Acquisition of Comparatives and Degree Constructions

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1. Introduction

A fundamental aspect of human cognition is the ability to form comparisons among objects and individuals in the world and rank order them along a relevant dimension. A child must learn that the language they are acquiring captures such comparisons using specific linguistic elements (morphology and word order), and furthermore, that each surface-level pattern has a corresponding semantic representation that reflects a particular rank ordering. For example, each of the comparisons in (1) reflects a relationship between two individuals (a-b) or a relationship between an individual to a standard of comparison made relevant by the discourse context (c-e).

(1) a. Tim is **taller than** Derek (is).

b. Emily is **as brave as** Thomas (is).

c. David is **clever enough** to win.

d. Beth is **too kind** to think twice.

e. Maggie is **very tired**.

In order to master each these comparative expressions, language learners must have an implicit understanding of the conceptual, lexical, and structural platforms that permit such comparisons. More specifically, they must understand what it means to differ in the extent to which a given property (such as height) is instantiated in an individual. They must be able to correctly order a set of individuals with respect to this dimension, or

[1] This work was made possible in part by funding from NIH grant HD-057699.

retrieve a standard of comparison and relate an individual to that standard. They must know which particular lexical item or predicate expresses a property of this dimension (e.g., *tall*) and whether such comparisons are actually permitted by the lexical semantics this predicate. And finally, they must recognize the specific way that their language encodes the ordering relation. Putting together these pieces is not trivial.

Given all of these conceptual and linguistic components, it is perhaps not surprising that children are known to produce comparatives that differ markedly from the adult form up through at least six years of age. For example, they make comparisons using both *more* and the *-er* morpheme, as in (2) and (3); they produce forms such as *biggester* or *biggerest* and interchange the superlative *–est* and comparative *–er* forms (Finch-Williams, 1981; Layton & Stick, 1979); they combine the comparative marker *than* with adjectives that lack the correct corresponding comparative morphology, as in (4) and (5); and they produce comparatives with noncanonical items in place of the comparative marker *than*, as in (6).

(2) (be)cause it's gonna be **more dirtier** # huh Ma ?

Sarah age 4;10, file 129, line 897 Brown (1973); MacWhinney (2000)

(3) Put it **more further** away.

Olga age 4;3 Feider (1973)

(4) I wan(t) (t)a make the **prettiest than** the whole wide world.

Adam age 5;2, file 52, line 771 Brown (1973); MacWhinney (2000)

(5) That's **orange than** my room.

(Rachel pointing to a card that is about the same shade of orange as the wall in Rachel's room)

Rachel age 2;10 Gathercole (2009)

(6) it's **bigger just like** de truck.

Adam age 3;5, file 30, line 2681 Brown (1973); MacWhinney (2000)

These productions, in combination with the way in which children seem to interpret comparatives such as (1a) (*Tim is taller than Derek (is)*) in certain tasks, have led a number of researchers to conclude that children proceed through a series of stages on the path to becoming adultlike, and do not initially understand that such a comparative does *not* necessarily assert that Tim is tall but *does* assert that Tim's height exceeds that of Derek's (cf. Bishop & Bourne, 1985; Clark, 1970; Donaldson & Wales, 1970; Gathercole, 1985, 2009; Moore, 1999; Piaget, 1928; Wales & Campbell, 1970).

A broad range of research has tracked children's production of comparatives over development (Clahsen & Temple, 2002; Feider, 1973; Finch-Williams, 1981; Gathercole, 1979, 2009; Graziano-King, 1999; Graziano-King & Cairns, 2005; Hohaus & Tiemann, 2009; Layton & Stick, 1979); their interpretations of *more* and *less* (Carey, 1978; Clark, 1970; Donaldson & Wales, 1970; Palermo, 1973, 1974; Townsend, 1974, 1976); correlations between the ability to seriate objects and the ability to comprehend and produce comparative expressions (Ehri, 1976; Finch-Williams, 1981; Shaffer & Ehri, 1980; Sinclair de Zwart, 1967, 1969); the ability to use comparative expressions to describe changes within an object or differences across objects in a set (Gitterman & Johnston, 1983); and children's interpretation of comparatives in tasks requiring comparisons among objects (Bishop & Bourne, 1985; Coots, 1976; Donaldson & Wales, 1970). However, surprisingly little research has actually taken as a starting point questions arising from syntactic and semantic linguistic theory about specific aspects of comparative constructions and asked specific questions about children's comprehension and the path of acquisition. As a result,

while we have a fairly good understanding of the relationship between linguistic and non-linguistic tasks of comparison and perceptual factors influencing performance in response to comparative language, at this point we know remarkably little about children's developing semantic comprehension of the full range of comparatives and degree constructions and the universal and/or language-specific factors underpinning the acquisition of these constructions. Using linguistic theory to deconstruct comparatives and degree constructions, and to identify the specific components of these constructions that children need to acquire, allows us to hone our investigations of what children know. It also helps us to identify which aspects of these constructions could be easily acquired and which aspects could present challenges to the language learner – and how all of these subcomponents interact with each other. Thus, this is the strategy I will pursue here.

The structure of this chapter is as follows. In the next section, I present recent linguistic analyses of comparatives and degree constructions, with particular emphasis on their semantics. This discussion will also highlight the cross-linguistic variability observed among these constructions, and implications that this variability has for both linguistic theory and language acquisition. While the main focus here will be on explicit comparatives and other degree constructions (e.g., equatives, superlatives, *so…that*, *too*, and *enough* constructions), we will also touch upon implicit (i.e., positive form) comparison with gradable adjectives (adjectives such as *tall*), since such adjectives are an integral component of comparative expressions, and expressions of measurement. It will become clear as we work through the theoretical accounts of comparatives and degree constructions that we might indeed expect to find interesting interactions between the syntax and semantics, and between the semantics and pragmatics – and that this interplay

may help to explain the ostensibly protracted development of these constructions that has been discussed in the literature.

Guided by this linguistic theory, I will pose specific questions relevant to language learnability as it relates to the acquisition of these constructions. I will then review a range of studies that have investigated children's understanding of comparative phenomena. For each specific topic that I address, I will summarize what we know about children's acquisition and development of comparatives from a core set of studies, and highlight the open questions that remain. Finally, I will close by suggesting a number of possible directions for future acquisition research on comparatives and degree constructions.

2. Semantics of Comparatives and Degree Constructions

Recent investigations into the syntax and semantics of comparatives and degree constructions have provided us with a picture of how the morphosyntactic elements in these constructions correspond to their semantics, as well as the variability of comparative expressions within and across languages. In this section, I begin by deconstructing the comparative and identifying its key components, drawing from recent semantic expositions on this subject (i.e., Bale, 2006; Beck, *to appear*; Hackl, 2001; Kennedy, 2006; Schwarzschild, 2008; Xiang, 2006). I will then extend this discussion to other degree constructions. What will become especially clear over the course of this discussion is that given the syntax and semantics of these constructions and their cross-linguistic variability, the language learner faces a number of challenges when acquiring comparatives. These challenges are not insurmountable, however, and may even be facilitated by building blocks already present in the child's grammar.

Deconstructing the comparative

Let's start by identifying the fundamental components of a comparative construction, using (1a), repeated here as (7) as a paradigmatic example.

(7) Tim is **taller than** Derek (is).

We can divide this sentence into two parts: the *main* clause (in English, everything to the left of *than*: *Tim is taller*) and the *subordinate* (or *comparative*) clause (in English, the comparative marker *than* and its complement to the right: *than Derek (is)*). Such a sentence thus involves a comparison between two values—one supplied by the main clause and one supplied by the subordinate clause. Within each of these clauses, there are also other, more specific components to identify.

The main clause provides us with three pieces of the puzzle. First, we are given the relevant individual being compared (here, Tim). Second, the gradable predicate (e.g., *tall*) provides us with the dimension along with we are performing the comparison (here, height). Third, the comparative morpheme *-er* gives us the ordering relation: Tim's height is greater than some standard. We could modify (7) slightly to include a *measure phrase*, which serves as a *differential* telling us exactly how much taller Tim is than Derek, as in (8). Other differentials could be vague, such as *much*, *a little (bit)*, or *a lot*.

(8) Tim is **10 inches** taller than Derek (is).

The subordinate clause is headed by the comparative marker (*than*), which indicates that we are comparing two values or extents (which, in this case, are not the same). Following *than*, we are given the *standard of comparison*. In (7), the standard is Derek's height. Putting these pieces together, (7) has the interpretation that Tim's height exceeds Derek's height. Note that in this example, we don't actually need to know Tim or

Derek's height—or even whether or not either would be considered to be *tall* in the abstract. What matters simply is that Tim's height exceeds Derek's. Note also that if the adjective were *short* instead of *tall*, we would have a different ordering relation between Tim and Derek.

Semantic analyses of comparatives

There have been two main approaches to comparatives such as (7). The first and most widely adopted approach assumes that the comparison takes place by comparing *degrees* (or intervals) ordered along a *scale* (cf. Bartsch & Vennemann, 1972a, b; Bierwisch, 1987, 1989; Cresswell, 1976; Givón, 1970; Heim, 1985, 2000; Kennedy, 1997, 1999, 2001, 2007; Kennedy & McNally, 2005; Rusiecki, 1985; Sapir, 1944; Schwarzschild & Wilkinson, 2002; Seuren 1978; von Stechow, 1984). A scale is an ordered set of *degrees*, which represent measurement values of a particular dimension (or field), corresponding to the property being measured. Any predicate that denotes a property that can be measured along a scale – that is, *gradable* predicates – should be able to participate in a comparative construction. Those that are not gradable will be infelicitous in a comparative.

For example, the gradable adjective *tall* can participate in a comparative, because we can measure degrees of height. However, *wooden* and *carnivorous*, which are not gradable adjectives, cannot, as illustrated in (9). (# translates as 'infelicitous'.)

(9) a. #Sculpture A is **more wooden** than Sculpture B.

b. #Dinosaur A is **more carnivorous** than Dinosaur B.

In fact, comparatives are typically used as a diagnostic for gradability, precisely because they make such a clear distinction between two types of predicates (cf. Bierwisch, 1989; Clark, 1970; Cresswell, 1976; Kennedy, 1997, 1999; Sapir, 1944; Seuren, 1944; Wallace,

1972; Wheeler, 1972; among others). Under a degree approach, gradable adjectives such as *tall* express a relation between an individual and a degree *d* on a scale such that the property of the individual is at least as great as *d*. The comparative *-er* morpheme fixes the ordering relation between the individual and the standard supplied by the subordinate clause, as described above.

