993) of the hierarchies given in (9) and one more such hierarchy, the Obviation Hierarchy, given in (13) (see Aissen 1997, 2001). I will assume that the Obviation Hierarchy is a separate hierarchy from the Person Hierarchy in (3), contrary to some formulations of the Person Hierarchy, which mark obviation status on 3rd persons. Harmonic alignment results in the markedness hierarchies in (14), where the symbol ≻ is read as 'is more harmonic than'. More harmonic is equivalent to 'less marked'.

(13) Obviation Hierarchy (OH)

Proximate > Obviative

(14) Harmonic Alignment of Hierarchies (=Markedness Hierarchies)

a. Obviation, Relational:
i. Proximate/Subject ≻ Proximate/Object
ii. Obviative/Object ≻ Obviative/Subject
b. Obviation, Thematic:
i. Proximate/Agent ≻ Proximate/Patient
ii. Obviative/Patient ≻ Obviative/Agent
c. Obviation, Animacy:
i. Proximate/Human ≻ Proximate/non-Human
ii. Obviative/non-Human ≻ Obviative/Human
d. Obviation, Discourse:
i. Proximate/Topic ≻ Proximate/non-Topic
ii. Obviative/non-Topic ≻ Obviative/Topic

In Odawa (and Algonquian languages in general) when there are two or more third persons in an 'obviation span' (Aissen 1997), only one can be proximate; all the rest are obviative. The key in choosing which verb form to use in any given context, I propose, is dependent on deciding the obviation status of the argument NPs in that context. As such, the hierarchies under consideration in (14) and the constraints in (15) are solely concerned with this choice. This approach differs from Aissen (1997, 1999a,b, 2001) in particular with respect to the candidate set: The candidates here are all licit syntactic constructions in Odawa. I do not propose constraints that will disqualify, for example, direct clauses with two third persons in which neither is proximate (or in which both are). Despite the fact that this state of affairs does need to be ruled out by the grammar—within either a constraint-based or derivational model—the position here is that ranked constraints operate as an *output filter* against which competing fully grammatical constructions can be evaluated; see (12). This conceptualization of OT is consistent, as far as I can tell, with the position of Broekhuis and Dekkers (2000).

The CONSTRAINT SET is derived from the aligned hierarchies in (14) as formalized in (15) (adapted from Aissen 1997) by inverting the aligned markedness scales in (14) and affixing the 'avoid' operator * and the 'is ranked higher than' symbol », as in the constraint subhierarchies in (15a-h). By assumption, since each Odawa sentence can have only one proximate NP, but numerous obviative NPs, I propose that it is the constraints on proximate assignment that by and large determine verb form choice. As such, these constraints, listed in (16) play the central role in the analysis that follows.

(15) Constraint Subhierarchies

a. *Proximate/Object » *Proximate/Subject

b. *Obviative/Subject » *Obviative/Object

c. *Proximate/Patient » *Proximate/Agent

d. *Obviative/Agent » *Obviative/Patient

e. *Proximate/non-Human » *Proximate/Human

f. *Obviative/Human » *Obviative/non-Human

g. *Proximate/non-Topic » *Proximate/Topic

h. *Obviative/Topic » *Obviative/non-Topic

(16) Constraints

a. *PROX/OBJ (Read: Avoid proximate syntactic objects)

b. *PROX/PAT (Read: Avoid proximate thematic patients)

c. *PROX/nH (Read: Avoid proximate non-humans)

d. *PROX/nT (Read: Avoid proximate non-topics)

The intuition behind the constraints in (16) is that the optimal candidate is the one whose proximate NP violates none of the constraints. In choices between sentences whose proximate NPs all violate at least one constraint, the least marked sentence (and hence the most preferred verb form) will be the one whose proximate NP stands in least violation to the constraint set. This verb form in turn will be used more frequently by speakers. As previously noted, the INPUT into GEN is a verb underspecified with respect to form (direct, inverse) and two NPs. The NPs include features denoting the NPs' animacy, topicality, and thematic roles, with the latter two sets of features determined by the context (the question condition and the stimulus drawing, respectively). The possible combinations of features for any given noun are derived by crossing the relevant hierarchies, as shown in (17). Subject vs. object and agent vs. patient are mutually exclusive. Topic vs. non-topic and human vs. non-human are not (a sentence can have no discourse topic, or at least have two nouns equally topical, and can have two nouns equal in animacy).[6] Thus, possible pairs of arguments in a given direct or inverse transitive clause are derived by crossing (17 1-4) with (17 a-d).

