

Underspecification of Cognitive Status in Reference Production: Some Empirical Predictions

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Abstract

Within the Givenness Hierarchy framework of Gundel, Hedberg, & Zacharski (1993), lexical items included in referring forms are assumed to conventionally encode two kinds of information: conceptual information about the speaker's intended referent and procedural information about the assumed cognitive status of that referent in the mind of the addressee, the latter encoded by various determiners and pronouns. The current work focuses on effects of underspecification of cognitive status, establishing that, while salience and degree of accessibility play an important role in reference processing, the Givenness Hierarchy itself is not a hierarchy of degrees of salience/accessibility, contrary to what has often been assumed. We thus show that the framework is able to account for a number of experimental results in the literature without making additional assumptions about form-specific constraints associated with different referring forms.

1. Introduction

Underspecification may be a property of the lexically encoded content of an expression or of the interpretation of that expression in a given context of use. For example, the pronoun *it* in (1) is lexically underspecified for conceptual content. However, the addressee's interpretation of this expression would most likely be fully specified as the scarf introduced in the first sentence.

(1) Your scarf is beautiful. It looks great on you.

Within the Givenness Hierarchy theory of Gundel, et al. (1993), the relation between (under)specification of lexically encoded meaning and (under)specification of representations associated with the interpretation of a referring expression is partly accounted for by the assumption that lexical items in referring forms conventionally encode two kinds of information, descriptive information about conceptual content of the speaker's intended interpretation and procedural information about the assumed cognitive status of that interpretation in the mind of the addressee. Thus, the fact that the lexical item *it* explicitly encodes the procedural information that the referent is in the addressee's current focus of attention compensates for the lack of conceptual content encoded by this form. It thereby facilitates processing, allowing the addressee to associate a fully specified interpretation of the speaker's intended referent as the scarf mentioned in the immediately preceding sentence. Since the scarf was introduced in a syntactically prominent (and therefore salient) position, it would most likely be the only entity in focus at the point when the form *it* is encountered.¹

¹Use of a form that is fully specified for procedural information does not always result in a fully specified interpretation. For example, as discussed in Poesio, Sturt, Artstein, & Filik 2006, the interpretation of *it* in (i)

Both conceptual information and cognitive status information can be underspecified.² For example, a speaker who wants an addressee to hand her a Macintosh apple that is on the counter could utter (2).

(2) Please hand me the apple that's on the counter.

Even though the lexical item *apple* is conceptually underspecified for whether or not it is a Macintosh apple and *the* is procedurally underspecified for whether the referent is in the addressee's current awareness, the reference would still succeed in context (3i) below. This is so because determiner *the* encodes the information that the addressee is to associate a unique representation with the speaker's intended referent, and the conceptual content encoded by *apple that's on the counter* allows this because a Macintosh apple is an apple.³ The reference would not succeed, however, in context (3ii), because this situation does not allow the addressee to associate a unique representation with the phrase *the apple that's on the counter* which matches the speaker's intended referent.

- (3) i. There is only one apple on the counter, which is a Macintosh.
ii. There are two apples on the counter, a Macintosh and a Granny Smith.

However, if the speaker had uttered either (4) or (5) instead of (2), the reference would succeed in both context (3i) and context (3ii).

- (4) Please hand me the Macintosh apple that's on the counter.
(5) Please hand me a Macintosh apple that's on the counter.

(4) succeeds because the conceptual content of the intended referent is adequately specified by *Macintosh apple that's on the counter* and the addressee could associate a unique representation because there is only one Macintosh apple on the counter. (5) succeeds because even though the

remains underspecified since it could be either Engine 2, the boxcar in Elmira, or the composite of the boxcar and the engine; however, the underdetermination/underspecification is unimportant for the communicative purpose here because if Engine 2 has been hooked up to the boxcar in Elmira, the result of sending the referent of *it* to Bath will be the same under either interpretation.

- (i) Hook Engine 2 up with the boxcar in Elmira and send it to Bath.

²We consider the lexically encoded content of a nominal expression to be underspecified if a property of the intended interpretation is not fully encoded in the form. It should be noted that conceptual content is in this sense always underspecified since there is no upper bound on the amount of conceptual content that can be encoded. As will be shown below, this is not the case with encoded information about cognitive status, which is considered to be fully specified just in case the form that is used explicitly encodes the highest cognitive status of the intended interpretation, as is the case with *it* in example (1).

³ This account further assumes interaction of linguistic knowledge with more general pragmatic/cognitive principles. Thus, in (2), the relevance-theoretic assumption (Sperber and Wilson 1986/95) that the addressee will assign the first interpretation that provides adequate contextual effects without undue processing effort results in an interpretation where the addressee associates a representation of an apple and counter in his current perceptual environment rather than searching memory for some other unique representation that satisfies the constraints imposed by the conceptual content encoded in the form. See Gundel (1996) for further discussion.

cognitive status encoded in the determiner *a*, unlike that encoded by *the*, is underspecified for whether or not the addressee is to associate a unique (and therefore specific) referent, it does not exclude this possibility, as it only requires that the referent match the description, that it be of the appropriate type; and anything uniquely identifiable is also type identifiable.

In this article, we focus on effects of underspecification of procedural information about cognitive status encoded by pronouns and determiners. We begin in §2 with a summary of the Givenness Hierarchy and some of its predictions, establishing that while salience plays a role in reference production and interpretation, the Givenness Hierarchy itself is not a hierarchy of degrees of salience or accessibility. We then turn in §3 to a discussion of some results in the experimental psycholinguistic literature on how different referring forms are interpreted, showing that the Givenness Hierarchy and its predictions, in conjunction with independently motivated pragmatic/processing principles, makes possible a principled explanation of these results. Finally, in §4, we summarize our arguments and conclude.

