

Development of Scalar Implicatures and the Indefinite Article

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## **Dedication**

To Chris, with the promise to never write another one.

## Abstract

Previous research in pragmatic development suggests that children as old as ten often fail to make pragmatic inferences associated with quantifiers like *some* and modal verbs like *might*; instead they initially interpret these forms in terms of their logical meanings (i.e. *some* is compatible with *all*) (Chierchia et al., 2001; Noveck, 2001). This dissertation examines children's acquisition of pragmatic inferences associated with the definite and indefinite articles *the* and *a* (Gundel et al., 1993). In a series of three experiments, pragmatic comprehension of these forms is assessed in children and adults through two tasks: an evaluation-based comprehension task similar to tasks used by previous researchers (Puppet Task) as well as an action-based task (Action Task).

The results of Experiment 1 indicate that, contrary to previous research with other scalar terms, by age 7 children overwhelmingly prefer the pragmatic interpretation of *a*. Experiment 1 also revealed that some 5-year-olds show non-adult-like behavior with respect to the definite article *the*—selecting a not-previously-mentioned object upon hearing *the* and accepting the puppet's actions when he did the same. Experiment 2 tests, and ultimately rejects, the hypothesis that the 5-year-olds' behavior in response to *the* in the previous experiment was due to processing difficulties as the result of their having a distributed attention. Experiment 3 attempts to arbitrate between two other explanations for the 5-year-olds' behavior in response to *the*; young children are either 1) less sensitive than adults and older children to the Relevance-based pragmatic inferences sometimes associated with *the* or 2) prone to favor new objects (in the Action Task) and agreeing

with the puppet (in the Puppet Task) as opposed to attending to the linguistic input in each trial. The results of the Action Task in Experiment 3 lend support to the latter hypothesis; the results of the Puppet Task, however, support the former, suggesting that the Puppet Task was problematic and potentially calling into question some findings from previous research using evaluation-based tasks as a means of evaluating comprehension.

## Table of Contents

List of Tables .....	viii
List of Figures .....	ix
Chapter 1 Introduction .....	1
Chapter 2 Referring Expressions and Their Use.....	5
2.1 Various Theories of Referring Expressions.....	5
2.2 The Givenness Hierarchy.....	11
2.3 The Givenness Hierarchy and Pragmatic Principles.....	16
2.3.1 Interaction with Grice’s Maxim of Quantity .....	18
2.3.2 Interaction with Relevance Theory.....	22
2.4 What Do Speakers and Addressees Need to Know? .....	24
Chapter 3 Referring Expressions, Pragmatics, and Scalar Implicatures in Development.	28
3.1 Children Use Referring Expressions Appropriately in Natural Conversation.....	29
3.2 Children Sometimes “Overuse” Referring Expressions .....	34
3.3 Children’s Understanding of Pragmatic Norms.....	36
3.4 Experimental Studies of Children’s Use of Referring Expressions.....	44
3.5 Summary and Motivation for Experiment 1 .....	48
Chapter 4 Experiment 1 .....	52
4.1 Participants.....	52
4.2 Design .....	53
4.3 Tasks .....	54

4.3.1	Action Task.....	54
4.3.2	Puppet Task.....	58
4.4	Results.....	61
4.4.1	Action Task.....	61
4.4.2	Puppet Task.....	63
4.5	Discussion.....	68
Chapter 5	Experiments 2 and 3.....	76
5.1	Experiment 2.....	76
5.1.1	Participants.....	76
5.1.2	Design and Tasks.....	77
5.1.3	Results.....	78
5.1.4	Discussion.....	81
5.2	Experiment 3.....	83
5.2.1	Participants.....	84
5.2.2	Design and Tasks.....	84
5.2.3	Results.....	87
5.2.4	Discussion.....	89
Chapter 6	Conclusion.....	92
6.1	A Review of the Findings from this Research.....	92
6.2	Is There Evidence That 5-year-olds Do Not Recognize Scalar Implicatures with the Indefinite Article?.....	95

6.3	Is There Evidence That 5-year-olds Do Not Make the Same Pragmatic Inferences as Adults?.....	96
6.4	Can These Results Be Explained with Present Theoretical Models? .....	97
	Limitations of the Present Research .....	99
6.5	Future Directions .....	101
6.5.1	Importance of the Action Task .....	101
6.5.2	Human versus Computer Interaction? .....	104
6.5.3	Production versus Comprehension .....	107
6.5.4	Unknown Factors .....	108
6.6	Concluding Remarks.....	111
	References.....	112
Appendix A:	Warm-up exercises used in Experiments 1 and 2 to elicit <i>a</i> and <i>the</i> .....	117
Appendix B:	Warm-up exercises used in Experiment 3 to elicit <i>it</i> .....	119

## List of Tables

Table 1: Sample trials for the action task.....	58
Table 2: Conditions for Puppet Task.....	60
Table 3: Action task means and standard deviations (in parentheses) of correct responses by age.....	62
Table 4: Scoring Method for Puppet Task .....	64
Table 5: Puppet task means and standard deviations (in parentheses) of responses by age .....	65
Table 6: Responses vs. chance by participants on the Puppet Task.....	66
Table 7: Means and standard deviations (in parentheses) of responses by 5-year-olds in the Action Task by experiment .....	79
Table 8: Puppet task: Means and standard deviations (in parentheses) of responses of 5-year-olds by experiment.....	80
Table 9: Sample trials for the action task in experiment 3.....	85
Table 10: Sample trials for the Puppet Task from Experiment 3.....	86
Table 11: Means and standard deviations (in parentheses) of correct responses by 5-year-olds in the Action Task by experiment .....	87
Table 12: Puppet Task: Means and standard deviations (in parentheses) of responses of 5-year-olds by experiment .....	88

## **List of Figures**

- Figure 1: Game board used in Experiment 1 ..... 55
- Figure 2: Game board with three-dimensional, open-top barn, used in Experiment 2.... 78

## Chapter 1 Introduction

One of the many things children must learn about language is that people can refer to the same thing in many different ways. For example, the neighbor's cat might be called: *the neighbor's cat*, *the fat orange cat I keep seeing*, *the cat*, *a cat* or even simply *it*, just to name a few possibilities. There has been a significant amount of research done on how speakers choose which form to use in conversation. Although individual theories vary, most researchers agree that referring expression used by speakers vary based upon assumptions made regarding what the hearer knows about the referent and where the referent is in the hearer's attention. Gundel, Hedberg, and Zacharski (1993) propose an implicational hierarchy of cognitive statuses, The Givenness Hierarchy, shown in (1), to explain the distribution of referring expressions in natural language.

(1) The Givenness Hierarchy:

in focus	>	activated	>	familiar	>	uniquely identifiable	>	referential	>	type identifiable
		<i>that</i>								
<i>it</i>		<i>this</i>		<i>that N</i>		<i>the N</i>		indefinite <i>this N</i>		<i>a N</i>
		<i>this N</i>								

This framework posits that referring forms encode procedural instructions about how the hearer is to access the referent. For example, personal pronouns (e.g. *it*) instruct the hearer to access the referent in his focus of attention. Entities can attain their status in many different ways. Since the hierarchy is implicational in one direction, higher

statuses implicate all of the lower ones. So, entities that are in focus are also activated, familiar, etc. Because of this, forms that encode lower statuses are frequently used to refer to entities whose cognitive status is, actually, higher than the form alone might indicate.

One interesting aspect of the one-way implicational hierarchy of the Givenness Hierarchy framework is how it interacts with Grice's Maxim of Quantity. This maxim suggests that we expect speakers to give us as much information as we need without giving more or less than necessary. Because of this expectation, when speakers use a weaker form as opposed to a stronger form on the same scale (e.g. *some* < *all*), the hearer infers that the stronger form does not hold. This type of inference is known as a *scalar implicature*. In this way, Gundel et al. (1993) note that use of the indefinite article *a* typically implicates that the referent is not uniquely identifiable.

Studies on children's spontaneous production of referring expressions in natural conversation reveal that they use all of the types of forms on the Givenness Hierarchy (definite and indefinite articles, demonstrative pronouns, and personal pronouns) appropriately by 3 years of age, or even younger (Bittner, 2002; Gundel & Page, 1998; Gundel, Sera, & Page, 1999; Rozendaal & Baker, 2010; Salazar Orvig et al., 2010). Several experimental studies reach the same general conclusion (Matthews, Lieven, Theakston, & Tomasello, 2006; O'Neill, 1996; Wittek & Tomasello, 2005). Despite the general finding that children produce forms appropriate to the cognitive status of referents beginning at an early age, children nonetheless do not always treat referring

expressions in an entirely adult-like manner. For example, sometimes children use the indefinite article *a* when the definite article *the* would be more adult-like (Gundel, Ntelitheos, & Kowalsky, 2007). Gundel, Ntelitheos, and Kowalsky suggest this type of “overuse” of certain types of referring expressions on the part of children is not due to children’s failure to understand the meaning encoded by the forms, nor their failure to assess the cognitive status the referent has in the hearer’s mind. Rather, they suggest, such patterns of use are reflective of children’s difficulty in drawing scalar implicatures, an ability that appears to develop rather late, at least those implicatures that arise out of modals and quantifiers (Noveck, 2001; Papafragou & Musolino, 2003).

The present dissertation aims to contribute to our understanding of how children acquire referring expressions. Specifically, I investigate whether the difficulties children experience in drawing scalar implicatures with modals and quantifiers extend to the indefinite article *a*.

This dissertation is organized in the following manner. Chapter 2 is devoted to a general overview of theories of referring expressions, with specific attention to the Givenness Hierarchy framework. Included in this is a more detailed discussion of how the statuses on the Givenness Hierarchy interact with Grice’s Maxim of Quantity and Relevance Theory to determine how referring expressions are typically used. Chapter 3 provides an overview of the research on children’s acquisition of referring expressions as well as their abilities with respect to scalar inferences. Included in this chapter is also the motivation for my study. Chapters 4 and 5 are devoted to presenting my three

experiments. In Chapter 6, I discuss the results of my experiments and how they fit within our current theoretical models of referring expressions. I also discuss the weaknesses of the present research and outline potential directions for future research.

## **Chapter 2 Referring Expressions and Their Use**

The purpose of this chapter is to give an overview of the theoretical assumptions that underlie the present research. I will begin by giving a general account of the various ways in which referring expressions have been conceptualized by researchers, concentrating on theories addressing the actual use of referential forms in human language. Referring expressions, for the purposes of this work, are those linguistic phrases that refer to, or “pick out,” some entity such as an individual, group of individuals, place, object, idea, or concept such as *a tree*, *the cat*, *that idea*, *this*, *it*, etc. I will then provide an overview of one specific theory of reference, the Givenness Hierarchy (Gundel et al., 1993). I will specifically address connections between the Givenness Hierarchy framework and Grice’s maxim of Quantity since this interaction is central to my investigation.

### **2.1 Various Theories of Referring Expressions**

The distribution and interpretation of referring expressions in natural language has long been a subject of linguistic inquiry. Linguists, philosophers, psychologists, and computer scientists have employed a variety of perspectives in trying to capture the essential differences between these linguistic forms. A number of these approaches have concentrated primarily on the English definite and indefinite articles, *the* and *a*, respectively. Furthermore, some of these approaches characterize the difference between

these forms in terms of a dichotomy, wherein the property (or properties) possessed by one form is not shared by the other(s).

Christophersen (1939) proposed one quite influential approach in which he characterized the difference between *the* and *a* in terms of whether or not the addressee is familiar with the referent: “Now the speaker must always be supposed to know which individual he is thinking of; the interesting thing is that the *the*-form supposes that the hearer knows it too” (1939, p. 28). The basic idea behind this is that a phrase marked with the definite article *the* tells the hearer that he or she is already familiar with the referent, whereas phrases marked with the indefinite article *a* signal the introduction of an unfamiliar referent. This notion, often referred to as the “familiarity theory of definiteness,” is summarized by Heim (1983) as follows: “A definite is used to refer to something that is already familiar at the current stage of the conversation. An indefinite is used to introduce a new referent” (p. 189). In her dissertation, Heim (1982) revises and formalizes previous familiarity theoretic approaches into her theory of File Change Semantics. Heim compares the unfolding of a discourse to the construction of file wherein discourse entities are represented by file cards, which contain information about them. Under this theory, the essential difference between definite and indefinite phrases in natural language is the way they affect the file that has been constructed. According to Heim, indefinite phrases must introduce new entities, while definite phrases tend to change the file card for already existing entities.

One obvious problem with dichotomous characterizations of referring expressions arises with examples like the one in (2).

(2) I went to Sara's birthday party yesterday. *The cake* was delicious.

It is easy to imagine that (2) could be uttered at the beginning of a conversation. As such, the cake would be a new referent in the discourse in that it has not yet been introduced into the conversation and the addressee is not likely to be familiar with the referent from previous experience. This fact seems to be at odds with dichotomous familiar/unfamiliar (or old/new) characterizations of definite and indefinite referents and yet, it seems unlikely that any native English speaker would find anything to be amiss with such an utterance. Heim (1982) allows for instances of the definite article like the one in (2) by invoking the mechanism of accommodation, which is available in cases where there is presupposed information. For example, in (2) the existence of a birthday party presupposes the existence of a cake. In this way, the cake is accommodated as a familiar referent.

Not only does an accommodation mechanism seem like an inelegant patch to this problem with dichotomous characterizations of definite and indefinites, but it also cannot account for utterances like (3).

(3) *The ice cream I bought yesterday* is already gone.

It is easy to imagine someone uttering (3) to a roommate in an exasperated tone after checking the contents of the freezer. However, the roommate might not be aware of the existence of the ice cream and it is not inferable from prior discourse.

Dichotomous familiar/unfamiliar characterization of definite and indefinite articles also fails to address instances of the indefinite article being used for referents that have already been introduced in discourse. One example of this occurring in natural conversation can be seen in (4).

- (4) K: It was really interesting, from Minneapolis to Mankato I was sitting next to a black woman. I don't know how old she was, probably my age or a couple years older, from Kansas City, who was going to the U, majoring in Spanish. She said that her Spanish teacher this quarter was Japanese.  
N: Is that right? Japanese. Oh wow.  
K: Yeah.  
N: And she was teaching it to *a black woman*—or he, or whatever.  
(Gundel & Mulkern, 1998, p. 25)

In this example, the phrase *a black woman* is used first to introduce a new referent and again to refer a second time to the already introduced referent. This obviously runs contrary to characterizations of indefinites as being used to introduce new referents.

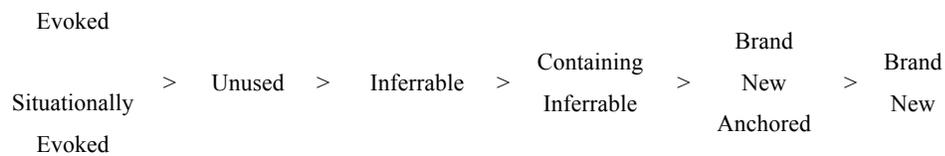
Clearly the given/new dichotomy is troublesome. In an attempt to account for some of the aforementioned problems, researchers have conceived of “givenness” in a variety of ways. Prince (1981) delineates the different forms givenness has taken in the literature; the concept has been defined terms of syntactic predictability or recoverability, saliency in the addressee’s consciousness (i.e. Chafe, 1976), and “shared knowledge” between speaker and addressee (i.e. Clark & Haviland, 1977). Prince goes further to argue that, regardless of how givenness is conceptualized, binary distinctions are not adequate to describe the distributions of referring expressions in natural language. She

suggests using the term “assumed familiarity” for the collective ways givenness has been defined and then draws our attention to the nuanced ways a referent might be “familiar” by invoking examples like those in (5).

- (5) a. *Noam Chomsky* went to Penn.  
 b. I got on a bus yesterday and *the driver* was drunk.  
 (Prince, 1981, p. 233)

*Noam Chomsky* in (5a) and *the driver* in (5b) seem as though they could both be assumed to be familiar to the addressee but, at the same time, they seem qualitatively different. In an attempt to capture these intuitive differences, Prince breaks down the concept of assumed familiarity into the categories *new*, *inferable* and *evoked* each of which she breaks down even further, ultimately ending up with seven categories comprising assumed familiarity: Brand-new (Unanchored), Brand-new Anchored, Unused, (Noncontaining) Inferrable, Containing Inferrable, (Textually) Evoked, and Situationally Evoked. Prince posits that these different types of familiarity can be related to one another in a “preferred hierarchy,” presented in (6):

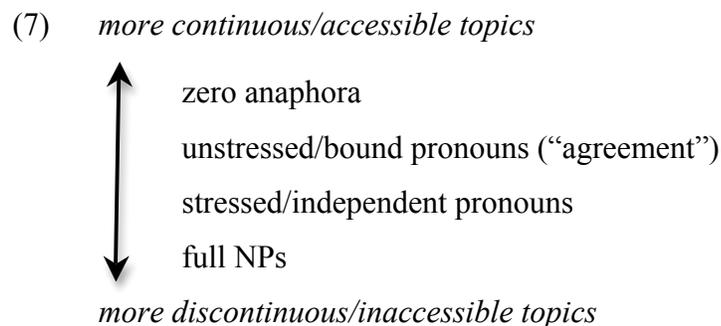
- (6) Familiarity Scale (Prince, 1981, p. 245)



While Prince’s scale does seem to reflect some of our intuitions about the various ways familiarity/givenness can present itself in human discourse, it falls short in that it does not make specific claims about the status of any particular form. Furthermore,

although the statuses can be ordered hierarchically, they appear to be in a mutually exclusive relationship with one another—an arrangement that fails to capture some facts about the distribution of referring forms in natural language, as shall be seen later in the chapter with my discussion of the Givenness Hierarchy.

In a similar vein, Givón (1983) recognizes that different forms in language seem to be correlated with the degree to which they are accessible for processing or predictability, and that this correlation is more complex than can be represented by a dichotomy. Thus, Givón proposes a general cross-linguistic hierarchy of referring forms based on phonological size, shown in (7). On this scale, zero and unstressed pro-forms are associated with more continuous topics, while full noun phrases (NPs) are associated with less continuous topics.