There are reasons to think that what is ordered is actually the *maximal* element in the set of degrees supplied by each clause, as indicated in (10). That is, the maximal degree that Tim is tall is greater than (or ordered above on the scale) the maximal degree that Derek is tall.

(10) a. Tim is **taller than** Derek.

b. $\boldsymbol{max}\{d \mid \textit{tall}(\text{Tim}) \geq d\} \succ \boldsymbol{max}\{d' \mid \textit{tall}(\text{Derek}) \geq d'\}$

There are two main consequences of claiming that the set of degrees has a maximal element. First, we predict negation to be excluded from the comparative clause, as illustrated by (11), since there would therefore be no maximal element in the set.

(11) *Tim is **taller than** Derek is**n't**.

Second, the subordinate clause headed by the comparative *than* is predicted to be a downward entailing environment, which would license negative polarity items (NPIs) such as *ever* or *anyone*, as illustrated in (12).

(12) a. Tim is **more** famous **than** he has **ever** been before.

b. Tim is **taller than anyone** else on the team.

The second approach does not make use of degrees (cf. Klein, 1980, 1982, 1991; Larson, 1988; Wheeler, 1972; see discussion in Schwarzschild, 2008). Instead, it has the comparative partitioning the domain of individuals into positive and negative sets or

extensions, such that the property in question is said to apply to one set, but not to the other. The idea is that there is some *threshold* such that one individual meets or exceeds it, while the other does not. Thus for a sentence such as (7), the property in question (being *tall*) applies to the individual in the main clause, but not to the individual in the subordinate clause. This analysis, which has been called the *conjunctive* or *A-not-A* analysis, can handle the sentence in (7) (*Tim is taller than Derek (is)*) in one of the following ways (which are basically notational variants). Here, both θ and α represent some relevant cutoff point, or threshold. (∃ is the existential operator that can be translated as "there is"; ¬ represents logical negation.)

(13) a. $\exists\alpha([\![\text{Tim is } \alpha \text{ tall}]\!] \wedge \neg[\![\text{Derek is } \alpha \text{ tall}]\!]$

b. $\exists\theta(\text{tall}(\text{Tim}, \theta) \wedge \neg(\text{tall}(\text{Derek}, \theta))$

One benefit of thinking of comparatives in this way is that the subordinate clause is inherently negative, and thus is predicted to license negative polarity items, as described above. In addition, modal verbs such as *allowed to*, *had to*, and *supposed to*, as well as verbs such as *said* and *promise* are predicted to interact with the negation, and may be interpreted inside or outside the *scope* of negation.

In a sentence such as (14), the standard is explicitly provided as 6 feet (tall). We therefore know quite matter-of-factly that Tim's height is greater than this amount.

(14) Tim is taller than **6 feet**.

There are, in fact, a variety of possible subordinate clauses in comparatives, which makes their analysis that much more challenging and the acquisition issue that much more interesting. We will return to this point shortly. Also important to note is that while the

standard is *explicitly* provided in sentences such as (7) and (14), there is an *implicit* standard encoded in sentences such as (15), in which a gradable adjective appears in its positive, non-comparative form—even though there is no overt subordinate clause providing the standard (cf. Bartsch & Venneman, 1972a, b; Bierwisch, 1967; Cresswell, 1976; Kamp, 1975; Klein, 1980; Ludlow, 1989; Sapir, 1944; Seuren, 1978; von Stechow, 1984; Wallace, 1972; among others).

(15) Tim is **tall**.

This sentence asserts that Tim's height exceeds a *contextually relevant* standard of comparison.

For example, let's say we know that Tim is an NBA player (and perhaps know more specifically that he plays center). Given the comparison class of men in general, we have an idea of what the standard height is for this *comparison class* (possibly based on some statistical calculations, such as the mean, median, or mode) and what counts as *tall* for a man in comparison to these value. If this sentence can be judged to be true, then it is because Tim's height exceeds this value by some amount. We can therefore think of (15) as saying something along the lines of (16).

(16) Tim is **tall *for a man***.

However, if we know that Tim is a toddler in a preschool, we have a much different idea of what his (minimum) height needs to be in order to count as *tall* and for the sentence in (15) to be true. This standard could be supplied by the noun, the larger context, or other world knowledge (see discussion in Kamp & Partee, 1995).

This observation about contextual variability of the standard of goes back at least as far as Aristotle (referenced in von Stechow, 1984), who observed that terms such as

large/great, *small*, *many*, and *few* are relative. Since then, a number of other researchers have appealed to a contextually-relevant comparison class for the interpretation of gradable adjectives in the positive form (cf. Bierwisch, 1989; Cresswell, 1976; Kennedy & McNally, 2005; Klein, 1980; Ludlow, 1989; Vendler, 1968; Wallace, 1972; Wheeler, 1972; among others). Comparison classes and contextually-salient standards of comparison are central to both degree and non-degree analyses. For the former, the context fixes the standard of comparison, which is then expressed formally as the standard degree on a scale to which other degrees are compared. For the latter, the context allows us to identify partitions (disjoint subsets) such that the predicate either holds, or does not hold (or is indeterminate). This position is most closely identified with Klein (1980) (see also McConnell-Ginet, 1973, 1979). Interestingly, in some languages, such as Mandarin Chinese, sentences involving implicit comparison are only possible given another discourse-salient individual; they cannot make reference to an abstract comparison class, as in English. (See Li (2009) and Xiang (2006) for recent discussion and references cited therein.)

Assuming an approach involving degrees, the comparative morpheme (e.g., *-er*) is assumed to head a Degree (Deg) phrase in the syntax. There are two main analyses of the syntactic structure of comparatives, which correspond to different assumptions about their semantic representation. According to classical analyses of sentences such as (7)(cf. Bresnan, 1973; Cresswell, 1976; Heim, 1985, 2000; among others), the comparative morpheme takes the subordinate *than* clause as its complement, and this DegP constituent is an argument of the adjective. The comparative morpheme is then posited to denote a two-place relation between two degrees (or intervals): one introduced by the main clause (*d*) and another introduced by the subordinate clause (*d'*), and $d > d'$ (taking into account

maximality).

According to another approach, the comparative morpheme heads DegP and forms a constituent with the adjectival phrase (AdjP) as its complement. The subordinate *than* clause then sits in spec, DegP (cf. Abney, 1987; Corver, 1990, 1993; Grimshaw, 1991; Larson, 1988; Kennedy, 1999, 2002; Xiang, 2006). This three-place comparative morpheme (whether it is realized as *-er*, *more*, or otherwise) is claimed to take the gradable adjective as its argument, and establish a relation between the maximal degree of the subordinate clause, and the individual or maximal degree in the main clause.

There are therefore various implementations of the denotation of the comparative morpheme, depending on the syntactic structure of the comparative assumed and whether or not degrees are assumed to be part of the representation. Also relevant is the expression of the standard of comparison involved in the subordinate clause (cf. Beck *et al*., 2004; Bhatt & Pancheva, 2004; Bhatt & Takahashi, 2007; Kennedy, 2009). In fact, variants of both of these approaches may be active across languages—and maybe even within a given language, complicating acquisition of these constructions.

Cross-linguistic variability of comparatives

While the conceptual structure that permits a comparison between two more entities along a given dimension should be the same at the core, how this comparison is realized on the surface varies from language to language. Recent linguistic analyses of comparatives have highlighted this cross-linguistic variability and the implications for syntactic and semantic accounts of comparatives. (See, for example, Beck *et al*. (*to appear*); Beck, Oda, & Sugisaki (2004); Kennedy (2009) and Kennedy & Merchant (2000) for extensive discussions of how cross-linguistic data from a variety of languages have

consequences for the syntactic and semantic accounts of comparatives.) It is quite possible that both of the semantic analyses of comparatives described above could be correct, and that one may better account for comparatives in a given language than the other. To illustrate this point, let's take a look at the way that comparatives such as the English example in (7) (repeated once more here) are expressed across a variety of different languages.[2]

Recall our English comparative in (7).

(7) Tim is taller than Derek (is).

A number of other languages also have a comparative marker similar to *than* and express an explicit standard of comparison, as shown in the examples in (17)-(21). However, the translation is not necessarily the same, and such comparatives may carry restrictions on the presence and position of elements such as measure phrases, adverbial phrases, and negation.

Hindi-Urdu (Bhatt & Takahashi, 2007)

(17) John Bill-se zyaadaa lambaa hai.

John Bill-COMP more tall is

John is taller than Bill.

Japanese (Beck, Oda, & Sugisaki, 2004)

(18) Sally wa Joe yori kasikoi.

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[2] In the glosses, the acronyms translate as follows:
COMP = comparative / *than*
DIR = directional
NOM = nominative case marker
TOP = topic
PERS.DET = personal determiner (used with proper names)

Sally TOP Joe COMP smart

Sally is smarter than Joe.

Mandarin Chinese (Lin, 2009)

(19) Yuēhàn bǐ mǎlì (gèng) gāo.

John COMP Mary even tall

John is taller than Mary.

Mandarin Chinese (Xiang, 2003, 2006; see also Li, 2009)

(20) Zhangsan bi Lisi gaoxing.

Zhangsan COMP Lisi happy

Zhangsan is happier than Lisi.

Fijian (an Austronesian, Oceanic language) (Pearson, 2009)

(21) e qase mai vei Meri ‘o Pita.

3SG old DIR PRP Mary PERS.DET Peter

Lit. *Compared to Mary, Peter is old.*

Peter is older than Mary.

Other languages, however, lack such a marker. The instantiation of the comparative in these languages seems most transparently to reflect an analysis that creates two partitions such that the property applies to the individual in the main clause, but not to the individual in the subordinate clause. Whether or not this means that degrees are not involved is up for discussion.

Motu (Beck *et al.*, *to appear*)

(22) Mary na lata to Frank na kwadogi.

Mary TOP tall but Frank TOP short

Lit. *Mary tall but Frank short.*

Mary is taller than Frank.

Hixkaryana (Stassen, 1985, cited in Kennedy, 2006)

(23) Kaw-ohra Waraka, kaw naha Kaywerye.

tall-NOT he-is Waraka, tall he-is Kaywerye

Lit. *Waraka is not tall, Kaywerye is tall.*

Kaywerye is taller than Waraka.