2. The Givenness Hierarchy

The major premise of the Givenness Hierarchy theory (Gundel et al., 1993) is that different determiners and pronouns encode, as part of their conventional meaning, information assumed by the speaker about the cognitive status of the intended referent in the mind of the addressee. The hierarchy defines an implicational relationship among six cognitive statuses, as shown in (6), along with the forms hypothesized to encode each status in English.⁴

(6) Givenness Hierarchy

in focus > activated > familiar > uniquely identifiable > referential > type identifiable

{*it*} {*that, this, this N*} {*that N*} {*the N*} {indefinite *this N*} {*a N*}

Forms that encode statuses on the hierarchy help guide the addressee in identifying the intended interpretation, by providing procedural information about where and how a mental representation of the referent is to be accessed, as described in (7).⁵

(7)			
<i>it</i>	associate representation in focus of attention		(in focus)
<i>this/that/this N</i>	associate representation in working memory		(activated)
<i>that N</i>	associate representation in memory		(familiar)
<i>the N</i>	associate unique representation with NP	(uniquely identifiable)	
indefinite <i>this N</i>	associate unique representation		(referential)
<i>a N</i>	associate type representation		(type identifiable)

⁴ Gundel, Hedberg, & Zacharski (1993) and Gundel, Bassene, Gordon, Humnick, & Khalifaoui (2010), inter alia, discuss applications of the theory to other languages.

⁵ As discussed in Gundel 2010, p. 153, the ontology of mental states embedded in the Givenness Hierarchy is a ‘folk psychological theory’ intended to explain human linguistic behavior, specifically the production and interpretation of different referring forms. The extent to which these folk psychological states correspond to the actual structure of human memory and to such mental states as (focus of) attention, working memory and familiarity discussed in the vast scientific literature on this topic remains an empirical question and is beyond the scope of this paper.

A speaker, in producing a particular determiner or pronoun, thus provides a processing signal to the addressee that helps restrict the set of possible referents. The rightmost status on the Givenness Hierarchy, the lowest one, restricts this set the least, and the leftmost status, the highest one, is most restrictive. Thus, the indefinite article in English only signals that the addressee is expected to identify the type of thing described. For example, in (8a), the indefinite article *a* in *a new scarf* signals that the addressee is to associate an appropriate type representation with the property of being new and a scarf. The pronominal *it* in (8b), however, restricts possible referents to those that are currently in the addressee's focus of attention.

- (8) a. I bought a new scarf.
b. It was on sale.

2.1. The Givenness Hierarchy as an Implicational Scale. The Givenness Hierarchy has often been misunderstood as a scale of degrees of accessibility similar to those proposed by Givón (1983) and Ariel (1990). It is, however, fundamentally different from these other referential hierarchies, both with respect to the role accessibility plays (or does not play) in the theory and in the kinds of assumptions and predictions it makes. Cognitive statuses on the Givenness Hierarchy are part of what Horn (1972) calls an 'implicational scale', a set of items of the same constituent class, ordered in terms of their degree of informativeness, as in (9).

- (9) all > most > many > some

Each item on the scale entails items to its right. Thus, (10) entails (11a-c).

- (10) All first year students came to the orientation.
(11) a. Most first year students came to the orientation.
b. Many first year students came to the orientation
c. Some first year students came to the orientation.

Use of a less informative (entailed) form gives rise to a special kind of pragmatic inference called an 'implicature', following Grice (1975). Thus, (11a-c) implicate that (10) is not true. If it were, the speaker would have uttered (10) instead of (11a-c).

The important point here is that such implicatures arise only in contexts where the information provided by the stronger form (*all* in this case) is relevant. For example, (11c) would not necessarily implicate that (10) is not true in a context like that in (12).

- (12) (Context: all first year students came to the orientation.)
Speaker A: If any first year students came to the orientation, we'll get reimbursed for the food.
Speaker B. Some first year students came to the orientation.

Such examples show that the quantifier *some* does not conventionally encode the meaning 'not all'; it is simply underspecified for the property 'all'. The Givenness Hierarchy works in the same way. Anything in focus is necessarily activated (in working memory), anything activated is

necessarily familiar (in memory); and so on. Forms that signal a particular cognitive status as part of their conventional meaning are thus underspecified for higher (entailing) statuses; they do not exclude them.

As with use of *some* implicating ‘not all’, forms lower on the Givenness Hierarchy are frequently used to implicate that a higher status does not obtain. Thus, use of pronominal *that*, which explicitly encodes the status ‘activated’, often implicates that the referent is not in focus. An example is given in (13), where the referent of *that* is taken to be the activated but not in focus closet. Use of *it* here could only mean the in-focus kitchen.

- (13) ...going on back from the kitchen then is a little hallway leading to a window, and across from the kitchen is a big walk-through closet. On the other side of that is another little hallway leading to a window. [Personal letter]

Similarly, the English indefinite article *a*, explicitly signals only that the referent is type identifiable, and this in turn typically implicates that the referent is not uniquely identifiable and therefore also not familiar and so on, as shown in (14), where both the first and second occurrence of *a student* implicate that the referent is not uniquely identifiable to the addressee.⁶

- (14) I met a student before class. A student also came by after class.
[Adapted from Hawkins 1991]

However, there is ample evidence that non-familiarity (or non-unique-identifiability) is not part of the conventional meaning of the indefinite article. This would be expected if forms that encode a particular status are underspecified for higher statuses, as we claim, rather than excluding them. For example, the non-familiarity implicature of the second occurrence of *a student* in (15) can be cancelled without contradiction, as in (15).