(Givón, 1983, p. 18)

As Givón explains, the principle underlying this scale is that “[the] more disruptive, surprising, discontinuous or hard to process a topic is, the more coding material must be assigned to it” (1983, p. 18). This principle and the corresponding scale of referring expressions is consistent with the use, in many languages, of null pronouns

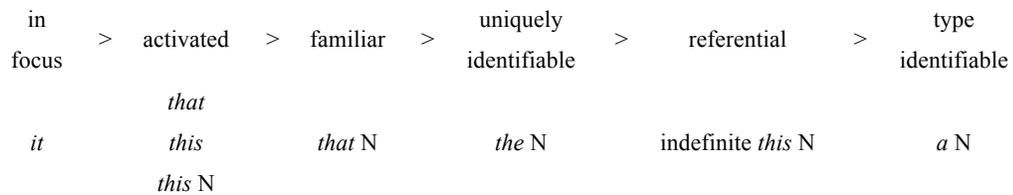
for continuing topics and overt pronouns to indicate a topic shift. Note, however, that no specific connection between form and status is made. Furthermore, this work attempts to account only for referents that are present in the linguistic context, but does not incorporate referents present in the extralinguistic context.

Still other researchers suggest that referring expressions provide procedural instructions to the addressee about how to access a representation of a referent (Ariel, 1988; Garrod & Sanford, 1982). Perhaps one of the most comprehensive of such proposals put forth is by Gundel, et al. (1993), which is described in the next section.

## **2.2 The Givenness Hierarchy**

As I have previously mentioned, Gundel et al. (1993) contend that certain referring expressions encode assumptions regarding the memory or attention status of the referent in the hearer's mind—its cognitive status—at the moment just before the referring expression is uttered. These cognitive statuses are thought to be part of the conventional meaning of these forms and fall along a unidirectional, implicational hierarchy ordered from most restrictive (in focus) to least restrictive (type identifiable). The Givenness Hierarchy, shown earlier in (1), is reproduced here in (8), along with the corresponding English forms.

(8) The Givenness Hierarchy:



A referent can get its cognitive status through a variety of means. For example, a referent could be in focus because it was just mentioned in the discourse. Alternatively, it can be in focus because both the speaker and hearer are focusing their visual attention on it. These statuses along the Givenness Hierarchy give procedural information to the addressee about how to access the referent. This procedural information is detailed in (9). For example, a form signaling an in focus referent (e.g. *it*) instructs the hearer that the referent is in his or her focus of attention.

- (9) in focus: associate representation in focus of attention  
activated: associate representation in working memory  
familiar: associate representation in memory  
uniquely identifiable: associate unique representation with NP  
referential: associate unique representation  
type identifiable: associate type representation  
(Gundel, Ntelitheos, et al., 2007, p. 3)

I will now introduce a number of examples for the purpose of illustrating the cognitive statuses of the Givenness Hierarchy and the procedural information they encode. Since the hierarchy is implicational in one direction, each status implies all of the lower, or less restrictive, ones. Thus, an entity with the status of in focus, entails that

it is not only in the focus of the hearer's attention, but it is also represented in their working memory, and so on. Because of this, I will begin this discussion with the least restrictive status, type identifiable.

Type identifiable. For the least restrictive status on the Givenness Hierarchy, type identifiable, the hearer only needs to access a mental representation of the type of entity denoted by the nominal form. Thus, in (10), the speaker is instructing the addressee to access a representation of the type 'elephant' and not 'squirrel' or 'burrito,' etc.

(10) I saw *an elephant* in the park.

Type identifiable status is required to grammatically use any noun phrase in any language and, in English, it is sufficient for appropriate use of the indefinite article *a* (Gundel et al., 1993, p. 276).

Referential. The next status, referential, signals to the addressee that the speaker means to refer to a particular instance of the type identified by the nominal expression. The addressee must either access an already existing representation from memory or construct a new representation. Often, phrases with the indefinite article *a*, such as (10), are ambiguous as to whether the speaker was referring to a particular entity or only a type-representation because *a* only signals type identifiability; by contrast, phrases with indefinite *this* overtly signal that the intended representation is referential; that is, the speaker the speaker is referring to a particular instance of the type-representation. Take, for example, the utterance in (11):

(11) I bought *this blue car* last week.

The representation of *this blue car* in (11) depends upon the content of the entire sentence and thus, when encountering an entity that is at most referential, the addressee must construct a representation of the entity by the time he is finished processing the sentence (Gundel et al., 1993, p. 276).

Uniquely identifiable. While entities that are at most referential require the addressee to access not only a type representation, but also a specific token representation, entities that are also uniquely identifiable can be identified merely from the descriptive content of the nominal expression. The status of at least uniquely identifiable is required for grammatical use of the definite article *the* in English (Gundel et al., 1993, p. 277). Two examples are provided in (12).

- (12) a. I bought *the blue car* last week.  
b. I bought *the blue car that Harry was selling* last week.

The utterance in (12a) is felicitous if the addressee is already familiar with the blue car and can thus uniquely identify the referent based upon previous experience. The utterance in (12b), on the other hand, does not require the addressee to already be familiar with the blue car because the referent is uniquely identifiable based upon the descriptive content in the nominal alone (x = the car that Harry was selling). Note that the referents in (12) differ from the referent in (11) in that the referents in (12) are uniquely identifiable independent of knowing that the speaker bought them.

Familiar. Referents with the status of familiar can be uniquely identified by the addressee based on representations already in long- or short-term memory. Familiar status is a minimum requirement for the appropriate use of the demonstrative determiner *that* in English (Gundel et al., 1993, p. 278). Thus, for (13a) to be felicitous, the addressee must already know that there was a baby in the back of the plane, whereas in (13b), such knowledge is not necessary.

- (13) a. *That baby in the back of the plane* cried throughout the flight.  
b. *The baby in the back of the plane* cried throughout the flight.

Activated. Entities that are activated are in the addressee's current short-term memory—this includes referents in the immediate linguistic context (i.e. a referent that has just been mentioned in conversation), as well as referents in the immediate extralinguistic context (i.e. referents that can be seen, heard, or otherwise experienced by the addressee). Activated status is required for the felicitous use of the demonstrative determiner *this*, the demonstrative pronouns *this* and *that*, as well as stressed personal pronouns in English (Gundel et al., 1993, p.278). Thus, the utterance in (14) is felicitous provided that the package is in the extralinguistic context and, in this case, has been activated by the speaker (by pointing, for example).

- (14) [Holding a package.] Would you please take *this* to Madison?

In focus. In focus status is the highest, or most restrictive, status of the Givenness Hierarchy. This status requires that the referent be in the addressee's center of attention. Only referents with in focus status may be felicitously referred to with an unstressed

personal pronoun in English (Gundel et al., 1993, p. 279). Referents can obtain their status in a number of different ways.<sup>1</sup> In focus referents, for example, can be in the addressee's center of attention by virtue of having been introduced in the main subject clause of the immediately preceding utterance, as in (15).

(15) My nephew was at the Christmas party. *He* has gotten so big!

Likewise, a referent may be in focus because it is in the shared visual attention of both the speaker and addressee. As an example, (16) would be a perfectly felicitous use of the personal pronoun if the speaker and addressee are both looking at a table full of tomatoes at a farmer's market (or, indeed, any number of similar scenarios).

(16) *They* were just picked this morning.

### **2.3 The Givenness Hierarchy and Pragmatic Principles**

The previous section explained the Givenness Hierarchy framework and gave examples of English forms that explicitly signal the cognitive statuses along the hierarchy. Since the forms that explicitly signal lower cognitive statuses may be used to encode referents with higher statuses, multiple referring forms may be acceptable for use with a particular referent. For example, a referent that is in focus can be referred to with a personal pronoun, but since anything in focus is also activated, familiar, etc., the

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<sup>1</sup> The aim of Gundel et al. (1993) was not to hypothesize about how referents *get* their cognitive status—but rather to propose the existence of the status hierarchy and the correspondence between forms and the cognitive statuses they encode. There are, however, coding guidelines for how to determine the cognitive status of a referent. These guidelines are available by emailing Jeanette Gundel at [gunde003@umn.edu](mailto:gunde003@umn.edu).

Givenness Hierarchy predicts that such a referent could also be referred to with forms that explicitly signal a lower cognitive status such as a demonstrative pronoun, demonstrative determiner, or even the indefinite article.

Despite this prediction, research on the distribution of these forms in naturally occurring speech shows that entities with certain statuses tend to co-occur with certain forms far more frequently than with others. For example, in their examination of transcripts of natural language, Gundel et al. (1993) found that the indefinite article *a* was used to encode only with referents that were at most type identifiable or referential (p. 291). This is despite the fact that, according to the Givenness Hierarchy, the indefinite article can, in principle, be used with entities of any cognitive status since all statuses entail those lower in the hierarchy. Conversely, several referents might have the same cognitive status for an addressee at a given time. It seems quite likely, for example, that a number of possible referents might be in an addressee's working memory (required of activated referents) at one time. Thus the question becomes how does a listener know precisely what a speaker is referring to when he or she uses a particular form?

Gundel et al. (1993) posit that pragmatic and processing restrictions place limits on how certain referring expressions are used and interpreted. The following sections examine how general pragmatic principles, such as those put forth by Grice's Maxim of Quantity (1975) and Sperber and Wilson's Relevance Theory (1986) further inform our understanding of the use and interpretation of referring expressions.

### 2.3.1 Interaction with Grice's Maxim of Quantity

In his examination of how humans go beyond the literal semantic content of utterances to actually understand what a speaker intends to communicate, the philosopher H.P. Grice famously appealed to the concept of cooperation (1975). He noted that we expect our conversation partners to communicate with us in a cooperative and efficient way. This overarching concept is given in his Cooperative Principle (17).

(17) Cooperative Principle:

Make your contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged. (Grice, 1975, p. 45)

Grice further delineates the ways in which we expect our conversational partners to adhere to the Cooperative Principle by posting four *conversational maxims*: Quantity, Quality, Relation, and Manner. The maxim most relevant to the current discussion is Quantity, which is made up of two sub-maxims:

(18) Quantity

Q1 Make your contribution as informative as required (for the current purposes of the exchange).

Q2 Do not make your contribution more informative than is required.

Simply stated, Grice's two Quantity sub-maxims (subsequently referred to as Q1 and Q2) say that we expect our conversation partners to be telling us as much information as we need without telling us more. The expectation that speakers are adhering to Q1 and Q2 restrict our interpretation of referring forms in a number of ways.

First of all, since addressees expect a speaker to provide as much information as necessary, when a weaker form on an implicational scale is used, the addressee infers that a stronger term does not hold. An implicational scale is a set of forms of the same syntactic type that can be ordered according to their informativeness (Horn, 1976). An example of one such scale is provided in (19):

(19) all > most > many > some

The use of *some* typically gives rise to the inference that the stronger term, *all*, is not appropriate. For example, in (20) we would typically infer that Eden did not eat *all* of the pizza. This is because we assume that the speaker is upholding Q1 and, as such, we assume that if Eden had eaten all of the pizza, the speaker would have used the quantifier *all*. This type of inference is known as a *scalar implicature*.

(20) Eden ate some of the pizza.

It is important to note that implicatures are not logical entailments; *some* implicates *not all*, but *some* is, in fact, logically consistent with *all*. Evidence of this can be seen in the fact that implicatures can be cancelled by giving additional information without resulting in a contradiction, as in (21). Entailments, on the other hand, cannot be cancelled without contradiction, as in (22).

(21) Eden ate some of the pizza. In fact, she ate all of it.

(22) Scott is married to Sara. In fact, Scott is a bachelor.

In (21) the additional clause *In fact, she ate all of it* explicitly cancels the implicature 'Eden did not eat all of the pizza,' which would typically be available from the first

clause; this does not give rise to a contradiction. By contrast, being married entails that a man is not a bachelor; thus in (22), the additional clause *Scott is a bachelor* contradicts the first clause where he is described as being married.

Scalar implicatures can arise from terms on any scale in which a stronger term implicates the weaker one, but not vice versa. As in the previous example, they can arise with quantifiers, but they can also arise out of a variety of other parts of speech, including: modals (e.g. *must* > *might*), verbs (e.g. *finish* > *start*), adjectives (e.g. *cold* > *cool*), and adverbs (e.g. *always* > *sometimes*).

Scalar implicatures can also be invoked to explain the non-random distribution of referring forms across referents that meet the minimal status for that form. As mentioned earlier, according to the Givenness Hierarchy, the indefinite article *a* can be used to encode entities of any cognitive status, since the status ‘type identifiable’ is entailed by all of the other statuses. Nevertheless, it is typically only found with referents that are at most type identifiable or referential. Gundel et al. (1993) attribute this distribution to scalar implicature in that the use of the indefinite article implicates that the speaker cannot uniquely identify the referent (p. 296).<sup>2</sup> For example, the typical interpretation of utterances like (23) is that the second client mentioned is different than the first one because the second client is referred to with the indefinite article and, as such, gives rise

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<sup>2</sup> Although the specifics are different, Grice himself recognizes that the indefinite article can give rise to an implicature when he notes that utterances like *I sat beside a man on the plane* typically implicate that the man in question is unfamiliar to the speaker and is not, for example, the speaker’s husband, brother, or son (Grice, 1975, p. 56).

to the scalar implicature that the second client is at most referential or type identifiable (i.e. *not* uniquely identifiable, familiar, activated or in focus).

(23) I met with a client this morning and I also spoke with a client this afternoon.

As in (21), this implicature can also be cancelled without creating a contradiction, as demonstrated in (24).

(24) I met with a client this morning and I spoke with a client this afternoon. In fact, it was the same client from this morning.

Gundel et al. (1993) also invoke Q1 to explain why in focus entities are nearly always referred to with an unstressed personal pronoun (or zero pronoun in languages where the grammar allows it) even though demonstrative pronouns, which encode activated status, should also be grammatical. As they explain, this is because speakers are adhering to Q1 and giving as much information as needed and, as such, they are giving the most specific information as they can about how to access the referent in signaling that it is in the addressee's current focus of attention (p. 297).

The second part of Grice's Quantity maxim (Q2)—don't give more information than necessary—may also help explain patterns of typical use of referring expressions. As Gundel et al. (1993) note, even though use of a weaker form often implicates that a stronger form is not appropriate, this is not always the case (p. 299). For example, they point out that in their corpus investigation that the large majority of uses of the definite article *the* were in reference to entities with higher cognitive status than uniquely identifiable. In other words, in the case of the definite article at least, Q2 (not being more

informative than necessary) appears to hold more weight than Q1 (be as informative as required) and the use of a weaker form does not seem to implicate that a stronger form does not hold.

### 2.3.2 Interaction with Relevance Theory

Sperber and Wilson (1986/1995) put forth Relevance Theory as an alternative to Grice's Maxims in explaining how we understand pragmatic meaning from natural language. It differs from Grice's explanation in that it attempts to account for pragmatic effects in terms of human cognition. Relevance Theory contends that human cognition has evolved in such a way that we instinctively search for relevance in all things, including not only that which we can physically observe but also "thoughts, memories, and conclusions of inferences" (Wilson & Sperber, 2002, p. 607). Sperber and Wilson define relevance as follows in (25):

(25) Relevance (Sperber & Wilson, 1986, p. 125)

Extent condition 1 An assumption is relevant in a context to the extent that its contextual effects in this context are large.

Extent condition 2 An assumption is relevant in a context to the extent that the effort required to process it in this context is small.

In short, an utterance is maximally relevant to a hearer when it contains a maximum amount of meaning (contextual effects) for a minimal amount of processing effort. Gundel and colleagues contend that Relevance Theory is helpful to explain how speakers are able to restrict their interpretations of forms on the Givenness Hierarchy. In their examination of the interaction between the Givenness Hierarchy and Relevance

Theory, Gundel and Mulkern (1998) demonstrate how Relevance Theory allows a hearer to assign reference to a form when there are multiple referents of the appropriate cognitive status.<sup>3</sup> Take, for example, the sentence reproduced in (26) (1998, p. 40).

(26) A guy was walking down the street and *the guy* said he had lost his keys.

Gundel and Mulkern note that the phrase *the guy* has three possible interpretations in this sentence:

[T]here are at least three interpretations consistent with the conventional meaning of *the*: (i) *the guy* could refer to a familiar guy (e.g., the guy introduced in the previous sentence [the adjoining clause]) or it could be introducing another guy that the addressee is already familiar with or could otherwise uniquely identify; (ii) *the guy* refers to the guy introduced in the first sentence; and (iii) *the guy* introduces a new guy; it is not co-referential with the guy walking down the street. (p. 40)

They go on to explain that the first interpretation (i) would be ruled out through Relevance Theory for being ambiguous and, hence, not providing sufficient contextual effects. The third interpretation would also be ruled out because the definite article requires the referent to be uniquely identifiable but the phrase *the guy* does not contain enough descriptive content for a unique representation to be assigned. The interpretation in (ii) provides the most contextual effects for the least processing effort. Thus, even though the definite article *the* only requires that a referent be at least uniquely identifiable

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<sup>3</sup> Gundel and Mulkern (1998) also discuss whether Relevance Theory alone can account for Q1 implicatures and conclude that Q1 is still required “either as a socially based assumption or as part of the Principle of Relevance itself” (p. 21).

and there are several possible uniquely identifiable referents, Relevance Theory constrains our interpretation so the sentence is not interpreted as being ambiguous.

#### **2.4 What Do Speakers and Addressees Need to Know?**

Under the Givenness Hierarchy model, referring expressions instruct the addressee on how to access a representation of the referent. As such, there are a number of things that a speaker must know in order to appropriately use referring expressions. Gundel et al. (2007) detail the types of things that children must know when using and understanding the forms associated with statuses on the Givenness Hierarchy. While they are specifically addressing the complex knowledge and abilities that children must acquire at young ages, the knowledge requirements are identical for adult speakers.

First is the linguistic knowledge of which forms encode which cognitive statuses. So, for example, a speaker must know that the definite determiner *the* encodes the status of (at least) uniquely identifiable. This association of form and meaning is arbitrary, like most all other lexical items in language and, as such, must be learned (akin to learning that the word *bird* means ‘bird’).