(17) 1. Sub/Ag/T/H

1-4 and a-b are the NPs possible in direct and inverse

2. Sub/Ag/nT/H

3. Sub/Ag/T/nH

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[6] Aissen (1999) discusses the fact that in many languages displaying obviation systems, the thematic role of agent is never assigned to syntactic subjects. This is also the case in Odawa (though see Rhodes 1994 for a dissenting view). As such, Aissen proposes a high-ranked constraint *Object/Agent [*OBJ/AG], whereby the NP featural combinations in (i) are invariably eliminated as optimal candidates. To simplify the tableaux in the present work, I will not include NPs of the type in (i) in the inputs here. An issue which remains unresolved is whether inviolable constraints like this within and across languages are in the same class as more easily violable constraints, such as those given in (16).

(i) NPs ruled out by *OBJ/AG: Obj/Ag/T/H, Obj/Ag/nT/H, Obj/Ag/T/nH, Obj/Ag/nT/nH

4. Sub/Ag/nT/nH
   a. Obj/Pat/T/H
   b. Obj/Pat/nT/H
   c. Obj/Pat/T/nH
   d. Obj/Pat/nT/nH

4.3.2 Candidate set

GEN generates candidate sets consisting of the licit direct and inverse constructions that can be formed by exhausting a given INPUT. In the direct, this means the proximate NP will always be the syntactic subject and thematic agent. In the inverse, the proximate NP will always be the syntactic object and thematic patient. Since the constraints given in (16a, b) penalize proximate objects and patients, it is obvious from the outset that inverse constructions have two strikes against them in all cases. However, since the inverse does occur, and actually does so more frequently than the direct in the Patient Question (PQ) condition when non-human animates are depicted as acting upon humans (A-H), we can assume that the two constraints in (16a, b) are ranked lower than those in (16c, d). If (16a, b) were ranked higher, the inverse would likely never be used. This inherent bias against the inverse in all but the most marked contexts is supported by the inverse's relative rarity in comparison to the direct in Odawa conversation and texts.

Passive constructions have been excluded from the candidate set in the present analysis, in contrast to the original analysis of these data (Christianson 2001a,b). The reason for this substantial change in approach is based on the syntactic fact that in Odawa, no agent NP is allowed in the passive. As such, the two-argument direct/inverse constructions submitted by GEN to EVAL in the present model do not really belong in the same candidate set as one-argument passives (or intransitives) if candidates must meet the criterion of 'lexical equivalence' (Aissen 1997). Müller (2001) also argues for a lexical limitation on the candidate set: Only derivations with identical numerations (in the sense of Chomsky 1995) are in the same candidate set. However, if it is subsequently shown that candidates need only meet the criterion of 'propositional equivalence' (Aissen 1997, Grimshaw 1997), we will need to expand the analysis here to account for Odawa passives, as well as intransitives derived by detransitivizing normally transitive verbs, such as *jiismabnige* 'S/he is pinching'.

4.4 Predictable variation in the production data

4.4.1 Constraint ranking

As discussed previously, the constraints that penalize inverse constructions in all contexts—*PROX/SUB and *PROX/PAT—must be ranked lower than the other two constraints, otherwise inverse constructions would, by assumption, never (or only very rarely) be used. In fact, these two low-ranked constraints are impossible to rank with respect to one another given the data below. Therefore they will remain unranked with respect to one another, as signified with a dotted line in the following tableaux.

Likewise, the two higher ranked constraints—*PROX/ nT and *PROX/nH—cannot be ranked with respect to one another either, as shown in Tableaux 1 and 2. In these tableaux, we observe a situation in which the top two constraints cancel one another out and leave the evaluation outcome to be decided by the two lower automatic violations incurred by the inverse. Recall also that the basic claim of this proposal is that the candidate whose *proximate* NP incurs the least serious violation(s) will be preferred. As such, I will ignore (and shade) the obviative NP's features in the tableaux. They are included only to show the full feature sets comprising each candidate. Each tableau will be labeled according to the experimental condition (GQ, AQ, or PQ), which provided the discourse context for the input. The animacy status of the characters in the line drawing in each context is labeled as follows: H-A signifies human agent and animal patient. A-H signifies animal agent and human patient. H-H signifies two human participants.[7] Finally, the Verb Form % columns reflect the percentages listed in Table 1.