- (15) I met a student before class. A student also came by after class. In fact, it was the same student I had seen before.

And in cases like (16), the non-familiarity implicature simply does not arise, as specification of the higher status is irrelevant.

- (16) I met with my student, Bill Martin, this morning. Since I already had one meeting with a student today, I’m going home.

For some scalar items, underspecification rarely, if ever, leads to the implicature that information encoded by an entailing form does not obtain. Gundel et al.(1993) propose that this is the case for the definite article *the* in English and other languages, for two reasons. First, the

⁶ Note that use of the indefinite article ‘a’, which only instructs the addressee to identify the appropriate type, does not implicate ‘not referential’. The scalar implicature associated with this form ‘skips over’ referentiality, because the English form that explicitly encodes this status, indefinite ‘this’ (e.g. ‘I boarded the bus, and this woman ...’) is restricted to colloquial speech, and is thus not available for signaling the stronger, referential status in other registers (but cf. Hedberg, et al., 2009 and Chiriacescu, & von Heusinger, 2010 for discussion of different facts in languages which explicitly encode referentiality in all registers).

most frequent (and therefore stereotypical) instances of uniquely identifiable referents are uniquely identifiable because they are familiar, and often also activated.⁷ Second, given the explicit information that the referent is uniquely identifiable, along with the conceptual content encoded in the NP, information about higher statuses is often unnecessary for identifying the speaker's intended referent, especially given independent pragmatic principles that favor the interpretation that involves the least processing effort (see footnote 3). Phrases with the definite article *the* thus frequently underspecify the cognitive status of the intended referent, as in (17) – (19).

(17) Mr. Clinton appeared to step on Mr. Bush's dog, Millie, momentarily, then bent down to pet the famous Springer Spaniel.

(18) A1: You've only known the dog how long did you say?
B1: Well, about a year, I guess.
A2: Oh well. Is it, uh, how old is the dog? [Switchboard]

(19) I have a dog and a cat. The dog has been with me for ten years.

In some cases, like (17), using a full noun phrase instead of a pronoun allows the addressee to add additional descriptive information. In others, like (19), it allows the speaker/writer to include conceptual content crucial for disambiguating between two potential referents which are both in focus. In all three examples, using the determiner *this* or *that*, although licit, would provide more information about cognitive status than necessary. The Givenness Hierarchy thus constrains the forms that can be used to refer to an entity in a given context, but cognitive status is not the sole determinant of what form is used.

In sum, use of a form does not entail that the cognitive status associated with a stronger form does not hold. On the other hand, a particular form may be chosen in order to implicate that a stronger form would not apply in the given context. The selection of forms thus follows from interaction of the Givenness Hierarchy with general cognitive/pragmatic principles and processes that govern language use (Grice, 1975; Gundel & Mulkern, 1998; Sperber & Wilson, 1986/95; Gundel, 2010).

2.2. Why the Givenness Hierarchy is not an accessibility/salience scale. As noted in the previous section, since the Givenness Hierarchy is an implicational scale, the statuses are not mutually exclusive. Because each status entails all lower statuses and forms are simply underspecified for higher statuses, referents of forms that explicitly encode a particular status also have all lower statuses and may even have a higher status. Moreover, cognitive statuses on the hierarchy encode procedural information about manner of accessibility (how and where a referent is to be accessed); they do not encode information about degree of accessibility. These features distinguish the Givenness Hierarchy from the Accessibility Hierarchy of Ariel (1990), which directly posits that forms that are higher on the hierarchy are associated with a greater degree of referent accessibility than forms that are lower on the hierarchy.

To show this, we could look at the upper bound of each status, for example comparing the accessibility of referents that are at most familiar in a given context (familiar but not

⁷ Explanations appealing to stereotypicality have also been suggested for why, for example, 'if' does not implicate 'not if and only if' (Atlas, & Levinson, 1981).

activated) with referents that are at most uniquely identifiable (uniquely identifiable but not familiar). Since the Givenness Hierarchy does not posit that different forms encode (or are otherwise necessarily associated with) different degrees of accessibility, it does not predict that referents attaining the higher status are necessarily more accessible than referents attaining the lower status. To arrive at a speaker's intended interpretation of a definite article phrase, which must yield a unique representation, the listener will have to process the conceptual and/or procedural meaning encoded in the phrase (which would have to be done in processing any expression), and doing so could yield a unique representation if the phrase encodes sufficient conceptual content. However, to process a phrase headed by the determiner *that*, if the referent is familiar, but not activated, the listener will also have to retrieve an existing representation of the referent from memory. Although we know of no experimental literature that addresses the issue, we expect that it would be easier to only process the encoded conceptual and procedural meaning, assuming this results in a unique representation, than to also search memory for an appropriate referent, since searching memory requires extra time and effort.

Example (20), from Gundel, Hedberg, & Zacharski (2001), illustrates a case where the addressee might not bother to search memory for a familiar referent since it could be adequate to simply create a new representation based on the information encoded in the nominal phrase.