Beyond this purely linguistic knowledge, the Givenness Hierarchy model contends that speakers must also know when a referent has a particular cognitive status (e.g. when a bird is in the focus of attention and can thus be referred to with *it*). This is similar to needing to recognize a bird as such before one can properly use the noun *bird* when talking about it. Knowing the cognitive status of a referent goes beyond the speaker simply knowing the status it has for himself; a speaker must be able to

appropriately assess the cognitive status of the referent in the mind of the hearer. Gundel et al. (2007) assert that this ability requires the speaker to have a certain amount of Theory of Mind—or the ability to assess the mental states of others.

In addition to the ability to assess the cognitive status of a referent in the mind of an addressee, a speaker must also be able to appropriately assess the relevance of cognitive status information to the goals of the communicative act. Just as a speaker must know when it is relevant to add descriptive content to an expression (e.g. when it is relevant to say *the large cup* as opposed to just *the cup*), a speaker must know when it is necessary or relevant to use the strongest possible referring form and when a weaker form will result in a scalar implicatures. Whether these abilities stem from some form of “mindreading”/Theory of Mind or are deduced statistically through patterns of use, they must develop in a child in order to use and understand referring expressions in an adult-like way.

While the speaker must know certain things to appropriately use referring expressions, addressees must also have specific knowledge in order to fully understand referring expressions. Like the speaker, the addressee also needs to understand the linguistic meaning encoded in a referring expression. Again, for referring expressions, the linguistic meaning comes in the form of procedural instructions for how the addressee can access a representation of the referent. Addressees, like speakers, must learn the linguistic meaning of referring forms just as they must learn that the noun *dog* corresponds to the concept ‘dog.’ Additionally, addressees must understand the

pragmatic norms of communication such as Grice's maxim of Quantity; an addressee should expect speakers to give as much information as necessary but not more than is necessary. As discussed in the previous section, this understanding of the Quantity maxim gives rise to scalar implicatures which, for example, result in interpreting sentences like the one in (27) as referring to two separate clients even though the indefinite article *a* can technically be used with referents of any cognitive status.

(27) I met with a client this morning and I also spoke with a client this afternoon.

In this chapter I gave a brief overview of some early approaches to explaining the distribution of the definite and indefinite articles in English. These early explanations typically suggest a dichotomous relationship with the articles (e.g. familiar vs. unfamiliar, old vs. new, etc.). I then examined some potential problems with these simple dichotomous approaches before moving into a review of cognitive approaches to framing the use and distribution of referring expressions, including the definite and indefinite articles. The bulk of the chapter focused on a look at the Givenness Hierarchy, a framework proposing that referring forms encode information about a referent's cognitive status. Crucially, the Givenness Hierarchy suggests that these cognitive statuses are implicational in a unidirectional hierarchy such that higher cognitive statuses encode lower ones, thus overcoming some of the difficulties and inaccurate predictions falling out of earlier theories. The chapter concluded with a discussion of how the Givenness Hierarchy interacts with pragmatic and cognitive principles and how these interactions can help to fully explain typical intuitions and findings from studies of natural language

data about the use and distribution of referring expressions. In the next chapter I will review research from both naturalistic and experimental studies about how children develop an understanding and use of referring expressions, pragmatic principles and scalar implicatures.

### **Chapter 3 Referring Expressions, Pragmatics, and Scalar Implicatures in Development**

This chapter reviews previous research on children’s development with regard to both referring expressions and pragmatic understanding, with special attention given to scalar implicatures. First, I review some relevant findings from studies conducted on children’s spontaneously produced referring expressions. These studies show children to be overwhelmingly sophisticated in their appropriate use of referring expressions corresponding with the Givenness Hierarchy. However, these studies also show “overproduction” of some referring forms, specifically the indefinite article *a* and demonstrative pronoun. I then provide an overview of recent experimental research on children’s understanding of scalar implicatures. The major consistent finding across these studies is that children tend to interpret weak scalar forms, like *some*, as consistent with stronger forms on the same scale (i.e. *all*). Adults, on the other hand, are far more likely to interpret these forms with their scalar implicature (i.e. *some* implicates *not all*). Although children’s interpretations of scalar implicatures has been investigated from multiple angles, it has thus far not been investigated in conjunction with referring expressions, which can also give rise to scalar implicatures. I then review some of the experimental research on children’s production and interpretation of *a* and *the*. I conclude the chapter by presenting my motivations for conducting Experiment 1.

### **3.1 Children Use Referring Expressions Appropriately in Natural Conversation**

Gundel, Ntelitheos and Kowalsky (2007) conducted a corpus analysis of how children use the English referring forms included in the Givenness Hierarchy (personal pronouns, demonstrative pronouns, demonstrative determiners, the definite article, indefinite *this*, and the indefinite article). In this study, they examined transcript files from both the Brown and Bloom corpora, available on CHILDES (Bloom, 1970; Brown, 1973; MacWhinney, 2000). They asked whether children used the forms corresponding to the statuses of the Givenness Hierarchy, whether those uses were appropriate (that is, whether the referent had at least the minimal cognitive status required by the form), whether children used the forms for their full possible range of uses as predicted by the Givenness Hierarchy (that is, whether a form is used not only with the highest cognitive status appropriate, but also with all of the lower statuses) and also whether, in a given context, a child could have made an error (i.e. there were forms that would have been incorrect, thus an error was possible).

By and large Gundel et al. (2007) noted that the children studied produced all of the studied forms with relatively few errors and did so before 3 years of age. This finding was confirmed and quantified by Gundel and Johnson (in press) who found errors in only about 5% of the child utterances they examined—specifically, the use of personal pronouns for referents that were at most activated, as in (28):

(28) Child aged 2;6.12

CHI: I'm going to clean it with my popper

MOT: you're going to what?

CHI: clean the barn with my popper

(Valian, 1991, as cited in Gundel & Johnson, in press)

In this particular example, the barn the child is talking about has not been mentioned for several utterances and, as such, cannot be assumed to still be in the focus of the mother's attention. In this instance, the child's use of the pronoun *it* is not licit and the mother's failure to understand confirms this. (Interestingly, however, the child knew precisely how to correct the statement such that it could be understood.)

Errors like the one in (28) were infrequent and the following examples provide a look at the rather sophisticated, adult-like ways in which even very young children use referring expressions in natural conversation.

Gundel et al. (2007) note that children produce personal and demonstrative pronouns quite early, typically before determiners. As the researchers point out, the dialog between the 18-month-old Eve and her mother (MOT), given in (29), is interesting both because it demonstrates an appropriate use of the personal pronoun *it* for an in focus referent, but also because it shows that children produce these forms spontaneously and not because they are merely parroting something that has just been uttered by an adult (her mother had not produced *it* in the preceding utterances).

- (29) Eve, age 1;6  
MOT: put the other one back  
MOT: those break  
MOT: put the two back  
MOT: thank you  
EVE: *it* break  
EVE: oh it break  
MOT: and those break too  
(Brown, 1973, as cited in Gundel et al., 2007)

The dialog in (30), between a two-and-a-half-year old child (CHI) and his mother shows another example of the spontaneous production of the personal pronoun for in focus referents.

- (30) CHI: well, I do like tinker toys.  
MOT: you do?  
CHI: I do like *them*  
(Valian, 1991, as cited in Gundel & Johnson, in press)

The researchers found that young children show similar sophistication in their use of other referring expressions. Take, for example, the dialogue in (31) between a 32-month-old boy and his mother:

- (31) (pause: sound of crashing dishes)  
MOT: how many cups do you think there are here  
CHI: *that* was the dishwasher making noise  
MOT: oh was it?  
(Valian, 1991, as cited in Gundel & Johnson, in press)

The child uses the demonstrative pronoun *that* to refer to a noise that is heard in the background. Although the child can assume that his mother heard the noise, he cannot assume that the noise is in his mother's focus of attention. He, thus, appropriately assesses that the noise is activated but not in focus and can be referred to with a demonstrative determiner but not a personal pronoun.

Gundel et al. (2007) and Gundel and Johnson (in press) found that children were just as sophisticated in their use of the definite and indefinite determiners, though Gundel et al. note that these seem to appear in children's speech slightly later than pronouns. One example of the appropriate use of the definite determiner *the* can be seen in a dialog between the two-and-a-half year old Peter (PET) and the adult investigator, Lois (LOI), shown in (32).

- (32) PET: what's over there?  
LOI: over there behind Jenny?  
PET: yeah  
LOI: that's a house  
PET: who's go in *the house*  
(Bloom, 1970, as cited in Gundel et al., 2007)

Here we see Peter refer to an entity with the definite determiner *the*. The adult has introduced this entity into the conversation and, as Gundel et al. note, it can be assumed to be at least activated as it was mentioned in the immediately preceding utterance. Since all activated entities are also uniquely identifiable, this is an appropriate use of the indefinite determiner.

Similarly, when children begin using the indefinite article spontaneously, they do so appropriately. One example of such usage can be seen in (33) where the 26-month-old Eve is talking with her mother and one of the investigators, Colin (COL):

- (33) EVE: I want my spoon  
MOT: well you have to have your spoon, yes  
COL: (%act gets spoon for his coffee)  
MOT: now you want a spoon Eve  
EVE: Fraser and Colin <have a> has *a spoon* for he cup  
(Brown, 1973, as cited in Gundel et al., 2007)

As Gundel et al. point out, as there is no uniquely identifiable spoon, the definite article *the* would be inappropriate in Eve's response. Thus, there was only one appropriate form available—the indefinite article *a*—and Eve made the correct selection.

It is clear that, at least when it comes to naturally produced, spontaneous conversation, even quite young children produce forms corresponding to various cognitive statuses. Moreover, they tend to use those forms appropriately. However, there are times when children use forms in ways that, while not technically incorrect, are not entirely adult-like. Some such instances are examined in the following section.

### 3.2 Children Sometimes “Overuse” Referring Expressions

Although children seem to have a fairly sophisticated understanding of the appropriate uses of referring expressions, Gundel and Page (1998) and Gundel et al. (2007) note instances in which children seem to “overuse” demonstratives and the indefinite article. Take, for example, the conversation in (34) between Adam (aged 2;5.12) and the adult Ursula.

- (34) ADAM: what dat?  
URS: that’s a paper clip  
ADAM: what *dat paper clip* doing  
(Brown, 1973, as cited in Gundel et al., 2007)

As Gundel et al. (2007) point out, the paper clip is in focus for Ursula at the time Adam uses the phrase *dat paper clip*. Since in focus entities are also activated and familiar, the demonstrative determiner *that* is grammatical but not adult-like, as an adult probably would have used the personal pronoun *it* (the strongest possible form) or a weaker form such as *the paper clip*.

Similarly, Gundel and Johnson (in press) note instances of children overusing the indefinite article, as in the example in (35), where the two-year-old Peter is talking to Lynn (LYN), one of the investigators.

- (35) LYN: the baby's taking a bath  
PET: the baby's taking a bath  
LYN: mmmhm getting all clean  
%Lynn puts baby in bed  
PET: *a baby's* going to bed  
PET: he wake up  
(Bloom, 1970, as cited in Gundel & Johnson, in press)

In this dialogue, Peter appears to be referring to the baby that Lynn has just put in bed—indeed the same baby that they have been talking about for several lines—when he says *a baby's going to bed*. At this point in the conversation, the baby is in focus, so it would have been licit to refer to it with a person pronoun (e.g. *He's going to bed*). Since referents that are in focus are also type identifiable, Peter's use of the indefinite article is not incorrect, although it does seem a bit odd to the typical adult speaker. This is due to the fact that, as discussed in Chapter 2, the use of the indefinite article in contexts where a stronger form can also be used often gives rise to a Q1 implicature (the implicature that a stronger form does not apply).

While examples of children overusing forms are rare, it is nonetheless interesting in that it may provide us with insight into the development of children's pragmatic understanding and abilities. Gundel and colleagues suggest that these instances may indicate that they have not yet fully mastered the pragmatic norms of conversation.

Specifically, they suggest that this overuse indicates that, while children appear to be sensitive to the minimum amount of information that their interlocutors require, they do not yet understand that using a weaker form may give rise to an implicature (2007; 1998; in press). Indeed, experimental studies also indicate that otherwise linguistically sophisticated children show some striking delays in understanding scalar implicatures arising from quantifiers, modals and other parts of speech. The next section reviews these studies.

### **3.3 Children's Understanding of Pragmatic Norms**

In many respects, children appear to have some preliminary inferential abilities at two years of age or even younger, before many coded aspects of communication have been fully developed. For example, 27-month-olds have been shown to tailor their gestural communication depending upon the knowledge state of their parent, pointing more at a requested object when their parent did not see where the object had been placed (Dunham, Dunham, & O'Keefe, 2000). Similarly, 3- and 4-year-olds have been shown to alter their choice of referring expressions depending upon whether an addressee saw where an object was placed or previously mentioned an object (Matthews et al., 2006). Additionally, between the ages of 2 and 4, children show increased understanding of conversational norms (Pellegrini, Brody, & Stoneman, 1987).

However, another recent line of research looking at how children understand the particular type of inference mentioned earlier – *scalar implicatures* – shows more significant delays in inferential abilities, with children not making these types of

inferences until as late as 9 years old in some cases (Chierchia, Crain, Guasti, Gualmini, & Meroni, 2001; Gualmini, Crain, Meroni, Chierchia, & Guasti, 2001; Noveck, 2001; Papafragou & Musolino, 2003).

Noveck (2001) was probably the first to systematically examine children's developing interpretation of scalar implicatures. In one experiment, he presented children (ages 5, 7, and 9) and adults with two open boxes and one covered box and told them that the contents of the covered box were the same as one of the open boxes. One open box held only a parrot while the other open box held a parrot and a bear. Participants were then asked to judge the correctness of a series of eight statements made about the contents of the covered box. The statements were either: true (e.g. *There has to be a parrot in the box*), false (e.g. *There cannot be a bear in the box*), or technically true but pragmatically under-informative (e.g. *There might be a parrot in the box*). He found that the 7- and 9-year-olds were more likely than adults to interpret *might* logically (e.g. as compatible with *Must*) than pragmatically. That is to say, the children were more likely say that the statement *There might be a parrot in the box* was true while adults said that it was false (because, in fact, there must be a parrot in the box). In another experiment, presented in the same article, Noveck found a similar developmental effect for the French existential quantifier *certaines* ('some').

Noveck's findings revealed scalar implicatures to be a robust psychological phenomenon that could be examined experimentally. His results also seemed to show that scalar implicatures are taken into account only after children have understanding of

the logical meaning of the scalar terms he tested. This finding that children are “more logical” than adults was surprising, given most adults’ intuition that the logical interpretation of scalar terms seems more difficult to reach (at least anecdotally, most adults require some persuasion that weaker scalar terms like *might* can be consistent with *must*).

In line with the Noveck (2001) finding, Chierchia, Crain, Guasti, Gualmini, and Meroni (2001) also found that children were less likely than adults to make scalar implicatures. They examined how both children and adults interpreted the conjunction *or*, which can give rise to the scalar implicature that *and* does not apply. For example, the statement *Each child got a popsicle or a cupcake* typically implicates that no child got both a popsicle and a cupcake. This interpretation is commonly referred to as *exclusive-or*. However, *or* can also have an inclusive interpretation in that it is logically consistent with *and*. Thus, rejection of the inclusive interpretation indicates that a scalar implicature has been produced.

In one of Chierchia et al.’s experiments, participants watched an experimenter act out a story with toys. Then, participants listened to a puppet—controlled by a second experimenter—report on what had happened during the story. Participants were instructed to reward the puppet if they thought that the puppet had said “the right thing.” For example, in one trial, participants heard a story about four boys choosing what toys they wanted to play with from among skateboards, bikes, a boat, and a truck. Each boy ended up deciding to take both a skateboard and a bike. The puppet then reported that

*Every boy chose a skateboard or a bike.* In this case, choosing to reward the puppet indicates that a participant has accepted the inclusive interpretation of *or*, while rejecting such a description indicates that the participant has interpreted the phrase with the scalar implicature: *Every boy chose a skateboard or a bike (but not both)*—the exclusive interpretation of *or*. Chierchia and colleagues found that children (average age of 5 years, 2 months) accepted the inclusive interpretation of *or* in 50% of the trials, whereas adults rejected the inclusive interpretation 100% of the time. Furthermore, they found that the 15 child participants were actually split with regard to whether they interpreted scalar implicatures with seven of the participants behaving like adults and rejecting the target sentences 92.8% of the time and seven children rejecting the target sentences only 7.2% of the time. Only one child participant behaved at chance.

In another experiment in the same study, children (with the mean age of 4 years, 8 months) went through the same basic task except that they were presented with two different descriptions by two different puppets. In each trial, one statement used *or* and one used *and*. For example, in one trial, children were presented with a story of some farmers cleaning their animals. Ultimately, every farmer chose to clean both a horse and a rabbit. Children then heard one puppet report *Every farmer cleaned a horse or a rabbit*. Another puppet reported *Every farmer cleaned a horse and a rabbit*. Children were instructed to reward the puppet that “said it better.” In this experiment, when more and less felicitous statements with the same truth value were made available to children at the same time, they rewarded the puppet who had used *and* 93.3% of the time.

A number of other studies have examined children's apparent difficulty computing scalar implicatures and, like Chierchia et al. (2001), have found that children can make adult-like inferences in some experimental conditions. For example, in their study on the interpretation of scalar terms by Greek 5-year-olds and adults, Papafragou and Musolino (2003) incorporated pre-task training to help make participants aware of the pragmatic goals of the experiment; prior to completing experimental tasks much like those in Noveck's (2001) study, participants were introduced to a puppet that sometimes said "silly things" and needed help learning to "say things better" (p. 270). In the warm-up period, when the puppet gave an accurate but infelicitous ("silly") description of an object—for example, describing a dog as a "little animal with four legs"—participants were asked if the puppet could have said it better. If the child failed to do so, the experimenter would provide a more pragmatically appropriate description (i.e. "This is a DOG") (p. 271). The researchers found that children who underwent this pragmatic training were significantly more sensitive to scalar implicatures during the test portion of the experiment. However, in another study, Guasti et al. (2005) found that the effects of this type of training are only temporary (Experiment 2).