This cross-linguistic variability will of course also have implications for the language learner. Regardless of any universal expectations guiding the language acquisition process, the learner will still need to identify the language-specific features of comparatives that are detectable on the surface. These surface-level characteristics are intimately connected with the denotation of the comparative morpheme and the syntax of the comparative structure. If the presence or absence of degrees is also something displays parametric variation across languages (cf. Beck *et al*, *to appear*), this makes the acquisition problem that much more challenging.

Bhatt & Takahashi (2007) actually considered the issue of learnability in reflecting upon why languages would vary on their inventories of comparative morphemes. In doing so, they suggested that a simpler, 2-place comparative morpheme may be the universal default, and that the learner would only posit the possibility of a more complex morpheme (and the syntactic structure and semantic assumptions that go along with it) if there were sufficient evidence to do so. If this idea is correct, then we might expect that one could obtain data that reflect this move during the course of acquisition.

Ellipsis and covert movement

We have been focusing our attention on comparatives such as (7), repeated here.

(7) Tim is taller than Derek (is).

(7)' Tim is taller than Derek (is *d-tall*).

In sentences like this, it is usually assumed that there is missing material, or a site of *ellipsis*, at the end of the subordinate clause. That is, there is material that is unpronounced at the surface level that is claimed to be present at some level of abstract structure. In an analysis that appeals to degrees, we can understand this material to posit some degree associated with the individual in the subordinate clause, as indicated in the prime variant.

Likewise, in (24), the missing material is understood as indicated in the prime variant. (Under many recent approaches, ⟦more⟧ is understood as ⟦-er⟧ + ⟦many⟧.)

(24) Tim made more shots than Derek (did).

(24)' Tim made more shots than Derek (did make *d-many* shots).

In these examples, the missing material is deleted under identity with the lexical material in the main clause. This operation is known as *comparative deletion* (Bresnan, 1973). Compare these examples to (14), repeated here, where the degree for the standard of comparison is explicitly given. In this case, there is no such ellipsis.

(14) Tim is taller than **6 feet**.

The subordinate clause in examples such as those in (7) and (24) (including the information in parentheses) is claimed to have clausal syntax (i.e., *than* takes a full CP clause with subject and verb, and the subordinate clause is assumed to be interpreted as having the same gradable predicate as in the main clause). Consequently, such comparatives are usually referred to as *clausal* comparatives. When there is no overt verb

in the subordinate clause and there is only a DP following *than* (i.e., *Tim taller than/made more shots than Derek*), such comparatives are often referred to as a *reduced clausal* comparatives or a *phrasal* comparatives. (For more on reduced clausal analyses, see Lechner, 2001, 2004.) Phrasal comparatives are said to not involve ellipsis.

In the English examples we have been considering, where only a DP follows *than*, it is not entirely possible to differentiate between reduced clausal and phrasal comparatives. It is therefore unclear whether these comparatives involve ellipsis or not. In other examples in English, the presence of a pronoun bearing case, a reflexive, a *wh*-word, a negative quantifier, or extraction out of the subordinate clause may help to tease the two apart and identify true phrasal comparatives, which are claimed to have both a different syntactic structure (cf. Hankamer, 1973; and others) and a different semantic analysis (cf. the 'reduced' analysis of Heim, 1985). However, it remains difficult to resolve the issue by focusing on English alone. Turning our attention to other languages, the difference becomes more apparent.

In Greek, there are two different *thans*: one for phrasal comparatives (*apo*) and one for clausal comparatives (*ap'oti*). This – along with the different case marking on the DP in the subordinate clause – makes reduced clausal and phrasal comparatives easily distinguishable, as shown in (25).

clausal

(25) a. clausal comparative

I Maria pezi kiθara kalitera **ap'oti** pezi kiθara **o** Giannis.

the Maria.NOM plays guitar better than.CLAUSAL plays guitar the Giannis.NOM

b. reduced clausal comparative

I Maria pezi kiθara kalitera **ap'oti** **o** Giannis.

the Maria.NOM plays guitar better than.CLAUSAL the Giannis.NOM

c. phrasal comparative

I Maria pezi kiθara kalitera **apo** **ton** Giannis.

the Maria.NOM plays guitar better than.PHRASAL the Giannis.ACC

Maria plays guitar better than Giannis (plays guitar).

Merchant (2009) has shown through extensive comparison of these two structures in Greek that it is necessary to appeal to the abstract syntactic structure and covert movement to account for differences in island effects evidenced between the two constructions. In fact, a number of other languages have been claimed not to have reduced clausal comparatives and to only have phrasal comparatives, among them Chinese (Li, 2009; Lin, 2009; Xiang, 2003, 2006); Hindi (Bhatt & Takahashi, 2007); Japanese (Kennedy, 2009; but see Shimoyama, *to appear*); and Malagasy (Potsdam, 2011).

For a number of reasons, comparative clauses are assumed to be *wh*- environments, which involve a silent operator. This position goes back at least as far as Chomsky (1977). An operator is claimed to undergo covert *wh*-movement to the edge of the *than* clause. The trace of the moved constituent is then interpreted as a variable over degrees, and the clause interpreted as a definite description of a maximal degree. For reasons of interpretability (that is, because of a semantic type mismatch), the entire DegP (*-er than…*) also undergoes covert movement (i.e., *Quantifier Raising*) out of the AdjP to a higher position, targeting a higher position in the main clause, as illustrated in (26) (cf. Bresnan, 1973; Heim, 2000; Wold, 1995).

(26) a. Tim is taller than Derek (is).

b. [[-er [than [QP$_1$ λd_1. [Derek is ~~d_1 -tall~~]]]] [λd_2. [Tim is d_2-tall]]

DegP movement has also been claimed to be necessary to resolve sentences with another form of ellipsis, antecedent-contained deletion—a point that we will return to when we review child language acquisition data on the components of comparatives. There are also reasons to think that the movement of DegP may not just be for purposes of ellipsis resolution, and is applicable to the interpretation of other degree constructions as well.

Other degree constructions

Because the *-er* morpheme is claimed to head the Degree Phrase (as described above), comparatives are also known as *degree constructions*. There is actually a fairly wide range of other degree constructions, as illustrated in (27). In place of the bound *–er* morpheme or *more*, another degree element (indicated here in bold) is then argued to head DegP.

(27) a. A is **less** tall than we thought he was.

b. A is the [tall**est**/**most** talented] player on the team. superlative

c. A is **as** tall as B. equative

d. A is tall **enough** to play varsity.

e. A is **so** tall that he towers over everyone else.

f. A is **too** tall to play small forward. excessive

The example in (a) is most closely connected with the comparatives we have been studying so far. In place of *more* or a bound *-er* morpheme is the comparative marker *less*. As I hinted at earlier, there is reason to think (following Hackl, 2000; Heim 2000, 2006) that both *more* and *less* can be decomposed into two separate morphemes which are sisters in the abstract structure and have their own scopal properties: ⟦more⟧ is ⟦-er⟧ + ⟦many⟧

and ⟦less⟧ is ⟦-er⟧ + ⟦little⟧.

Superlatives also encode a comparative meaning. The example in (b) above carries the interpretation that A is *taller* or *more talented than* anyone else on the team. The ⟦-*est*⟧ morpheme composes with a gradable adjective (e.g., *tall*) and says that the maximal degree of the property of an individual *x* is greater than the maximal degree of any another individual, who is not *x* (cf. Heim, 1985, 2000). As indicated earlier, the ⟦-*est*⟧ morpheme heads a DegP, and also undergoes covert movement, and can therefore interact with other scopal operators. Sentences with a superlative can therefore give rise to sentence-level ambiguity. For example, (28) could mean that of all the mountains, John climbed the highest one, or that of all of the people who climbed mountains, John climbed the highest mountain, compared to all the others

(28) John climbed the highest mountain.

Appealing to maximal degrees, an equative such as the example in (c) can be interpreted as saying that A is at least as tall as the maximal degree of height associated with B. However, note that an equative is usually used to mean that A and B have equal values (i.e., that they are the same height). The fact that equality may not be strictly endoded into the meaning of an equative can be highlighted by including the modifier *exactly*. We can account for this interpretation by saying that while the equative asserts that A's height is greater than or equal to B's, it carries with it a conversational implicature that A's height is not taller than B's (cf. Schwarzschild, 2008). We can cancel this implicature with sentence-final phrase such as *if not taller*. (This line of reasoning is reminiscent of arguments made with respect to number semantics.) In fact, von Stechow (1984) argues that equatives are vague, based on the fact that both *exactly* and *at least* can

both appear with these constructions (attributing this observation to Lars Hellan).

Enough, *so…that*, and *too* constructions (d-f) have been said to go hand in hand (cf. Beck, *to appear*; Meier, 2003; Hacquard, 2005, 2006; Heim, 2000; von Stechow, 1984). In fact, Meier (2003) offers the definition of *so* in (29).

(29) ⟦*so*⟧ = ⟦*enough*⟧

To illustrate this relationship, consider the following set of sentences, variants of those discussed in the literature.

(30) a. John was clever **enough** to leave early.

b. John was **so** clever that he left early.

Likewise, in discussing the 'duality' of *too* and *enough*, Hacquard (2005) points out that the sentences in (31) are truth-conditionally equivalent. This fact, of course, relies upon the antonymy of *fast* and *slow* and their position on the same scale.

(31) a. Jean was fast **enough** to escape.

b. Jean was not **too** slow to escape.

These constructions also exhibit cross-linguistic variability. In Japanese, for example, the excessive *too* is expressed as a morpheme bound to the verb (Nakanishi, 2004, cited in Li, 2009).

(32) Kono sukaato-ga (san inchi) naga-**sugi**-ru.

this skirt-NOM 3 inch long-exceed-present

This skirt is (3 inches) too long.

(33) John-ga (san jikan) ne-**sugi**-ta

John-NOM 3 hours sleep-exceed-present

John slept (3 hours) too long/much.

Various analyses of such comparatives have also argued for a modal component (e.g., Meier, 2003; Heim, 2000; von Stechow, 1984), appealing to conditionals, possibility operators, possible worlds, or goals and desires to account for their meaning. Indeed, von Stechow (1984) referred to *too* as a 'counterfactual comparative morpheme' (and also claimed it has the most complicated semantics of the comparative morphemes). In their account of the interpretation of *too* constructions with gaps, as in (34), Nissenbaum & Schwarz (2011) incorporated this modal component, along with covert of the movement of the degree phrase to the edge of the clause, as outlined above.

(34) Jean was too fact for us to catch [___ / him].