- (20) 'At one point, the hijacker fired a shot inside the cockpit, perhaps accidentally,' one of the three pilots aboard said.... [14 sentences later] 'Those aboard the plane did not get a good look at the hijacker, because when he stood up, he told everyone to hide their faces in their laps and not look at him; then he walked to the cockpit,' passengers said in radio reports. [Hijacker Leaps to Safety After Robbing Passengers, Oliver Teves, Associated Press, 25 May 2000]

At the second mention, the cockpit is already familiar because it had been mentioned 14 sentences earlier. But there is no reason to think that it is easier for the reader to access an existing representation of that referent from memory than to simply create a new unique representation by way of "bridging" to the activated airplane (Clark & Haviland, 1977, Prince, 1981). The new representation is thus arguably more accessible than the representation in memory, since less effort would be required to arrive at it. However, the cognitive status that applies—uniquely identifiable—is lower on the hierarchy than the status of the representation in memory—familiar.

Similarly, in a newspaper story we coded for this article⁸, we found that the most frequent case of underspecification of cognitive status was with definite article phrases (at least uniquely identifiable) whose referents were coded as at most familiar, 23 out of 66 definite article phrases (34.8%). For example, both annotators coded the phrase *the Labor Department* in (21) as familiar, because we judged that most readers would have prior knowledge of the existence of a US government department with that name. But it is likely that readers will not bother to access their existing representation of the referent, since a unique representation can be constructed based solely on the information encoded in the phrase and the inference that the relevant Labor Department would be one associated with the United States. It would involve more processing

⁸ Referents of nominal phrases in the first 50 paragraphs of a randomly selected New York Times article were coded for cognitive status by two of the authors, following the cognitive status coding protocol of Gundel et al. (2006). The coders agreed on 164 of 189 tokens coded. The kappa agreement was .7975. Only tokens agreed upon by both annotators were analyzed.

effort than necessary for them to retrieve an existing representation from memory.

- (21) On average, only two-thirds of unemployed people received state-provided unemployment checks last year, according to the Labor Department. [The New Poor, Peter S. Goodman, The New York Times, February 21, 2010]

A similar point can be made with indefinite article phrases that we coded as at most referential (20 out of 48), but where simply identifying the type could be sufficient to understand what is being communicated. An example is shown in (22), where both annotators coded the phrase *a federal extension* as referential, but there is no need to conclude that readers will necessarily bother to create a representation of a new referent (the federal extension that resulted in Ms. Elson's unemployment check being restored), rather than simply processing the conceptual content and thereby constructing an appropriate type representation.

- (22) Twice, Ms. Eisen exhausted her unemployment benefits before her check was restored by a federal extension. [The New Poor, Peter S. Goodman, The New York Times, February 21, 2010].

Again, we can reason that upon encountering an indefinite noun phrase, the listener/reader must process its encoded conceptual and procedural content, which would have to be done in processing any nominal expression. This is all that needs to be done for an indefinite article phrase that is at most type-identifiable. To interpret the phrase as referential, additional work is required in that a unique representation of the referent must also be created by the time the whole sentence is processed. Thus, the interpretation of an at most type-identifiable phrase is arguably more accessible than that of a referential phrase since it is easier to process, although 'type identifiable' is lower on the Givenness Hierarchy than 'referential'.

3. Psycholinguistic experiments relevant to the Givenness Hierarchy.

In recent years, several researchers have argued that forms like demonstrative pronouns (Brown-Schmidt, Byron, & Tanenhaus, 2005; Kaiser & Trueswell, 2008) and indefinite article phrases (Masharov, 2008) do not simply encode lower degrees of salience than personal pronouns and distal demonstrative/definite article phrases, respectively. These authors propose that their results support a form-specific, multiple-factor account of constraints on the use of these forms. We will argue that the Givenness Hierarchy, because it is an implicational scale of manner of accessibility rather than a hierarchy of degrees of accessibility/salience, is not only consistent with the experimental results reported in these works, but contributes to a principled explanation for them, without requiring formulation of form-specific constraints beyond the cognitive status information and person/number/gender constraints encoded in the referring expressions.⁹ We begin our discussion with Masharov's findings regarding indefinite article phrases because they

⁹ It should be noted that the experiments discussed in this section all measure comprehension. While the focus of our article (like that of this volume) is on production, we believe that facts about comprehension inform our understanding of production in as much as both are constrained by the same underlying 'competence', in this case knowledge of which forms encode which statuses on the Givenness Hierarchy. Production and comprehension may also be related by probabilistic interpretation biases about forms produced in particular contexts (see Kehler, et al., 2008, p. 140 for further discussion).

clearly illustrate the effect of underspecification with respect to the Givenness Hierarchy.

3.1. Masharov: Indefinite article phrases. Masharov (2008) investigated the behavior of English determiners, *a*, *the*, and *that*, through a series of referent selection, scene verification and eye-tracking experiments. In the first three experiments, which will be the focus of the discussion here, participants selected a referent in response to an auditory instruction by clicking on an item on a screen at the same time as their eye movements were recorded. Participants were presented with a screen with drawings of 16 objects in a 4 x 4 grid, and were instructed to respond to a series of three instructions. For example, experiment 3 included the sequence of instructions in (23):

- (23) a. Click on the heart above the lemon.
- b. i. <blank>
OR
ii. Now look at the cross.
OR
iii. Now click on the broom.
- c. i. Now click on that lemon.
OR
ii. Now click on the lemon.
OR
iii. Now click on a lemon.

Thus, an example input was, “Click on the heart above the lemon. Now click on the broom. Now click on the lemon.”