The type of judgment participants are asked to make can also affect whether they reject pragmatically infelicitous statements. The experimental tasks used by Noveck (2001) required participants to do two fairly complex things: 1) reason about the possible (and impossible) contents of a covered box when presented the "rule" that the contents are the same as in one of the open boxes they can see (Experiments 1 and 2) and 2) assess

the truth value of a proposition by either agreeing or disagreeing with a statement of encyclopedic knowledge (e.g., “Some airplanes have wings”) (Noveck, 2001, p. 187), often called a Set Evaluation Task (Experiment 3). Likewise, as mentioned earlier, Experiment 2 of Chierchia et al.’s study (2001) required participants to evaluate the truth-value of a sentence and construct other alternatives against which to judge its felicity. Children appeared to have difficulties making pragmatic judgments on these tasks, but when presented with an alternative with the same truth-value, they were able to make more pragmatic responses.

Gausti et al. (2005) examined the effect of task type on children’s ability to make scalar implicatures. One of their arguments was that the Set Evaluation Tasks, such as the one used by Noveck (2001, Experiment 3), might allow participants to create misleading evidence. For example, when evaluating the statement “Some giraffes have long necks” (Noveck, 2001, p. 187) a participant might imagine a possible set of giraffes that do not have long necks such as baby giraffes and thus accept the statement not because the participant is insensitive to the scalar implicatures, but because he is not clear on the evidence under consideration (691). They instead used a Truth Value Judgment Task (TVJT) where participants were asked to verify a puppet’s report of an event. In a procedure similar to that of Experiment 2 of Chierchia et al. (2001), described above, participants watched videos of various scenes such as a group of soldiers deciding whether to ride motorbikes or horses and, ultimately, all agreeing to ride horses. Participants then heard a puppet describe the scene by saying “Some soldiers are riding a

horse” (p.686). In this context-rich task, 7-year-olds made scalar implicatures nearly as often as adults (Experiment 4). Although children younger than 7 were not tested in this experiment of Gausti et al. (2005), it is interesting to note that, with nearly the same task, Chierchia et al. (2001) found that 5-year-old children were equivocal in their responses, with approximately half of their participants responding like adults and half of their participants accepting pragmatically infelicitous statements.

Several other factors have been found to improve children’s ability to make scalar implicatures. Pouscoulous, Noveck, Politzer, and Bastide (2007) conducted a series of experiments showing that children made significantly more pragmatic interpretations in action-based tasks—tasks in which participants performed an action based on their own interpretations of scalar terms as opposed to accepting or rejecting the use of such terms by others. They found that this task change, along with the reduction of distractor items and simplification of terms used (using the French quantifier *quelques* instead of *certains*, both meaning ‘some’ but the former is thought to be easier to process by young children), resulted in children 4 to 7 years old making pragmatic interpretations at least 68% of the time (Experiment 2) whereas, in a separate experiment that used a truth-value judgment task, 9-year-old participants gave pragmatic evaluations only 9% of the time (Experiment 1).

Despite the fact that certain experimental manipulations can increase the likelihood that children will make scalar implicatures, the basic finding that adults tend to have an easier time making these inferences remains. Huang and Snedeker (2009)

wanted to examine children's understanding of scalar implicature in a task where participants were free from needing to make overt judgments. In order to do this, they used a visual world eye-tracking paradigm. In this procedure, 5-year-old participants and adults were presented with a "visual-world display" while they heard a short story corresponding to the characters and objects in the display. For example, participants would be presented with four children, two boys and two girls, and hear a story about how some of the children received socks and some of the children received soccer balls. In a trial testing participant's acceptance of *some* as compatible with *all*, two children (a boy and a girl) would receive socks and only one child (a girl) would receive all of soccer balls and one child would receive nothing. The participants were then asked to "Point to the girl that has some of the socks" (p. 381). Researchers examined the eye movements of the participants when completing the task since early eye movements are thought to indirectly measure unconscious reflection and understanding. Of critical interest was where participants looked when they first heard the quantifier *some*. Equal proportions of looks to the girl with (some of) the socks (the target) and the girl with (all of) the soccer balls (the distractor) indicate delayed processing of the scalar implicature. Indeed, this is what the researchers found with 5-year-olds while the eye movements of the adults indicated rapid scalar implicature comprehension.

There is also some evidence from naturally occurring child production data indicating that young children sometimes overproduce forms. Though these overproductions are not technically ungrammatical, they are not entirely adult-like when,

because of how referring expressions interact with pragmatic principles, they give rise to scalar implicatures. Some researchers have hypothesized that these overproductions may be evidence of children's relatively late-developing ability to process scalar implicatures (Gundel et al., 2007; Gundel & Johnson, in press). This evidence is consistent with findings from other research on children's understanding of scalar terms showing that children tend to interpret scalar forms "logically" until relatively late, as was detailed in this section. To the best of my knowledge, no experimental studies have explicitly examined children's understanding of scalar implicature with regards to referring expressions. Most controlled studies of children's production and understanding of referring forms have primarily concentrated on children's seeming overproduction or overextension of the definite article *the* and the possible reasons for this behavior. Nevertheless, some experimental findings do show children overproducing the indefinite article, as well, as detailed in the following section.

### **3.4 Experimental Studies of Children's Use of Referring Expressions**

Michael Maratsos completed some of the first experimental investigations of children's use of the definite and indefinite articles (1974, 1976). In his Experiment 1, 3- and 4-year-old children were told several stories intended to elicit responses containing an indefinite or definite article. For example, to elicit the definite article, one of the stories was about a boy and girl who were playing loudly and were asked to be quiet. After this request, one of the children made a noise. Participants were asked "Who was making the noise?" (1974, p. 448). The expected response in this case was "The boy" or

“The girl.” Likewise, in order to elicit a response with the indefinite article, participants heard a story about “lots of boys and girls” who were playing noisily. After being asked to be quiet, one of them made a noise. As in the previous example, participants were asked “Who made the noise?” The expected response for this type of trial was “A boy” or “A girl.” Only responses containing an article and noun were counted in the analysis. Children in both age groups performed well on the indefinite-eliciting trials, producing *the* 83% and 79% of the time, respectively. In definite-eliciting trials, on the other hand, 3-year-olds produced the definite article only 61% of the time, producing the indefinite article the rest of the time.

Maratsos hypothesized that this relative difficulty producing the definite article in definite-eliciting contexts was due to younger children having difficulty keeping track of the referents of the stories in memory and he gives support for this hypothesis with Experiment 2, in which children performed an “imitation with expansion” task. In this task, participants heard stories similar to the earlier definite- and indefinite-eliciting stories. However, unlike the previous experiment, in this task participants repeated the story sentence-by-sentence following the experimenter. Crucially, one of the sentences produced by the experimenter is missing a required article. It is expected that, upon imitation, participants will unconsciously fill-in the article they were expecting to hear, either *a* or *the*. Three-year-olds in this experiment had very little trouble producing the definite article in the definite-eliciting trials and Maratsos uses this as evidence that their poor performance on definite-eliciting trials was due to memory constraints. He argues

that the imitation task eases the memory requirements on the participant because it “more firmly establishes for the child both the story and the referents’ place in it” (1974, p. 453).

However, another possible explanation for the 3-year-olds’ over production of the indefinite article in definite-eliciting contexts (Experiment 1) is that, although young children understand the minimal requirements of the definite and indefinite articles, they do not fully grasp the pragmatic implications of the use of these forms. In Experiment 1, it is possible that children knew that either the definite or the indefinite article would be grammatically acceptable in definite-eliciting contexts but they failed to realize that the indefinite article often gives rise to a scalar implicature. Likewise, Maratsos attributes the 3-year-olds’ improved performance on the imitation task in Experiment 2 to the idea that repeating stories line-by-line made it easier for the children to keep track of the various referents in the stories and, thus, made “establishing and maintaining the uniqueness of referents” easier for the children (p. 453). However, the improved performance on the imitation task could also be due to lowered processing requirements placed on the participants, allowing them to dedicate cognitive resources to assessing the pragmatic felicity of their responses.

Zehler and Brewer (1982) examined patterns of *a* and *the* production in 3- and 4-year-old children as well as adults. They used a sentence completion task whereby researchers would use toys to act out short scenes while narrating the action. The researchers would then stop their narration and use intonation to indicate that the

participant was expected to complete the utterance in accordance with the scene they saw being acted out. The lead-in sentences were designed to elicit six different categories of article usage, including what Zehler and Brewer call *Introductory* usage or “the first mention of a referent for later comment” (p. 1269) and *Anaphoric* usage or “the mention of an already introduced item” (p. 1269). An example lead-in sentence for eliciting an Introductory usage is “This boy is walking to school and he looks down and sees \_\_\_\_\_” (p. 1269). In this scenario, the experimenter would be manipulating a doll and the doll would look down and see an entity on the ground (for instance, a spider). Thus, the expected response would be “A spider.” An example lead-in sentence for eliciting an Anaphoric usage is “This girl sees a glass of milk on a table. She reaches for it and spills milk all over \_\_\_\_\_” (p. 1269). The expected response in this case is “The table.”

In this study, the Anaphoric uses are of particular interest with regard to children’s understanding of scalar implicature and the indefinite article because, although a full list of trial sentences is not provided by the authors, this context appears to have the most chance for implicature generation. As such, the use of the indefinite article by children in response to these trials might be evidence that they are not sensitive to the possibility of an implicature. Indeed, the children in this experiment did have difficulty producing *the* where it was expected (in accordance with the adult participants’ responses). In fact, the least mature children (those with the lowest MLU) responded nearly exclusively with *a* and bare nominals across all trials and, overall, children produced the fewest definite articles in Anaphoric trials. The authors do not indicate

precisely what the “incorrect” productions were in Anaphoric trials—they only indicate the proportion of correct responses and do not detail how many incorrect responses were *a* and how many were bare nominals. Nevertheless, this study shows the least mature participants (lowest MLU) producing the indefinite article *a* and bare nominals earlier and more frequently than the definite article *the*. As Zehler and Brewer note, this finding is consistent with early diary studies (Leopold, 1949) but it is inconsistent with experimental studies that show overextension of *the*.

### **3.5 Summary and Motivation for Experiment 1**

In this chapter I have reviewed the literature on children’s understanding and production of referring expressions as well as research on children’s pragmatic understanding of scalar terms. With regard to the spontaneous production of referring expressions in natural conversation, much of the current observational research shows children to be quite adept in their use of these forms. Inappropriate uses, from a Givenness Hierarchy perspective, are rare. Nevertheless, children occasionally “overuse” some forms, including the indefinite article, indicating that children understand the logical meaning of forms before acquiring a full understanding of the pragmatic implications of their use in conversation. A parallel body of experimental research on children’s understanding of the pragmatic use of scalar terms, such as *some*, reveals that pragmatic understanding lags behind logical understanding—quite considerably in some studies. Experiments targeting children’s acquisition of referring forms such as *a* and *the*

have typically been designed to target children's overuse of *the* and have approached these forms as if their distribution was categorical as opposed to scalar in nature.

My motivation for Experiment 1, presented in the following chapter, was to fill what I viewed as a gap in our understanding of both the acquisition of the referring expressions *a* and *the* as well as the development of pragmatic competence with respect to scalar implicatures. This initial experiment was designed to investigate whether children's understanding of the indefinite article *a* follows a developmental pattern similar to that of other scalar terms such as *some*.

Children's use of referring expressions, as well as their understanding of pragmatic norms, has been studied via both spontaneous language production as well as controlled experiments. Both approaches have their merits as well as their limitations. Studies of children's spontaneous language production can be helpful in answering questions about what forms children produce in a variety of situations. However, since production does not necessarily equate with understanding, it can be difficult to make conclusions about the full extent of children's comprehension of referring expressions and pragmatic meaning. Furthermore, corpus studies that rely on data gathered for previous studies, such as the data made widely available through the CHILDES database, has often not been coded with referring expression pragmatics in mind and sometimes lack helpful nonverbal clues about how the children in question may be interpreting their input (such as eye gaze). Even with a good account of non-verbal signals, it can be impossible to know from a transcript—or even a video—the full extent of a child's

understanding. Moreover, the ideal scenario for gauging understanding might never occur in the data set. For example, if a parent asks a child to “Hand [her] some blocks” the child might hand the parent some (but not all) of the blocks in question, a fact that might be indicated on a thoroughly annotated transcript. However, this does not tell a researcher interested in scalar implicatures whether the child would accept *some* as being compatible with *all*. Alternatively, the child might hand his parent all of the blocks in question but this would not likely have been noted in the transcript and, even if it were, it would be very difficult to find enough of such cases to determine whether, for example, children are more likely to make such interpretations than adults. Thus, experimental studies designed specifically to target cases such as this are important in gaining a full understanding of children’s comprehension and abilities.

I designed this experiment to examine scalar understanding of *a* from two perspectives. I first wanted to know how children behave when asked to select a referent upon hearing the indefinite and definite articles. Spontaneous production data tells us that children’s use of *a*—a scalar term—is quite similar to that of adults while experimental investigations paint a different picture of children’s interpretation of scalar implicatures in general. However, much of the experimental research targeting scalar implicatures—indeed, many child development experiments in general—have used a paradigm by which children must consciously evaluate the actions of another (evaluation-based tasks), rather than demonstrating how the children themselves act upon hearing these forms (action-based tasks). The one scalar implicature experiment study I know of

to use an action-based task found that children showed more pragmatic understanding than when evaluation-based tasks were used (Pouscoulous et al., 2007). Therefore, to target this first question, I designed an action-based task using the definite and indefinite articles. I also wanted to know whether children recognized violations of pragmatic expectations with respect to scalar terms. Furthermore, I wanted to be able to compare my results to those of researchers examining child development and other scalar forms as much (as is possible across different experiments). Therefore, I also included an evaluation-based task in my experiment. I present this initial experiment in the following chapter.

## Chapter 4 Experiment 1

### 4.1 Participants

Sixteen 5-year-olds, sixteen 7-year-olds, and sixteen adults participated in Experiment 1. Each participant was a native English speaker. Each age group was made up of eight males and eight females. The children's mean ages (range) were 5 years 6 months (5 years 1 month to 5 years 10 months) and 7 years 5 months (7 years 0 months to 7 years 9 months). Children were recruited from the Minneapolis metropolitan area via a telephone list of potential research participants that is maintained by the Institute of Child Development at the University of Minnesota. These were children who were born to two-parent families in Minneapolis and St. Paul, Minnesota, and were mostly white and of upper SES. Children received a small toy as a thank you for their participation. Adults were recruited from the University of Minnesota community by way of advertisement posters placed around campus and were paid \$10 for their time.

Four additional 5-year-olds and two 7-year-olds were tested but excluded from analysis for the following reasons: three 5-year-olds (two males and one female) failed to produce the indefinite article *a* during the warm-up session or in spontaneous

conversation<sup>4</sup>, a fourth 5-year-old (female) and two 7-year-olds (males) were unable to complete the tasks as directed.

## 4.2 Design

Each participant completed two tasks, the Action Task and the Puppet Task. The Action Task was aimed at investigating the extent to which participants made scalar implicatures with *a* naturally. The Puppet Task examined whether participants accepted scalar and non-scalar interpretations of *a*. Since the Action Task was meant to determine if participants naturally made scalar implicatures with the indefinite article, it was desirable to minimize the influence that encountering the scalar implicature would have on the participants. For this reason, all participants completed the Action Task prior to the Puppet Task. Trials within the Action Task were presented in two random orders (A1 and A2) and trials within the Puppet Task were presented in four random orders (P1, P2, P3 and P4). These were combined to create four overall orders (A1P1, A2P2, A1P3 and A2P4). Four participants in each age group received each order.

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<sup>4</sup> Although non-target responses were not recorded, typically these children produced bare nouns in these situations as opposed to nouns with articles. It should be noted that, at least in the *the*-eliciting stories, bare nouns were also a grammatical answer given that some adults produced bare nouns in response to at least one of the *the*-eliciting stories.

### **4.3 Tasks**

Prior to beginning the experimental tasks, all participants completed a warm up task. The purpose of the warm up task was two-fold. First, it gave the children a chance to become familiar with the investigator and the lab surroundings. Second, in the event that the children's spontaneous speech prior to the experiment did not include instances of definite or indefinite articles, the structured activity was designed to try to elicit them. The warm up activity consisted of four short stories that were read to participants. After each story, participants were asked a question meant to elicit a response beginning with either *a* or *the*. The stories are based on ones used by Maratsos (1974) and are presented in Appendix A. Both adult and child participants completed the warm up activity so that the conditions would be identical across all ages. All of the participants included in the analysis produced the expected forms in spontaneous conversation or during this warm up session.

#### **4.3.1 Action Task**

At the beginning of the Action Task, a small figurine of a farmer was placed on the edge of the table and participants were told that the figure was Farmer Joe. The investigator explained that Farmer Joe was going to watch while the participant and the investigator visited his farm. The investigator then presented participants with a game board approximately 18 inches wide by 12 inches long (Figure 1). This game board was used in both tasks.

Figure 1: Game board used in Experiment 1



The investigator explained that the game board was Farmer Joe’s farm and asked participants to point to the different places on the farm: the barn, the wagon, the tree, the garden and the pond. Participants identified each of the places by pointing to them in response to questions like “Can you find the barn?” This exercise ensured that both participants and investigator were in agreement about what to call each location. In those cases where the warm up stories failed to elicit an indefinite article from the participant and that participant had not shown evidence of indefinite article production in spontaneous speech, the question was changed to “What is this?” and the experimenter pointed to a location in an attempt to elicit a response like “A barn.”

Once all of the locations on the farm were identified and named, the investigator explained that they were going to play a game by moving animals around on Farmer

Joe's farm but first the child would get to practice moving things from place to place on the farm. The experimenter presented participants with a small blue block, a blue crayon and a small blue plate. The investigator identified the objects by holding them up individually and saying, "Here is a block, a crayon and a plate." Participants were then led through a series of questions/directions where they had the chance to practice moving items around on the game board. These questions/directions are shown in (36).

- (36) Can you put them in the barn?
- Can you move the block to the tree?
- Can you move the crayon to the pond?
- Can you move it to the garden?

