A STUDY OF THE COMPREHENSION OF EQUATIVE TAUTOLOGIES IN ADULTS AND CHILDREN

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ABSTRACT

ZACHARY A. WILKINS: A Study of the Comprehension of Tautologies in Adults and Children.
(Under the direction of Bruno Estigarribia)

The main objective of this paper is to examine the interpretation of so-called "equative tautologies" in adults and children. An experiment designed to assess the capacity of adults and children ages 7-9 to calculate implicature from tautologies is discussed. The prediction of the "Radical Semantic" account of tautologies (Wierzbicka 1987, Gibbs & McCarrell 1990) that human referent tautologies (e.g. "a plumber is a plumber") are easier to interpret than concrete referent tautologies (e.g. "a snack is a snack") was not confirmed by data from 23 adult subjects. Furthermore, the child data suggest that children do not interpret tautologies in an adult-like way. When presented with tautological statements, 7-year-olds tended to rely on their own preferences and knowledge of others' preferences rather than computing a conversational implicature as adults do, but this tendency decreased with age. Several explanations are provided to explain the poor performance of children compared to adults in the experiment, with suggestions for future work on the comprehension of tautologies.

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Chapter 1: Introduction

The main objective of this paper is to examine the interpretation of so-called "equative tautologies" in adults and children. An experiment designed to assess the capacity of adults and children ages 7-9 to calculate an implicature from tautologies is discussed. The prediction of the "Radical Semantic" account of tautologies (Wierzbicka 1987, Gibbs & McCarrell 1990) that human referent tautologies (e.g. "a plumber is a plumber") are easier to interpret than concrete referent tautologies (e.g. "a snack is a snack") was not confirmed by data from 23 adult subjects. The child data suggest that children do not interpret tautologies as adults do. When presented with tautological statements, 7-year-olds tended to rely on their own preferences and knowledge of others' preferences rather than computing the conversational implicature that adults do, but this tendency decreases as the children approach age 10.

Chapter 2: Equative Tautologies in Adults

Section 2.1: Tautologies and Implicature

Tautologies are statements that are true in every possible world. This truth is independent of evidence from the real world; the form of the tautology itself makes the statement necessarily true. For example, the statement in (1):

(1) Either you go or you don't go.

The statement in (1) cannot be false—regardless of whether the hearer goes or doesn't go, the statement holds. (1) does not provide falsifiable information about the world. Thus, whatever meaning the utterance has must be inferred in some way.

Equative tautologies[1] in particular are utterances that exhibit the form "*x is x*" (e.g. "*water is water*") where *x* is some NP (or DP). As with all tautologies, equatives are semantically uninformative in that they are necessarily true in all possible worlds. Regardless of the actual real-world properties of referent of *chair* (whether there are many or only one, whether they are large or small, etc.), it is always true to say that *a chair's a chair*.

In his seminal work *Logic and Conversation,* Grice (1975) coined the term "implicature" to describe meaning that is implied rather than being explicitly stated, and more specifically "conversational implicature" to indicate an inference that the hearer is

[1] Equative tautologies are sometimes also referred to as "nominal tautologies" (Okamoto 1991, Gibbs & McCarrell 1990)

compelled to make, assuming the speaker is obeying the cooperative principle. He identified two types of conversational implicature, *generalized* conversational implicature and *particularized* conversational implicature (Grice 1975).

Generalized conversational implicatures are implicatures associated with a particular form that persist throughout a variety of contexts, while particularized conversational implicatures are highly dependent on a specific context to be licensed. The difference between these two types of implicature is illustrated in the example below.

(2) A: Is it time to call everyone for dinner?

B: I burned some of the pizza.

IMPLICATURE$_1$: It is not yet time to call everyone in for dinner.

IMPLICATURE$_2$: Not all of the pizza is burned.

In the particular context of A's utterance, B's utterance generates IMPLICATURE$_1$. However, the form "I burned some of the pizza" does not carry the implicature "It is not yet time to call everyone for dinner" in other contexts. This is because IMPLICATURE$_1$ is a *particularized* conversational implicature. The implicature is licensed only in the context of the preceding utterance. On the other hand, IMPLICATURE$_2$ is not specifically licensed by this context. The lexical item *some* generates the conversational implicature *not all* across a variety of contexts.

Grice considered tautologies extreme examples of a flouting of the maxim of Quantity (1975: 33). Upon hearing a tautology, a hearer knows that since the speaker is being cooperative in conversation, he or she knows to make all conversational contributions as informative as is required by the context. Thus, the hearer knows that if the speaker wished to convey more information with the utterance, he or she would have

done so. The hearer must reason through the tautology and attempt to extract the meaning that the speaker intended.

However, Grice does not provide explicit predictions how implicature is generated by a tautology in context. Rather, according to Grice, the hearer's interpretation hinges upon her or her ability to explain a particular tautology in its context (Grice 1975: 33). In other words, he advocates for no uniform interpretation of tautologies, relegating their meaning to the context in which they were uttered.

Since Grice's (1975) first characterization of them, tautological statements have been the subject of intense debate in the pragmatics literature, with several proposals attempting to capture their meaning. The neo-Gricean approach (Ward & Hirschberg 1991) has expanded how the maxim of Quantity (as well as the maxim of Relation) applies to the case of tautologies by claiming that tautologies are commonly used to identify a class of referents (to the exclusion of other classes). Discarding the need for universal pragmatic maxims, the "radical semantic" account Wierzbicka (1987) of tautologies has proposed a different means of interpreting them.

Section 2.2: The Neo-Gricean Account of Tautologies

Neo-Griceans (Levinson 1983, Ward & Hirschberg 1991) claim that hearers interpret tautologies in a similar way across contexts, and thus tautologies are said to produce *generalized conversational implicatures*, such as the one in (4) below.

(3) A: My husband really wants me to buy a Toyota and my mother really wants me to buy a Ford…

B: *A car's a car*.

(4) IMPLICATURE: Speaker B regards individual differences between cars as irrelevant.

Ward & Hirschberg (1991) have expanded the Gricean program to delineate explicitly how the maxims of Quantity and Relation apply to (equative) tautologies in order to generate the implicature in (4) from the context in (3). The authors state that when a speaker *S* utters an equative tautology (as in the example *a car's is a car* in (1)) the hearer *H* may reason as follows:

- S has affirmed a tautological utterance of the form 'a is a', which appears to add nothing to our mutual beliefs in general, and, in particular, nothing to our mutual beliefs about 'a'.
- Assuming that S is observing the Cooperative Principle, then, by the maxims of Quantity and Relation, S has said as much as s/he truthfully can about 'a'.
- S might have produced utterances of a similar form, say 'a is b', which *could* have added something to our mutual beliefs about 'a'.
- S chose *not* to utter such alternatives.
- Thus S implicates that these alternatives are not relevant for the purposes of the exchange.

(Ward & Hirschberg 1991: 511)

That is, divergence from some prototype of "*a"* mutually salient to both interlocutors should be disregarded for the purposes of the conversation. Say then, for example, that

the prototype of a bird is an animal that features feathers and has the ability to fly. Consider this in light of the following example:

(5) A: You said you were taking me to the zoo to show me some pretty birds, but all I see are these penguins that sit around and don't fly.

B: A bird is a bird.

In the example above, Speaker B indicates with the tautology that divergence from a prototype, i.e., individual differences within the class of all birds, are not relevant for the purpose of the exchange.

The crux of Ward & Hirschberg's (1991) expansion of the Gricean (1975) approach to tautologies is the exclusion of alternatives. Ward & Hirschberg noted one expansion of this idea in that within certain contexts, speakers use tautologies to communicate to the hearer the importance of boundaries between two given sets. For example, Speaker B in (5) seeks to communicate that membership or non-membership of an animal in the class of all birds is unambiguous; Speaker A is expected to draw upon the common knowledge that a penguin is, in fact, a bird. This particular use of equative tautologies was noted by Ward & Hirschberg as "a denial that… a distinction between particular members of the class denoted is relevant" (Ward & Hirschberg 1991: 511).

