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Children's knowledge of non-truth-conditional conventional meaning: evidence from the contrastive element of *aval* ('but')

Abstract

This paper discusses an experimental study into adult and child Hebrew speakers' knowledge of the non-truth-conditional part of the meaning of *aval* (*but*). The use of *aval* in sentences like (1) suggests that the speaker postulates a contrastive relationship between the propositions expressed in the two conjuncts.

(1)   *ha ish sone melafefounim aval hu oxel otam*
         the man hates cucumbers but he eats them
         The man hates cucumbers but he eats them.

Recent research in developmental semantics within a Universal Grammar framework has focused on young children's knowledge of truth-conditional meaning. Research into children's knowledge of the logical connectives *and* and *or* (eg. Gualmini, Meroni and Crain, 1999) and of quantifiers *some* and *every* (eg. Chierchia, Crain, Guasti, and Thornton, 1998) shows that children from very young ages have knowledge of truth-conditional meaning of these 'logical words'. This research has supported the argument that UG includes not only syntactic, but also formal semantic knowledge.

What is the place of non-truth-conditional aspects of meaning like the contrastive nature of *aval/but* in (1)?

It has long been argued that along with the truth-conditional meaning, there are other elements of meaning which contribute to the interpretation of language, but do not affect truth-conditions (eg. Grice, 1975). Some of these elements, particularly those which Grice (1975) named *conversational implicatures,* have been considered pragmatic in nature, outside the realm of linguistic meaning. Some of these elements, such as those Grice (1975) describes as *conventional implicatures* appear to belong to a gray area in between semantics and pragmatics.

The requirement of contrast between propositions coordinated by *but* is one example of this latter type of non-truth-conditional conventional meaning.

On the basis of the acquisition data obtained in this project, I argue that the contrastive nature of *aval* is pragmatic, rather than semantic in nature.

Six adults and twenty children, all mono-lingual Hebrew speakers, were administered an appropriateness judgment task this task, similar to truth-judgment task (see McDaniel, McKee and Cairns, 1996). Participants were shown fifteen pictures paired with auditorily presented sentences. Ten items involved descriptions using *aval* with no contrast between the conjuncts. Five filler items involved descriptions using *aval* with contrast between the conjuncts. An example of an experimental item is given in (2).

(2)   *elmo soxe aval hu ratuv*
         elmo swims but he wet
         Elmo is swimming but he's wet.

The results show consistent differences between adult and child judgments of the acceptability of using *aval* when no contrast exists between the conjuncts. The adult subjects rejected these sentences 100% of the time, while the children rejected these sentences only 10% of the time. On 90% of the trials the children did not object to the use of *aval* when no contrast was present.

Definitions of linguistic meaning in terms of formal semantics or truth-conditions has been preferred by formal semanticists for theoretical reasons with non-truth conditional meaning being allocated a separate status (eg. Grice, 1975). On the other hand, researchers into language acquisition have concentrated on truth-conditional aspects of meaning as likely candidates for being part of UG (eg. Chierchia, et al, 1998). The results of this investigation lend empirical support for both the formal semanticists and the language acquisition theorists. The

non-truth-conditional meaning investigated here, the contrastive nature of *aval*, appears to have a separate status from that of truth conditional meaning. The children's lack of this aspect of meaning supports the argument that this knowledge is outside of UG, possibly belonging to pragmatics.

This investigation has shown that child language acquisition research can provide empirical support for theoretical linguistic arguments, such as the truth-conditional versus non-truth conditional distinction in meaning, which are initially motivated by theoretical considerations.

1. Introduction

This paper deals with the interaction between linguistic and non-linguistic aspects of language and how this interaction is reflected in children's first (Hebrew) language acquisition of the contrastive element of *but.* The experiment described here is part of work in progress.

1.1 *Components of Language / Language Acquisition*

The various components of language, and therefore language acquisition can be seen as in Figure 1, taken from Schaeffer (2000).

Figure 1. Components of language/language acquisition.

I. Lexicon
II. Computational System: Grammar: - phonology
- morphology
- syntax
- semantics
Processor/Parser
III. Pragmatic System

In Figure 1, the language system is divided into three components. The first component is the lexicon. The second is the computational system which is comprised of grammar and a processor. The third component is the pragmatic system.[1] The three components interact in the adult speaker's language competence. Similarly they interact in their contribution to children's language acquisition as children approach adult like language behavior.

1.2 *Developmental Hypotheses*

Language acquisition researchers have hypothesized that grammar is in place much earlier than pragmatics. Some aspects are considered to be part of Universal Grammar (UG) and therefore present from earliest child language. Language specific aspects of the grammar may appear slightly later as universal principles acquire their language specific parameter settings (as in the principle and parameters theory, eg. Chomsky, 1993). Thus, it becomes crucial to

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[1] Following Kasher (1991), I assume different sub-systems of the pragmatic component. The subsystem relevant to this paper would be the general pragmatic subsystem (which includes felicity decisions), which would be part of the pragmatic system outside the grammar. For the remainder of this paper, I will use the term pragmatic to refer to this sub-system since a discussion of the entire range of pragmatic subsystems is beyond the scope of this paper.

know what is part of the grammar in order to predict which aspects of language will appear earlier, and which later in child language.