In this practice exercise, participants got practice moving an object to a location and leaving it there (as with the block, which remained in the tree) and they had the opportunity to select a new object (the crayon) and move it twice in succession (to the pond and then to the garden). The contrast between *a* and *the* was avoided by using the pronoun *it*.

Following this practice exercise, the action task began. Participants were told that they were going to pretend to be Farmer Joe and they were going to hear a story about how he moves animals around the farm throughout the day and they should follow along and move the animals like it said in the story. For each trial, three identical plastic animal figurines were placed in the center of the barn on the game board. Participants were asked to identify the type of animal by the experimenter asking a question such as "Can you tell me what these are?" This was to ensure that participant and experimenter

were using the same term to refer to each animal. If the child suggested a different name than the one to be used in the trial (e.g. *sheep* instead of *lamb*) the experimenter would suggest a different term by saying something such as “That’s a good name, but let’s call them *lambs* for this game.”

For the Action Task, participants completed eight trials, each using a different type of animal. Trials had the basic form shown in (37).

- (37) First, Farmer Joe moved a [animal] to the [target location 1].  
Then, he moved a/the [animal] to the [target location 2].

Every trial began by explaining that Farmer Joe moved an animal to a certain location on the farm. After this line was read, the experimenter paused to allow the participant to select one of the three identical animal figurines from the barn and move it to the named location (location 1). This first line served to set up the contrast between *a* and *the* that would be used in the second line of the trial. Then the experimenter read the second line of the trial. Again, after this line was read, the experimenter would pause to allow the participant to move a figurine to another location (location 2).

In the second line of each trial, the article used to refer to the animal varied between the definite article *the* and the indefinite article *a* according to the condition. There were two conditions: the A condition and the THE condition. Examples of each condition are given in Table 1.

Table 1: Sample trials for the action task

Lead-in: <i>First, Farmer Joe moved a lamb to the garden.</i>	
Condition	Target sentence
A	<i>Then, he moved a lamb to the wagon.</i>
THE	<i>Then, he moved the lamb to the wagon.</i>

In THE trials, I expected that participants would elect to move the same object following both the lead-in and the target sentence. This is because, following the initial move of one of the three figurines, it is the “old” figurine that is uniquely identifiable. Likewise, participants who make a scalar implicature upon hearing the second line of A trials are expected to move a new figurine.

Participants completed four trials in each condition for a total of eight trials. Each trial used a different type of animal so participants encountered each type of animal only once. Each of four possible locations (wagon, tree, pond, garden) was used four times: two times it was the target location in the first line of the story and two times it was the target location in the second line of the story. The same location was never used as location 1 and location 2 within the same two-line story.

### 4.3.2 Puppet Task

The purpose of the Puppet Task was to examine children’s recognition of scalar implicatures. In this task, participants watched a puppet act on an object following verbal directions designed to elicit a scalar implicature with the indefinite article *a*. The puppet could either act pragmatically—in accordance with the implicature—or in accordance

with the “logical” meaning. Participants were asked to decide whether the puppet correctly followed the directions. If a participant recognizes the possible scalar implicature, he or she should reject the puppet’s logically/literally-driven actions as inappropriate.

Upon completion of the Action Task, all participants were introduced to a hand puppet named Frank who was controlled by the experimenter. Participants were told that Frank was learning to play the same game that the participant just played but that Frank was still just learning and thus, occasionally, he made mistakes. Participants were told that their help was needed in helping Frank learn the game. They would watch while Frank played and, after each story, they would say whether Frank “did it right.”

Participants completed two practice trials, shown in (38) and (39). For each practice trial, the same three practice objects from the Action Task (a plate, a crayon, and a block) were placed in the barn in the center of the board and the experimenter read the directions while Frank moved the objects.

(38) Can you move the block to the tree?

Can you move it to the pond?

[Frank moves correct object.]

(39) Can you move the plate to the garden?

Can you move it to the wagon?

[Frank moves incorrect object.]

Following each practice trial, participants were asked whether the puppet “did it right.”

The practice trials were presented in the same two-line format as the test trials. As

before, the contrast between *a* and *the* was avoided by referring to the target object with *it*

in the second line of both trials. These practice trials were designed to ensure that participants could give both positive and negative responses to Frank’s behavior and, thus, the puppet moved the correct target object in the first practice trial (38) and moved an incorrect object (the crayon, which was still in the barn) in the second practice trial (39).

Participants completed sixteen test trials that had the same basic two-line format as those in the Action Task, shown in Table 1, except that the puppet was the one moving the objects and the participants evaluated the puppet’s actions. Participants completed four trials in each of four different trial types: A-NEW, A-OLD, THE-NEW and THE-OLD. Examples of sentences, along with the puppet’s associated actions, are provided in Table 2.

Table 2: Conditions for Puppet Task

Lead-in: <i>First, Farmer Joe moved a rooster to the wagon</i>		
Condition	Target sentence	Puppet’s Actions
A-NEW	<i>Then, he moved a rooster to the garden.</i>	Move a new rooster.
A-OLD	<i>Then, he moved a rooster to the garden.</i>	Move the old rooster.
THE-NEW	<i>Then, he moved the rooster to the garden.</i>	Move a new rooster.
THE-OLD	<i>Then, he moved the rooster to the garden.</i>	Move the old rooster.

As in the Action Task, the article used to refer to the target animal varied between *a* and *the*. The *old* and *new* trial-type designations refer to whether, upon hearing the target sentence of the trial, the puppet selected the same animal he had just moved (the

“old” animal) or a different animal (a “new” animal). The A-OLD trials have two possible responses. If the participant generates a scalar implicature when hearing the test sentence, we would expect him to answer that the puppet did “not do it right.” On the other hand, a response indicating that the puppet did “do it right” indicates that the participant did not generate an implicature or did not find an implicature to be relevant in the interpretation of the target sentence.

## **4.4 Results**

### **4.4.1 Action Task**

During the experimental session, the experimenter recorded whether the participant selected a “new” or the “old” animal following the target sentence of each trial. For scoring purposes, selection of a new animal for A trials was given a score of 1 and selection of the old animal was given a score of 0. The reverse was true for THE trials, where selection of the old animal was given a score of 1 while selection of a new animal was given a score of 0. Scores for each participant on each trial type were represented as a percentage of the total score, with 100% representing a total score of 4/4. Table 3 presents the means and standard deviations of responses in the action task by age.

Table 3: Action task means and standard deviations (in parentheses) of correct responses by age

		Age		
	Response	5-years-old	7-years-old	Adult
A	Move new animal	84.37 (35.20)	95.31 (10.07)	100 (0.00)
THE	Move old animal	39.06 (49.13)	87.50 (30.27)	96.87 (8.53)

These percentages were submitted to a two-way mixed design ANOVA with Age (5, 7, or adult) as a between subjects factor and Determiner (A or THE) as a within-subjects factor. The analysis yielded a main effect of Age ( $F(2,45) = 28.17, p < .001, \eta^2 = .55$ ). Post-hoc Tukey's HSD tests ( $\alpha = .05$ ) showed that 5-year-olds scored lower than 7-year-olds and adults, while 7-year-olds and adults did not perform reliably different from each other. There was also a main effect of Determiner ( $F(1,45) = 7.34, p = .01, \eta^2 = .12$ ) indicating that participants reliably scored higher on A than on THE. The analysis also revealed a significant interaction between Determiner and Age ( $F(2,45) = 3.72, p = .032, \eta^2 = .12$ ) showing that the 5-year-olds selected an old object in response to THE significantly less often than both 7-year-olds and adults (39.06% versus 87.50% and 96.87%, respectively).

Adults and 7-year-olds showed strong preferences for selecting a new animal in A trials (100% and 95.31% of the time, respectively) while selecting the old animal in THE trials (96.87% and 87.5% of the time). This behavior indicates that these participants were overwhelmingly interpreting the indefinite article with a scalar implicature. The 5-year-olds did not show these preferences, however. While they selected a new animal in

84.37% of the A trials, they chose the old animal in only 39.06% of THE trials, opting for a new animal the other 60.94% of the time.

To see if the 5-year-olds' behavior on the Action Task was random, I analyzed whether their selection of objects in each condition differed from chance (50%). One-sample *t*-tests show that object choice by 5-year-olds in the THE condition does not differ from chance ( $t(15) = 0.89, p = .387, d = .22$ ), whereas object choice in the A condition does significantly differ from chance ( $t(15) = 3.90, p = .001, d = .98$ ). Indicating that the 5-year-olds were reliably interpreting the indefinite article with a scalar implicature but did not reliably interpret the definite article as co-referential with the previously introduced (“old”) object.

However, despite the fact that, as a group, the 5-year-olds' performance with respect to *the* did not differ from chance, individual performance was highly consistent. Nine 5-year-olds selected a new animal on the THE trials in 4 of 4 trials while six 5-year-olds selected the old animal on 4 of 4 THE trials. This is to say that, clearly, the 5-year-olds did not waver in their selections. Individual participants were not guessing; rather, they each seemed to have a strategy or rule for object selection that they stuck to throughout the task.

#### **4.4.2 Puppet Task**

During the puppet task the experimenter recorded whether subjects stated that the puppet had “done it right” (i.e. followed the story/directions read by the experimenter). For the purposes of analysis, the following behaviors received scores of 1: accepting the

puppet’s actions when he took a new object in response to “Then, he moved *a* \_\_\_\_” on A-NEW trials and when he took the old object in response to “Then he moved *the* \_\_\_\_” on THE-OLD trials and rejecting the puppet’s actions when he took the old (previously moved) object in response to “Then, he moved *a* \_\_\_\_” on A-OLD trials and when he took a new object in response to “Then, he moved *the* \_\_\_\_” in response to THE-NEW trials. The opposite responses in each respective trial type received a score of 0. This scoring strategy is displayed in Table 4.

Table 4: Scoring Method for Puppet Task

	Target sentence	Puppet’s Actions	Scored as 1
A-NEW	<i>Then, he moved a</i> ____	Move new rooster	Accept
A-OLD	<i>Then, he moved a</i> ____	Move old rooster	Reject
THE-NEW	<i>Then, he moved the</i> ____	Move new rooster	Reject
THE-OLD	<i>Then, he moved the</i> ____	Move old rooster	Accept

Each trial type had a potential high score of 4/4. Each participant’s score for each trial type was then calculated as a percentage. Table 5 presents the means and standard deviations for responses in the puppet task by age. For example, five-year-olds accepted the puppet’s actions on A-OLD trials 46.87% of the time and THE-NEW trials 51.56% of the time. They rejected the puppet’s actions on A-NEW and THE-OLD trials 93.75% of the time.

Table 5: Puppet task means and standard deviations (in parentheses) of responses by age

	Condition			
	A-OLD: Rejected	A-NEW: Accepted	THE-OLD: Accepted	THE-NEW: Rejected
5-year-olds	46.87 (47.32)	93.75 (25.00)	93.75 (19.36)	51.56 (50.38)
7-year-olds	90.62 (25.61)	98.43 (6.25)	93.75 (14.43)	87.50 (25.81)
Adults	73.43 (44.34)	100.00 (0.00)	100.00 (0.00)	98.43 (6.25)

Responses were submitted to an Age (5, 7, or adult) x Determiner (A and THE) x Givenness (OLD and NEW) ANOVA with Age as the between-subjects factor and Determiner and Givenness as repeated measures. This analysis yielded main effects of Age ( $F(2,45) = 9.04, p = .001, \eta^2 = .90$ ) and Givenness ( $F(1,45) = 4.975, p = .031, \eta^2 = .01$ ). The Age effect indicated that the 5-year-olds scored lower overall than the 7-year-olds and the adults. The Givenness effect indicated that participants scored higher when judging the puppet on NEW trials than on OLD trials. There was also a significant two-way interaction between Determiner and Givenness ( $F(1,45) = 19.709, p < .001, \eta^2 = .17$ ). The pattern of this interaction reveals that participants, overall, scored lowest on A-OLD and THE-NEW trials. These factors also participated in a significant three-way interaction with Age ( $F(2,45) = 5.455, p = .008, \eta^2 = .10$ ). Tukey HSD post hoc tests ( $\alpha = .05$ ) reveal that 5-year-olds rejected the puppet's actions on A-OLD trials at rates significantly lower than 7-year-olds, and they rejected the puppet's actions on THE-NEW significantly more often than both 7-year-olds and adults.

To test whether behavior on the Puppet Task was random, one-sample *t*-tests were conducted to compare acceptance or rejection of the puppet’s actions by participants of each age in each condition to chance (50%). The results of these tests are presented in Table 6. Only the 5-year-olds’ responses on A-OLD and THE-NEW did not significantly differ from chance.

Table 6: Responses vs. chance by participants on the Puppet Task

	5-year-olds			7-year-olds			Adults		
	t(15)	p	d	t(15)	p	d	t(15)	p	d
A-OLD	0.26	.795	.07	6.34	< .001	1.59	2.12	.051	.53
A-NEW	7.00	< .001	1.75	31.00	< .001	7.75	n/a <sup>1</sup>	n/a	n/a
THE-OLD	9.03	< .001	2.23	12.12	< .001	3.03	n/a	n/a	n/a
THE-NEW	0.12	.902	.03	5.80	< .001	1.45	29.00	< .001	7.75

<sup>1</sup> One sample *t*-tests could not be computed where there was no variation in responses.

As with performance on the Action Task, despite the fact that, as a group, 5-year-olds’ performance on A-OLD and THE-NEW trials did not differ from chance, individual behavior within the 5-year-olds was consistent. Turning first to the A-OLD trials, seven 5-year-olds were “logical” responders, accepting 4 of 4 A-OLD trials, while six 5-year-olds were “pragmatic” responders, rejecting the puppet’s actions on 4 of 4 A-OLD trials. In parallel fashion, seven 5-year-olds accepted the puppet’s actions on 0 of 4 THE-NEW trials and eight 5-year-olds accepted the puppet’s actions on 4 of 4 THE-NEW trials. By contrast, the 7-year-olds were by-and-large pragmatic responders, with 13 participants

rejecting the puppet's actions on 4 of 4 A-OLD trials and the remaining three participants doing so on 3 of 4 A-OLD trials. The adults, like the 5-year-olds, were split in their behavior with four logical responders who accepted 4 of 4 A-OLD trials and 12 pragmatic responders (11 who rejected 4 of 4 A-OLD trials and one participant who rejected 3 of 4 A-OLD trials).

Turning to THE-NEW trials, the 5-year-olds, as a group, did not perform better than chance. However, individual level performance shows high levels of internal consistency. Eight participants in this group rejected the puppet's selection of a new object in response to *the* in 4 of 4 THE-NEW trials, while seven participants accepted the puppet's selection of a new object in response to *the* in 4 of 4 trials.

To review, 5-year-old participants respond by either consistently accepting or consistently rejecting the puppet's actions on A-OLD trials and either largely accept or reject the puppet's actions on THE-NEW trials. To investigate whether pragmatic/logical behavior on *a* corresponded to behavior with respect to *the*, I combined the scores from A-OLD and THE-NEW trials across 5-year-old participants. Inspection of the distribution of the combined scores reveals that individual five-year-olds tended to either 1) accept the puppet's behavior on A-OLD trials and also accept the puppet's behavior on THE-NEW trials (seven participants), or 2) behave "pragmatically" by rejecting the puppet's behavior on A-OLD trials and reject the puppet's behavior on THE-NEW trials (seven participants). This was also the case with the 7-year-olds; there was only one logical responder on A-OLD trials in the 7-year-old age group and that child also

accepted the puppet's actions on THE-NEW trials like the 5-year-old participants. So it appears that, in children, behavior on A-OLD and THE-NEW vary systematically. By contrast, this was not so with the adults; the four adults who treated *a* logically in A-OLD trials (accepting the puppet's actions) still rejected the puppet's selection of a new object in response to *the* in THE-OLD trials, suggesting a bias on the part of younger children to accept anything the puppet does.

#### 4.5 Discussion

I designed this experiment to ask whether children are more “logical” than adults in their understanding of the English indefinite article *a*, in the sense that they tend to interpret the form in a way consistent with its logical entailments rather than by making inferences based on general pragmatic principles that govern language use. Most previous work on the subject has found a fairly robust effect of children even as old as seven to nine interpreting weak scalar forms as logically consistent with their stronger counterparts. Overall, the results from this experiment are consistent with previous work on the acquisition of scalar implicatures associated with other forms except that they do not appear to be as robust. I found that when asked to select a referent for the article (in the Action Task), both 7-year-olds and adults preferred a pragmatic interpretation of the indefinite article—selecting a new object as co-referential with *a*. However, when tasked with accepting or rejecting referents selected by a puppet (in the Puppet Task), 7-year-old children overwhelmingly rejected the pragmatic reading of indefinite article while the adults they were divided, with some participants preferring the pragmatic reading of *a* and

some accepting the logical reading. As a group, 5-year-old children were ambivalent in response to the indefinite article in both tasks. In addition, as a group the 5-year-olds were divided as to their interpretation of the definite article *the*; some children selected a new object in response to *the* in the Action Task and, likewise, some accepted the puppet's actions when he chose new objects in response to *the*. I now turn to a more in-depth discussion of performance by age group.

In the Action Task, the adults selected a new animal in A trials, indicating that they were sensitive to the scalar implicature in the experimental “story” (“Then, he moved *a* \_\_\_\_”). Although selecting the old animal in A trials would be logically consistent with the instructions, there were no adults who chose to do this. However, in the Puppet Task, the adults can be broken into two groups: “pragmatic responders” who rejected the puppet's logical actions in A-OLD trials and “logical responders” who accepted the puppet's logical actions in A-OLD trials. This result was not unexpected as other researchers have found that adults frequently fall into groups of “logical responders” and “pragmatic responders” (Bott & Noveck, 2004; Noveck & Posada, 2003).

The 7-year-olds behaved the most pragmatically out of all three age groups. In the Action Task, 7-year-olds behaved the same as adults in that they selected a new animal upon hearing *a*, indicating that they interpreted the experimental instructions with the scalar implicature. Furthermore, in the Puppet Task, the 7-year-olds rejected the

puppet's selection of the old animal in response to "Then, he moved *a* \_\_\_\_" (A-OLD trials) more often than the adults.