However, Ward & Hirschberg (1991) were not the only researchers to note this common use of equative tautologies. For Bulhof & Gimbel (2004), when a given predicate denotes a "vague set" (that is, it denotes a set with some internal variation) a tautology can be used to disregard that internal variation within that set. Gibbs & McCarrell (1990) termed this use of tautologies "token indifference," but did not explore in detail how this interpretation might be applied more globally, nor did they provide

examples. The authors simply recognized that the meaning expressed by equative tautologies in this context is "that any one instance of a concept is equivalent to any other" (Gibbs & McCarrell 1990: 129).

Whether it is referred to as (in)distinction of class members (Ward & Hirschberg 1991), a "vague set" (Bulhog & Gimbel 2004) or "token indifference" (Gibbs & McCarrell 1990), this particular use of equative tautologies constitutes an important one, worth investigating. However, while noted in the literature, this feature of tautologies has yet to be tested experimentally to corroborate informal observations; it remains to be seen if, in fact, speakers employ this understanding of tautologies in a diversity of contexts. This particular use of tautology will be the subject of much analysis in the experiment presented in this paper, but first it is essential to discuss an alternative approach to tautologies.

Section 2.3: The "Radical Semantic" Account of Tautologies

The primary alternative to a neo-Gricean approach has its origins in Wierzbicka's (1987) self-described "radical semantic" account of tautologies.[2] Wierzbicka's (1987) central claim about tautologies, for which Gibbs & McCarrell (1990) sought to offer empirical evidence, is that in order to interpret otherwise uninformative tautologies, hearers infer specific propositions that are dependent upon utterance-internal factors,

[2] Wierbicka (1987) explains the use of the word "semantic" for her approach as follows: "According to Levinson ([1983]), among others, a sentence like *boys are boys* is NECESSARILY true. I dispute the validity of this statement, which reflects a mistaken belief that the sentence under discussion is factual. It is clearly not: it expresses a certain attitude, and attitudes can hardly be called 'true' or 'false'." (Wierzbicka 1987: 99) Wierzbicka has chosen the word "semantic" in light of the importance she attributes to the semantic properties of a given NP/DP "x". For an approach that treats phrases such as the one in (1b) such that the second NP is predicative, see Autenrieth (1997) and Meibauer (2008).

such as the type of referent in the NP of the tautology (i.e. abstract, human, or concrete) and the syntax of the tautology (i.e. singular or plural, the presence or absence of an article). Wierzbicka (1987) divides the class of equative tautological utterances into three subclasses based on their form. Each is interpreted as conveying some kind of speaker attitude:

A. A 'sober attitude towards complex human activities' is expressed by the syntactic formula $N_{abstract}$ is $N_{abstract}$ *(e.g. 'war is war')*
B. 'Tolerance for human nature' is associated with the rule $N_{hum.plural}$ are $N_{hum.plural}$ *(e.g. 'boys are boys')*
C. 'Obligations' and 'rules of human behavior' map to the form (*Art*) N is (*Art*) N. *(e.g. 'the law's the law')*

(Wierzbicka 1987: 105-107)

In this way, Wierzbicka argues that universal pragmatic principles are unnecessary for the interpretations of tautologies. Rather, she suggests that specific propositions are somehow generated via a hearer's recognition of the type of referent used in the tautology. That is, specific tautologies have conventionalized meanings depending on the semantics of the noun.

Gibbs and McCarrell (1990) conducted an experiment on adults, in which they sought to provide evidence for Wierzbicka's claim by showing that the interpretation of tautology depends on the type of the NP in a given equative tautology (i.e. whether the referent is abstract vs. concrete vs. human, and whether the tautology is plural or singular and has or lacks a determiner). In their first experimental study, they tested the effect of syntactic variation and referent type on 36 UC-Santa Cruz freshmen's understanding of

tautologies. TGibbs & McCarrell varied the tautological utterances in this first experiment in both the syntax and the type of referent. They split their tokens into six groups: two groups varied by noun type ("human/abstract/concrete inanimate"), two groups varied by "modality" (*x will be x / x is x*) and two groups varied by number (*x is x / x's are x's*).

In their first experiment, tautologies were presented in isolation to the subjects, who were asked to evaluate each utterance without context. The goal was to ascertain the subjects' perceived "attitudes towards" and "acceptability of" certain noun phrase tautologies. Subjects ranked the tautologies that appeared on-screen from 1 to 7 for two measures: "highly unacceptable to highly acceptable" and affectively "very positive to very negative." Gibbs & McCarrell's (1990) results from the first experiment suggest that speakers interpret most easily: human or abstract nouns over concrete inanimate (e.g. "business is business" > "a flower is a flower") nouns and "non-modal" syntactic structures over "modal" constructions (e.g. "kids are kids" > "teachers will be teachers"). In addition, their affectivity results suggested that certain phrases (e.g. "boys will be boys") have context-independent negative charge. For the authors, this is evidence that each tautology has a token-specific meaning as well as token-specific affective charge, and they interpret this as confirmation that there is no systematic mechanism responsible for proper interpretation of tautologies.[3] However, as I will discuss in greater detail below, in recording the judgments of their subjects the authors did not consider the frequency of each tautology, which could potentially influence both their "affective charge" and "acceptability."

[3] Gibbs & McCarrell (1990) provide no qualitative information about subjects' interpretation of tautologies in their experiment; they provide only quantitative data on "acceptability" and "affectivity".

The second experiment incorporates context into the interpretation of tautology, providing either a positive or negative context in order to encourage positive or negative readings of the tautology. For example, for the tautology "Boys will be boys", participants were presented with one of two scenarios: "Boys give such trouble…" or "Boys give such joy…". The result of the procedure yielded a preference similar to that of Experiment 1 wherein human and abstract nouns were more easily processed than concrete inanimate nouns. In the discussion of Experiment 2, Gibbs & McCarrell (1990) note that some tautologies (e.g. "*a telephone is a telephone*") showed considerable contextual sensitivity. However, these authors do not consider that the potential impact of participants' previous exposure to tautologies that have become conventionalized (e.g. "*a promise is a promise*") may cause those tautologies to be less contextually sensitive than non-conventionalized tautologies (e.g. "*a telephone is a telephone*").

With respect to the affectivity ratings (i.e. "positive" or "negative") of certain tautologies, Gibbs & McCarrell (1990) posit that some referent types being more positively regarded than others as evidence that stereotypical information facilitates interpretation of tautologies. A stronger reaction to a tautology may be an accurate measure of a stronger stereotype associated with a particular class of referents. However, negative charge for a given tautology did not seem to be a good indicator of acceptability of the tautology in Gibbs & McCarrell's experiment. For example, the mean affectivity ratings for each referent type in their first experiment (human = 4.11, abstract = 3.75, concrete = 4.14) did not map predictably onto the mean acceptability ratings (human = 4.99, abstract = 4.62, concrete = 3.84). In other words, even though abstract noun tautologies were regarded most negatively, human noun tautologies were the easiest to

interpret. As will be discussed in the following section, other predictors such as high or low conventionalization in speech of tautologies may explain this discrepancy.

Furthermore, Gibbs & McCarrell's (1990) results do not necessarily provide evidence of context independence; a positive response may in fact be a reflection of the speaker's personal feelings regarding the class of all referents denoted by a particular NP. For example, if we observe a more positive affectivity rating for "*A plumber is a plumber*" than for "*A doctor is a doctor*", the result may in fact provide more insight about speakers' views on plumbers and doctors rather than speakers' views on tautologies in general.

In addition, Wierzbicka (1987) claims that tautologies are not interpreted uniformly by speakers cross-linguistically, but, rather, have language- and token-specific meanings. For example, she notes the fact that the tautology "Boys will be boys" in English is incomprehensible in French:

(6) #Les garçons sont les garçons.[4]

Wierzbicka (1987) uses the fact that this and other such tautologies cannot be easily translated as evidence that a universal pragmatic approach is untenable.

Wierzbicka and other proponents of the "radical semantic" approach have received criticism in the literature for using the non-translatability of certain tautologies as evidence that their interpretation does not require any universal pragmatic principles. As Ward & Hirschberg note, the lack of translatability of tautologies is no stronger a claim than to say that any literal translation should maintain other components of

[4] "#Les garçons sont les garçons" is the original translation used by Wierzbicka (1987), and this precise translation has subsequently been repeated by those who have criticized her, such as Ward & Hirschberg (1991) and Bulhof & Gimbel (2004), even though "Des garçons sont des garçons" or "Un garçon est un garçon" may be more plausible options.

utterance meaning (Ward & Hirschberg 1991: 509). For example, that fact that a language does not possess determiners comparable to English *a* and *the* is not an indication that the language does not possess the capacity for scalar implicature exemplified by the English Horn scale < *a*, *the* >.