Hacquard (2005, 2006), however, has argued that *too* and *enough* constructions are not modal, and that by focusing on examples from English and German, which are morphologically impoverished languages, the previous authors did not confront the kind of distinctions that would highlight this fact. Appealing to French examples, Hacquard has shown that the imperfective/perfective morphological difference (e.g., *était* vs. *a été*i for the verb *être* 'to be') has a significant effect on the interpretation of these constructions, and that they only assert what is in the complement clause. (*Too*, on the other hand, asserts the negation of the complement clause.)

While not strictly 'degree constructions', intensifiers and so-called 'adverbs of degree' deserve mention here, since they are also a diagnostic of gradability and make reference to standards of comparison. A number of researchers have discussed the ability of certain modifiers, as well as intonation, to highlight the gradable/non-gradable distinction (cf. Bolinger, 1967a, 1967b, 1972; Klein, 1980; Wheeler, 1972) and even distinctions within gradable adjectives related to the structure of the scale they map onto

(cf. Kennedy & McNally, 2005). For example, compare ***very*** *big* with #***very*** *carnivorous*, or ***VERY*** *tall* with #***VERY*** *wooden*. Under recent accounts (e.g., Barker, 2002; Kennedy & McNally, 2005), this asymmetry can be explained by appealing to the fact that *very* is a modifier that is a relation over degrees. To say that someone is *very tall* is to say that they are tall relative to the contextual standard, and then some.

Implications for the language learner

By deconstructing comparatives and other degree constructions, we have gained more insight into the nature of the syntactic and semantic representations that must be in place for children to manifest an adult-like understanding of these constructions. Specifically, we have identified a number of essential components of comparatives and degree constructions that are an integral part of understanding and expressing these constructions. These components naturally give rise to a number of questions the language learner must resolve when acquiring these constructions. These include at least the following: Does the target language have degree semantics, a partition among properties of individuals, or both? What is in the inventory of comparative morphemes or Degree Phrase heads, and comparative markers? What kind of predicates can appear in comparative constructions and with comparative morphology? What sort of observable patterns on the surface are displayed as a consequence of the abstract syntactic and semantic representations of comparative environments?

In the following section, I will take as a starting point the topics covered in the theoretical analysis of comparatives to ask what we know about the developing comprehension and production of comparatives in language acquisition. For each subtopic, I will focus on a core set of research findings – either from analysis of children's speech or

more controlled experimental investigations – that speak to this specific aspect of comparatives. What will be clear from the outset is that research into this particular area of child language acquisition has relied heavily on children's productive output, and – with the exception of a few recent studies – has in large part not been driven by linguistic theory or cross-linguistic differences, but by the relation between language and cognition and an interest in the meaning assigned to individual words as they enter the child's lexicon. Moreover, the vast majority of this work has focused on comparatives in English. While this unfortunately translates to a general lack of understanding of what children know about many of the specific syntactic and semantics aspects of comparatives in English or in any other language, it also means that there are many open questions waiting to be answered by future linguistic research on comparatives and degree constructions.

3. Acquisition of Comparatives and Degree Constructions

Many studies of children's developing understanding of comparative expressions have highlighted children's non-adult-like substitutions and omissions, as well as their apparent biases in response to comparatives, and interpreted this pattern as an indication of immature interpretations. For example, Gathercole (2009) introduced her paper by saying that "an examination of spontaneous speech data from two children will reveal that the process of learning is long and drawn out, involving considerable early lexically specific knowledge that evolves through small, repeated steps" (pg. 320). It is true that a lot can be gained by tracking children's production over the course of their development, and Gathercole was very careful about compiling and reflecting upon her examples. However, it is also true – as evidenced by recent work on the acquisition of other linguistic phenomena (such as relative clauses and passives) – that production- and performance-

centered approaches have routinely underestimated children's knowledge, and that performance factors linked to pragmatics and processing may be overcome using more comprehension-based tasks. In this section, I review a wide range of literature on comparative expressions (broadly speaking), drawing from both production and comprehension data to shed light on the acquisition process in this area of language.

comparative constructions

A number of early researchers doing pioneering work on this topic converged upon the conclusion that acquisition of comparatives proceeds in a stage-like manner. Donaldson & Wales (1970) suggested, based on results in a number of different tasks administered to preschoolers, that the order of acquisition proceeds in this order: "stem polar adjectives" (e.g., *big*, *tall*, *more*), followed by superlatives, *too*, true comparatives, and *too* and *enough* used functionally (although they briefly noted that such a course of acquisition would need to be substantiated by longitudinal data). It is not certain that the order of acquisition is as clear-cut or as additive as Donaldson & Wales suggested. In large part, we are missing the kind of specific and controlled experimental comparisons we would need to make this point based on empirical evidence.

Layton & Stick (1979) tested children 2;6 to 4;6 using a cloze technique, in which they asked children to complete sentences such as the following.

(35) a. This truck is big, but this truck is _____.

b. This car is fast, this car is faster, but this car is the very _____.

The authors found that the youngest children in this age range tended to omit the *-er* morpheme and only produce the positive form to complete the first sentence. When producing the superlative in (b), they tended to either omit *-est* or substitute the *-er*

morpheme. After 3;6, children began to use *-est* for the superlative, but they also substituted more *-est* for the *-er* morpheme. There may be good reason to think, however, that this method of elicited production (even given training on the type of completion that is relevant to the task) may not accurately reflect children's understanding of these morphemes, since the possibilities for completion are open-ended and could be subject to priming by previous items. In addition, use of the positive form to indicate intensity could be perfectly felicitous, given a particular pitch accenting and intonation contour – an observation similar to claims by Bolinger (1967). Indeed, Finch-Williams (1981) reported that she observed children using increased amplitude, and other strategies such as reduplication, in her studies.

Despite this, Bishop & Bourne (1985) actually claimed Layton & Stick (1979) *over*estimated children's ability to produce comparatives. To rectify this, Bishop & Bourne took the following approach. They presented four- to seven-year-olds with a series of sets of three pictures, each of which had pairs that differed with respect to size and color (making for a total of six objects on display at once). For each set, they used either a different novel adjective or familiar adjective, in either comparative or positive form. These manipulations were all within subjects. Children's task was to select among the three pictures the one that had the pair that corresponded to the description that they heard, as in (36).

(36) a. The green pear is zutt and the yellow pear is zutt.

b. The green pear is zutter than the yellow pear.

Not so surprisingly, children's performance improved significantly with age, novel adjectives were more difficult than real words, and comparatives were more difficult than

the positive forms. It is hard to see how such a design (with the number of items in the forced-choice scenario and the number of novel items) does not set four-year-olds up for failure. In fact children of all ages were 'at floor' with the comparatives with novel words. In another comprehension task, children were asked to identify the picture among a display of four in which "the horse is taller than the wall." Even four- and five-year-olds apparently experienced difficulty with this task, choosing the picture in which the positive adjective (*tall*) could be applied to both objects in the scene (i.e., the horse and the wall). However, without additional data on children's justifications of their selection and the distribution of their selections, it is hard to interpret this claim.

Gitterman & Johnston (1983) also argued for a stage-like progression of comparative language. Testing children ranging from 4;5 to 7;9 in an elicitation task, they found that children were better at using comparative expressions when changes took place within a single object (e.g., a balloon getting bigger) than when comparisons were made across objects, while still along a single dimension (although see Gathercole, 1985). The authors concluded that, "even before they demonstrate an ability to compare objects according to their relative positions along a dimensional continuum, young children use comparative adjectives to talk about within-object changes. Next, children use comparative adjectives to express mature notions of between-object comparison, but only for certain dimensional attributes such as size. Finally, children construct a wide variety of attribute dimensions and extend their comparative expressions to these new domains" (pg. 620). While this conclusion may be compatible with performance across the conditions in their research, it is again hard to know whether this pattern can or should be generalized beyond this specific context to the process of language development in general.

Evidence for a tight link between language and other non-linguistic cognitive skills comes from tasks such as those reported by Sinclair-de-Zwart (1967, 1969), Ehri (1975), Shaffer & Ehri (1980), and Finch-Williams (1981) in which children anywhere between approximately three and eight years of age were asked to seriate (i.e., put in order) a set of objects, produce descriptions of the objects, point to the smallest/largest object or to one that is smaller/larger than another, and compare the items. In general, those children who are labeled as "seriators" are better at the linguistic tasks than "non-seriators." One of the main conclusions arising from these studies is that ability to produce comparative language is a relatively reliable predictor of ability to perform well in such tasks. Finch-Williams (1981) concluded, for example, that, "The producers knew more about recognizing seriated arrays from non-seriated arrays, more about identifying items within these arrays, more about constructing seriated arrays, and more about inserting items within seriated arrays" (pg. 81). While the correlation does appear to be strong, it still remains an open question what exactly the nature of this relationship and the direction of causality is between language and cognition in this instance.

more v. less

In the 70s and 80s, a number of studies were focused on the meaning children assigned to *more* and *less*, investigating whether children interpreted *less* as *more* or were just exhibiting a default response pattern, and determining how children progress to becoming adult-like in their interpretation over the course of development. The interest in *more* arose not only from its role in explicit comparative constructions, but also because of its inherent comparative interpretation.

In their "hierarchy of complexity of comparisons," Donaldson & Wales (1970)

classified *more* as a one-state comparison: "While [*more*] is perhaps not strictly comparative, it might be claimed that it would be unintelligible without a prior general context of comparative judgments" (pg. 257). In their hierarchy, *more* was then followed by 'two-state' comparisons (superlatives, implicitly comparative adjectives, 'functional' comparatives such as *too* and *enough*), 'three-state' comparisons (explicit descriptive comparatives), and finally by their 'four-state' comparisons (*just…enough*, *just the same as*), which they claimed were more complex because they involved "comparison of exactness of fit (or lack of it) with respect to a given standard." (See also Wales & Campbell (1970).) This hierarchy predicted an asymmetry in the acquisition of polar terms (which was extended to other lexical items, including adjectives and prepositions).

In his review of Donaldson & Wales (1970), Clark (1970) also proposed stages of acquisition pertaining to the acquisition of terms such as *more* and *less*. In the first stage, children learn the positive form to name the dimension, but treat it as a 'nominal' term. Next, they learn the comparative meaning of the lexical item, but treat antonyms similarly (both referring to positive extension). This stage could account for the "response biases" reported in the literature in which children are claimed to interpret *less* as *more* (cf. Donaldson & Balfour, 1968; Palermo, 1973, 1974; Trehub & Abramovitch, 1978). Finally, they assign the members of this polar pair the correct meanings.