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[7] One drawing, of a dog chasing a cow, was coded as H-H, since the homogeneity of the participants resulted in descriptions patterning with the true H-H drawings.

Tableau 1 PQ: H-A

V{Ag/nT/H, Pat/T/nH}	***Prox/ nT**	***Prox/ nH**	***Prox/ Obj**	***Prox/ Pat**	**Verb Form %**
☞ DIRECT Prox/Sub/Ag/nT/H	*				D 100%
Obv/Obj/Pat/T/nH					
INVERSE Prox/Obj/Pat/T/nH		*	*	*	I 0%
Obv/Sub/Ag/nT/H					

Tableau 2 AQ: A-H

V{Ag/T/nH, Pat/nT/H}	***Prox/ nT**	***Prox/ nH**	***Prox/ Obj**	***Prox/ Pat**	**Verb Form %**
☞ DIRECT Prox/Sub/Ag/T/nH		*			D 97%
Obv/Obj/Pat/nT/H					
INVERSE Prox/Obj/Pat/nT/H	*		*	*	I 3%
Obv/Sub/Ag/T/nH					

Based on these observations, I take the ranking of the four constraints proposed above to be as shown in (18). The commas signal that the two constraints that they separate are unranked with respect to one another. The >> symbol is read as 'are ranked higher than'.

(18) Constraint ranking in Odawa

*PROX/nT, *PROX/nH >> *PROX/OBJ, *PROX/PAT

4.4.2 Invariant production

Along with Tableaux 1-2, Tableaux 3-6 show how the direct form dominates production in most contexts. I will assume that any construction occurring in 5% or less of the responses represents either production errors or decidedly non-standard responses, and that 5% overlap of frequency between constructions signals their equivalence in terms of preference. It should be stressed again that these are production *preferences* not grammaticality *judgments*. All of the constructions included in the candidate set in each tableau are grammatical, and, given any one of a large number of potential intrusions on the production system (an unexpected shift in focal attention or failure to recognize one of the characters in the line drawing, to take two examples), could all be used to describe the drawing in question.

Tableau 3 AQ: H-A

V{Ag/T/H Pat/nT/nH}	***PROX/ nT**	***PROX/ nH**	***PROX/ OBJ**	***PROX/ PAT**	**Verb Form %**
☞ DIRECT Prox/Sub/Ag/T/H Obv/Obj/Pat/nT/nH					D 100%
INVERSE Prox/Obj/Pat/nT/nH Obv/Sub/Ag/T/H	*	*	*	*	I 0%

Tableau 4 GQ: H-A

V{Ag/nT/H, Pat/nT/nH}	***PROX/ nT**	***PROX/ nH**	***PROX/ OBJ**	***PROX/ PAT**	**Verb Form %**
☞ DIRECT Prox/Sub/Ag/nT/H Obv/Obj/Pat/nT/nH	*				D 100%
INVERSE Prox/Obj/Pat/nT/nH Obv/Sub/Ag/nT/H	*	*	*	*	I 0%

Tableau 5 AQ: H-H

V{Ag/T/H, Pat/nT/H}	*PROX/ nT	*PROX/ nH	*PROX/ OBJ	*PROX/ PAT	Verb Form %
☞ DIRECT Prox/Sub/Ag/T/H					D 100%
Obv/Obj/Pat/nT/H					
INVERSE Prox/Obj/Pat/nT/H	*		*	*	I 0%
Obv/Sub/Ag/T/H					

Tableau 6 GQ: H-H

V{Ag/nT/H, Pat/nT/H}	*PROX/ nT	*PROX/ nH	*PROX/ OBJ	*PROX/ PAT	Verb Form %
☞ DIRECT Prox/Sub/Ag/nT/H	*				D 97%
Obv/Obj/Pat/nT/H					
INVERSE Prox/Obj/Pat/nT/H	*		*	*	I 2%
Obv/Sub/Ag/nT/H					

4.4.3 Variability in production

Verb form preferences in certain contexts are not as clear-cut as those shown in Tableaux 1-6, however. Tableau 7 accounts for speakers' preference for the direct over the inverse when the Discourse Hierarchy is crossed with the Thematic Hierarchy, and animacy is held constant (illustrated in (10b)).