In spite of the flaws in her argument mentioned above and pointed out in the literature (cf. Fraser 1988, Bulhof & Gimble 2004, Meibauer 2008, *inter alia*), Wierzbicka's (1987) and Gibbs & McCarrell's (1990) approach sheds light on a very revealing aspect of the tautology debate that has seemed to elude researchers on both sides. This aspect is that, in fact, some tautologies have become conventionalized in speech and do not need to be calculated. The pragmatic approach as well has been encumbered by a preoccupation with attempting to explain certain highly familiar tautologies, such as *war is war* (Levinson 1983) or *business is business* (Meibauer 2008), which appear to carry meaning that has become conventionalized in speech by frequent use that is difficult to project on to equivalent tautologies in other languages. I will argue that this is an important component to a discussion on all equative tautologies, though, and I propose a way to think about these conventionalized tautologies in light of the (seemingly) infinite number of nonce tautologies.

Section 2.4: Conventionalized/Short-Circuited Tautologies

I argue in this paper that prior to analyzing equative tautologies, one should consider sub-dividing all equative tautologies into one of two categories: conventionalized and non-conventionalized. This crucial aspect of the class of all (equative) tautologies appears to have evaded analysis on both sides of the debate. That

is, Wierzbicka's (1987) observation that not all tautologies are interpreted equally was not unfounded. Indeed, certain tautologies (*war is war, business is business, a promise is a promise*) have become so commonplace in speech that pragmatic principles are no longer needed for their interpretation. In other words, the meaning has become stored in the lexicon and the implicature is not calculated in the conversational exchange.

The conventionalization of certain tautologies can be thought of in terms of "short-circuited" implicature (Morgan 1978). That is, certain implicatures, such as "Can you pass the salt?" have become so conventionalized in speech that they no longer require the listener to compute the implicature. Rather, the meaning is readily available upon hearing a specific sequence.[5] On the other hand, when a speaker is presented with a novel tautology, he calls upon Gricean principles in order to recover meaning from an otherwise uninformative utterance (Ward & Hirschberg 1991). In the case of "Can you pass me the salt?" it would be infelicitous to inquire about the hearer's ability to pass salt when it is obvious to both speakers that he or she possesses the ability to pass the salt. So, the hearer infers that the speaker must have intended something other than this request for information, namely, that the speaker is requesting that the hearer actually reach and grab the salt.

However, as Morgan (1978) states, this process of reasoning is unnecessary in actual speech due to the fact that requests of this type are so common in speech; that is, the implicature is "short-circuited", and the hearer immediately interprets a request upon hearing the utterance. By making this key distinction between conventionalized and non-conventionalized implicature, we can isolate those tautologies for which the implicature

[5] Whether conventionalized tautologies acquired their idiomized meanings historically from the repeated application of pragmatic principles is not a claim that I wish to explore in this paper.

is *not* short-circuited. This allows us to isolate tautologies that exploit the maxims of Quantity and Relation in a more predictable way.

The Corpus of Contemporary American English (COCA, Davies 2008) was used to identify those tautologies which, as a result of greater frequency in usage, are more likely to have become conventionalized in speech due to short-circuiting. This corpus is a compilation of 450 million words from transcripts of spoken language, fiction, magazines, newspapers, and academic journals. The corpus will help in determining which tautologies have become 'conventionalized' from their high frequencies and aid in isolating the remainder, which can be labeled as 'non-conventionalized'.

This idea of conventionalized implicature vs. non-conventionalized implicature is especially enlightening in view of Gibbs & McCarrell's claims about tautologies. The authors state that the type of referent in an equative tautology conditions its interpretation. As justification for their looking at the "acceptability" of certain tautologies in their experiment, Gibbs & McCarrell (1990) state the following:

> "Phrases such as *A hat is a hat* or *Carrots will be carrots* seem less acceptable as meaningful tautologies than do phrases such as *Business is business* or *Boys will be boys* that mention people or activities for which speakers/listeners have strong stereotypes."
>
> (Gibbs & McCarrell 1990: 129)

Gibbs and McCarrell assume that the stereotypes associated with "business" and "boys" monitors their participants' interpretation of tautologies. Yet, there is one salient alternative for explaining why some of the authors' referent classes may be more readily interpretable than other classes. Gibbs & McCarrell (1990) mix freely tautologies

common in American English (≈conventionalized) with those that they seem to have coined themselves (≈unconventionalized). This likely has an effect on their participants' responses because it narrows the interpretation of the tautology toward its conventional use in speech. At no point do Gibbs & McCarrell address the potential influence of frequency in the input on their results. The authors do note that some tautologies such as *Business is business* and *Boys will be boys* are listed as idioms in some dictionaries, but nevertheless argue for the need for a universal account of tautologies that groups common tautologies with novel ones. The following table shows the frequency of the representative tautologies mentioned above from Gibbs & McCarrell (1990) above in the Corpus of Contemporary American English (COCA):

Figure 1: Frequency of Conventionalized vs. Non-Conventionalized Tautologies in the Corpus of Contemporary American English (COCA)

Tautology	*"A hat is a hat"*	*"Carrots will be carrots"*	*"Business is business"*	*"Boys will be boys"*
Frequency in COCA	**1**	**0**	**55**	**108**

(Davies 2008)

The fact that phrases such as *Business is business* and *Boys will be boys* are clearly more common in everyday speech as evidenced by the corpus suggests that respondents may employ memorized knowledge about certain tautologies as a potential resource for interpreting these semantically uninformative utterances. This kind of association is crucial for Gibbs & McCarell's (1990) hypothesis that stereotypical knowledge is the determining factor in speakers' interpretation of tautologies. While the authors do use some nonce tautologies that are unattested in the Corpus of Contemporary

American English (e.g. *teachers will be teachers, vacations are vacations*), these cases represent a small portion of the materials they provide in their appendix. I argue that meanings have become conventionally associated with certain frequently used tautology, in a way similar to certain idioms that have been identified as "non-compositional" (Nunberg, Sag & Wasow 1994), that is, having conventionally acquired a meaning that is automatically calculated from memory rather than from context.[6]

[6] As Nunberg, Sag & Wasow (1994) note, many idioms do in fact contain some level of semantic compositionality, but I argue here that conventionalized tautologies are highly comparable to their definition of (truly) non-compositional idioms.

Chapter 3: Equative Tautologies and Pragmatic Development in Children

As discussed in the previous chapter, it is possible to isolate a generalized conversational implicature generated by tautologies in certain contexts, as seen in example (5). Namely, this implicature denotes a lack of class-internal distinction (Ward & Hirschberg 1991), a "vague set" (Bulhof & Gimbel 2004) or "token indifference" (Gibbs & McCarrell 1990). While adults perceive this implicature in conversation[7], it remains to be seen at what age children begin to use generalized conversational implicature to understand these tautologies. Before investigating this question, it is useful to examine previous studies of pragmatic knowledge in children to determine when they begin to understand other generalized conversational implicatures, such as scalar implicature.

Section 3.1: Late Pragmatic Development in Children

Do children ages 7-9 exhibit pragmatic skills in previous studies on implicature in children? What does this suggest for a study on child comprehension of tautologies? As Clark & Amaral (2010) have noted, while some studies suggest that certain Gricean maxims such as Quality and Relation are used by children as young as 3 or 4, often many scalar implicatures (generated by the maxim of Quantity) seem to create difficulty for

[7] Empirical support for this claim is also presented in the following section.

children as old as 9 or 10. Recent studies on the pragmatic development of children (Noveck 2000, Chierchia et al 2001, Bott & Noveck 2004) suggest that children as old as 9 do not interpret scalar implicatures in an adult-like way. That is, children tended to favor a semantic interpretation rather than an interpretation enriched by recognizing that the speaker chose to utter a weaker term when a stronger term is available. For example, while adults infer *some elephants* to mean *not all elephants*, children infer *some elephants* to mean *some and possibly all elephants*. As the authors state, this is because adults pragmatically restrict the domain of items such as *some* to exclude *all* while children only interpret the terms semantically.