The behavior of the 7-year-olds is intriguing and provides an initial indication that the development of pragmatic understanding of scalar implicatures with the indefinite article does not exactly follow the developmental arc of implicatures arising out of other scalar terms. The 7-year-olds' behavior is not adult-like in that there were no 7-year-olds who could be called "logical responders." Furthermore, it contrasts rather starkly with the behavior of children of this age in previous experiments with other scalar forms. Seven-year-olds in Noveck's (2001) study were the most logical responders, responding logically 80 – 94% of the time across the three experiments in which he investigated scalar implicatures arising from the modal *might* and the French existential quantifier *certain* (*some*) but even 9- and 10-year-old children answered logically at a significantly higher rates than the adults.

To the best of my knowledge, this is the first experiment specifically investigating the development of scalar implicatures as they result from the indefinite article *a* and it is not necessarily surprising that the 7-year-olds in this experiment were entirely pragmatic although they still frequently accept or prefer logical interpretations of other scalar terms as asymmetries in the rates of development of inferential abilities have been found with regards to other types of scales. For example, Papafragou and Musolino (2003) found that children gave significantly more pragmatic responses on items involving implicatures with numerals (e.g. *two*) than they did with the implicatures involving

aspectual verbs (e.g. *start*) and quantifiers (e.g. *some*). A similar pattern of behavior was found with implicatures involving proportional modifiers like *half* (Papafragou, 2006).

Given the fact that some of the adults gave logically consistent responses in the puppet task, it is clear that both logical and pragmatically enriched readings of the indefinite article are possible. However, as just discussed, 7-year-old children in this study strongly prefer the pragmatic reading. So is there a stage in development when children favor the logical interpretation of *a*? To try to answer that question, I turn to an examination of the 5-year-olds' behavior.

In the Action Task the 5-year-olds, showed an overwhelming preference for selecting a new animal in both types of trials. That is, regardless of whether the instructions were to move “a lamb” or “the lamb” many participants selected a new lamb to move. In the Puppet Task, six out of the sixteen 5-year-old participants agreed with everything the puppet did all or almost all of the time, regardless of trial type.

There are several possible reasons for the behavior the 5-year-olds displayed on the two experimental tasks. One possibility is that some of the 5-year-olds misunderstood the experimental tasks. For example, on the Action Task, they may have simply believed that a new animal must be moved after each instruction. This seems unlikely, however, since all participants passed a control trial requiring the participant to move an object that had already been moved in the same trial. Furthermore, if participants had believed that a new animal was supposed to be moved in each trial type,

then in the Puppet Task participants should only accept the puppet's actions on NEW trials types and reject his actions on OLD trial types but this was not the case.

A second possibility is that some 5-year-olds do not make a sharp distinction between the definite and indefinite article. This, however, also seems unlikely since each participant successfully and appropriately produced both the definite and indefinite articles during either the warm-up exercises meant to elicit these forms or in spontaneous conversation prior to the experiment.

A third possibility involves two related explanations to account for the pattern of behavior found in the five-year-olds. First, it is possible that they were, in fact, more “logical” than 7-year-olds and adults in their interpretations of the indefinite article, *a*, but that there are still some differences between their interpretation of *the* in comparison to older children and adults' interpretations. *The* overuse by children in experimental settings has been found by other researchers (e.g. Karmiloff-Smith, 1979; Maratsos, 1974; Schaeffer & Matthewson, 2005). This overuse may be explained in terms of cognitive and attention differences in younger children in that result in them not finding relevance in utterances in the manner adults do.

To examine these potential differences, it is necessary to revisit the Givenness Hierarchy and its interaction with Relevance Theory. Recall from Chapter 2, that relevance-based inferencing restricts how we interpret both the indefinite and definite articles. Turning specifically to the definite article, even though appropriate use of the definite article only requires that a referent be uniquely identifiable (identifiable based

solely on the descriptive content of the nominal), it is often used when referring to things that have a higher cognitive status (see Chapter 2). That is, use of the definite article rarely, if ever, results in a Q1 implicature that a higher status does not obtain. For example, in the present experiment, the previously mentioned animal in each trial has a cognitive status of in focus by virtue of being mentioned in subject position of the immediately preceding clause. Reference with the definite article is not only possible here (since higher cognitive statuses imply all lower ones), but it does not result in the implicature 'not in focus.' Moreover, since all three of the identical animals present on the game board are plainly in view of the participants, each of these animals is at least uniquely identifiable by virtue of being in the participants field of vision. In this case, however, Relevance-based principles, such as the assumption that the speaker is not being ambiguous in their choice of referring form and the desire to maximize cognitive effect while minimizing processes effort, allow listeners to restrict their interpretations of the definite article phrase so that the most natural interpretation is that it refers to the animal that is currently in focus.

To see how this works in the present experiment, consider again a trial like the one in (40), which begins with three roosters on the barn in the center of the game board:

- (40) First, Farmer Joe moved a rooster to the wagon.  
Then, he moved *the rooster* to the garden.

Just like example (26) in Chapter 2, analyzed by Gundel and Mulkern (1998), there are three possible interpretations of the phrase *the rooster*:

- (i) It is ambiguous between the rooster introduced in the previous sentence and selected by the participant or puppet (i.e. the rooster that has just been moved) and the introduction of a new rooster that the addressee is already familiar with—possibly one of the roosters remaining in the center of the board
- (ii) It refers to the rooster introduced in the previous sentence and selected by the participant or puppet
- (iii) It introduces a new rooster and does not refer to the (already in focus) rooster mentioned in the previous sentence

While the conventional meaning of the definite article *the* allows for any of the above interpretations, Relevance Theory predicts (correctly, in the case of adults and 7-year-olds) that the interpretation in (ii) will be preferred as it provides the most contextual effects for the least amount of processing effort.

In the case of the 5-year-olds, this prediction from Relevance Theory is not borne out. This is perhaps because the 5-year-olds' attention is more distributed across all objects on the board, whereas the older children and the adults are able to place more of their attention on the previously moved object in each task. This would follow from substantial research indicating that younger children are more distracted by “irrelevant” material and remember more in incidental memory tasks than older children and adults (Druker & Hagen, 1969; Lubker, 1967; Wagner, 1974).

Furthermore, participants of all ages may be drawn to the two “new” objects due to inherent biases stemming from human visual attention; not only is the barn in the center of the board and thus, likely the most natural fixation point, but they may have also

been drawn to it as the area on the board containing the most objects – a possibility also noted by other researchers who point to current models of visual attention suggesting that during visual search we are drawn to areas with the highest likelihood of containing the objects we seek (Kanan, Tong, Lingyun, & Cottrell, 2009, as cited in Grodner, Klein, Carbary, & Tanenhaus, 2010). Although the center of board in this task contains only two objects (versus the one object that is elsewhere on the board), when combined with a more distributed attention and a tendency to pay more attention to irrelevant details, this inclination may have resulted in some of the youngest children adopting a strategy whereby they were equally likely to interpret the definite article *the* as co-referential with any of the objects on the board and, thus, always selected a new object in the Action Task and always accepted the puppet’s actions in the Puppet Task.

In order to try and account for the possibility that more distributed visual attention among 5-year-olds resulted in their lower success on THE trials in both tasks, a modified version of Experiment 1 was devised and is presented in the following chapter.

## **Chapter 5 Experiments 2 and 3**

The following two experiments were conducted in order to investigate possible explanations for 5-year-olds' overextension of the definite article *the* in Experiment 1.

### **5.1 Experiment 2**

Experiment 2 was designed to see whether altering the perceptual availability of the animals on the game board would change 5-year-old participants' behavior in response to THE trials. Recall that in Experiment 1 adults and 7-year-old participants tended to interpret the definite article in THE trials as referring to the animal that had already been introduced (the "old" animal) while the 5-year-old participants performed at chance as a group, with some participants always selecting a new animal in the Action Task, regardless of whether the animal had been referred to with *a* or *the*. Furthermore, many of the 5-year-olds accepted all of the puppet's actions in the Puppet Task, most notably the selection of a new animal when the definite article *the* was used (THE-NEW trials). One possible explanation for this pattern of responses is that children at this age have a more distributed attention than older children and adults and this affects the way in which they find relevance in language.

#### **5.1.1 Participants**

Sixteen 5-year-olds participated in Experiment 2. As in Experiment 1, each participant was a native English speaker with eight participants being males and eight

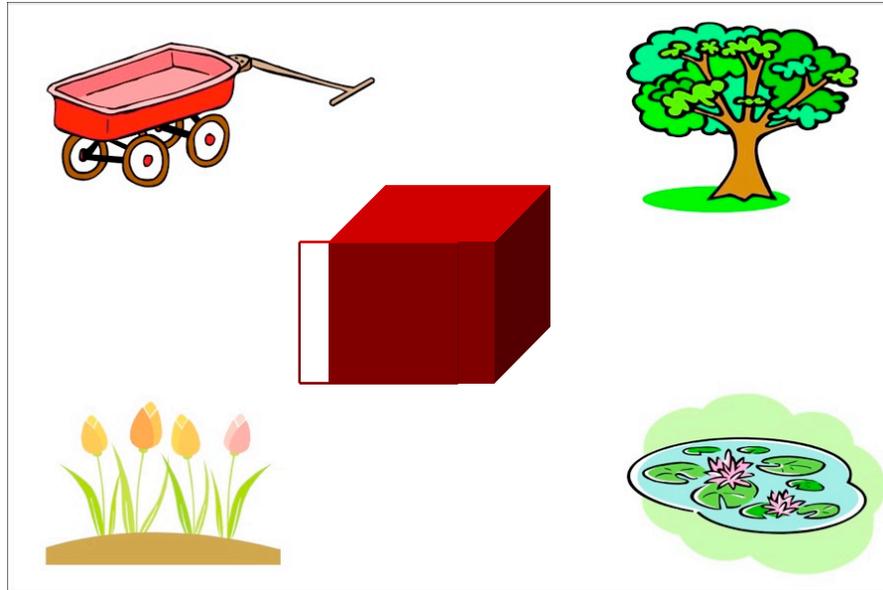
females. The mean age of participants (range) was 5 years 6 months (5 years 1 month to 5 years 10 months). Participants were recruited from the Minneapolis metropolitan area via a telephone list of potential research participants that is maintained by the University of Minnesota's Institute of Child Development. Children received a small toy as a thank you for their participation.

Five additional participants completed the experiment but were excluded from analysis because they did not produce one or both determiners during the elicitation portion or in spontaneous speech. Two of these participants did not produce *the* and three of these participants did not produce either *the* or *a*.

### **5.1.2 Design and Tasks**

The design of Experiment 2 and the tasks completed were identical to Experiment 1 with the exception of the game board. Experiment 2 used the same game board as Experiment 1 with the addition of a three-dimensional barn, which was constructed out of cardboard, painted red and black to resemble a barn. This barn was a four-sided box with an open top. The outside of the box was painted red with a black decorative door. The barn was then taped to the middle of the game board on top of the two-dimensional barn image from the previous experiment.

Figure 2: Game board with three-dimensional, open-top barn, used in Experiment 2



The tasks proceeded exactly as in Experiment 1 except that at the start of each trial the animals were placed in the barn through the opening on top as opposed to the animals just sitting on a picture of a barn, as in the previous experiment. When animals were moved from the barn, the participants (in the Action Task) or the puppet (in the Puppet Task) reached into the box through the open top to get the animal.

### 5.1.3 Results

Participant responses were scored in an identical manner to those in Experiment 1.

### 5.1.3.1 Action Task

Table 7 presents the means and standard deviations of responses in the Action Task in Experiment 2. This same information from the 5-year-olds from Experiment 1 is also reprinted in Table 7 for comparison.

Table 7: Means and standard deviations (in parentheses) of responses by 5-year-olds in the Action Task by experiment

	Condition	
	A: moved new animal	THE: moved old animal
Experiment 2	87.50 (34.15)	54.67 (45.84)
Experiment 1	84.37 (35.20)	39.06 (49.13)

In order to examine whether reducing the visual availability resulted in an increased preference for the old animal in THE trials, I conducted an independent-samples *t*-test to compare performance on THE in Experiment 1 and Experiment 2. Reducing the visual availability resulted in slightly more adult-like treatment of the definite article in 5-year-old participants during the action task (39.06% in Experiment 1 vs. 54.68% in Experiment 2), though this difference is not significant ( $t(30) = -0.93, p = .36, d = .33$ ).

To examine whether object selection in the THE condition in Experiment 2 was random, I conducted a one sample *t*-test comparing performance on THE trials to chance (50%). The results indicate that, as in Experiment 1, performance was not significantly different from chance ( $t(15) = 0.41, p = .69, d = .10$ ). Again it is worth mentioning that

performance did move in the predicted direction, from 39.06% in Experiment 1 to 54.68%, though neither was reliably different from chance.

However, as with the 5-year-olds in Experiment 1, group behavior was split, with seven participants moving the old object in response to *the* in at least 3 of 4 trials and seven of the participants moving the old object in only 1 of 4 or 0 of 4 trials. So, once again, the chance level of performance by the 5-year-old group is due to the fact that the group was strongly bimodal rather than individual participants performing randomly.

### 5.1.3.2 Puppet Task

Table 8 presents the means and standard deviations of response scores in the Puppet Task in Experiment 2. This information from the 5-year-olds in Experiment 1 is also reprinted for comparison.

Table 8: Puppet task: Means and standard deviations (in parentheses) of responses of 5-year-olds by experiment

	Condition			
	A-OLD: Rejected	A-NEW: Accepted	THE-OLD: Accepted	THE-NEW: Rejected
Experiment 2	46.88 (47.32)	96.88 (8.54)	95.31 (10.08)	51.56 (46.07)
Experiment 1	46.87 (47.32)	93.75 (25.00)	93.75 (19.36)	51.56 (50.38)

The reduced visual availability of new objects in Experiment 2 made no difference in 5-year-olds' behavior in the Puppet Task. The mean performance on THE-NEW trials, which were of particular interest in this experiment, was identical to that of the 5-year-olds in Experiment 1 (51.56%).

As with the 5-year-olds in Experiment 1, the group mean is not indicative of a group-wise tendency. Once again, participants were quite divided on their responses on both A-OLD and THE-NEW trials. To see whether the logical responders on A-OLD trials were also the ones who accepted THE-NEW trials, as in Experiment 1, I combined the responses to A-OLD and THE-NEW trials from individual participants. The distribution of these combined responses shows quite clearly that, indeed, logical responders on A-OLD trials tended to also accept THE-NEW trials (seven participants) and pragmatic responders on A-OLD trials rejected THE-NEW trials (eight participants) indicating that the 5-year-olds who interpreted *a* with a scalar implicature were the same ones who interpreted *the* with a Relevance-based inference.

#### **5.1.4 Discussion**

Experiment 2 was designed to test the possibility that 5-year-olds' "over-application" of *the* in Experiment 1 was due to the fact that both the "old" and "new" objects on the game board had equal visual availability and, as such, were all equally relevant (in a Relevance Theory view) resulting in children's failure to interpret *the* as referring to the previously mentioned object as adults overwhelmingly do. While reducing the visual availability of the new objects did not significantly alter 5-year-olds' performance with respect to *the*, group behavior did shift slightly in the direction of more adult-like behavior on the Action Task, from 39.06% selection of the old object in response to *the* in Experiment 1 to 54.67% in Experiment 2. So there is some weak evidence for more adult-like performance with reduced visual availability.

Another possible reason for this behavior by 5-year-olds is on the Action Task they had a bias for always selecting a new object and on the Puppet Task they had a bias for always agreeing with the puppet's actions, regardless of trial type. Puppets are often used in truth-value judgment tasks such as this because it is thought that children may be able to correct or disagree with a "silly puppet" or a puppet who is "still just learning" than to disagree with an adult figure like an experimenter but it is still possible that a child would be biased to agree with a puppet as opposed to paying attention to linguistic features. The control trials at the beginning of each task were included as an attempt to prevent including children with a bias toward new objects in the Action Task or agreeing with the puppet rather than attending to the linguistic features of the trials in the Puppet Task. The control trials before the Action Task were designed to highlight that sometimes a new object is moved and sometimes the old, already-moved object is moved again. The control trials before the Puppet Task were designed to verify that participants were able to both accept and reject the puppet's actions. The participants from the previous two experiments passed these control trials. Nevertheless, it is possible that even children who passed the control trials changed their behavior during the actual test trials.

In order to examine these two possibilities, I designed a third experiment that contrasted the indefinite article *a* with the third-person pronoun *it*. Since use of *it* is only licit when referring to objects in the addressee's focus of attention, selection of a "new" object in response to *it* would not simply be not the most pragmatically enriched option,

but it would be clearly incorrect. Assuming that 5-year-olds have acquired an understanding of personal pronoun use (which, to my knowledge, all accounts indicate they have), then *it* should act as a true control, indicating whether participants are responding to the linguistic stimuli in the experiments. Experiment 3 is presented in the following section.

## **5.2 Experiment 3**

Experiment 3 was designed to arbitrate between two competing hypotheses about why the 5-year-old participants in Experiments 1 and 2 behaved as they did on THE trials in both the Action and the Puppet Tasks. The present experiment was identical to Experiment 2 except that in this experiment THE trials were replaced with IT trials in both of the tasks. I hypothesized that, if the 5-year-olds' performance on THE trials was due to an overextension of the meaning of *the*, they should perform accurately on IT trials in this experiment. No difference between IT trial performance and performance on THE trials in Experiment 2 would indicate that overextension of the meaning of *the* was not likely the reason behind their performance on the previous experiments – or at least not the entire cause – and it would lend further evidence to a possible preference toward attending to novelty (in the Action Task) or agreeing with the puppet (in the Puppet Task) rather than the pragmatics of the linguistic input.

### 5.2.1 Participants

Sixteen 5-year-olds participated in Experiment 3. As in Experiments 2 and 3, each participant was a native English speaker with eight participants being males and eight females. The mean age of participants (range) was 5 years 6 months (5 years 1 month to 5 years 11 months). Participants were recruited from the Minneapolis metropolitan area via a telephone list of potential research participants that is maintained by the University of Minnesota's Institute of Child Development. Children received a small toy as a thank you for their participation.