In experiment 1, the instruction in (c) referred to an entity of the same type as the theme of (a), a heart; in experiments 2 and 3, the instruction in (c) referred to an entity of the same type as the goal of (a), a lemon. In 1 and 2, two hearts or lemons were given on the screen and in 3, three lemons were given on the screen. Masharov reasoned that in the ‘click’ instruction of (b) (b.iii), a new referent would be added into the discourse model, thus decreasing the salience¹⁰ of the entities mentioned in (a). In the ‘look’ instruction (b.ii), it was always the cross that was referred to and the cross was the item always used in calibrating the eye-tracker with a ‘look at’ instruction. Since the cross could not be clicked on, Masharov assumed that it did not introduce a discourse referent, but that it would still decrease the salience of the entities mentioned in (a) more than would the ‘blank’ instruction (bi).

Abstracting over details, the overall proportion of selecting in (c) an item referred to in (a) (the mentioned lemon) as opposed to an unmentioned item (one of the other lemons) was greater for *that N* than for *the N*, and least for *a N*, with the largest proportion of mentioned items in the ‘blank’ condition and the least in the ‘click’ condition. Approximate percentages of mentioned referent selection with different intervening material conditions from the bar graphs for Masharov’s Experiment 3 are shown in the table in (24). For example, *a N* was taken to refer to the mentioned item 75% of the time in the ‘blank’ condition but only 42% of the time in the

¹⁰ We follow Masharov in using the term ‘salience’ for the activation status of a referent independent of linguistic reference, and use ‘accessibility’ for the activation status of a referent in relation to a referring expression.

‘click’ condition.

(24) Percent mentioned referent choice, Experiment 3 (estimated from Masharov, p. 75, Figure 3.2)

Target Form	Intervening Material Condition		
	Blank	Look	Click
that N	97%	88%	83%
the N	83%	80%	64%
a N	75%	50%	42%

The eye-tracking data mirrored the results of the behavioral data. Masharov had expected these differences for the three forms and notes that they support a salience hierarchy account (such as, according to him, the Givenness Hierarchy of Gundel, et al., (1993)). However, the results of the ‘*a N*’ condition surprised him because this form also showed a strong preference for the mentioned entity as referent, even though this preference was smaller than with the other two forms. He concludes from this data that the hypothesis, which he takes to be predicted by the Givenness Hierarchy framework, that indefinite article phrases will only be used for non-mentioned—i.e. ‘new’—entities, is disconfirmed by his findings, suggesting instead that the behavior of *a N* should be explained as resulting from a form-specific constraint that gives the indefinite article an existential *any* interpretation.

A fourth experiment involving a scene verification judgment task in response to narrative discourse confirmed the results of the other three experiments. Masharov concluded again that it disconfirms the Givenness Hierarchy because participants responded close to 100% of the time that *a N* sentences matched scenarios in which a previously mentioned item had moved, and that the experiment thus argues for a form-specific constraint.

Masharov thus observed that indefinites can refer to previously mentioned, seemingly salient entities. This contradicts the commonly held view that indefinites introduce a new (and thus non-salient) referent (e.g. Heim, 1982), which would also be predicted by a strict salience hierarchy interpretation that requires *a N* phrase referents to be low in salience. However, the Givenness Hierarchy differs from such accounts. Due to its implicational nature, the hierarchy does not predict that the indefinite article always introduces a new, and therefore non-salient referent, as this form is simply not specified for statuses higher than type identifiable; it does not exclude them. It does, however, predict Masharov’s results that the indefinite article is less likely to refer to an already salient entity than the definite article and demonstrative determiner because it only requires that the referent be type identifiable. The Givenness Hierarchy thus allows a principled explanation of Masharov’s findings without appealing to additional ‘form-specific’ constraints. This is in contrast with accounts that specifically associate low accessibility with referents of the indefinite article or (as with Ariel’s Accessibility Hierarchy) do not include this form on their hierarchy at all.

One thing that remains to be explained, however, is why such a high proportion of interpretations of the *a* phrase in the test sentence in (c) were taken to be coreferent with the item mentioned in (a) rather than one of the other items in the array whose conceptual content fits the conceptual content encoded in the phrase, e.g. that it is a lemon. A Givenness Hierarchy account of these facts would go as follows: Both the item mentioned in the lead-in sentence in (a) (e.g., the referent of *the lemon* in ‘Click on the heart above the lemon’) and the other item(s) in the array which are of the same type would be activated at the beginning of the instruction in (a),

since all are in the perceptual environment. None of them would necessarily be in focus at the end of (a), however, since none has been mentioned in a syntactically prominent position.¹¹ Thus, the Givenness Hierarchy account, contrary to Masharov's assumptions, would not predict that mere mention of an entity would raise its cognitive status beyond that of other activated entities. However, although cognitive statuses on the Givenness Hierarchy (like other meanings encoded by linguistic forms) are viewed as discrete categories which are mapped onto discrete forms that explicitly encode these categories, it is consistent with the theory that in reality the encoded categories are gradient, and that at most activated entities may be more or less activated, just as green apples may be more or less green. An activated entity that has been explicitly mentioned will thus be more activated, and hence more salient and likely to be chosen as the referent of an expression than one that has not.¹²

In addition, we propose that given a situation where two or more entities have the same cognitive status, but differ with respect to salience within that status, the likelihood that a particular form consistent with (though underspecified for) the cognitive status in question will refer to the most salient entity within a particular status will vary with the degree to which the form is specified for cognitive status. The more specified it is, the more likely it is to refer to the more salient entity. Thus, *that*, which requires familiar status, is more likely to refer to the more salient entity than *a*, which only requires the interpretation to be type identifiable. And *the*, which requires the referent to be uniquely identifiable, will be somewhere in between. This is exactly the situation we find in Masharov's results. We note again, however, that the salience-related experimental results do not follow directly from the Givenness Hierarchy, which only makes predictions about degrees of salience/accessibility as a result of interaction with more general cognitive/pragmatic principles that govern language processing.¹³ This assumption has always been part of the Givenness Hierarchy theory, and was first articulated in relevance-theoretic terms in Gundel 1996.