Noveck (2000) found that the ability to restrict the domain of "might" to exclude "must" increases with age, and by extension the ability to calculate (scalar) implicature increases over time. Another study by Noveck & Chevaux (2004) suggests that in fact the generalized conversational implicature often associated with *and* in which conjoining propositions are expected to have occurred in temporal succession is not quite grasped in children ages 7-10. Similarly, Chierchia, Crain, Guasti, Gualmini & Meroni found in their experiment looking at disjunctive *or*, children "lack the computational resources to apply scalar implicatures when a single assertion is presented alone." (2001: 157). Taken in conjunction, these studies seem to suggest that the computation of scalar implicature involves an advanced mechanism that is acquired very late in the scheme of language acquisition. This computation requires that the child develop a complete understanding of how the maxim of Quantity applies in conversation. That is, when a speaker makes a conversational contribution that is semantically under-informative, children do not enrich the meaning of the utterance pragmatically. Such a lack of comprehension of the maxim

of Quantity would cause clear problems for tautologies, which convey no truth-conditional meaning.

Other, more recent studies (Papafragou & Tantalou 2004, Musolino 2004, Miller, Schmitt, Chang & Munn 2005) have found that by reducing the cognitive burden of the experimental paradigm, children may in fact be able to compute scales as young as 4 or 5. For the case of tautologies, a similar prediction may be made; an experimental paradigm that removes cognitive confounds may provide the earliest possible indication of a child's ability to compute implicature.

As Noveck & Chevaux (2002) point out, more research is needed on child comprehension of *other* types of implicature. Tautologies present a unique opportunity for examining child interpretation of non-scalar Quantity-derived implicature; as pointed out by Ward & Hirschberg (1991), tautologies involve both the maxim of Quantity and the maxim of Relation and require computation of decidedly non-scalar implicature. While both tautologies and scales involve pragmatic enrichment triggered by insufficient information (Quantity), tautologies, unlike scales, involve an additional burden of the speaker to integrate a semantically uninformative utterance into the discourse (Relation). That is, the main difference between implicature calculated in the context of tautologies and scalar implicature is that while both involve Quantity, tautologies involve one additional pragmatic maxim than scalar implicature, Relation.

Given the two groups of studies on scalar implicature stated above, two salient hypotheses emerge for how children interpret tautologies: on the one hand, children may only be able to compute this implicature in the latter part of this age range. On the other, children may acquire this skill at a young age, but can only exhibit this skill under

conditions that minimize cognitive burden. This study provides a unique opportunity for examining whether children interpret non-scalar implicatures in an adult way, and it may provide us with a clearer picture of the development of pragmatic competence in children.

Section 3.2: Previous Work on Equative Tautologies in Children

The best-known previous study conducted on child interpretation of tautological utterances is that of Osherson & Markman (1975). The authors were primarily interested in whether children were capable of evaluating tautologies (as well as contradictions) truth-conditionally. That is, are children aware that tautologies are inherently true (and contradictions inherently false) by virtue of their linguistic form, rather than evidence?

The experiment involved the reading of statements regarding the color of an object in the experiment's hands, usually a chip. The experimenter would either hide the chip inside his or her hands, or leave it exposed for the child to see. The researcher read the 7-year-olds both tautological and contradictory utterances, such as "Either this chip is green or it is not green" and "This chip is green and it is not green", respectively. The experimenter then asked the child "Is it true? Is it false? Or can't you tell?" Children experienced considerable difficulty in providing a response to these utterances. The table below from Osherson & Markman (1975) summarizes some of the authors' results. Note most importantly the tautologies in items (3) and (4).

Figure 2: Data from Osherson & Markman's (1975) Experiment

Item Number	Question	Status of chip	Correct answer	Percent correct, Group 1 (N = 26)	Percent correct, Group 2 (N = 25)
	Nonempirical:				
1.	The chip in my hand is white and it is not white.	hidden	false	31%	24%
2.	The chip in my hand is not blue and it is blue.	hidden	false	–	56%
3.	Either the chip in my hand is yellow or it is not yellow.	hidden	true	23%	28%
4.	Either the chip in my hand is not red or it is red.	hidden	true	–	24%
	Simple Assertion:				
5.	The chip in my hand is blue.	blue	true	100%	–
6.	The chip in my hand is green.	blue	false	96%	100%
7.	The chip in my hand is yellow.	hidden	can't tell	73%	56%

(Osherson & Markman 1975: 218)

Ultimately, the authors conclude that children cannot interpret tautologies because of an inability to process metalinguistic truth-value, which is independent of tangible, real-world evidence. That is, they see children's failure to interpret these tautologies as true or false as a result of the fact that the children preferred to look for real-world correlates to prove or disprove each utterance, rather than recognizing that it is true or false based on the form of the sentence.

In the aforementioned results, only a quarter of Osherson & Markman's 7-year-olds provided what they deemed the 'correct' answer, which is that the statement is automatically true since it is a tautology. However, it is difficult to regard Osherson & Markman's as conclusive evidence that children are incapable of calculating metalinguistic truth values from tautologies and contradictions, especially without an adult control group to verify the 'correct' response. Adults may provide "can't tell" as a

response to items (3) and (4) above (deemed incorrect by the experimenters) as the children did; it cannot be certain that subjects interpret "can't tell" as "I can't tell whether the statement is true or false" rather than "I can't tell what color the chip is", when the chip is hidden from view.

Prior to moving on to an experiment on children's ability to evaluate tautologies pragmatically, is it important to consider whether Osherson & Markman's (1975) experiment provides evidence as to whether children interpret tautologies as semantically uninformative. However, given the lack of adult control group in the experiment, it is unclear if the children did not recognize tautologies as "adding nothing to our mutual beliefs about 'a'" (Ward & Hirschberg 1991) which is necessary prior to calculating implicature. Without conclusive data to this respect, it is admittedly an assumption that children do in fact recognize the uninformativity of tautologies. The current experiment simply addresses children's ability to compute implicature from contexts with tautologies, and does not establish their semantic interpretation of the phrases.

Chapter 4: Experiment

Section 4.1: Motivation

The goal of the present experiment is to assess child comprehension of novel tautologies, specifically whether children compute implicature from tautologies as adults do in a controlled context. While tautologies may be involved in the computation of several different implicatures depending on the context, one specific implicature computed from tautology will be tested for in this experiment. Equative tautologies license the implicature that, when a hearer is given several options from within a salient class, "all options are equally relevant" (Ward & Hirschberg 1991). To examine Ward & Hirschberg's theory for actual adult speech, a control group of adults is first assessed, and then used to compare with the child group. Since the context in the experiment is controlled and limited to one particular type of implicature that can be generated by tautologies, the adult group will also provide evidence for or
against the impact of the of referent x is a given equative tautology *x is x*, as proposed by Wierzbicka (1987).

Section 4.2: Participants

Sixteen child and twenty-three adult American English-speaking participants completed this study. Children were between the ages of 7;0 and 9;6 and adults were age 18 or

older. All participants resided in central North Carolina, in the Triangle region of Chapel Hill, Durham and Raleigh. Participants were recruited using advertisements throughout the Triangle and via in-person recruitment at the Kidzu Children's Museum in Chapel Hill. The target age range of 7-9 years was chosen based on Noveck (2000) and Noveck (2001), due to the fact that of their groups of 5-, 7- and 9-year-olds, age 7 appeared to be the first point at which children began to exhibit to at least a minimal degree the pragmatic ability that Noveck examined. To the right is the actual age distribution of the child participant pool.

Figure 3: Child Participants Age in Years/Months

	Child Years	Child Months
1	7	0
2	7	6
3	7	6
4	7	8
5	7	9
6	7	9
7	7	9
8	7	11
9	7	11
10	8	0
11	8	0
12	8	8
13	8	10
14	9	0
15	9	1
16	9	6

Section 4.3: Predictions

The adult group is expected to calculate this implicature at a high frequency. This particular implicature is that upon hearing "*a is a*", an interlocutor recognizes that class-

internal differences among all *a* are not relevant for the purposes of the exchange. That is, the prediction is that when a participant is presented with a scenario in which three options are presented to a person in the story and that person utters a tautology, he or she implies that all three options are equally acceptable. For example, as in the example in (1), say we present three different models of cars to an interlocutor: a Toyota, a Honda, and a Ford. If, when asked to choose among the three, the interlocutor states "*A car's a car*", we infer that she has no preference among the three. All three cars are thought to be acceptable. On the other hand, if the 9-year-olds were to be unable to calculate this implicature, the children would use other information to make a decision about desirability, such as personal preference or knowledge about others' preferences[8]. The data will also be examined to see if this rate of comprehension increases significantly with age (i.e., from age 7 to age 9), which would be an indication of increasing capacity to calculate this implicature as the child gets older.