Klatzky, Clark, & Macken (1973) sought to pin down the reason why children would treat *less* as *more* in the initial stage. 24 children ranging from 3;7 to 4;11 years of age took part in four experimental sessions over a 6-week period of time. In each experimental session, children were asked about a set of five objects described by a pair of novel CVC polar items. Each pair corresponded to a real adjective pair (e.g., *maf-bup* corresponded to

big-small, applied to a set of orange cardboard cubes). Children were shown the set of items in order, a standard was pointed out, and the other objects were labeled according to the positive or negative polar member of the novel word pair. This procedure was then repeated with the objects in random order. During the test session, children were shown the objects in random order. The experimenter then pointed to the standard for the set and asked the child to identify another object based on a novel term. Children were provided with correction throughout. At the end of the session, children were asked about the extreme items (e.g., *Which one is the most bup?*), and their performance was analyzed for a criterion of learning (correct responses on seven out of ten consecutive trials in which the novel word was used).

Klatsky *et al*. found the same asymmetry that had been discussed with real polar pairs. The negative members of the pair required the experimenter to use the novel word in more trials before the child could reach criterion, and children were more likely to be correct with post-trial requests involved the negative term. The authors concluded that because the same effect was found with novel words, the *less* = *more* stage cannot be driven by the greater frequency with which the specific word *more* appears in the input. The authors presented a series of rather compelling reasons to rule out the possibility that analogy played a role; however, the antonyms so clearly correspond to frequent dimensions (size, height, length, and thickness) and real antonym pairs that it still remains a possibility that the learning strategy used for the real words and the frequency of the real words could have played some role. If there is indeed a stage where children treat *less* as *more*, and display a response bias for choosing the object with greater extent, Klatsky *et al*. argued that this response bias is the result of a difference in the role that the standards play

in the calculation of *less* versus *more*. *More* only requires evaluation of "greater extension than that of a given standard," while less requires one to access the standard and "double-back," determining whether the extension is less than the standard. Thus, this proposal could be understood identifying elements of the linguistic representation (i.e., the standard represented by a degree on a scale, scalar intervals, and directionality) that explain an apparently non-linguistic response strategy.

Carey (1978) sought another angle on the issue, questioning whether or not children actually do treat *less* as *more*. She compared how children three- to four- years of age interpreted *less* versus a novel word (*tiv*), reasoning that if children really interpreted *less* as *more*, then responses for these two items (the real negative polar term and the novel one) should differ, with the latter resulting in much noisier responses. However, if children exhibited a response bias towards increase in the property, both items should exhibit a similar pattern. Carey introduced children to a fussy puppet, who wanted the children to fix the level of water in a glass, pointing to the desired level. In one version of the task, the puppet made requests using *tiv*, *less,* and *more* within a session; in another version, the puppet either made requests using *more* and *less* or *more* and *tiv*, allowing for a between-subject comparison of *less* and the novel word *tiv*. (In the second task, when children asked about the meaning of *tiv*, they were told it meant *less*.)

In the first version, there were a variety of responses, with only one child treating *more* and *less* similarly (always adding, as would be expected) and patterning at chance with *tiv*. Carey also found age differences: four-year-olds were less likely than three-year-olds to simply add water with all lexical items (approximately 20% v. 40%), and were more likely than three-year-olds were likely to add with *more*, subtract with *less*, and question or

not respond to *tiv*. In the second version, however, there were no differences between *less* and *tiv*, with children more likely to subtract in responses to requests using these items. Only one child responded as if *less* is equal to *more*. Carey's conclusion was that there is not a stage where *less* has an incomplete or partial entry, and is interpreted as its positive counterpart.

Wannemacher & Ryan (1978) came to a similar conclusion. After investigating how three- and four-year-olds responded to instructions with *more* and *less* across a variety of tasks, they pointed out that tasks effects and a willingness to select a salient alternative in the face of uncertainty could give rise to the appearance of a *less* is *more* interpretation. After reviewing data across a number of studies, Gathercole (1979) also concluded that there is no *less* is *more* stage, but that *more* is learned before *less* (some time between two and three years of age), which she argued is not acquired until the "middle of the fifth year" (pg. 148). However, it is not clear from this if non-linguistic responses biases are supposed to account for interpretations of *less* in the interim, or how to account for Carey (1978)'s findings with children younger than that age.

more* v.*-er

Apart from the *meaning* of the comparative morpheme, children have to learn when a lexical item selects for either *more* or *-er*. Graziano-King & Cairns (2005) hypothesized that children's use of these morphemes might parallel acquisition of verbal past tense morphology, since both require learning a rule, along with lexical-specific knowledge licensing deviation from this rule. In their first experiment, children four to eight years of age participated in a forced-choice judgment task in which they were asked which forms 'sounded better' (e.g., *My aunt is **older** than yours* v. *My aunt is **more old** than yours*). The

items tested included a range of mono- and disyllabic adjectives, which selected for one or the other morpheme and were either high or low frequency. Among these adjectives were non-gradable adjectives, such as *dead*, *right*, and *whole*. It appears that their inclusion was motivated by the authors' reasoning that these adjectives would, unlike the gradable ones, take the periphrastic comparative form (i.e., *more*); however, the fact that these are not gradable makes them an odd choice for an experiment focused on assessing proper formation of the comparative. The results were somewhat of a mixed bag, with both younger and older children showing preferences for either comparative form. In addition, data from 26 of their 74 children had to be excluded because of apparent response biases for order of mention.

Their second experiment involved an elicited production cloze technique involving children ranging from 4;9 to 10;9 (although it seems that the youngest were not included, so the minimum age actually appears to have been higher), and adult controls. Participants were asked to complete sentences such as the following: *X is Adj, but Y is even* _____. Again, children's response patterns varied considerably. However, children who were classified as "rule-users" appeared to use the bound *-er* morpheme more than "non-rule-users" for low frequency adjectives (and more so than adults), leading the authors to conclude that these children were not just appealing to stored forms in the lexicon and were applying a rule. As with previous authors, these authors, too, argued for a stage-like approach to development. In the first stage, children gather information about comparative forms and begin to make lists. At some point, a critical mass of listings creates sufficient regularity for children to posit an "add –*er*" rule. At the next stage, which – they argued, based on their data – occurs between 5;11 and 8;3, suffixation would be overextended to new adjectives

(as the "add –*ed*" rule is with verbs). Further experience with *more* would lead children to become more conservative and only use -*er* when there was positive evidence to do so. Finally, around eight years of age, children become adult-like.

Clahsen & Temple (2002) ran a similar elicited production cloze task with a small group of individuals diagnosed with Williams Syndrome. Their chronological ages ranged from approximately 11 to 15 years of age, but their scores on the Wechsler Intelligence Scale for Children ranged from 5;7 to 7;7. They found that while children in their two control groups (4;10 to 5;8 and 6;10 to 7;9) used a range of comparatives, including -*er* suffixation, *more*, *more* + -*er*, and so on, the Williams Syndrome individuals had just one strategy: use -*er*. Clahsen & Temple concluded that they had developed a suffixation rule that could "freely generalize to any adjective." These findings seem to bolster the conclusion that, much like the past tense rule, the comparative suffixation rule is acquired at some point in language development, is overgeneralized, and is then pruned back once children are better able to recruit lexical-specific knowledge.

standards of comparison

There is by now a large body of research demonstrating that the process of comparison and highlighting commonalities among perceptually and/or conceptually similar objects facilitates word learning in three- to four-year-olds benefit. Gentner & Namy (2004) presented a comprehensive review of such studies. For example, Namy & Gentner (2002) have argued from a set of experiments with four-year-olds that the process of labeling invites a comparison among objects within a taxonomic category, serving to highlight deeper commonalities. Waxman & Klibanoff (2000) have shown that presenting three-year-olds with an explicit contrast among objects *within* a basic-level category

differing along one dimension (e.g., a white cup v. fork that are either transparent or opaque), accompanied by a novel label for the property (e.g., *blickish*), allowed them to successfully identify a new object with the same property, given a choice between two new objects. Moreover, presenting children with a property similarity among objects *across* basic-level categories accompanied by a common label was also successful. These studies may be taken as demonstrating that the formation of a comparison class is an essential aspect of word learning. If this is so, then it is quite possible that children also form a standard for this comparison class with respect to one or more dimensions. In fact, a number of papers dating back to the 80s demonstrate that children are able to use both contextual and object-specific knowledge to set the standard of comparison, and allow it to shift given changes in the context.

In a series of papers, Ebeling and Gelman investigated how children as young as two years of age incorporate both perceptual information and standards related to an object-specific comparison class when making judgments about *big* and *little*. Ebeling & Gelman (1988) showed that children age 2;6 to 5;1 were able to base their judgments of these terms on both salient perceptual and object-kind information. The youngest children were more successful when they were asked to judge the size of a known object (mittens) rather than a novel shape. All children were able to appeal to stored standards for objects. For example, they considered a 10-cm egg to be *big*. However, when perceptual and normative standards were in conflict, they opted for the former. Children's performance improved when they were asked to give the experimenter *the big one* or *the little one* as opposed to being asked to evaluate the size themselves and provide a label.

Gelman & Ebeling (1989) and Ebeling & Gelman (1994) also showed that children of

this same age use *functional* information to make judgments about size. For example, when a piece of clothing or tool was held up to a doll and asked to evaluate the size of the object (i.e., whether or not it was big *for that doll*), children took into account the 'goodness of fit' when rendering their judgments. When the experimenter explicitly drew the children's attention to the mismatch by attempting to try the clothing on the doll or asking whether the object was *too big* or *too little*, children's performance improved. Children did experience some difficulty, however, when asked to switch between different sorts of standard. This asymmetry occurred when they were asked to switch *to* a normative, or object-kind, standard – that is, when they were asked to evaluate whether something like a mitten was big, using as a standard what counts as big for mittens in general. Switching from a normative standard to a perceptual standard (comparison of the features of objects in the immediate scene) or functional standard, however, proceeded smoothly.

Smith, Cooney, & McCord (1986) demonstrated that five-year-olds are able to assign a context-sensitive standard of comparison and recalibrate that standard when the context changes. In one study, children (3;8-5;10) were asked to judge whether a large red 11-inch disk, which was raised and lowered to ascending or descending heights by the use of a pulley system, was *high* or *low* relative to a six-foot backdrop. When responses for these two adjectives at various heights were plotted on a scale, the authors found that three- to five-year-olds exhibited intersecting judgments for these polar terms around the midpoint of the range. However, four- and five-year-olds had higher slopes, indicating a dropoff in acceptance moving towards the midpoint, and were also more likely to allow heights closer to the midpoint to count as *high*. Some three-year-olds absolutely refused to label the midpoint of the range. (This trend for the younger group was also noted in Smith,

Rattermann, & Sera (1988).) Interestingly, when the height of the backdrop was four feet instead, five-year-olds' judgments changed, apparently because they kept the proportion of *high* and *low* judgments constant; the same was not found for the younger age groups.