Three additional participants completed the experiment but were excluded from analysis for the following reasons: two participants did not produce the indefinite article *a* during the elicitation session or in spontaneous conversation and one participant was distracted by the presence of a parent who entered the testing room.

### 5.2.2 Design and Tasks

The design of Experiment 3 was the same as Experiments 2 except that all trials involving the definite determiner *the*, including warm up trials and control trials, were replaced with trials involving the third-person pronoun *it*. Specifically, in the warm-up/elicitation portion prior to the experimental tasks, the *the*-eliciting stories were replaced with two activities designed to elicit *it* (Appendix B) and precise changes to the experimental items are as follows.

### 5.2.2.1 Action Task

The practice trials for the Action Task were identical to those used in Experiments 1 and 2 with the exception that instances of *it* were replaced with full determiner phrases. So, during the practice exercise where children practice moving objects around on the game board, they were shown the same blue block, crayon and plate that were used in the previous experiments. They were then asked the questions/instructions in (41).

- (41) Can you put them in the barn?  
Can you move the block to the tree?  
Can you move the crayon to the pond?  
Can you move the crayon to the garden?

The rest of the Action Task proceeded as before with the exception that all THE trials were replaced with IT trials and instances of *the* [animal] were replaced with *it*.

Examples of each type of trial used in Experiment 3 are provided in Table 9.

Table 9: Sample trials for the action task in experiment 3

Lead-in: <i>First, Farmer Joe moved a lamb to the garden.</i>	
Condition	Target sentence
A	<i>Then, he moved a lamb to the wagon.</i>
IT	<i>Then, he moved it to the wagon.</i>

### 5.2.2.2 Puppet Task

The Puppet Task was also the same as it was in Experiments 1 and 2 with a few changes to wording. On the practice trials, full determiner phrases replaced instances of *it*, as is presented in (42) and (43).

- (42) Can you move the block to the tree?  
 Can you move the block to the pond?  
 [Frank moves correct object.]
- (43) Can you move the plate to the garden?  
 Can you move the plate to the wagon?  
 [Frank moves incorrect object.]

The trials for the Puppet Task were also similar to those in Experiments 1 and 2 except that THE-NEW and THE-OLD trials were replaced with IT-NEW and IT-OLD trials. Examples of each type of trial used in Experiment 3 are presented in Table 10.

Table 10: Sample trials for the Puppet Task from Experiment 3

Lead-in: <i>First, Farmer Joe moved a rooster to the wagon</i>		
Condition	Target sentence	Puppet's Actions
A-NEW	<i>Then, he moved a rooster to the garden.</i>	Move a new rooster.
A-OLD	<i>Then, he moved a rooster to the garden.</i>	Move the old rooster.
IT-NEW	<i>Then, he moved it to the garden.</i>	Move a new rooster.
IT-OLD	<i>Then, he moved it to the garden.</i>	Move the old rooster.

## 5.2.3 Results

### 5.2.3.1 Action Task

Responses were scored in an identical manner to Experiments 1 and 2. Table 11 presents the means and standard deviations of responses. These figures are also provided for the previous two experiments for comparison.

Table 11: Means and standard deviations (in parentheses) of correct responses by 5-year-olds in the Action Task by experiment

	Condition	
	A: moved new animal	IT/THE: moved old animal
Experiment 3	85.94 (30.23)	76.56 (33.50)
Experiment 2	87.50 (34.15)	54.67 (45.84)
Experiment 1	84.37 (35.20)	39.06 (49.13)

An independent-samples t-test was conducted to compare performance on IT trials in Experiment 3 and THE trials in Experiment 2. There was not a significant difference in the scores for IT and THE ( $t(30) = -1.54, p = 0.134, d = .55$ ).

To see if children's object choice on IT trials was random, I compared their performance to chance. A one-sample *t*-test reveals that the choice of old referents in the IT condition is significantly different from chance (50%) ( $t(15) = 3.17, p = .006, d = .79$ ).

Looking at the behavior of individual participants in response to *it* reveals far more group cohesion than was evident in response to *the* in the previous two experiments. Twelve children selected the old animal in at least 3 of 4 trials while only

three children selected a new animal in at least 3 of 4 trials. This difference was significant ( $\chi^2 = 5.4, p = .02$ ).

### 5.2.3.2 Puppet Task

Table 12 presents the means and standard deviations of responses in the Puppet Task in Experiment 3. This information from the 5-year-olds in Experiments 2 and 3 is also reprinted for comparison.

Table 12: Puppet Task: Means and standard deviations (in parentheses) of responses of 5-year-olds by experiment

	Condition			
	A-OLD: Rejected	A-NEW: Accepted	THE/IT-OLD: Accepted	THE/IT-NEW: Rejected
Experiment 3	48.44 (46.97)	87.50 (25.82)	98.44 (6.25)	59.38 (43.66)
Experiment 2	46.88 (47.32)	96.88 (8.54)	95.31 (10.08)	51.56 (46.07)
Experiment 1	46.87 (47.32)	93.75 (25.00)	93.75 (19.36)	51.56 (50.38)

To examine whether 5-year-olds were more likely to reject IT-NEW trials in Experiment 3 than THE-NEW trials in Experiment 2, I conducted an independent samples *t*-test comparing performance on these items. This test revealed that there was not a significant difference in performance on new objects in response to *the* or *it* ( $t(30) = -0.49, p = .63, d = .17$ ). In addition, a one-sample *t*-test revealed that responses to IT-NEW did not significantly differ from chance (50%) ( $t(15) = 0.86, p = .40, d = .21$ ).

Looking at individual responses on both A-OLD and IT-NEW reveals that, as with the previous two experiments, individual children were quite consistent in their

performance on these trial types. Seven children agreed with the puppet's actions on all four A-OLD trials (the logical interpretation) while seven children rejected the puppet's actions on at least 3 of 4 A-OLD trials (the pragmatic interpretation). Individual performance on IT-NEW was also divided, with ten children rejecting at least 3 of 4 IT-NEW trials and only five children accepting at least 3 of 4 IT-NEW trials.

As in the previous two experiments, to see if individual participants behaved similarly on these two trial types, I combined the responses for individual participants on both trials. The combined responses indicate that participants who agreed with the puppet on A-OLD trials were not necessarily the same children who agreed with the puppet on IT-NEW trials.

#### **5.2.4 Discussion**

Experiment 3 was designed to investigate the possibility that the sharply split performance of 5-year-olds on *the* in Experiments 1 and 2 was due to some participants preferring new objects (in the Action Task) or agreeing with the puppet (in the Puppet Task) instead of attending to the pragmatic meaning of linguistic features. If, in the first two experiments, participants acted with a new object bias in the Action Task, then they should perform similarly with respect to both *it* and *the*. Likewise, if participants in Experiments 1 and 2 had a yes bias in the Puppet Task, then they should perform similarly on both *it* and *the*.

Although there was not a significant difference between Experiment 2 and Experiment 3 group performance on the Action Task, there were clear differences in the

distribution of individual responses. Specifically, significantly more children who selected the old animal than children who selected a new animal in response to *it*, while in Experiment 2, the number of children selecting the old animal in response to *the* was virtually the same as the number of children who selected a new animal. I believe this is evidence against the explanation that 5-year-olds in the first two experiments were acting on a preference for new objects on the Action Task and instead reveals that, even at age 5, some children have a less relevance-driven understanding of *the* in that they have an easier time accepting violations of Q2 of the Maxim of Quantity (do not give more information than is relevant).

It is more difficult to reject the possibility of a yes bias in the Puppet Task since in Experiment 3 there were still five of 16 participants who incorrectly accepted the puppet's actions when a new object was chosen in response to *it* in 4 of 4 trials (compared with six who did so with *the* in Experiment 2). This is despite the fact that these children correctly produced *it* in the warm-up elicitation portion (or in spontaneous conversation) and were able to reject the puppet's actions in the pre-task exercise. So it appears that some 5-year-olds had difficulties with the Puppet Task that resulted in them agreeing with whatever the puppet did.

One possible reason that some of the 5-year-olds seemed to simply agree with the puppet in lieu of attending to linguistic features that the task might have been too complicated for them. Participants had to listen to the lines of the story, each of which contained an animal and a location. They then had to track a puppet and make sure that

both the object and the location were correct. Even with reduced visual availability of the new objects (Experiments 2 and 3), they may have had difficulty keeping track of all of the elements in each sentence and corresponding actions carried out by the puppet.

Likewise, they may have not focused on which animal—mentioned or new—was moved because all animals were of the same type within each trial (three lambs, three pigs, etc.) while the locations of the animals changed within each trial. Unfortunately, the pre-task practice did not serve to correct this misunderstanding that some children may have had since the objects used in those exercises (a plate, a block, and a crayon) were all different. When children disagreed with the puppet's action in the practice trial, they were disagreeing with the kind of object moved (a crayon instead of a plate) but during the actual experimental trials, the kinds of objects moved were always of the correct type mentioned (as where the locations).

In the next chapter I will discuss the overall findings from all three experiments and how these findings relate to my original research questions. I also present the limitations of these experiments and propose directions for future research.

## **Chapter 6 Conclusion**

The research presented in this dissertation is, to the best of my knowledge, the first experimental inquiry specifically designed to examine scalar implicatures arising from the English indefinite article *a*. This research had several main findings, which I discuss in this chapter along with presenting possible explanations of the results from a Givenness Hierarchy/Relevance Theoretic perspective. I also discuss the weaknesses and limitations of my research. Finally, while the research included in this dissertation appears to be the first study specifically aimed at testing scalar implicatures with referring expressions, there are at least three other published results of experiments which have implications for questions of scalar implicatures and referring expressions (Masharov, 2008; Schaeffer & Matthewson, 2005; van Hout, Harrigan, & de Villiers, 2010). The results of these studies are compared and contrasted with those from the present work in Section 6.5 of this chapter, along with a discussion of how research into this aspect of child language acquisition might proceed.

### **6.1 A Review of the Findings from this Research**

First, and perhaps most importantly, Experiment 1 has provided experimental support for theories suggesting that the relationship between the definite and indefinite articles is not categorical but rather that they are part of a unidirectional implicational scale whereby *the* entails *a* and, through pragmatic implicature, *a* is often understood to

mean ‘not *the*,’ i.e. not uniquely identifiable. (Gundel et al., 1993; Hawkins, 1991; Horn, 2007). The extent to which *a* implicates ‘not *the*’ in a given context also depends, as do other scalar implicatures, on the relevance of the information encoded by the stronger form (*the* in this case) in the given context (Gundel & Johnson, in press; Gundel, Hedberg, & Zacharski, in press). Although the 7-year-olds overwhelmingly interpreted *a* as not compatible with *the*, adults were divided, with some treating *a* as meaning ‘not *the*’ and some accepting an interpretation of *a* that is compatible with *the*. While the present research cannot account for why some adults are more willing than others to accept the logical interpretation of *a*, it is clear that such an interpretation is possible and was easily available for some adults in this experimental context.

Another finding of Experiment 1 is that, by the age of 7, children overwhelmingly prefer the pragmatic interpretation of the indefinite article, where *a* is interpreted as meaning ‘not *the*.’ This finding differs from the general finding that children as old as 9 or 10 do not interpret scalar implicatures from other forms (e.g. quantifiers and modals) as readily as adults. On the other hand, the 5-year-olds in Experiment 1 were split with respect to whether they preferred the logical interpretation (where *a* is interpreted literally as entailed by, and therefore not inconsistent with, *the*) or the pragmatic interpretation of the indefinite article. This appeared to be the case both when they were asked to select an object as co-referential with *a* (in the Action Task) and when they were asked to evaluate a puppet’s selection of objects as co-referential with an object referred to with *a* (in the Puppet Task). This suggests that age five is a critical time in the development of scalar

implicature understanding with respect to referring expressions and at this age children may be just beginning to recognize that, although *a* is perfectly compatible with any referent, it often signals that the intended referent cannot be assumed to have a higher cognitive status (i.e. is not uniquely identifiable).

Furthermore, Experiment 1 revealed that many 5-year-old children also show non-adult-like behavior with respect to the definite article *the*. Although this was not wholly unexpected given that “overuse” of the definite article has often been reported in experimental studies of children’s interpretation of referring expressions (e.g. Karmiloff-Smith, 1979; Schaeffer & Matthewson, 2005), I attempted to control for this by testing 5-year-old children—an older age group than is frequently targeted when studying *the* overuse. I also tried to make sure that these children were producing both articles in an adult-like manner. It is important to note, however, that this overuse of *the* by the 5-year-olds was a pragmatic overuse (as the most recently moved object was deemed by adults to be the most relevant referent for *the*) as opposed to a grammatical overuse in the sense that the referent did not have the required cognitive status. Nevertheless, this experiment provided a glimpse into what appear to be differences in pragmatic understanding of both *a* and *the* in children as compared with adults.

Experiment 2 found that, even when the visual availability of non-selected objects was reduced, about half of the 5-year-old participants preferred selecting a new object in response to *the*. Experiment 3 was intended to test whether children’s behavior in Experiment 2 could be explained by a preference for selecting new objects (in the Action

Task) or always agreeing with the (in the Puppet Task) as opposed to attending to linguistic features. This third experiment provided evidence that children's new object selection in response to *the* in the Action Task in Experiment 2 was not the result of a new-object preference, but rather may have been the result of children not making Relevance-based implicatures like adults. However, the results from Experiment 3 also indicate that the Puppet Task may have been problematic for some 5-year-olds.

## **6.2 Is There Evidence That 5-year-olds Do Not Recognize Scalar Implicatures with the Indefinite Article?**

I began this research by asking whether children have difficulty understanding scalar implicatures that arise out of use of the indefinite article *a*. Recall that selection of the previously moved item in the Action Task indicates that a child might not be sensitive to Q1 of the Maxim of Quantity (give as much information as is relevant) and do not interpret *a* as implicating 'not *the*' (i.e. 'not uniquely identifiable'). Likewise, in the Puppet Task, accepting the puppet's selection of the previously moved animal in response to *a* indicates that a child is less sensitive to Q1.

The Action Task did not provide evidence that children have difficulty with indefinite article scalar implicatures because in each of the three experiments even the youngest children tended to select a new animal upon hearing *a* (more than 84% of the time across all three experiments). The Puppet Task did not provide clear evidence that children have difficulty with indefinite article scalar implicatures, either. Even though about half of the 5-year-olds in each of the three experiments accepted the puppet's

actions in A-OLD trials, the results of Experiment 3 indicate that these children may have simply been agreeing with whatever the puppet did as opposed to attending to the linguistic input.

### **6.3 Is There Evidence That 5-year-olds Do Not Make the Same Pragmatic Inferences as Adults?**

The present research did find evidence that young children are not as sensitive to Relevance-based inferences. Recall that in the Action Task selecting a new animal upon hearing *the* indicates that a participant may be less sensitive to the Relevance-based pragmatic inferences typically associated with the definite article (that the phrase refers to the most recently mentioned, and therefore possibly in focus and most relevant, uniquely identifiable referent), as does acceptance of the puppet's actions on THE-NEW trials in the Puppet Task.

The Action Task in Experiments 1 and 2 provides some evidence that children are less sensitive to the Relevance-based inferences that frequently arise from use of the definite article. Although as a group 5-year-olds selected new (i.e. not recently mentioned) animals in THE trials at about chance rates, individual participants were very consistent in their selections, with about half of the participants selecting a new object in THE trials in at least 3 of 4 trials. The Puppet Task, on the other hand, cannot provide evidence that 5-year-olds are less sensitive to Relevance-based inferences than older children and adults, since Experiment 3 suggests that some children simply agree with the puppet regardless of linguistic input.

#### 6.4 Can These Results Be Explained with Present Theoretical Models?

It is worth emphasizing that the Givenness Hierarchy framework, in conjunction with Grice's Maxim of Quantity and Relevance Theory provides an elegant explanation for the fact that about half of the 5-year-olds in Experiments 1 and 2 selected a new animal upon hearing *the* in the Action Task. It follows from the unidirectional nature of the Givenness Hierarchy that each status entails all of the statuses below it on the hierarchy. In my experiment, all of the animals, whether previously moved or not, might be considered uniquely identifiable (the minimum cognitive status necessary for reference with the definite article). In Experiment 1, all of the animals were visually available to both the experimenter and the participant and, thus, were at least uniquely identifiable and reference with *the* is not incorrect; it is, however, not adult-like because pragmatic principles (specifically Relevance Theory) predicts reference to the most salient and therefore most easily accessible uniquely identifiable referent, as this requires the least amount of processing effort. Likewise, in Experiment 2, even though the unmoved animals were not visually available on the game board, both the experimenter and the participant saw the objects being placed in the barn at the start of each trial. Because of this, even these "hidden" objects may have been judged by participants to be uniquely identifiable.

As discussed at the end of Chapter 3, the reason adults selected the previously mentioned object in THE trials is because they are attuned to Relevance-based principles of cooperative conversation. Specifically, even though all of the animals present on the

game board were at least uniquely identifiable, adults and 7-year-olds find the most recently-moved object to give adequate contextual effects without unnecessary processing effort. Five-year-olds, on the other hand, are equally likely to associate *the* with the previously moved object as they are with a new object, indicating that they may have a yet-underdeveloped sense of Relevance.

### **6.5 Word and Implicature Frequency**

Something that must be considered when looking at the results of my experiments is whether the frequencies of the definite and indefinite articles in natural language may have an effect on when children begin to make pragmatic interpretations. The definite determiner *the* and the indefinite determiner *a* are two of the most frequent words in the English language; they are the first and fifth most frequent terms, respectively, that appear in the Brown Corpus (Francis & Kučera, 1979). The prevalence of these determiners in English may at least partially explain why children who are as old as 9 appear to have some difficulty with scalar implicatures that arise from quantifiers and modal verbs while the 7-year-olds in Experiment 1 showed no evidence of a similar difficulty; it is reasonable to hypothesize that the more frequent an implicature is encountered in every day use, the more conventionalized it becomes for an individual. Thus, since the indefinite article is more frequent in English than modals or quantifiers, we might guess that the implicatures arising from the indefinite article develop earlier

than those arising from other forms<sup>5</sup>. I am not aware of any studies examining the effects of frequency on pragmatic interpretation in language acquisition but it appears as though this is an area in need of more research.