In addition, another condition was built into the adult group, in which an equal number of three different referent types were used: abstract nouns, concrete nouns and human nouns. The purpose of this was to examine the neo-Gricean argument that the implicature is derived independent of the referent type, whereas the alternate "radical semantic" argument predicts that due to the stereotypes commonly associated with abstract and human referents, concrete referent tautologies should be more difficult to compute (as discussed above). Under the neo-Gricean prediction, all three referent types should be comprehended roughly equally. Under the "radical semantic" prediction, concrete-referent tautologies (e.g. "a drink is a drink") should be significantly more

[8] For example, a participant could use personal preference to respond "no" to bottled water simply because he or she does not like bottled water. Similarly, a participant could use knowledge of other people's preferences to respond "yes" to soccer because a lot of boys they know like soccer.

difficult to comprehend than abstract- or human-referent tautologies (e.g. “a sport is a sport” / “a plumber is a plumber).

Section 4.4: Methodology

The participants were presented with a PowerPoint presentation that included fifteen slides, each containing an audio recording and three pictures. The pictures always included three members of some class (e.g. “a sweet apple, a sour apple and an old apple” / “lemonade, cherry soda, and bottled water”). The participant listened to an audio recording of the scenario with one image each of the three options.

Five slides were of the tautology condition (e.g. “an apple is an apple” / “a color is a color”). Five slides were of a condition which I will call Control A, in which the interlocutor expresses some preference about certain members of the class (e.g. “I want an apple that tastes good” / “I want a color that’s good for a baby girl”). Finally, five slides were of a condition I will call Control B, in which the interlocutor states indifference towards individual class differences (e.g. “Any of those apples sounds good” / “I think all of those colors look good”). These three groups were alternated randomly throughout the presentation, with the limitation that the PowerPoint never begin with a tautology. Find in Figure 4 a representative example of these stimuli (see Appendix 2 for all 15 stimuli).

Figure 4: Example of Visual Stimulus

A. Lemonade

B. Cherry Soda

C. Bottled Water

The participant was then asked three yes-or-no questions about each of the three options given what the character in the story said. In order to avoid conditioning the responses for or against 'yes-to-all' responses, no practice trials were provided to the participant. For example, "Do you think John would eat the sweet apple? (Yes/No) Do you think John would eat the sour apple? (Yes/No) Do you think John would eat the old apple? (Yes/No)". Context will be provided for novel tautologies such that a flouting of the maxims of Quantity and Relation provides a straightforward interpretation mirroring that outlined by Ward & Hirschberg (1991). That is, upon hearing a tautology *x is x,* participants are predicted to accept all items that are considered to be within the category of all *x*'s. Uniformity in participant interpretation of the tautologies will be taken as evidence that speakers are indeed making predictable decisions based on pragmatic skills. The prediction for this portion of the study is that indeed children begin to possess the kind of pragmatic reasoning necessary to felicitously interpret tautologies within this age range.

Figure 5: Transcript of Audio Stimulus Example

Scenario A
This conversation is between two friends, **Katie** and **John,** who just took a break from playing soccer in Katie's back yard.

Katie: John, what kind of drink do you want? We have some lemonade, some cherry soda, and some bottled water.

John: A drink's a drink.

(Control A) **John**: I don't want anything sweet.
(Control B) **John**: I'm thirsty, so I'll take any of them!

Do you think John would drink the lemonade (A)?
Do you think John would drink the cherry soda (B)?
Do you think John would drink the bottled water (C)?

Section 4.5: Responses

Responses were coded in a binary fashion in which successes were given a value of 1 and failures were given a value of 0. Success was calculated differently for the Control A, Control B and Tautology conditions. See for example one of the fifteen scenarios below, for which a participant heard one of three responses from John: a tautology, an explicit preference, or explicit indifference.

i. Control A:

- Interlocutor expresses an explicit preference (*e.g. "I don't want anything sweet."*)
- Success = Detected Stated Preference (*e.g. no to cherry soda, yes to bottled water)*

ii. Control B:

- Interlocutor expresses explicit indifference (*e.g. "I'm thirsty, so I'll take any of them."*)
- Success = Yes to All

iii. Tautology:

- Interlocutor states a tautology (*e.g. "A drink's a drink."*)
- Success = Yes to All

In this way, the participant was believed to have comprehended Control A if he or she replied "yes" to one specific target option and "no" to another specific target option. The participant was believed to have comprehended Control B if he or she replied "yes" to all three. Similarly, the participant was believed to have comprehended the Tautology condition if he or she replied "yes" to all three.

Section 4.6: Results/Discussion – Quantitative Analysis

As seen in the table below, adults had a very high rate of success in calculating the target implicature when hearing the tautology.

Figure 8: Adult Tautology Success Rate Across Referent Type

Tautology **type**	Successes	Out of (*n*=)	Comprehension Rate
Abstract noun	37	40	92.5
Human noun	32	40	80.0
Concrete noun	36	40	90.0
All Tautologies	105	120	87.5

Furthermore, the prediction made by Wierzbicka (1987) and colleagues that, due to salient stereotypes, abstract- and human-noun tautologies should be significantly easier to compute does not seem to bear out in this data. In fact, human nouns seem to be the most difficult of the three, though much more data is needed to reject the null hypothesis that the three values are significantly different.

Now let us compare the success rates of adults and children to see if child treatment of tautologies diverges from adult treatment of tautologies. As seen in the table

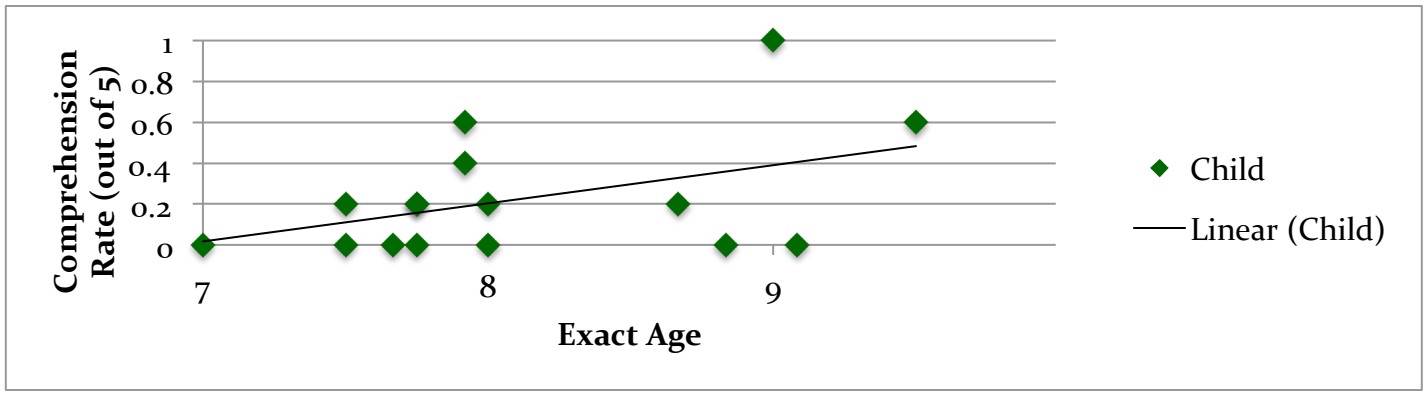
below, children were largely unable to compute the appropriate implicature that was licensed from the tautology. A chi-squared test was performed on these values, and this difference was found to be highly significant, x^2 (1, N = 200) = 30.16, p < .0001.