We thus explain the findings with regard to indefinite article phrases without positing form-specific constraints beyond the requirement of type identifiability. In the experimental situations, the hearer understands that it wasn't relevant for the speaker to signal a higher cognitive status with a stronger form, nor was a weak form necessarily selected in order to signal that a stronger status does not obtain. The *any* interpretation thus falls out of the Givenness Hierarchy approach to the indefinite article without further stipulation.

3.2. Kaiser & Trueswell: Demonstrative and personal pronouns in Finnish. Kaiser & Trueswell (2008) report on a sentence completion study and an eye tracking study aimed at examining the use of two gender-neutral pronominal forms in Finnish, both of which can be used to refer to humans —*hän*, a personal pronoun, and *tämä* a demonstrative pronoun. The authors characterize both Ariel's (1990) Accessibility Theory and Gundel et al.'s (1993) Givenness Hierarchy theory as claiming that demonstrative referents are less salient than personal pronoun referents. Ariel treats demonstrative pronouns as signaling a lower level of accessibility than

¹¹ One of the sufficient criteria for in-focus status given in the coding guidelines of Gundel et al., 2006 is that the referent has been mentioned in a syntactically prominent (e.g. subject or topic) position in the previous sentence.

¹² This follows from the assumption that processing effort is a central factor in determining relevance—and the more salient/accessible the referent is, the less processing effort there will be (Sperber & Wilson, 1986/95).

¹³ The results with respect to greater preference of *that* vs. *the* for more salient entities do follow directly from the Accessibility Hierarchy of Ariel (1990), since within that hierarchy individual forms encode degrees of accessibility, and *that* encodes a higher degree than *the*.

personal pronouns, and Gundel, et al. posit that (unstressed) personal pronouns require ‘in focus’ status while demonstrative pronouns only signal that the referent is activated.¹⁴

Kaiser & Trueswell compare SVO with OVS order in Finnish to determine the effect word order has on the interpretation of *hän* and *tämä*. In the sentence completion study, they examined four experimental conditions: SVO/*Hän*, OVS/*Hän*, SVO/*Tämä*, and OVS/*Tämä*. They created stories in which the first sentence introduces a character, and the second continues talking about that character and introduces a second character. The third and fourth sentences distinguish the four experimental conditions. The third sentence can be either SVO or OVS and refers to the second character in initial position and to a third character in final position. The fourth sentence, which the participant completes, starts out with either *hän* or *tämä*. An example discourse is given in (25) (Kaiser & Trueswell, example 6).¹⁵

- (25) *Niina oli ostoksilla ruokakaupassa*
 Niina-NOM was shopping-ADESS grocery-store-INNESS
 ‘Niina was shopping at the grocery store.

Jonossa odottaessaan hän näki takanaan valkohattuisen kokin
 Line-INNESS waiting-INNESS-poss she-NOM saw behind-poss white-hatted-ACC cook-ACC
 ‘While waiting in line, she saw a cook with a white hat behind her.’

Kokki töni jonon hännillä seisovaa leipuria SVO
 Cook-NOM pushed line-GEN tails-ADESS standing-PART baker-PART
 ‘The cook-SUBJ pushed a baker-OBJ standing at the back of the line
 OR
Kokkia töni jonon hännillä seisova leipuri OVS
 Cook-PART pushed line-GEN tails-ADESS standing-NOM baker-NOM
 ‘A baker-SUBJ standing at the back of the line pushed the cook-OBJ .

Hän/Tämä...
 S/he-NOM/This-NOM
 ‘S/he/This....’

The completed sentences were coded for which referent of the preceding sentence was chosen as the referent of the pronoun. Results are shown in the table in (26).

- (26) Percentage of different continuation types in the four conditions of the sentence continuation task, showing which referent the anaphoric expression was used to refer to. (Kaiser & Trueswell, p. 720, Table 1)

Condition	Referent Selected			
	1 st mentioned	2 nd mentioned	Other	Unclear/other

¹⁴ While we don’t make language-independent claims for statuses signaled by different forms, for most of the languages investigated using the Givenness Hierarchy framework, demonstrative pronouns only require activation and unstressed personal pronouns require in-focus status.

¹⁵ Nominative (NOM), Accusative (ACC), Genitive (GEN), Partitive (PART), Adessive (ADESS) and Inessive (INESS) are morphological cases in Finnish.

	referent	referent	demonstrative interpretation	
SVO/ <i>Hän</i>	64% (41)	13% (8)	0% (0)	23% (15)
OVS/ <i>Hän</i>	13% (8)	64% (41)	0% (0)	23% (15)
SVO/ <i>Tämä</i>	0% (0)	88% (56)	9% (6)	3% (2)
OVS/ <i>Tämä</i>	9% (6)	44% (28)	30% (19)	17% (11)

It can be seen that the subject referent of the preceding sentence was most frequently selected as the referent of *hän*, regardless of whether the subject was preverbal or postverbal, while the postverbal referent was most frequently selected as the referent of *tämä*, regardless of whether it was a subject or an object. The postverbal referent was almost always chosen in the case of postverbal objects, while this preference was slightly weaker but still present for postverbal subjects. In the latter case, participants also interpreted *tämä* quite often as referring to the entire event of the previous sentence. As Kaiser & Trueswell's eye tracking experiment generally supported the results of the sentence completion experiment, we will not discuss it here.