## 6.6 Limitations of the Present Research

One limitation of the present research is the relatively small number of participants in each experiment may have been another limitation of this research. Although performance on *it* in the Action Task in Experiment 3 was over 20% better than performance on *the* in the Action Task in Experiment 2 (76.56% versus 54.67%, respectively), this difference did not reach statistical significance. Likewise, although the reduced visual availability of non-introduced objects in Experiment 2 led to over 15% better performance on *the* in the Action Task as compared with 5-year-olds in Experiment 1 (54.67% versus 39.06%, respectively), this difference was not statistically significant. The fact that the differences in these means were so large and yet not significant may have been due to the huge variability within each group; and it is possible that the differences would reach significance with the addition of more participants.

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<sup>5</sup> It is also possible that the likelihood that a certain form is used with an intended pragmatic enrichment or implicature may also be important in children's developing understanding of the meaning of that form. Although it is licit to use the indefinite article for entities of any cognitive status, it seems to rarely be used this way in natural conversation; Gundel et al. (1993) found that, of the 96 tokens of the indefinite article *a* examined in their data set, 100% of them were used to refer to entities whose highest cognitive status was referential or type identifiable (p. 291). While this figure cannot tell us whether the scalar implicature was relevant 100% of the time, it does point to the strictly "logical" use of *a* being rare in conversation.

Because of the high levels of internal variability in 5-year-old participants, future research on children's acquisition of scalar implicatures and the referring forms *a* and *the* should include more participants.

A second weakness of the present research was the difficulty that many of the youngest participants seemed to have fully understanding the Puppet Task. I included control trials before the Puppet Task to ensure that children were able to both accept and reject the puppet's actions. Despite the fact that 5-year-old children had no difficulty appropriately accepting and rejecting control trials using *it* prior to the Puppet Tasks in Experiments 1 and 2, when *it* was used in opposition to *a* in Experiment 3, many children failed to reject inappropriate actions by the puppet. Clearly the Puppet Task, at least as it was constructed for this study, was problematic for 5-year-olds. As hypothesized in Chapter 5, the control trials themselves may have led participants to focus on elements of the game, such as the type of animal being moved, as opposed to the referring expression being used. Other researchers have suggested that evaluation-based methods of testing may obscure some of children's early pragmatic abilities; Pouscoulous et al. (2007) argued this and, in their experiments, found children made more scalar implicatures in an action-based task than in an evaluation-based one. I believe the results of the experiments in this dissertation add to this question of the appropriate way to assess children's pragmatic understanding and, taken together with those from Pouscoulous et al., may call into question some past results that were based on evaluation-based tasks. The importance of task selection is discussed in further in the following section.

I nevertheless think that experimental tasks like the Puppet Task are an important component in examining children's full understanding of the pragmatic use of scalar terms and these types of tasks are commonplace in scalar implicature research. It is clear, however, that further investigations into children's pragmatic understanding of referring expressions should make sure that children fully understand the goals of the task and are not misled or distracted by training items.

## **6.7 Future Directions**

As research progresses in development of the ability to make pragmatic inferences, I think it is important to examine the importance of the experimental tasks used in this research. This section highlights this by comparing the results from the present study with those of other studies. Several of the studies discussed in this section were not designed to explicitly study pragmatic inferences; nonetheless, I feel their findings are important to this line of research.

### **6.7.1 Importance of the Action Task**

The three experiments presented here investigated language comprehension using two distinct tasks. One task asked participants to provide judgments about the appropriateness of an action in relation to a given verbal description (the Puppet Task). Verification tasks like the Puppet Task are used in a great number of experimental studies on children's language comprehension. However, this type of task alone cannot provide us with a full understanding of the children's language comprehension. This much is

evident when we examine the differences between Experiments 2 and 3 in terms of task type. In the Action Task, nearly half of the children in Experiment 2 selected a new object upon hearing both *the* and *a* (the other children tended to select the old object when hearing *the* and a new object when hearing *a*). One non-linguistic explanation of this behavior is that some of the children just thought that they were always supposed to select a new object regardless of the referring expression they heard. However, this possibility seems unlikely considering that in Experiment 3, when *it* was used in place of *the*, children were significantly more likely to move the previously mentioned (and therefore more salient) object upon hearing *it* and an unmentioned object upon hearing *a* than they were to move a new object irrespective of referring expression. Instead, this action-based task, allows us to see that in some circumstances, 5-year-old children are equivocal between a pragmatically enhanced meaning of the definite article (in this case as referring to a previously-introduced object) and the semantic meaning as simply referring to a uniquely identifiable entity (in which case, both old and new objects are licit).

Drawing conclusions from the Puppet Task, however, is more difficult.

Participants in Experiment 2 were equally likely to agree with the puppet's actions when he moved a new object in response to *the* as they were to disagree with his actions. This could be because this is a licit action given the semantic meaning of *the* (though not the adult-like, pragmatically enriched response). However, those participants who agreed with the puppet's actions on these THE-NEW trials, agreed with his actions across the

board. Thus, another explanation is that these participants favored agreeing with the puppet over attending to the linguistic input. Experiment 3 replaced instances of *the* with *it* and yet the results were indistinguishable from those of Experiment 2; despite the fact that moving a new object in response to *it* was not licit, subjects were equally likely to agree with the puppet's actions on such trials as they were to disagree with the puppet's actions. This result points to an agreement bias on the part of some of the 5-year-old participants, or a misunderstanding of the task (possibly due to the warm-up trials, as discussed at the end of Chapter 5). So, in this case, non-linguistic aspects of the verification task (the Puppet Task) may have obscured the 5-year-olds' comprehension of referring expressions and pragmatic principles.

Pouscoulous et al. (2007) recognized the possibility that the overall difficulty of verification tasks might obscure children's recognition of pragmatic norms and scalar implicature production. In a verification-task where they investigated scalar implicature understanding with the French quantifier *certaines* ('some'), they found that children responded to the critical trial with logically consistent (as opposed to pragmatic) answers 91% of the time. (p. 358). However, when implementing an action-based task, they found that even the youngest children tested (4-years-old) responded pragmatically at rates significantly greater than chance (p. 364). It is worth noting here that going from a verification task to an action-based task was not the only change Pouscoulous et al. implemented between their first and second experiments. They also removed the distractor trials that they had used in the verification task and changed the quantifier from

*certain* to *quelques* (both mean ‘some’ in French but *certain* is thought to be more complex because it is a partitive while *quelques* is a simple existential). Because all of these changes were implemented in the same experiment, we cannot know the effect of the task change alone on children’s pragmatic behavior, though both Pouscoulous et al. (2007) and the experiments I have presented in this dissertation give reason to believe that including both tasks in future studies may be important in investigating the full range of children’s acquisition of language and pragmatic meaning.

In the following sections I examine several other studies, conducted on both children and adults, which bring to light additional factors that might need to be considered in future research pertaining to pragmatic interpretations.

### **6.7.2 Human versus Computer Interaction?**

Beyond the importance of using a complementary set of tasks as opposed to single tasks when investigating children’s understanding of pragmatic norms, is the importance of carefully considering the tasks themselves since even adult behavior can vary dramatically depending upon the experimental task. One consideration in future research is whether participants in a task are interacting with a human (or at least a human-controlled puppet) or a computer. The import of this consideration is evident when we compare the differences between adult behavior in the present dissertation with the behavior of adults in Mashrov’s (2008) dissertation. In his study, Masharov looked at how adults interpreted various referring expressions (*a*, *the*, and the demonstrative determiner *that*) as a function of how much intervening material came between the initial

linguistic mention of a referent and the referring expression being studied. In his first experiment, participants viewed a 4 x 4 grid of object images on a computer screen and received auditory instructions to click on certain objects in the grid. In all conditions, participants were instructed to click one specific object. For example, they were told to “Click on the heart above the lemon” (p. 31). Then, in the conditions most similar to the items in the Action Task, participants heard “Now click on the heart” or “Now click on a heart” (p. 31). Participants in this experiment strongly preferred clicking on the already mentioned heart (the first heart they clicked on, or the “old” object) when they heard *the* (nearly 100% of the time<sup>6</sup>) and, contrary to Masharov’s predictions, participants also tended to click on the mentioned heart when they heard *a* (over 80% of the time). Masharov predicted that participants would click on a new heart when they heard *a* but instead they showed a preference for the previously mentioned referent regardless of whether the definite or indefinite article was used. This result contrasts drastically with the behavior of the adults in my Experiment 1 Action Task who unequivocally (100%) selected a new object upon hearing *a*. Two follow-up experiments with small alterations did not significantly alter these results.

Masharov also conducted a scene verification experiment where participants viewed a scene on a computer—for example, a picture of a kitchen with various objects that might be in a typical kitchen such as bowls, a rolling pin, etc. Participants would

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<sup>6</sup> Masharov does not provide exact numbers in text of his thesis but does present bar graphs of the responses.

then hear a short description of a person moving objects around in the scene and they would see changes happening to the scene. Participants were supposed to verify whether the scene change matched with the description that they heard by pressing a “yes” or a “no” button. A sample of what participants heard is provided in (44):

- (44) The kitchen was a mess, so Lisa decided to clean up.  
She moved a bowl to the table.  
Then, she put *the/a* bowl in the cupboard.

In some trials the same bowl (the “old” bowl) moved following each mention, whereas in other trials, a different (“new”) bowl moved; thus, some of the trials in this experiment were similar to those used in my Puppet Task in alternating both *a* and *the* with old and new objects while the participants verify whether the movements match with what is being said. In this experiment Masharov found that adults were largely accepting of *a* regardless of whether the old or a new object moved in the scene (equivalents of A-NEW and A-OLD). Participants also accepted *the* when the old object moved in the scene (THE-OLD), but they tended to reject *the* when a new object was moved (THE-NEW), accepting these trials only about 40% of the time. This contrasts with the adults’ behavior on the Puppet Task in Experiment 1 who accepted A-OLD trials only 73.43% of the time but nearly always rejected THE-NEW trials.

Although Masharov’s experiments are similar to the Action and Puppet Task that I used in my research, there is at least one obvious difference between them: Masharov’s tasks took place on a computer screen, whereas mine were conducted in a face-to-face set-up where participants were individually tested by an experimenter. It seems

reasonable to hypothesize that in an experiment using terms with significant pragmatic meaning, interacting with a human (or even a puppet) might result in different behavior than interacting with a computer. Masharov acknowledged this to an extent when he suggested that the object array used in his first experiments may have “hinder[ed] visual search for referents” and that, since it was not a natural scene it may have “restrict[ed] contextual interpretation of the reference” (p. 87). He tried to remedy this unnatural situation in his scene verification experiment but this still involved participants interacting with a computer as opposed to a human (or a human-controlled puppet).

Why might participants be more likely to make pragmatic inferences when interacting with another human than when interacting with a computer? Behind all pragmatic inferences is the basic assumption that someone is trying to communicate something. Even in tasks that are relatively far removed from typical human interactions, when a participant is interacting with a human, it seems reasonable to hypothesize that the participant will assume that the human has some reason for using *a* as opposed to *the*. Whereas, if the participant is only hearing pre-recorded phrases at a computer, they may be less likely to assume that such terms have any particular pragmatic importance. Unfortunately, I am unaware of any research that explicitly tests this hypothesis.

### **6.7.3 Production versus Comprehension**

It is not surprising that children may differ in their production and comprehension of pragmatic implicatures and, in fact, there is some experimental evidence supporting this idea. For example, Shaeffer and Matthewson (2005) examined article production in

2- and 3-year-old children. Children were presented with pictures and questions designed to elicit a response containing either a definite or indefinite article. For example, in one type of trial, participants were shown a picture of Mickey Mouse drawing a house and asked “What did Mickey Mouse just do?” Adult participants nearly always responded with “He drew *a* house” while children said “He drew *the* house” about 25% of the time (pp. 76-79). As Gundel and Johnson (in press) note, these findings are consistent with the Givenness Hierarchy. The children likely understand that the investigator can see the referent (the house) so the referent is uniquely identifiable and, as such, use of *the* is licit. Gundel and Johnson propose that the children, unlike adults, are not sensitive to the pragmatic, Relevance-based, information that the definite article provides more cognitive status information than is needed (a violation of Q2 of the Maxim of Quantity) since what is relevant in this case is the property of being a house (type identifiable) and not the specific house. Thus, going forward in examining the acquisition of the pragmatics of referring expressions (and likely other scalar terms), it is important to design experiments to examine both what children produce as well as what they understand.

#### **6.7.4 Unknown Factors**

Finally, a study by van Hout, Harrigan, and de Villiers (2010) warrants discussion here. Unfortunately, this study only recently came to my attention, but because some of the tasks seem, in many ways, quite comparable to the tasks I used in the present dissertation. Specifically, van Hout et al. incorporated an action-based task (the Referent

Selection Task) that was similar to my Action Task in their investigation of how 3- to 5-year-olds produced and interpreted *a* and *the*.

Participants were presented with illustrations and were told an accompanying story about what was happening in each picture. Participants were also told that the experimenter “made some mistakes” that the participant should correct by moving some objects (attached to the picture with Velcro) in each illustration (p. 1985). One example (the determined-referent condition) shows an illustration of two children, a boy and a girl, standing near a set of cubbies and coat hooks. The girl is holding a sweater and there are also two sweaters hanging on the coat hooks. All of the sweaters, it appears from the example provided, could potentially be moved by participants. Part of the story was then as follows: “Stacey has an orange sweater. She knows that orange is John’s favorite color, so she lets him wear the orange sweater!” (2010, fig. 12). The target object in this example is the sweater that Stacey is holding. The example provided targeting a new object (the new-referent condition) shows a boy and an adult who is holding a piece of cake. There are several other pieces of cake on a table in front of them. The story told to the participants was as follows: “John sees his teacher with a piece of cake. He asks her if he can have a piece of cake” (2010, fig. 12). In this case the target object is a different piece of cake than the one the teacher is holding.

When the children in van Hout et al.’s referent selection task heard *the* they tended to select the already mentioned, “determined” referent (over 80% of the time). However, when these children heard *a*, they also tended to select the determined

referent—selecting a new referent only 40% of the time. Interestingly, this is nearly the exact opposite behavior exhibited by the 5-year-olds in my Experiment 1 Action Task who tended to select a new referent upon hearing *a* but, upon hearing *the*, only selected the determined referent around 40% of the time. Thus, the children in van Hout et al.’s Referent-Selection Task “overextended” the meaning of *a* (violating Q1 of the Maxim of Quantity) than the children in my Action Task from Experiment 1, but had more adult-like, Relevance-based interpretations of *the*. The researchers did not provide information about individual participant differences and whether group behavior was bi-modal as in my experiment.

It is difficult to know why the children in van Hout et al.’s Referent-Selection Task behaved so differently from the children in my Action Task although task differences might have contributed. The “game” in my Action Task was very simple, relatively distraction-free, repetitive, and, although participants were responding to a human and not a computer, it was not very representative of typical communication. By contrast, the Referent-Selection Task in van Hout et al.’s experiment may have been somewhat more naturalistic in that each of the trials were integrated into stories as opposed to being told in isolation. It is possible that the relative cohesion of van Hout et al.’s Referent-Selection Task (compared with my Action Task) made the children more attuned to Relevance-based inferences while simultaneously leading them to violate Q1 more frequently—perhaps due to children having more limited processing capacity.

Clearly, more research needs to be done into the factors affecting when children make pragmatic inferences.

## **6.8 Concluding Remarks**

In this dissertation I described several parallel lines of research: theoretical accounts of the distribution and use of referring expressions, children's acquisition of referring expressions in English, and children's acquisition of pragmatic inferences—especially scalar implicatures. I then proposed an experiment that would investigate children's understanding of scalar implicatures that arise from the indefinite article *a*. I hypothesized that, in accordance with other studies of children's acquisition of scalar implicatures arising from other grammatical forms, young children may be less likely than older children and adults to make scalar implicatures in response to the indefinite article. The primary experiment, along with two follow-up experiments, did not provide evidence to this effect. However, they did provide evidence that 5-year-old children make fewer Relevance-based inferences in response to the definite article *the*. The results of these experiments, in conjunction with other recent work on the understanding of *a* and *the* in both children and adults, highlights the importance of carefully considering experimental tasks when investigating forms with high pragmatic importance.

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## **Appendix A: Warm-up exercises used in Experiments 1 and 2 to elicit *a* and *the***

Participants heard the following stories prior to Experiments 1 and 2. Prior to Experiment 3, participants heard the stories intended to elicit *a* and completed two tasks intended to elicit *it* (Appendix B).

Participants were asked to answer the question at the end of each story however they wanted and that there was no right or wrong response. These stories are based on experimental stimuli used in Maratsos (1974) designed to elicit the definite and indefinite articles.

1. I know a little boy and he is very happy. Do you know why? Well, he has a racecar and a truck. Which one does he like more?

Expected response with *the*.

2. Once there was a little girl who was at the grocery store with her mom. The little girl wanted to have a treat so her mom showed her lots of treats: four popsicles and four cupcakes. The girl's mom said she could choose just one treat. There were four popsicles and four cupcakes. What do you think she chose?

Expected response with *a*.

3. Once there was a little girl. The little girl liked to walk all over tables and chairs, even though she wasn't supposed to. One day she was walking on a table that had

a glass and a plate on it. The little girl knocked one of them over onto the floor.

Which one did she knock over?

Expected response with *the*.

4. I know a little boy who was at the toy store with his dad. The little boy wanted a toy so his dad showed him many different toys: four airplanes and four robots. The boy's dad said he could only choose one toy. There were four airplanes and four robots. What do you think he chose?

Expected response with *a*.

## Appendix B: Warm-up exercises used in Experiment 3 to elicit *it*

During the warm-up/elicitation portion of the experiment, in order to elicit the pronoun *it*, children were presented with the two pictures below, one at a time. Upon being shown the first picture, which shows a girl eating an apple, children were asked, “What did the girl do with the apple?” The expected response was “She ate *it*” or “Ate *it*.” The children were then shown the second picture, featuring a boy who has hit a baseball through a window. Children were asked, “What happened to the window?” The expected response was “It broke,” “The boy broke it,” or an equivalent response.