Figure 9: Overall Tautology Success Rates – Adults and Children

Group	Successes	Out of (n=):	Comprehension Rate
Children	18	80	22.5
Adults	105	120	87.5

Furthermore, the children did increase their ability to interpret the tautology with age significantly x^2 (1, N = 80) = 5.94, p = 0.042. This ability can be observed in the following plot[9]:

Figure 10: Tautology Condition Success Rate Across Age

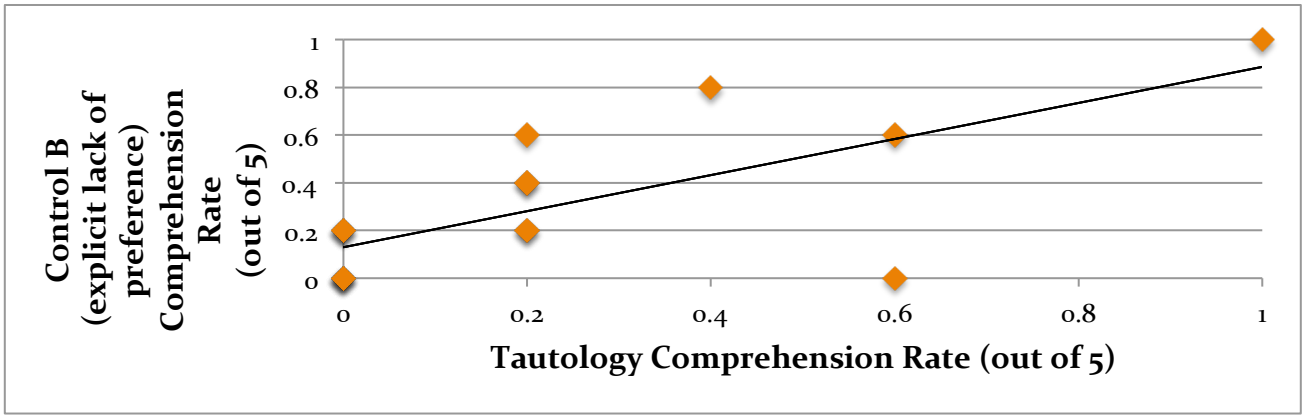


[9] Also, see qualitative responses in the section below regarding one outlier child.

The line draws the approximate mean probability of success at a given age, with exact values given below. While ability to compute the implicature was very significantly lower than that of adults, some children closer to age 10 did indeed begin to show an ability to compute the implicature.[10] Nevertheless, as seen in the graph, there is a still a great deal of variation in the children near age 9. Less than a third of all child participants were older than age 8, so more data from 9-year-olds is needed to provide further support for this conclusion.

The question then becomes: why did the children fail to compute the implicature when the adults did? There may be many possible reasons, but one plausible answer might be that children use their personal preferences and knowledge of others' preferences rather than using information from the tautology in the scenario. This will be further explored in the next section where qualitative responses are discussed. In addition, those kids that were more likely to use their own preferences on the tautology conditions were also more likely to do so on the Control B condition (explicit indifference). The correlation coefficient between these two conditions was .732 (p =.0013).

Figure 11: Control B Success Rate Across Age



[10] Statistical significance was found within the child group itself, without considering the adult data.

That is, some children (especially those closer in age to 7) relied on personal preference and knowledge of others' preferences in both the Control B condition and the tautology condition.

Given this data, one may be inclined to assume that children employed their own opinions and knowledge of others' opinions across **all** conditions, with no regard to the dialogue. However, this pattern did not hold for Control A (explicit stated preference):

Figure 11: Summary of Child Success Rates for All Three Conditions

Condition	Successes	Out of (*n*=):	Comprehension Rate
Tautology	18	80	22.5
Control A	69	80	86.3
Control B	22	80	27.5

As seen above, while children were overall unsuccessful on the Tautology and Control B conditions, they were generally successful on the Control A condition. Important to note in the measurement of success on Control A is that the child was required to detect a specific preference from the dialogue (e.g. "*I don't want anything too sweet"* and "*I want a toy that I can play with outside*"). This is relevant for the conclusion because it tells us that children were indeed able to detect preferences in the dialogue. However, in the absence of clear preferences for one or two options in the Tautology and Control B conditions, the children drew on other information, especially personal preference or knowledge of other people's preferences, to accept only one (or two) of the options presented. As such, the children were much more capable of detecting a character's

explicit preference in the story (e.g. “I want a strong plumber”, “I don’t want anything sweet”) than detecting indifference towards all three options. One reason for this may be that younger children hesitate to accept all three options, and as a result if the story does not provide them a means of excluding at least one of the three, the children then proceed to employ their own opinions or knowledge of others’ opinions to exclude one or more options.

Section 4.7: Results/Discussion – Qualitative Analysis

Upon completing the experiment with each child, the experimenter proceeded to ask specific questions to investigate the child’s motivations behind any non-target responses on the tautology condition. The goal was to see how children were making decisions when they failed to compute the “token indifference” implicature from the tautology. These responses have been organized chiefly into three categories: “Type 1” in which the child used individual preference or personal experience to inform decisions; “Type 2” in which the child invoked knowledge of other people’s preferences to respond “yes” to certain options to the exclusion of others; and “Type 3” in which the child seemed to reject one referent on the basis that it did not belong in the greater category stated. These three response types are organized in the tables below. Children were also asked about what they think specific tautologies mean, and these responses are summarized as well.

Figure 12: Child Qualitative Response Type 1

Type 1*: Used individual preference or personal experience to inform decisions*	
Age	**Explanation Given for Non-Target Response**
7;0	*A cat is a cat*: "I said no to the Siamese cat because it's not so cute."
7;6	*A chore is a chore:* "I picked taking out the trash because it's easy."
7;8	*A vacation is a vacation:* "I've been to the beach before."
7;9	*A sport is a sport*: "I picked soccer because I like it."
7;9	*A vacation is a vacation:* "I think Grandma's house would be really special."
8;0	*A sport is a sport*: Why did you say no to volleyball? "I was just thinkin' about what I wanted."
9;1	*A snack is a snack*: "I said no to celery because it's not sweet."

Figure 13: Child Qualitative Response Type 2

Type 2: *Invoked knowledge of other people's preferences to assume interlocutor preference*	
Age	**Explanation Given for Non-Target Response**
7;6	*A snack is a snack*: "I picked celery because it's healthier."
7;6	*A chore is a chore*: "I said no to trash because trash might be stinky."
7;9	*A drink is a drink*: "I said no to cherry soda because it's bad for you."
7;11	*A superhero is a superhero*: "I picked Spider Man because a bunch of kids like him."
8;0	*A drink is a drink:* "I don't think he should have soda after a [soccer] game."
8;8	*A toy is a toy*: "I said no to the stuffed animal because it's babyish."

9;1	*A sport is a sport*: “I said no to volleyball because volleyball is for girls.”

Figure 14: Child Qualitative Response Type 3

Type 3: *Rejected referent(s) not perceived as belonging to tautology category*	
Age	**Explanation Given for Non-Target Response**
7;11	*A vacation is a vacation*: "[Going to grandma's house] isn't a vacation."
8;0	*A superhero is a superhero:* “I said no because I’ve never heard of Orange Man before.”
9;1	*A toy is a toy*: “I said no to the stuffed animal because it isn’t playful.”

The prevalence of Type 1 and Type 2 across different children seems to indicate that these were the two primary strategies that kids employed to guide their decision-making. This information supports the claim from the quantitative analysis above that children used personal preference or knowledge of other people’s preferences, in the absence of a clear preference provided by the dialogue. Category membership of all three referents is a necessary prerequisite to felicitously generating the implicature of interest in this experiment, and Type 3 seemed to show that some children did not draw the same mental category boundaries as suggested in the dialogue. With only three instances, this mismatching seems to be perhaps a product of this experiment and not an indication of global strategies children were using to guide their responses in the experiment.

Furthermore, subjects were asked about what they thought phrases like *A plumber is a plumber* and *A color is a color* mean. Most children, especially the 7-year-olds, did not offer informative responses to these questions. However, three children provided

interesting responses. One child (age 7;11) offered variable information about the meaning of tautologies. When first asked what the speaker in the dialogue meant when he said *A superhero is a superhero*, he responded “he wants a powerful superhero”, but when asked about *A plumber is a plumber*, he stated “that means he’ll take all of them,” offering clear rationale for the “yes” answers he had provided for all three. Furthermore, the only child to receive a perfect score on the tautologies (age 9;0) explained in the experimental follow-up that “*A plumber is a plumber* means he doesn't care even if the plumbers are different." This child also received perfect scores on Control A and Control B (as seen in the figure in the previous section).