Tableau 7 PQ: Homogeneous participants, H-H

V{Ag/nT/H, Pat/T/H}	*Prox/ nT	*Prox/ nH	*Prox/ Obj	*Prox/ Pat	Verb Form %
☞ DIRECT Prox/Sub/Ag/nT/H	*				D 81%
Obv/Obj/Pat/T/H					
☞ INVERSE Prox/Obj/Pat/T/H			*	*	I 18%
Obv/Sub/Ag/nT/H					

We can begin to see here an interesting pattern, which will emerge more clearly in subsequent tableaux: Violations of the two higher ranked constraints by direct candidates are, to varying degrees, 'forgiven' due to the inherent violations incurred by the inverse candidates in all contexts, as represented by the difference in hand-size in the tableaux. Tableaux 8 and 9 show similar effects of context and animacy. Of greatest descriptive interest are the data in Tableau 7 in comparison to those in Tableau 8. In T7, we see that discourse effects alone dampen the general preference for the direct form a bit. In T8 though, the combination of discourse and animacy effectively penalize the direct to such an extant as to make the inverse the clear favorite.[8] Unfortunately, the experimental design only included one A-A drawing (see fn. 7), a larger number of which would be required to test the effects of animacy alone on the verb choice independent of discourse status. The constraint ranking proposed here, however, predicts that responses in an AQ: A(nimal)-A(nimal) condition would pattern similarly to those in T7.

Tableau 9 presents an interesting situation: Given the small number of observations in the GQ: A-H condition (n=37), it is safest to assume that the 59%-41% difference represents a 50%-50% split. The inference, then, is that the two constructions tie on one high ranked constraint, and that violation of the second one by the direct is approximately as costly as the violations of the two low ranked constraints by the inverse. As we shall see in the re-

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[8] The inverse also occurred more than the passive in this context (Christianson 2001a).

mainder of this section, this state of affairs requires a more complex evaluation algorithm than is standardly assumed in the OT literature.

Tableau 8 PQ: A-H

V{Ag/nT/nH, Pat/T/H}	***Prox/ nT**	***Prox/ nH**	***Prox/ Obj**	***Prox/ Pat**	**Verb Form %**
☞ DIRECT Prox/Sub/Ag/nT/nH	*	*			D 16%
Obv/Obj/Pat/T/H					
☞ INVERSE Prox/Obj/Pat/T/H			*	*	I 84%
Obv/Sub/Ag/nT/nH					

Tableau 9 GQ: A-H

V{Ag/nT/nH, Pat/nT/H}	***PROX/ nT**	***PROX/ nH**	***PROX/ OBJ**	***PROX/ PAT**	**Verb Form %**
☞ DIRECT Prox/Sub/Ag/nT/nH	*	*			D 59%
Obv/Obj/Pat/nT/H					
☞ INVERSE Prox/Obj/Pat/nT/H	*		*	*	I 41%
Obv/Sub/Ag/nT/nH					

4.4.4 'Winner-take-most' approach to OT

It is obvious that this approach is not 'standard' OT in at least one major respect. This does not seem to be a winner-take-all situation (hence the difference in hand sizes), although rankings are still critical. Violating one of the highest-ranked constraints does not disqualify the candidate altogether, as long as it does not violate any other low ranked constraints; the high violation simply makes that candidate less likely to be produced.

This picture of OT as being a 'winner-take-most' system is not unprecedented, at least in the application of OT to language processing. In their exploration of OT as a means of comparing models of ambiguity resolution in English, Gibson and Broihier (1998) conclude that a weighted-constraint

English, Gibson and Broihier (1998) conclude that a weighted-constraint approach seems most promising in explaining ambiguity resolution preferences. A weighted-constraint approach is one in which multiple violations of lower-ranked constraints can outweigh single violations of higher-ranked constraints. Gibson and Broihier claim that constraint weighting accounts for relative strength of preferences and garden path effects, and processing overload effects (as with doubly center-embedded sentences). Keller (2000) also finds support in a study of German word order preferences for a constraint-weighting version of OT.