Kaiser & Trueswell conclude from the results of both experiments that a salience difference alone cannot explain the choice between *hän* and *tämä*, since *hän* is sensitive to syntactic role while *tämä* is sensitive to linear position. They reject single-factor accounts that distinguish the forms solely on the basis of salience in favor of a 'multi-factor, form-specific' account, whereby "each anaphoric form has its own set of weighted constraints that guide its interpretation" (p. 739). They imply that the Givenness Hierarchy is a single-factor account.

We point out again, however, that the Givenness Hierarchy is not a hierarchy of degrees of accessibility/salience, and is also not a 'single-factor' account. In addition to the general cognitive/pragmatic factors that interact with the Givenness Hierarchy (see above), it has always been an important premise of the theory that multiple factors contribute to the cognitive status a referent has (Gundel, et al. 1993, p. 280). The coding guidelines for cognitive statuses on the Givenness Hierarchy (Gundel et al., 2006) explicitly lay out a variety of factors that contribute to the cognitive status of a referent. For example, a referent is assumed to be in focus if it was mentioned in subject or other syntactically prominent position of the immediately preceding sentence or was mentioned in both the preceding two sentences. For a referent to be activated, however, it is sufficient that it be mentioned in one of the immediately preceding two sentences

Assuming that *hän* encodes the status 'in focus', while *tämä* encodes only the status 'activated' can explain Kaiser & Trueswell's results, given independently motivated assumptions about the factors that contribute to cognitive status. In the experimental materials, the referent of the preverbal element, whether S or O, is assumed to be in focus at the point where the pronoun was encountered because it was introduced in a syntactically prominent (subject or topic) position. The postverbal subject referent was also in focus because it was introduced in subject position. Subjects always bring an entity into focus because they are structurally prominent. Thus all three referents are necessarily accessible for reference by *hän*, while this is not the case for the postverbal object.

At first glance, however, it is puzzling that more referents of preverbal objects were not referenced by *hän* since they would seem to be in focus due to their introduction in topic position. The high percentage of unclear cases (almost 25%) in both SVO and OVS might account for this, but we might also propose an explanation based on encoding of future topics. It has often been suggested that subject is a preferred position for encoding future topics, i.e., the referents speakers intend to continue to talk about in subsequent sentences, regardless of whether

they are also the topic of the current sentence (Gundel et al. 1993, p. 279; Arnold, 2008; Grosz, Joshi, and Weinstein 1983). It then follows that *hän* will prefer subject antecedents to object antecedents in a previous OVS sentence.

On the other hand, let us assume that *tämä*, because it is underspecified for the status ‘in focus’, implicates a shift in what is in the focus of attention (and thereby also a shift in topic). An initial *tämä* in the completion sentence is thus used to encode a new topic, e.g. a shift from talking about the cook to talking about the baker. Because subsequent mention of the referent of a previous postverbal object meets both criteria (topic shift and focus shift), it is readily encoded by *tämä*. The referent of a preceding postverbal subject, on the other hand, will already have been brought into focus by virtue of its introduction in subject position, thus eliminating the need to use *tämä* to indicate a focus shift. *Tämä* could still be used, however, to indicate a shift in topic since postverbal subjects are less likely to be current topics than preverbal ones, and in fact are typically indefinite first mentions in these examples. Hence *tämä* prefers both postverbal subjects and postverbal objects as antecedents, but is less likely to be interpreted as being used to pick up a postverbal subject referent than a postverbal object referent.

In sum, within a Givenness Hierarchy account where *hän* explicitly encodes the status ‘in focus’ and *tämä* explicitly encodes the status ‘activated’, the latter form would be underspecified for whether its referent is in focus, due to the implicational nature of the hierarchy, and could therefore refer to entities that are in focus as well as those that activated, but not in focus. The differential distribution of *hän* and *tämä*, moreover can be attributed to interaction of the cognitive statuses conventionally signaled by these forms with independently motivated functions associated with linear position and grammatical role without stipulating additional weighted constraints on the anaphoric forms themselves. This again shows the explanatory value of the Givenness Hierarchy as an implicational scale, from which it follows that forms lower on the hierarchy are underspecified for statuses higher than the one they explicitly encode.

3.3. Brown-Schmidt, Byron, & Tanenhaus: Demonstrative and personal pronouns in English. Brown-Schmidt, Byron, & Tanenhaus (2005) present results of a series of eye-tracking experiments where participants manipulated a set of objects at the same time as their eye movements were being tracked. We focus here on the behavioral results of Experiment 1, which dealt with the difference between the personal pronoun *it* and the demonstrative pronoun *that*. The eye-tracking data supported the behavioral data, so we don’t discuss it here.

Participants either manipulated blocks of wood or familiar objects such as cups and saucers. They were told to either put one object (the theme) next to another object (the goal), or to put it on top of another object. Then they were told to move ‘it’ or ‘that’ to another location. Sample instructions are given in (27). The four experimental conditions are distinguished in (27a) and (27b).