Perhaps most interestingly, the only nine-year-old of the three to receive a zero on the comprehension task offered indications that he was in fact capable of computing implicature from tautologies. Despite the fact that he responded “yes” only to the color “green” (among green, blue and pink) after the experiment the child (age 9;1) stated "*A color is a color* means it doesn't matter which one." When pressed about *A drink is a drink*, he gave a similar response, stating that all three drinks were okay, even though he had said “no” to cherry soda during the experiment. When asked why this may have been, he responded, “Oh, I guess I forgot.” This anecdote seems to indicate that children near age 9 were capable of calculating the same implicature from tautologies as adults, but used other information to make decisions in the experiment. With more data, this may provide support for the trend found in the previous section of proficiency increasing with age across children.

Chapter 5: Conclusions

Based on the data gathered in the experiment presented in this paper, two conclusions can be drawn. First, the prediction of the "Radical Semantic" account of tautologies (Wierzbicka 1987, Gibbs & McCarrell 1990) that human referent tautologies (e.g. "a plumber is a plumber") are easier to interpret than concrete referent tautologies (e.g. "a snack is a snack") was not confirmed by data from 23 adult subjects. While Gibbs & McCarrell (1990) had a higher number of subjects (36) in their study, the fact that the opposite trend was observed in the current 23 subjects lends support to a "Radical Pragmatic" account of tautologies (Ward & Hirschberg 1991), whereby referent type is not a significant factor in the interpretation of tautologies by adults. The difference between Gibbs & McCarrell's (1990) result and the result of the current study may be explained by the fact that the current experiment carefully controlled for conventionalization of tautologies (e.g. "business is business"). Only tautologies infrequent or absent in a corpus of American English (Davies 2008) were included, while Gibbs & McCarrell mixed these two sub-types indiscriminately in their stimuli. Second, adults performed significantly better than children in providing target responses to tautological utterances. Several reasons may be attributed for the higher performance of adults in the experiment, which will be discussed in the following section.

Section 5.1: Why did adults understand tautologies better than children?

While adults succeeded, children at age 7 failed to comprehend tautologies presented in context. This result is consistent with the original predictions of the experiment based on data on child interpretation of scalar implicature (Noveck 2000, Chierchia et al 2001, Bott & Noveck 2004). That is, that children ages 7-9 do not yet have a complete understanding of the maxim of Quantity, necessary for interpreting both tautologies and scalars. However, is it clear that children failed to behave like adults due to a pragmatic failure, or could the result be attributed to some other experimental confound or cognitive burden?

The data presented in the previous section suggest that rather than using context (i.e., the tautology) in forming their responses to questions in the experiment, children drew on other strategies to inform their responses, such as personal preference or knowledge of others' preference. This experimental confound prevents one from reaching the conclusion that children ages 7-9 lack the pragmatic competence that adults possess.

Furthermore, additional research must be conducted in order to conclusively establish whether children recognize the fact tautologies such as *x is x* are inherently uninformative, which is a necessary step that must come before calculating the implicature (Ward & Hirschberg 1987). The question was raised by Osherson & Markman (1975) but must be tested more carefully in the future with an adult control group to determine whether children in fact recognize tautologies as uninformative statements.

Section 5.2: Future Studies

A revised study that successfully averts interference of extralinguistic information in the computation of implicature is needed. Such a study will determine whether the reason for children's low success rate in comprehending tautologies is a product of their failure to compute an implicature. A paradigm that prevents the child from selecting based on personal preference would first begin with a meticulously designed priming phase. In this phase, children would be presented with scenarios in which the interlocutor either (a) expresses a preference the child likely shares (e.g. "sweet apple"), (b) expresses a preference the child likely does not share (e.g. "old apple"), or (c) expresses an indifference towards all three options, even if one of these options is undesirable.

Upon receiving each response, the experimenter needs to provide the child with explicit feedback as to whether there response was "correct" or "incorrect". This phase will condition the child to pay close attention to the dialogue as the sole guiding source of information for their responses. Children are then discouraged from using information, such as personal preference, in making their selections. These steps should provide additional protection against the confounds reported in this paper's experiment.

Such an experiment should also include an additional adult control group that helps determine more conclusively whether children recognize tautologies as semantically uninformative. This portion of the study would be similar of Osherson & Markman's (1975) approach, asking adults (in addition to children) whether tautologies (or contradictions, etc) are "true" or "false", as the authors did with children. The adult group is necessary to ensure that Osherson & Markman's result is a confusion observed

only in children. Careful piloting would be needed to ensure that this method is usable with children.

APPENDIX 1 – RAW CHILD DATA

Child 1	Group 1	(tautology)				(preference)				(no preference)			
Age 7;11	A-T-B	Tautology				Control A				Control B			
		op1	op2	op3		op1	op2	op3		op1	op2	op3	
	apple	N	Y	N	drink	N	N	Y	toy	Y	Y	Y	
	cat	N	N	Y	snack	Y	Y	N	time out	Y	Y	N	
	vacation	Y	Y	N	color	N	Y	N	sport	Y	Y	Y	
	superhero	Y	Y	Y	chore	Y	N	N	babysitter	Y	Y	Y	
	plumber	Y	Y	Y	teacher	Y	N	N	waiter	Y	Y	Y	

Child 2	Group 2	(tautology)				(preference)				(no preference)			
Age 7;9	A-B-T	Tautology				Control A				Control B			
		op1	op2	op3		op1	op2	op3		op1	op2	op3	
	snack	Y	Y	Y	apple	N	Y	N	toy	N	Y	N	
	color	N	Y	N	cat	Y	N	N	time out	N	Y	N	
	chore	Y	N	N	vacation	Y	Y	N	sport	N	N	Y	
	teacher	Y	N	Y	superhero	Y	N	N	babysitter	Y	Y	N	
	drink	Y	N	Y	plumber	N	Y	N	waiter	Y	Y	Y	

Child 3	Group 3	(tautology)				(preference)				(no preference)			
Age 7;0	B-T-A	Tautology				Control A				Control B			
		op1	op2	op3		op1	op2	op3		op1	op2	op3	
	cat	Y	N	Y	time out	N	Y	N	snack	N	Y	N	
	sport	Y	N	N	vacation	Y	N	N	color	N	N	Y	
	superhero	N	Y	N	babysitter	N	Y	N	chore	Y	N	N	
	waiter	N	Y	N	plumber	N	Y	N	teacher	Y	N	N	
	drink	Y	N	N	toy	N	N	Y	apple	N	Y	Y	

Child 4	Group 1	(tautology)				(preference)				(no preference)			
Age 8;8	A-T-B	Tautology				Control A				Control B			
		op1	op2	op3		op1	op2	op3		op1	op2	op3	
	apple	N	Y	N	drink	N	N	Y	toy	N	Y	Y	
	cat	N	Y	Y	snack	Y	Y	N	time out	Y	N	N	
	vacation	N	Y	Y	color	Y	N	Y	sport	N	Y	Y	
	superhero	N	Y	N	chore	Y	N	Y	babysitter	N	N	N	
	plumber	Y	Y	Y	teacher	N	N	Y	waiter	Y	N	Y	

Child 5	Group 2	(tautology)				(preference)				(no preference)			
Age 7;6	A-B-T	Tautology				Control A				Control B			
		op1	op2	op3		op1	op2	op3		op1	op2	op3	

snack	N	N	Y	apple	N	Y	N	toy	N	N	Y
color	N	Y	N	cat	Y	N	N	time out	N	Y	N
chore	Y	N	N	vacation	Y	N	N	sport	N	Y	N
teacher	Y	N	N	superhero	N	Y	N	babysitter	N	Y	N
drink	Y	N	N	plumber	N	Y	N	waiter	Y	N	N

Child 6 Group 3 (tautology) (preference) (no preference)

Age 7;6 B-T-A Tautology Control A Control B

	op1	op2	op3		op1	op2	op3		op1	op2	op3
cat	Y	N	N	time out	Y	N	N	snack	Y	Y	Y
sport	Y	Y	Y	vacation	Y	Y	Y	color	Y	Y	Y
superhero	Y	Y	Y	babysitter	N	Y	N	chore	N	Y	Y
waiter	N	N	Y	plumber	N	Y	N	teacher	Y	N	Y
drink	N	Y	N	toy	N	Y	Y	apple	N	Y	N