4.4.5 Evaluation algorithm

This winner-take-most situation presented in T7-T9 requires an algorithm for evaluating the candidates with respect to the constraints they violate that is more complex than the one employed in standard OT. While an explicit algorithm is necessary—perhaps along the lines of a constraint-weighting system—its exact specification turns out to be somewhat problematic. Asudeh (2000) argues that it is both conceptually and practically difficult to expect the grammar—OT or otherwise—to predict frequency of occurrence in any corpus. Aside from learnability issues (see Asudeh for a full discussion), frequency of use must be mediated by performance issues. However, since I have proposed that the hierarchies discussed here comprise a major portion of performance considerations, we should be able to define roughly the manner in which various constellations of constraint violations affect the choice between the two candidates examined here. The performance of the algorithm, however, will certainly be mediated by lower-ranked constraints not considered here (for example, *OBV/SUB). More difficult to incorporate into this sort of model for production are non-hierarchical performance issues (such as focal attention, schematic oddity, age differences in the Odawa language community with respect to inverse use, etc.), as well as the fact that in the mixed-animacy conditions, we have a small number of observations per condition.

The assumption with which I begin is that each candidate has an equal chance of being used most frequently before the introduction of the relevant variables (NP ranks on the various hierarchies). For each constraint violation that any given candidate incurs, that candidate loses some proportion of the probability that it will be the favorite (call this its 'probability strength'). Candidates lose a higher proportion of this probability strength when they violate either of the higher-ranking constraints, less when they violate lower-ranking ones. The inverse, by virtue of its inherent violations of the two low ranked constraints *PROX/OBJ and *PROX/PAT, automatically loses some proportion of its probability strength in each evaluation. Thus far, the data observed here appear to behave according to a weighted-constraint system. In addition, however, it appears that when one candidate violates a given constraint, and the other does not, the non-offending candidate receives some portion of probability strength lost by each offending candidate. If one candidate violates a constraint, the non-offending competitor assumes some portion of the offending candidate's lost probability strength. This conceptualization of OT EVAL is consistent with processes assumed to be operative in other cognitive domains. For example, memory theory seeks to capture this same sort of 'compensatory dynamic' between candidates as their activation levels increase and decrease in relation to each other as modulated by formal constraints (and environmental 'noise'). The Boltzmann Equation has been used as one such memory model (Anderson and Lebiere 1998). Research is planned to investigate the applicability of this model to the results observed here.

4.5 Deriving variability within OT

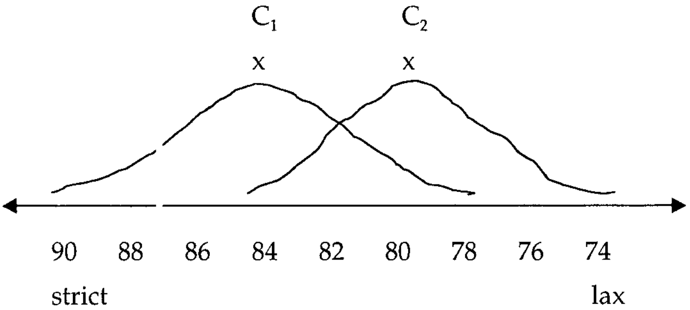
Variability, whether in language processing or in grammaticality judgments, is something which neither OT nor derivational approaches (e.g., the Minimalist Program) handle very well (Broekhuis and Dekkers 2000). Very recently, however, the thorny issue of variability and gradient well-formedness has been addressed in the work of Asudeh (2000), Bresnan and Deo (to appear), Hayes (2000), Keller (2000), Keller and Alexopoulou (2001), and Müller (1999, 2001 and the references cited therein), among others. The variability inherent in production data is notorious: Ever since Chomsky's (1959) seminal review of Skinner's (1957) foray into language, linguists and psychologists alike have admitted that it is impossible to predict what people will say in any given context, even under relatively controlled conditions. Nevertheless, admitting that variability exists in performance systems (and competence systems), perhaps OT can in principle capture—and even predict—the patterns which emerge out of the variability with only slight modification to the theory.