Smith, Cooney, & McCord (1986) followed up by painting the six-foot backdrop with a scene of a tree and some grass, and substituted an animal (a bunny or a bird) for the disk. They reasoned that what is high for a bird is different than what is high for a bunny, and wondered whether children would take this object-kind information into account. Three-year-olds had some difficulty with the task, and four- and five-year-olds displayed slightly different patterns. Five-year-olds judged the bunny to be higher more often and the bird low more often, whereas the four-year-olds appeared to treat the characteristically high animal as *high*, and the characteristically low animal as l*o*w more often. Thus, as children develop, information about object kind and more general real world knowledge play different roles in the calculation of the contextual standard.

Barner & Snedeker (2008) were interested in the nature of the information that fed into the calculation of the standard of comparison for *tall* and *short*, and also focused on the role of object kind. Across four experiments, they assessed what children 3;11 to 4;11 knew about a set of novel objects (*pimwits*) – specifically what counted as *tall* or *short <u>for a pimwit</u>*. Children were asked to place the target objects for which the predicate applied in a separate area. In a baseline assessment of nine objects ranging from one to nine inches in height, children demonstrated an average minimum cutoff for *tall* at 7.19 inches, and an average maximum cutoff for *short* at 3.19 inches.

In a subsequent task, four additional same-kind objects were added pseudorandomly to the array. In one condition, the height of the additional objects was at

the shortest end of the spectrum, while in another, it was at the tallest end. Thus, the average height of the objects changed, given the additional objects, skewing the location of the average in the series towards one end or the other. This change had consequences for children's judgments based on this contextual standard.

The addition of the shorter objects pulled judgments for *tall* and *short* towards the lower end of the scale. Specifically, the minimum height for *tall* decreased from 7.19 inches to 5.44 inches. Children in the original condition did not allow *any* of the nine objects to count as *tall* until the sixth object, but in this new condition, children were willing to allow the third object to be judged as *tall*. The maximum height for *short* decreased from 3.19 inches to 2.19 inches. By contrast, the addition of the taller objects *in*creased the minimum height for *tall* to 8.44 inches, but did not significantly affect their judgments for *short* (3.69 inches). When, in the next experiment, objects that were perceptually distinct from the first set were mixed in, children's judgments only differed significantly if the objects were given the same label as the first set and therefore treated conceptually as the same object kind. When labeled as *tulvers*, there was no change, but when labeled as *pimwits*, judgments shifted in a manner similar to the second experiment. Thus, children took both object-kind (not just perceptual similarity) and distribution of the dimension within the relevant set into account when setting the standard.

standards, scalar structure, and implicit comparisons

As I mentioned earlier in the theoretical discussion of adjectival semantics, not all adjectives can appear in a comparative construction. Only gradable adjectives (e.g., *tall*, *big*) are felicitous in such constructions. In a degree-based semantics, this is because they map entities onto a scale composed of degrees, and individuals can differ with respect to

the degree that they possess a property. Consequently, there are differences within the category of adjectives with respect to the nature of the standard of comparison and its ability to shift. In fact, there are also differences among gradable adjectives with respect to the role of context and the scalar standard.

While some gradable adjectives such as *tall* and *big* rely on a context-dependent or *relative* standard, others make reference to a fixed or *absolute* standard. This distinction can be captured by making reference to differences in the standard of comparison and the scalar structure encoded in the semantics of these adjectives. While relative GAs have a context-dependent standard and map onto an open scale, absolute GAs have a fixed standard associated with the endpoint of a bounded scale. For absolute GAs, the standard can either be minimum and indicate the existence of some degree of a property (as it is with *spotted* and *wet*) or maximum and indicate the total presence of a degree or the total absence of its opposite (as it is with *full* and *straight*) (cf. Kennedy, 2007; Kennedy & McNally, 2005; Rotstein & Winter, 2004; Rusiecki, 1985; Yoon, 1996). (See also Hamann (1991).)

There is at least one instance of early acquisition work in this area comparing differences within adjectives with respect to explicit and implicit comparisons. Using a forced-choice picture task, Nelson & Benedict (1974) asked children to point to an image, given either a positive or comparative adjectival form (e.g., *the leafy one* v. *the leafier one*). The authors found that adding comparative morphology to relative GAs such as *big* and *long* resulted in more errors than with the positive form, but that the comparative form of these adjectives did not take as long to respond to as comparative of adjectives such as *furry* or *striped*. However, it is rather difficult to interpret these data, given the coarseness

of the response time evaluation, and the fact that the linguistic division among their stimuli was ad-hoc and were not motivated by theoretical claims about within-category distinctions. What we can take away from this work, however, is the possibility that there might psychologically motivated empirical evidence for a semantic distinction between adjectives, and children might demonstrate awareness of such distinctions in their behavioral responses.

In a more recent study, Nadig *et al*. (2003) found a difference between adjectives based on their link to the context. Children as young as three years of age treated stressed prenominal size terms (e.g., *big*) contrastively more often than color terms, giving a puppet an object of the same kind that differed along the dimension highlighted by the adjective (e.g., size) more often than an object that differed by kind but aptly represented the target property. Thus, there is evidence that size terms in particular seem to automatically call for a reference to a contextually-relevant comparison class. Because this study presented color terms as mapping on to categorical contrasts, the authors were able to demonstrate a difference among adjectives, but not specifically among *gradable* adjectives.

Syrett (2007), Syrett, Bradley, Kennedy, & Lidz (2006), and Syrett, Kennedy, & Lidz (2010) were interested precisely in how differences in semantic representation of different gradable adjectives (GAs) play out in how children and adults assign a standard of comparison, and what the role of the context is for these different types of GAs. In a scalar judgment task reported in Syrett (2007) and Syrett *et al.* (2006), children age 3;3 to 5;11 were asked to render judgments for four sets of seven objects corresponding to three types of GAs and four different dimensions: relative (*big*, *long*); absolute minimum (*spotted*); absolute maximum (*full*). Objects were presented all at once, in linear order. Both children

and adults assigned a standard around the midpoint of the series for the relative GAs (consistent with evidence for children's judgments of *tall* discussed above). Their judgments for *spotted* and *full* were quite different though. For both groups, only the objects with spots were judged to be *spotted*, regardless of the differing number of spots. This is consistent with a view that existence of the property or deviation from a minimum standard is what is relevant for application of this adjective. Adults did not allow containers to be *full* unless they were either completely or almost full. Children were unlike adults in allowing more of the containers to be *full*, but their judgments for *full* were significantly different from the relative GAs, demonstrating that they did not simply assign a context-dependent standard relative to the midpoint of the scale. Foppolo & Panzeri (*to appear*) have replicated such judgment patterns.

Given this baseline evidence for differences in how the standard of comparison is set, Syrett (2007) and Syrett, Kennedy, & Lidz (2010) sought to investigate whether or not participants allowed the standard to shift with the context for all GAs, or just for relative GAs, which encode a context-sensitive standard of comparison in their denotation. Children three- to five years of age were shown a series of two objects at a time and asked by a puppet to give him *the ADJ one*, where *ADJ* was one of the targeted GAs. The singular definite DP forced the interpretation that there was one such object in the context. No matter what size the cubes or rods were corresponding to *big* and *long*, children automatically gave the bigger or longer of the two items. When there were two spotted disks or two bumpy boards, differing in degree of the relevant property, children did not behave as they did with the relative GAs, handing over the more spotted or bumpier item; instead, they rejected the request, saying both of the objects had the property.

In response to a request for *the full one* or *the straight one*, children – but not adults – were inclined to accept the request, even if neither object was maximally full or straight. However, further analysis indicated that this response pattern arose for reasons other than an automatic shift of standard. Children who had seen the maximally full/straight object earlier in the series did not exhibit this pattern. Moreover, an analysis of reaction times indicated that for those children who did, they took longer to do so for the *full* and *straight* stimuli than with the relative GAs. Syrett *et al*. interpreted these findings as demonstrating a difference between grammatically-encoded vagueness (with relative GAs) and pragmatic imprecision around a maximal standard (with absolute maximum standard GAs).

Relevant to our discussion of gradability and the role of the standard is the fact that other lexical items, such as adverbs, are known to interact with GAs in a way that highlights their underlying semantic representation. Although space precludes us from discussing in detail studies investigating what children know about the meaning of adverbial modifiers that compose with gradable adjectives and comparative constructions, recent work by Syrett (2007), Syrett & Lidz (2010), Syrett, Musolino, & Gelman (*to appear*) and Amaral (2010) deserve mention. Combined, these studies have shown that children are attending to the distribution and selectional restrictions of adverbs such as *very*, *completely*, and *almost*, which pattern differently in their co-occurrence with GAs.

Syrett (2007) and Syrett & Lidz (2010) have shown that distributional information detectable at the surface provides the learner with evidence that intensifiers such as *very* are more likely to appear with a relative gradable adjective such as *big* than with an absolute gradable adjective, and that proportional adverbs such as *completely* display the opposite pattern. Moreover, using a preferential-looking paradigm, they demonstrated

that children as young as 2;6 appear to be recruiting this information in the word learning process. These findings are bolstered by the more recent findings by Arunachalam, Syrett, & Waxman (*submitted*) that children of the same age benefit from adverbial modification when learning new verbs. Syrett *et al*. (*to appear*) have shown that children as young as 2;8 appear to be aware that *very* is more likely to appear with a size or color term than with a number word.

Finally, Amaral (2010) told children age 4;0 to 5;11 a story about some characters, accompanied by a series of slides, and asked them a question in which *almost* modified a number word or a directional prepositional phrase (e.g., *Which boy has almost 4 blocks?* or *Which snail got almost to the vase?*). In the scenarios, there were characters that fitted a 'less than', an 'equal to', and a 'more than' interpretation. These children were more likely to select the character who represented the 'less than' interpretation – the one who had not reached the reference point or standard. Thus, these studies demonstrate that at a young age, children display knowledge of scalar structure and standards of comparison with lexical items beyond property-denoting terms.

ellipsis and covert movement

When discussing the parts of the comparative, we differentiated between the lexical material preceding *than*, which we referred to as the main clause, and the lexical from *than* on, which we referred to as the subordinate clause. One could ask whether in a comparative such as (7), children actually interpret the entire sentence, or if they interpret the sentence as asserting that Tim is tall (perhaps to the exclusion of any information about Derek).