- (27) a. Put the cup on/next to the saucer.
b. Now put it/that over by the lamp.
c. Put the table next to the lamp.
d. Now put the cup in front of the table.
(Display includes: cup, saucer, table, and lamp.)

Crucially, in the ‘on top of’ condition, the instruction creates a composite entity, which can be manipulated as a group. Thus, a cup on a saucer is a meaningful object in its own right, and can be treated as such by language users.

Results of the object manipulation are shown in (28), where the percentage reflects the approximate number of times the pronoun (*it* or *that*) was interpreted as the theme, the goal, or the composite in the ‘next to’ condition and in the ‘on top of’ condition. The task with blocks was similar but showed a somewhat lower degree of preference for composite interpretations in the ‘on top of’ condition.

(28) Referent selections for objects condition split by object location (*on top/next to*), and pronoun (*it/that*). (Estimated from Brown-Schmidt et al. p. 298, Fig. 2B)

Objects condition	Referent Selected		
	Theme	Composite	Goal
Next-it	99%	1%	0%
On-it	60%	40%	0%
Next-that	50%	43%	7%
On-that	12%	88%	0%

Brown-Schmidt et al. argue that a salience difference between referents of *it* and *that* does not predict these data, and instead propose a form-specific constraint which states that composite entities are preferentially referred to by *that*. They say (p. 302), “According to a salience account, conditions that increase *it*-interpretations should decrease *that*-interpretations because *that* does not prefer the most salient alternative.” Thus they view it as a problem for a salience account that the ‘on-top-of’ condition increased the likelihood of a composite interpretation for *it* beyond what it was in the ‘next-to’ condition, while the same condition also increased the likelihood of composite selection for *that*. They conclude that this result “is consistent with the prediction that the demonstrative pronoun would be interpreted as the composite if one was available, regardless of salience.”

We suggest that Brown-Schmidt et al.’s results are compatible with predictions of the Givenness Hierarchy, without positing a special condition on the use of *that* for composites. First, it is important to note that since the ‘on top of’ condition creates an entity, but the ‘next to’ condition is much less likely to do so, it is also more likely that there will be a composite referent for either *that* or *it* in the former condition. This fact is independent of any particular account of the referents of *that* vs. *it*. Second, within the Givenness Hierarchy framework, it would be assumed that the referent of the theme (the structurally most prominent syntactic position in these sentences) is always brought into focus, and is therefore available for reference with either *it* or *that*, but most likely the former, since explicitly marking that the referent is in focus would distinguish it from the other entities. Third, the composite will only be referred to when a composite is likely to be created that is easily conceptualized as an individuated entity, i.e., in the ‘on top of’ condition but less likely in the ‘next to’ condition. We would assume that such composites could also be brought into focus, since they incorporate the in-focus theme, but they would be less in focus than the theme itself (see discussion in §3.1 above about different degrees of salience among entities with the same cognitive status). This explains why composites are sometimes interpreted as referents of *it*, but are much more likely to be interpreted as referents of *that*, which only encodes activated status, and is underspecified for (but not inconsistent with) the status ‘in focus.’ The goal will never be in focus, even weakly so, and should therefore never

be interpreted as the referent of *it*; it should also be much less likely to be interpreted as the referent of *that*, especially when there is a competing composite, as it is the least salient of the three possible referents.

Brown-Schmidt, et al. argue that the Givenness Hierarchy cannot account for their results; but their argument is based on an incorrect premise that the hierarchy predicts that in-focus entities cannot be referred to by ‘that’. As we have emphasized, however, forms that encode lower statuses on the Givenness Hierarchy can be used to refer to entities with higher statuses. Since the statuses are in a unidirectional entailment relation, forms are underspecified for higher statuses rather than excluding them. In this particular case, since the theme is always brought into focus, and the composite is sometimes brought into focus, both are available for reference with *it*. However, the composite is much more likely to be referenced with *that*, even when it is in focus, since it is less salient than the theme. As discussed in relation to (13) above, use of ‘that’ tends to trigger an implicature that the referent is not in focus. This results in the composite being overwhelmingly selected over the theme referent in the ‘on-that’ condition.

4. Conclusion

We have emphasized that reference production (and understanding) is a complex product of a number of interacting cognitive systems and factors, some linguistic and some not linguistic. The linguistic system imposes constraints on the encoding of conceptual and procedural information in referring expressions. Specifically, with respect to procedural information, we claim that determiners and pronouns in natural language provide information about how and where the speaker’s intended referent is to be mentally accessed, by explicitly encoding one of six cognitive statuses on an implicational ‘Givenness Hierarchy’. These lexical items constrain possible interpretations to ones that minimally have the cognitive status encoded by the particular pronoun or determiner. However, mapping between forms and the statuses of their possible referents is one-to-many rather than one-to-one, because forms that explicitly encode a particular status are underspecified for higher statuses rather than excluding them. The Givenness Hierarchy in turn interacts with more general cognitive/pragmatic factors and principles relating to relevance, informativeness, and salience/accessibility to further constrain and determine how referring forms are produced and interpreted.

We thus agree with the growing number of researchers in experimental psycholinguistics whose findings suggest that an adequate account of reference production and interpretation cannot be given solely in terms of salience. While we also agree with those who posit an important role for salience in reference production and understanding, we disagree on the exact nature of this role. Specifically, we do not think that information about salience and degree of accessibility is directly built into linguistic forms used in reference production. Rather, the linguistic forms simply encode cognitive status.

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