The data and analysis so far present a descriptively important and theoretically interesting question: Why is it that in some situations the violation of one constraint results in a sharp reduction in preference, while in others, the same construction's violation of an equally high-ranked constraint has a smaller effect? Take for example, Tableau 7 in comparison to Tableau 9. In T7, the direct candidate violates one of the high ranked constraints, and the inverse incurs only the two (automatic) violations of the low constraints. In T9, the direct and inverse tie on one high-ranked constraint, and the direct violates the other one. The unexpected results are that the violation of *Prox/nT in T7 only minimally impacts the prevailing preference for the direct; whereas violation of *Prox/nH in T9, along with what should be a tie on the other high ranked constraint, basically drops the direct into a dead heat with the inverse. One option, ranking *Prox/nH higher than *Prox/nT does not seem like the correct solution, as it would be inconsistent with the more general evidence of the equal ranking of the two constraints (compare T1 and T2 with T6). In the next subsections, I explore the idea of Stochastic OT to help account for the puzzle posed by T7 and T9. I follow Asudeh (2000), and especially Bresnan and Deo (to appear), whose proposal for the stochastic evaluation of candidates I will first summarize.

4.5.1 Stochastic OT

The intuition of Stochastic OT, as described in detail in Bresnan and Deo (to appear), is that constraints are ranked on a continuous scale of real numbers, rather than on a simple ordinal scale. This assumption makes it possible to posit that constraint values can vary slightly from one evaluation to the next. In other words, the value a constraint has in the grammar "is the mean of a normal distribution or 'bell curve' of variant values that it has when applied in evaluations" (Bresnan and Deo, p. 7), as illustrated in Figure 1 (Bresnan and Deo, Figure 6).

Figure 1: Relation of two constraints (C_1, C_2) under stochastic evaluation



The point of overlap in the two curves equals the amount of potential overlap there is in the two constraints. Obviously, the closer two constraints are ranked on the ordinal scale, the more they will overlap; if two constraints are ranked far apart on the scale, they will not overlap at all.

Constraints unranked with respect to one another, e.g., *Prox/nT and *Prox/nH, are assumed to be so close on the scale that all or practically all of their curves overlap. Another take on this situation is found in Hayes (2000), who proposes a mechanism of *strictness bands* to account for variability in well-formedness judgments in phonology. As far as I can tell, Hayes's approach and Stochastic OT differ only in their technical details.

4.5.2 Stochastic evaluation of the Odawa data

Returning to Tableaux 7 and 9, imagine that the two higher ranked constraints [*Prox/nT, *Prox/nH] are C_1 and C_2 on the scale schematicized in Figure 1, with nearly total overlap in their distributions, since they are unranked with respect to one another. Next, assume that the two low-ranked constraints stand in a similar relation to one another on the lower end of the ordinal scale in Figure 1. Now consider a situation where the direct's violation of *Prox/nT in T7 is at the lowest end (least costly) of its curve, and its violation of *Prox/nH in T9 is at the highest end (most costly). At the same time, the inverse's violations of the two low-ranked constraints in T7 are at the high end (most costly) of their curves, but at the low end (least costly) in T9. Depending on the amount of 'wiggle room' afforded the constraints in Stochastic OT (i.e., how large the normal distribution of the variant values of each constraint actually is), variation in language processing (and gradience in grammaticality judgments) may find an elegant solution in this framework. Of course the danger is that this latitude in constraint strength and ranking will prove to be so powerful that it provides an explanation for just about any unexpected data.