(7) Tim is **taller than** Derek (is).

Piaget (1928) argued that children do not understand such comparatives until a very late age, and instead apply the adjective to both nouns. The basis for this claim was children's answers to scenarios and questions such as the following.

(37) Edith is fairer than Suzanne. Edith is darker than Lili. Which is the darkest, Edith, Suzanne, or Lili?

Townsend (1974) tested three- to five-year-olds on comparatives using as stimuli wooden dolls, plastic apples, and plastic apples, all of different sizes. Children were asked comparative questions such as *Which boy is taller?* and *Which boy is taller than Johnny.* Townsend also included other more complicated questions such as the subcomparative *Which boy is taller than **Johnny is fat**?* and *Which boy is taller than **he is fat***, *Who has more apples than he has oranges?*, and comparatives in which the usually-dropped nominal in the subordinate clause was present (e.g., *Who has more oranges than **Johnny has oranges**?*). Children were more accurate in their responses to *more* questions than to *less* questions, younger children were better with *taller* than *shorter* questions, and overall, children appeared not to benefit from having the standard explicitly stated and appeared to have difficulty with the more complicated comparatives. Townsend also described apparent response strategies of which both younger and children appeared to make use, based on their lack of knowledge of the adjective meaning, lack of knowledge of the discourse referent, salient features of the stimuli, and so on (pg. 301).

It could very well be that three- to five-year-olds do misinterpret comparatives in the way that these previous authors have suggested (i.e., by attending to the first part of the comparative to the apparent exclusion of the second clause, or resorting to a perceptually-based rubric). However, it is also quite possible that these non-adult-like responses are a

result of tasks involving increased cognitive load (which ends up masking children's linguistic knowledge), or where children began to respond to the question as the comparative was still being delivered (and therefore only appeared to parse the initial clause).

Research by Syrett & Lidz (2009) may bear on this issue. The authors were interested in children's interpretation of sentences such as (38), which involves what is known as *antecedent-contained deletion*.

(38) a. Lola jumped over every frog that Dora did.

b. Lola [jumped over every frog that Dora *did*]

c. Lola [<u>every frog that Dora did</u>] [jumped over *t*]

In this sentence, there is a site of verb phrase ellipsis (VPE), which is signaled by the word *did*. In order to interpret the VPE, we must identify its antecedent. The problem with these sentences is that the VPE is contained in the VP antecedent (as shown in (b)). The problem is solved, however, if the quantified NP containing the VPE is able to undergo covert movement (Quantifier Raising) out of the antecedent (as in (c)). At that point, the ellipsis can be interpreted.

Syrett & Lidz (2009) reasoned, based on previous research, that without the QR mechanism in their grammar, children might interpret these sentences as coordinated conjunction, as in (39). In a Truth Value Judgment Task, they compared four-year-olds' interpretations of both sentences in two different contexts: one in which Lola and Dora jumped over the same set of frogs, and one in which they each jumped over a different set.

(39) Lola jumped over every frog <u>and Dora did, too</u>.

The results demonstrated that at age four, children treat the two sentences distinctly,

accepting the ACD sentences in the 'one set' condition and rejecting them in the 'two set' condition, and displaying the opposite pattern for the conjunction sentences. Subsequent work by Syrett & Lidz (2011) and earlier work by Kiguchi & Thornton (2004) shed additional light on the nature of the QR mechanism in child grammar. Recall that QR is also claimed to be essential to the interpretation of the comparatives that we have been considering. If this is the case, then children should be able to interpret comparatives such as the one in (7), and others, and should not be stuck predicating the gradable adjective in the main clause of both of the individuals in the construction, or interpreting the comparative as asserting the predicate in its positive form of the individual in the main clause.

Instead of focusing on the *main* clause of comparatives, Moore (1999), claimed that the *complement* clause drives the comparison. She appealed to examples such as those in (40), which she gathered from the CHILDES database (MacWhinney, 2000).

(40) a. This is a different kind of lamp I ever saw.

Abe age 3;10; file #; line # Kuczaj (1976)

b. I think I need to make my bigger canoe I ever seen in my whole life.

Abe age 3;2; file #; line # Kuczaj (1976)

c. Oh # here's a dangerous bird too # you ever saw.

Adam age 4;6; file 49; line 1574

d. Dat's a funny tail bird I ever saw # isn't it # Mommy?

Adam age 4;6; file 49; lines 2546 (repeated again on line 2556)

Brown (1973)

e. She's just a silly dog that you ever saw.

Adam age 4;7; file 50; line 768 Brown (1973)

Whether or not Moore's claim was correct, these examples also highlight the use of a negative polarity item (the NPI *ever*) in the subordinate clause. It is possible that the two children in these examples are simply plugging in phrases they have heard in comparatives before, but it is also possible that they know that such phrases are licensed in a comparative precisely because it is a downward entailing environment. Such a conclusion is not unwarranted, especially in light of independent evidence from Boster and Crain (1993) and Gualmini, Meroni, & Crain (2003) that children are aware of the entailment properties of *every* in disjunctive environments at three to five years of age. Clearly the studies focused on children's understanding of comparative language over the years have left many open questions about how children process, represent, and interpret these constructions.

phrasal and clausal comparatives

Hohaus & Tiemann (2009) and Tiemann, Hohaus, & Beck (2010) argued that children should not make productive use of a new grammatical construction in their spontaneous speech until they have identified that the construction is licensed in adult language and that there is a grammatical basis for it. They therefore predicted that there would be an order in children's production (consistent with earlier claims in the literature reviewed above): basic comparative (e.g., *Sue is taller*), followed by phrasal and clausal comparatives (e.g., *Sue is taller than Joe (is)*) and superlatives, and finally measure phrases and degree questions. The authors targeted three sets of transcripts of child-produced speech in American English and in German from the CHILDES database (MacWhinney, 2000). Following previous authors (Stromswold (1990) and Snyder (2007)), they noted

the very first use of the target constructions, followed by the "age of acquisition" (marked by regular and repeated use).

The authors found that clausal comparatives were highly infrequent, as were measure phrases. In English, the other constructions largely followed their predictions (mean age of acquisition: comparatives: 3;1, phrasal comparatives: 3;8, superlatives: 4;3), but in German, the phrasal comparatives were observed markedly later than comparative and superlative morphology (mean age of acquisition: comparatives: 3;1, phrasal comparatives: 6;4, superlatives: 3;3). This led the authors to argue that the German/English contrast may show that there is a direct analysis of phrasal comparatives in English, but a reduced clausal analysis of these comparatives in German. Mastery of the elliptical process would present an additional challenge that would result in a protracted acquisition stage in German. Although the idea is promising, this corpus-based study was not accompanied by an analysis of other forms of ellipsis in English or German or any experimental data from children this age, so there is not independent support for this claim. Moreover, the corpora that were targeted were small in number and were not consistent within and across the two languages. However, this study is one of the few instances of work on comparatives that is driven by theoretical and cross-linguistic observations, and so invites the possibility of follow-up work that could make a very nice contribution to work on comparatives in acquisition.

measure phrases

Although measure phrases may be infrequent in children's speech, there is evidence that by four years of age, children are beginning to comprehend important aspects of the semantics of these constructions. In recent work, Syrett (2010, *submitted*) has investigated

what three- and four-year-olds know about *attributive* and *pseudopartitive* measure phrases (MPs), exemplified in (41).

(41) a. **3-pound** strawberries Attributive

b. **3 pounds** of strawberries Pseudopartitive

Both MPs are constructed from the combination of a numeral or a weak quantifier (e.g., *several*) and a word expressing a unit of measurement (e.g., *pound*) corresponding to some relevant dimension (e.g., weight). Attributive MPs modify a noun to indicate a kind of individual (although perhaps not in all cases), and track weight (or another dimension) *per unit*. Pseudopartitives, however, measure out the entire weight of a group, such that removing some amount results in a decrease in the total weight. Pseudopartitives are thus said to be monotonic on the part-whole relation, whereas attributives are not (Jackendoff, 1977; Schwarzschild, 2006).

Using a forced-choice task, Syrett (2010) demonstrated that children three- to four years of age were able to differentiate between attributive syntax (*2-cup card*) and similar noun-noun compound syntax (*2 cup-cards*) to select the correct image. In a second task, using a visual world paradigm display, children 3;8 to 5;0 were shown a contrast between two cards with cups and two cups with cards. Children who heard the pseudopartitive *2 cups of cards* correctly selected the cell with the cups in it. However, children who heard the attributive were at chance. When only one card with cups on it was contrasted with the two cups, children who heard the attributive were actually more likely to choose the competitor (the two cups). Syrett took this pattern to indicate that children's initial inclination, especially in light of the results of the first task, was to treat the numeral as an indication of the cardinality of the set as they parsed the sentence online. However, this

study did not involve the collection of real-time data that would support this claim. This conclusion may, however, receive support from Syrett (*submitted*). In this study, four-year-olds participated in a Truth Value Judgment Task. In each story, a character was forced to make a decision about two sets of objects, and ultimately chose one set over the other. Children appeared to be aware that a character who had purchased small strawberries, which all together weighed three pounds, had not, in fact, purchased 3-pound strawberries. Children also responded differently to scenarios involving subtraction from a set for attributive and pseudopartitive MPs (*Do I still have 3-pound strawberries/3 pounds of strawberries?*), indicating that their representations differ with respect to how they encode monotonicity.

most

In recent years, a growing number of researchers have been interested in the interpretation adults and children assign to the word *most*. The main interest in this topic stems from its quantificational status and its relationship to 'half'. This line of work deserves mention here, because of the inherently comparative status of this lexical item and the possibility that *most* encodes a superlative in its denotation (e.g., ⟦most⟧ = ⟦many⟧ + ⟦-est⟧).

Halberda, Taing, & Lidz (2008) showed children age 2;5 to 5;1 a trials in which they saw a series of screens with images of crayons on them. In the last screen of each trial, the set of crayons filled the screen and was composed of two subsets of crayons – each of a different recognizable color – of various ratios. Children were asked by a voice on the computer, *Are most of my crayons [color]?* Overall, children were correct 65% of the time, which was greater than chance performance. Their analyses indicated that age, and not

counting ability, was a significant predictor of children's success in this task. They concluded that the "ages of transition into *most* comprehension" (pg. 116) are between 3;6 to 4;3, when performance (for counters and non-counters alike) is above chance, but not yet at 100%.