Child 7 Group 1 (tautology) (preference) (no preference)

Age 7;11 A-T-B Tautology Control A Control B

	op1	op2	op3		op1	op2	op3		op1	op2	op3
apple	N	Y	N	drink	N	N	Y	toy	N	Y	N
cat	Y	Y	N	snack	N	N	Y	time out	N	Y	N
vacation	Y	Y	Y	color	N	Y	N	sport	Y	Y	N
superhero	Y	Y	Y	chore	Y	Y	N	babysitter	Y	Y	N
plumber	Y	Y	Y	teacher	Y	Y	Y	waiter	Y	N	Y

Child 8 Group 2 (tautology) (preference) (no preference)

Age 9;1 A-B-T Tautology Control A Control B

	op1	op2	op3		op1	op2	op3		op1	op2	op3
snack	Y	Y	N	apple	N	Y	N	toy	N	Y	Y
color	Y	N	N	cat	Y	N	N	time out	Y	N	N
chore	Y	Y	N	vacation	Y	Y	N	sport	N	Y	Y
teacher	Y	N	Y	superhero	Y	Y	N	babysitter	Y	Y	N
drink	Y	N	Y	plumber	N	Y	N	waiter	Y	N	Y

Child 9 Group 3 (tautology) (preference) (no preference)

Age 8;0 B-T-A Tautology Control A Control B

	op1	op2	op3		op1	op2	op3		op1	op2	op3
cat	Y	N	N	time out	Y	N	N	snack	N	Y	N
sport	N	Y	Y	vacation	Y	Y	N	color	Y	Y	Y
superhero	Y	Y	N	babysitter	Y	Y	N	chore	N	Y	N
waiter	Y	N	Y	plumber	N	Y	N	teacher	Y	N	Y
drink	Y	N	Y	toy	N	Y	N	apple	N	Y	Y

Child 10	Group 5	(tautology)				(preference)				(no preference)			
Age 7;9	B-A-T	Tautology				Control A				Control B			
		op1	op2	op3		op1	op2	op3		op1	op2	op3	
	sport	N	Y	N	snack	N	Y	N	apple	N	Y	N	
	toy	N	N	Y	color	N	Y	N	cat	Y	Y	N	
	babysitter	N	Y	N	superhero	Y	Y	N	vacation	Y	Y	Y	
	plumber	Y	Y	Y	timeout	Y	N	N	teacher	Y	Y	Y	
	chore	N	N	Y	drink	N	N	Y	waiter	Y	Y	Y	

Child 11	Group 5	(tautology)				(preference)				(no preference)			
Age 7;9	B-A-T	Tautology				Control A				Control B			
		op1	op2	op3		op1	op2	op3		op1	op2	op3	
	sport	N	N	Y	snack	Y	Y	N	apple	N	Y	N	
	toy	N	Y	Y	color	N	Y	N	cat	Y	N	N	
	babysitter	Y	Y	N	superhero	Y	Y	N	vacation	Y	N	Y	
	plumber	N	Y	N	timeout	Y	N	N	teacher	Y	N	Y	
	chore	N	Y	N	drink	N	N	Y	waiter	Y	N	Y	

Child 12	Group 5	(tautology)				(preference)				(no preference)			
Age 8;10	B-A-T	Tautology				Control A				Control B			
		op1	op2	op3		op1	op2	op3		op1	op2	op3	
	sport	N	Y	N	snack	Y	N	N	apple	N	Y	N	
	toy	N	Y	Y	color	N	Y	N	cat	Y	Y	N	
	babysitter	N	Y	N	superhero	Y	Y	N	vacation	Y	Y	Y	
	plumber	N	Y	N	timeout	Y	Y	N	teacher	Y	N	Y	
	chore	Y	N	Y	drink	N	N	Y	waiter	Y	N	N	

Child 13	Group 4	(tautology)				(preference)				(no preference)			
Age 9;6	B-A-T	Tautology				Control A				Control B			
		op1	op2	op3		op1	op2	op3		op1	op2	op3	
	sport	Y	Y	Y	snack	Y	Y	Y	apple	N	Y	Y	
	toy	Y	Y	Y	color	N	Y	N	cat	Y	Y	Y	
	babysitter	Y	Y	N	superhero	Y	Y	N	vacation	Y	Y	Y	
	timeout	Y	Y	Y	plumber	N	Y	N	teacher	Y	N	Y	
	chore	Y	N	N	drink	N	N	Y	waiter	Y	Y	Y	

Child 14	Group 4	(tautology)				(preference)				(no preference)			
Age 7;8	B-A-T	Tautology				Control A				Control B			
		op1	op2	op3		op1	op2	op3		op1	op2	op3	
	sport	N	N	Y	snack	Y	N	Y	apple	N	Y	N	

toy	Y	N	Y	color	N	Y	N	cat	Y	N	N
babysitter	N	Y	N	superhero	N	Y	N	vacation	Y	N	N
timeout	Y	N	N	plumber	N	Y	N	teacher	Y	N	N
chore	N	N	Y	drink	N	N	Y	waiter	N	N	Y

Child 15	Group 1	(tautology)				(preference)				(no preference)		
Age 9;0	A-T-B	Tautology				Control A				Control B		
		op1	op2	op3		op1	op2	op3		op1	op2	op3
	apple	Y	Y	Y	drink	N	N	Y	toy	Y	Y	Y
	cat	Y	Y	Y	snack	Y	Y	N	time out	Y	Y	Y
	vacation	Y	Y	Y	color	N	Y	N	sport	Y	Y	Y
	superhero	Y	Y	Y	chore	Y	N	N	babysitter	Y	Y	Y
	plumber	Y	Y	Y	teacher	Y	N	N	waiter	Y	Y	Y

Child 16	Group 1	(tautology)				(preference)				(no preference)		
Age 8;0	A-T-B	Tautology				Control A				Control B		
		op1	op2	op3		op1	op2	op3		op1	op2	op3
	apple	N	Y	N	drink	N	N	Y	toy	Y	Y	Y
	cat	Y	Y	N	snack	Y	Y	Y	time out	Y	Y	Y
	vacation	Y	Y	Y	color	N	Y	N	sport	N	Y	Y
	superhero	Y	N	N	chore	Y	N	N	babysitter	Y	Y	N
	plumber	N	Y	Y	teacher	Y	N	N	waiter	Y	N	N

APPENDIX 2 – STIMULI

1. “A drink is a drink”

A. Lemonade

B. Cherry Soda

C. Bottled Water

2. “An apple is an apple”

A. Old

B. Sweet

C. Sour

3. “A toy is a toy”

A. Stuffed animal

B. Race car

C. Video game

4. “A snack is a snack”

A. Chips

B. Crackers

C. Celery

5. “A cat is a cat”

A. Baby tabby cat

B. Siamese cat

C. Fat white cat

6. “A time out is a time out”

A. Five Minutes

B. Fifteen Minutes

C. Thirty Minutes

7. “A color is a color”

A. Green

B. Pink

C. Blue

8. “A vacation is a vacation”

A. Disneyworld

B. The Beach

C. Grandma’s House

9. “A sport is a sport”

A. Volleyball

B. Baseball

C. Soccer

10. “A chore is a chore”

A. Take out the trash

B. Vacuum the floor

C. Wash the dishes

11. “A superhero is a superhero”

A. Superman

B. Spiderman

C. Orange Man

12. “A babysitter is a babysitter”

A. Old lady

B. Cheerleader

C. Mean girl

13. “A teacher is a teacher”

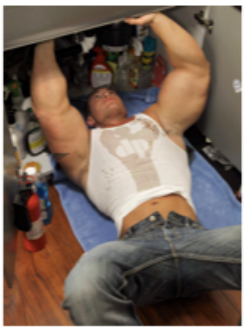
A. Young teacher

B. Strict teacher

C. Old teacher

14. “A plumber is a plumber”

A. Fat plumber



B. Strong plumber

C. Funny plumber

15. “A waiter is a waiter”

A. Friendly waiter

B. Boring waiter

C. Fun waiter

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