5.0 Residual questions

5.1 Empirical questions

Several empirical language-specific issues remain to be addressed in future research. First, can the Animacy Hierarchy be articulated further, say with respect to gender (natural and/or grammatical) or age? If so, the present analysis should extend to intransitive constructions and ones with both animate and inanimate arguments. Second, what role might nonlinguistic factors play, such as focal attention? Might focal attention act to increase, decrease, or eliminate the assignment of certain features to NPs? For instance, if attention is drawn away from a human patient by an odd, amusing, or remarkably human-like animal agent, might the animacy ranking of the animal be boosted (and perhaps that of the human depressed)? The experimental paradigm used by Tomlin (1997), in which people described video clips in which one of the participants was blinking in order to attract attention, might prove helpful in answering this question. Third, what role, if any, does definiteness play? The data presented here have yet to be analyzed with respect to definiteness, but it may turn out that there is a definiteness hierarchy at work as well, perhaps *definite* > *indefinite*, which can be aligned with the Obviation Hierarchy on par with the other hierarchies discussed here. Fourth, does this type of data collection merit more widespread use outside the realm of psycholinguistics proper, as attempted here? Keller (2000) found the informal grammaticality judgment of native speakers unreliable in his examination of word order preferences in German. And, as noted above, the intuitions of native Odawa speakers were unreliable in one crucial condition: Two speakers reported that there should be no effect on verb form in H-A or A-H conditions. Had I taken their word for this, the additive effects of discourse status and animacy on verb form choice would still be mysterious. Fifth, this interaction of animacy *and* discourse on verb form choice points to a necessary refinement in descriptive and functional accounts of the inverse (at least in Algonquian languages). Givón (1994) calls the inverse a grammaticization of topicality, and Rhodes (1994) attributes direct/inverse choice to discourse status of the NPs. But, as we have seen, topicality/discourse status is only one factor in verb form choice. As such, Richards's (2000) description of the inverse as a reversal of the 'centrality' of the argument NPs, as determined by their relative position on the hierarchies investigated here, would appear to be more accurate.

Finally, a very large, and in my opinion fascinating, question is how to account for the free word order in Odawa and other nonconfigurational languages. As pointed out in fn. 4, Odawa allows all logical word orders with all verb forms, as well as *pro*-drop of either one or both arguments. If we take at least some facets of linear order to depend on some post-syntactic module of the grammar—perhaps at the interface with Phonological Form (see the discussion of linearization in Chomsky (2000) or Uriagereka (1998) and the references cited there)—it is easy to imagine how the various orders could be derived within OT constraint satisfaction. This question becomes especially interesting if linearization in Odawa is determined by factors which we have seen ranked on the hierarchies investigated here, including the (arguably) non-syntactic ones, such as animacy and topicality, rather than exclusively by the syntax (cf. Fuller 1981).

5.2 Theoretical questions

Two major theoretical questions immediately arise from this sort of research. First, what are these hierarchies? Where in the grammar are they represented? As instantiations of universal markedness tendencies, it seems that they should be part of UG, but is also apparent that different hierarchies 'live' in separate sub-modules of the grammar: The Relational Hierarchy is surely syntactic; the Discourse Hierarchy appears pragmatic, although could be seen as syntactic, at least in part (e.g., Kiss 1995, Horvath 1995); the Animacy Hierarchy is semantic, but may have a syntactic aspect if observed asymmetries in the acceptability of animate and inanimate subjects in certain constructions (e.g., Rhodes 1994) are accurate; the Thematic Hierarchy is semantic as well, but it must interface with the syntax. The Obviation Hierarchy is arguably a subhierarchy of the Person Hierarchy and is at least in part syntactic, but may also be argued to operate in some morphological module of the grammar. Perhaps these hierarchies are not even part of the grammar, as Asudeh (2000: fn. 35) notes, but rather cognitively/functionally motivated constraints on the possible range of human language grammars.

Second, if constraint ranking and satisfaction can account for cut-and-dried grammaticality and ungrammaticality, and at the same time account for preference patterns in language processing, does this imply that the grammar equals the processor (cf. Stevenson and Smolensky 2001)? If so, do grammar-learning and preference-learning proceed concurrently? Are they one and the same process? Drawing the line between the grammar and the processor, between competence and performance, would become difficult if the answer to these questions were to be found to be affirmative.

6 CONCLUSION

I have proposed an analysis of variability in production in the 'nonconfigurational' Algonquian language Odawa. In doing so, I have demonstrated the role played by various hierarchies at work in the language, and shown how these hierarchies interact to explain the frequencies with which certain constructions occur in various contexts. In doing so, I have employed experimentally controlled data collection, which is not commonly done in formal linguistics, and a version of Optimality Theory which, although technically 'non-standard,' is consistent with recent work on language variation and variation in the evaluation function of the theory. As a result, several issues—both empirical and theoretical—have been raised for future research.

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