However, findings by Barner, Chow, & Yang (2009) may be at odds with this conclusion. In their Experiment 1, the experimenter placed various amounts of strawberries in a circle, leaving some to the side, and asked the children about the amount in the circle using various quantifiers and numerical terms (e.g., *Are some/most/all/two of the strawberries in the circle?*) Child participants ranged anywhere from 2;4 to 5;7, and participated in baseline tasks to assess their 'number knower status'. While children performed well with terms such as *all*, *some*, and *a*, they were highly likely to respond incorrectly with the *most* questions, simply responding *yes*. In fact, performance with *most* was the worst of all items tested. Moreover, the children who were most likely to provide correct responses were 3-knowers and CP (cardinal principle)-knowers.

Papafragou & Schwarz (2005/6) were interested in the competition between semantics and pragmatics in children's and adults' interpretations of sentences with *most*. On the one hand, a sentence asserting a property of *most* of a set of objects should be judged true in case the property is predicated of all of the objects in the set. On the other hand, there are pragmatic reasons (i.e., reasons based on the calculation of scalar implicature) to reject such a sentence, because it is infelicitous and not maximally informative. In one of their experiments, Papafragou & Schwarz asked adults and children age 3;5 to 11;11 to judge whether or not a character actually did what s/he said s/he was going to do. In one scenario, Grumpy the dwarf said he was going to light *most* of the

candles. (*Most* was compared with *half* between subjects.) He first stood in front of a set of six unlit candles, then he was shown in front of the same set of candles, and this time some proportion of them was lit. Participants were exposed to all seven possible proportions (e.g., 0/6 to 6/6).

Results showed that with one age group exception, all participants said the character did what he said he was going to do when more than half of the candles were lit (thereby indicating that they did *not* calculate the implicature with *most*). Children, but only 30% of the adults, also agreed when half of the candles were lit. Finally, only the youngest group accepted it when one or two were lit). (20% of the 3- to 5- age group actually agreed when none were lit, so it did not seem to even translate to *some* for them.) Thus, children 6- to 11 years of age seemed to assign *most* an interpretation with a lower bound of *half* (not greater than). Together, these results demonstrate that while children at a young age (i.e. preschool age) may be acquiring the basic meaning of this term, it may give rise to task effects. However, even through the upper elementary years, children continue to exhibit difficulty with expressions in which *most* appears.

Geurts *et al*. (2010) found that 10- and 11-year-olds (speaking British English) made errors when asked perform an action with boxes and toys to make the scene match the sentences. In the task, there were six boys, and six toys, and multiple arrangements, such that between two and four boxes already contained a toy before the sentence was heard. The sentences included *more than 3*, *fewer than 3*, *at least 3*, *at most 3*, and *exactly 3* (e.g., *at most 3 boxes have a toy*.). Surprisingly, when asked to make it so that *at least three* of the boxes had a toy, 11-year-olds sometimes did nothing with the '2-arrangement' scene, whereas they should have added at least one toy. A small percentage of responses also

involved taking toys out of a '3-' or '4-arrangement'. These percentages were extremely low, however, as were errors with *fewer than 3*. Where the real outliers came was with the responses to *at most three*. Children added two toys to a '2-arrangement' more than one third of the time, added one or two toys to a '3-arrangement' 30% of the time, and added nothing or added one or two toys to a '4-arrangement' more than half of the time. Clearly, if 11-year-olds are still having difficulty with these expressions, semantic understanding is either protracted (perhaps because of the complexity of the superlative denotations, Geurts *et al* argue) and/or contextual factors make it extremely difficult to succeed on tasks testing the interpretation of these expressions.

many

Relevant to our discussions of how children interpret the word *most* is the issue of how they interpret the word *many*. Krämer (2005) was interested in the interpretations that adults and children age 4;0 to 8;1 assign to *many*, given its ambiguity. For instance *Many children are on the playground* could mean that many of the children are out on the playground, or that the playground is full of children. Krämer asked whether participants in all age groups could access both readings: the strong (wide scope, topic, partitive, proportional) reading and the weak (narrow scope, focus, existential) reading. In a clever and simple task in Dutch, she asked participants to judge the sentences that follow (with either topicalized *many* DP or an existential construction), given two scenarios. In one, all but two of a small set of small eggs were in a large basket (so that most of the eggs were in the basket). In another, all of a small set of small eggs were in the same-size basket. In either case, the basket was far from full.

(42) a. Veel eieren zitten in de mand

Many eggs are in the basket. (= 'many of the eggs')

b. Er zitten veel eieren in de mand.

There are many eggs in the basket.

Adults only accepted (a) when most, but not all, of the eggs were in the basket, and never accepted (b) (apparently since the basket was never anywhere near full). Children exhibited an age effect. The youngest group was largely at chance for both sentences whenever two of the eggs were left out, but trended toward accepting sentences whenever all of the eggs were in the basket. The older children tended to reject the sentences, as adults did with (b). Krämer also included an additional condition in which she asked children to judge whether most of the eggs were next to the basket, in the scenario in which all but two were in the basket. The fact that children 5;2 to 6;4 correctly rejected this sentence led her to conclude that children do not have difficulty with the proportional reading at this age, but that they did not rely upon the correct context-dependent standard of comparison. Further investigation of this phenomenon both in Dutch and across languages would be certainly be interesting.

too

Evidence that children at age three might not fully understand that *too* denotes an excess of a property instead of just a greater degree of the property has been claimed to come from their spontaneous productions. These examples recorded by Gathercole (1979) hint that children do not have the correct interpretation of *too ADJ*. In (43), she argued, the utterance apparently means 'not high enough' while in (44) it apparently means 'closer'.

(43) I'm **too high**, Daddy.

(standing on table to turn light on, can barely reach light switch)

Rachel age 3;6 Gathercole (1979)

(44) Put it **too close**.

(asking mom to move a bowl of candy closer)

Jaime age 3;3 Gathercole (1979, 2009)

Gathercole (1979, 2009)'s carefully-catalogued utterances (chiefly from her children Rachel and Jaime) provide us with a number of illustrative examples of children's productions of comparatives and degree constructions over the course of development. However, relying primarily upon children's spontaneously produced utterances as an indication of children's semantic awareness has its pitfalls, and conclusions that the process is protracted and stage-driven seem almost inevitable. Using such data, it is hard to know whether children are imitating or repeating utterances they have previously heard, what role the context had (if any), what meaning was attached to their utterance, and so forth. In short, while we can take these utterances as a starting point, it is difficult to assess based on these data alone just how much children's production accurately reflects their comprehension.

Take, for example, the following utterances reported in Gathercole (1979). In (45), Jaime (Gathercole's son) comments on the sound of the windshield wipers.

(45) They're **too loud**.

Jaime age 3;10 Gathercole (1979)

Her notes on this utterance indicate that there was "no sign that J dislikes the level of noise they are making." It is therefore possible that this example, like those cited above, shows that Jaime – seven months after (44) – apparently still thinks that *too* marks a greater

degree (i.e., *very loud*). However, it is also possible that this child had the right interpretation, and simply exhibited no signs of discomfort from the noise level. Relying solely on inference, we cannot be sure.

equatives

A similar question about comprehension and production can be raised about children's understanding of equatives, such as those in (46) and (47).

(46) I'm **big and strong as** the piggie+bank .

Sarah age 4;1, file 93, line 161 Brown (1973)

(47) he's not **big as** that turtle.

Sarah age 4;2, file 96, line 1001 Brown (1973)

Does the omission of the initial *as* indicate a lack of linguistic structure or a lack of knowledge of how to form an equative, or is it a sign of production limitations? There may be reason to think that it is the latter.

In the forced- choice task assessing children's interpretation of *almost* described earlier in this paper, Amaral (2010) included both test items in which *almost* modified an equative (e.g., *Which animal jumped almost as far as the zebra?*) and filler items with an ordinary equative (e.g., *Point to the elephant that is as big as the house.*). Children 4;0 to 5;11 had no trouble interpreting the filler items, although it should be noted that the difference between the *exact* and *at least* readings of the equative was not the main factor being compared. Interestingly, when the equative was modified by *almost*, children behaved differently than with the number words and directional PPs discussed earlier, and often assigned a *more than* interpretation. It appears, then, that in these cases *almost* may still have a 'near the standard' type of interpretation, but it does not entail a direction.

4. Conclusions

In this chapter, I have approached comparatives and degree constructions from two perspectives. First, I examined the components of these linguistic expressions, taking into account a range of syntactic and semantic theoretical accounts of their representations and interpretations. In doing so, I also reviewed evidence of cross-linguistic similarity and diversity in the realization of comparatives across languages. Second, I used the linguistic theory as a jumping-off point to examine what investigations into comparatives and degree constructions in child language have discovered in this area. In doing so, I highlighted how little – despite a relatively wide range of research on explicit and implicit comparison in child language – we actually know about the linguistic representations children assign to these constructions, and how their interpretation of comparatives as a whole and their subcomponents actually aligns with that of adults over the years. Moreover, we lack much-needed cross-linguistic data.

Overall, there are a number of points we can make about the literature as a whole in this area. In large part, these studies have been focused on English. The data have been skewed towards analysis of children's spontaneous productions, offline judgments, and production-based tasks. There has been little to no analysis of the distributional cues available in the input, including frequency of comparatives overall, types of comparatives (i.e., phrasal, reduced clausal, full clausal), and other degree constructions. Despite these critiques, we can, however, end on a positive note. There is clearly ample room for future research to fill in these gaps, and the research on this topic is clearly headed in this direction. By working with the linguistic theory to identify the specific syntactic and semantic components of comparatives and by taking into consideration the ways in which

languages differ in the instantiation of comparative expressions, studies of the acquisition of comparatives can begin to more rigorously investigate the path, and better pin down what children know and when they know it. It appears likely that we will soon find out that young children know a great deal more about comparatives than was previously thought – and at a younger age than would have been expected, given the earliest studies in this area.

In doing so, it is quite possible that the acquisition data will, in turn, shed light on the linguistic theory. Data collected on children's and adults' interpretation of comparatives and degree constructions will inform our understanding of comparative morphology, the proper semantic analysis of comparatives within and across languages, and the possibility that some languages rely on a degree semantics, while others do not. Moreover, given the relationship between semantics and pragmatics in constructions such as equatives and the presuppositions and entailments that accompany garden-variety comparatives, an assessment of how children and adults pattern with respect to each other may help in assigning the division of labor between different parts of the linguistic system. Clearly, much exciting research remains to be done.

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