1.3   *Pragmatic Delay Model*

The universal account described above does not explain the differences between child and adult language. Although a grammatical account, attributing the later development of grammar specific to a particular language is possible, evidence from other areas of language acquisition lends favor to a pragmatic explanation The *pragmatic delay model* attributes these differences to pragmatics and not lack of grammar. This means that the children's non-adult like language is the result of an immature pragmatic system and not an immature grammatical system.

Chien & Wexler (1990) investigated Principle B violations in young children. They found that these violations were not a result of lack of knowledge of the grammatical Principle B but rather due to lack of a pragmatic principle. Hyams (1996) in her research into Root Infinitives and missing determiners attributed these to an immature pragmatic system and not a lack of grammatical knowledge of I. Schaeffer (1997; 1999; 2000) found that children's lack of scrambling, missing clitics and over-generation of the definite determiner resulted from the children's immature lack of obligatoriness of a pragmatic concept and not a lack of knowledge of the relevant syntactic rules.

1.4   *Research questions*

In the context of these developmental hypotheses the following research questions were raised:
  (i)   When do children show knowledge of different types of **meaning/semantic** elements?
  (ii)   Where do different types of **meaning/semantic** elements belong? Grammar, pragmatics, or even outside language?

1.5   *Truth-conditions*

Some researchers have claimed that truth-conditions are part of grammar, even Universal Grammar (e.g. Chierchia, Crain, Guasti and Thornton, 1998, Gualmini, et al., 1999).

'Given that UG is the initial state of the language learner, the task of the child exposed to, say English, is to figure out that the English word 'and' maps into the semantically interpreted LF expression &. This view of LF leads to the expectation that children learning any language would 'know' the truth conditions of its logical words as soon as these words enter their speech.' (Chierchia, et al, 1998, p.97)

1.6   *Non-truth-conditional elements of meaning – e.g. contrastive meaning of* aval ('but')

The status of the non-truth-conditional meaning is not as clear. Consider example (1).

  (1)   ha ish sone melafefonim aval hu oxel otam
          the man hates cucumbers but he eats them
          'The man hates cucumbers but he eats them.'

In this case the truth-conditional meaning of the sentence is as in (2).

(2)   It is the case that the man hates cucumbers and it is also the case that the man eats cucumbers.

In addition there is a non-truth-conditional element, given in (3).

(3)   There is some contrast between eating cucumbers and hating them.

1.7   *Main claims*

From the UG hypothesis, truth-conditional meaning should appear very early in child language. There have been no claims made to date about the development of conventional non-truth-conditional meaning. As these elements of meaning may be non-universal, they be later developing. However, if they are part of the grammar, as will be argued below, there may be an extra-linguistic explanation for them developing later. These leads to the following claims (4) and (5):

(4)   *Claim 1. C*hildren acquire non-truth-conditional meaning elements significantly later than truth-conditions.

(5)   *Claim 2.* Non-truth-conditional meaning elements lie within the grammar, but require either pragmatic (non-grammatical) or non-language knowledge for interpretation.

1.8   *Structure of this paper*

The remainder of this paper is organized as follows: First some background will be given on semantic and pragmatic analyses of *aval/but* in adult language and predictions for child language following form these. In section three, I will describe the current experiment and its results. These results are discussed in section four. Finally Section five includes some brief conclusions.

2.   **Background**

2.1   *Truth-conditional meaning of* but

First we define the conventional truth-conditional meaning of *but.* This is quite simply the same as that of *and*. Provided that all of the propositions expressed by the conjuncts are true, the coordinated proposition will be true. A formal translation of *but* taken from Winter and Rimon (1994) is found in (6).

(6)   Formal translations of truth-conditions for *but:*
        Truth conditions: p*but*q ? p^q (Winter and Rimon, 1994)

Let us return to our example (1) repeated here as (7).

(7)   ha ish sone melafefonim aval hu oxel otam
        the man hates cucumbers but he eats them

'The man hates cucumbers but he eats them.'

We see that the truth of the coordinated proposition is dependent solely on the truth of its individual propositions. As long as it is both true that the man hates cucumbers and true that he eats them, (7) will be true.

Kartunnen and Peters (1979) suggest a formula for representing the extensional or truth-conditional values of various expressions. For *but* the extensional expression would be as in (8).

(8)   extensional expression for *but :* p-but-q = [p^e ? q^e] (Kartunnen and Peters, 1979)

This states that the extensional expression of 'the man hates cucumbers *but* he eats them' is the same as the extensional expression of 'the man hates cucumbers *and* he eats them'. An extensional expression, according to Kartunnen and Peters (1979) is the meaning of the expression with reference to the state of a given model of the world.

Purely on the basis of its extensional or truth-conditional meaning, there would be no reason to expect *but* to appear later in child language or for that matter to be distinguished from *and* in either child or adult language. But there is more to *but.*

2.2   *Non-truth-conditional meaning of* but

In example (1), the use of *but* adds a suggested element of contrast between the two conjuncts. As described in (3) repeated here as (9).

(9)   There is some contrast between eating cucumbers and hating them.

2.2.1   *Semantic analyses of the contrastive meaning of* but.

This contrastive element of meaning was chosen by Grice (1975) as a classic example of a *conventional implicature* defined in (10).

(10)   A *conventional implicature* (Grice, 1975) is a non-context-dependent arbitrary element of meaning which is always associated with a given expression but which does not affect the truth of utterances in which it occurs.

Hence, the contrastive meaning of *but* is always associated with *but,* however, in the event that two true but non-contrasting propositions are coordinated with *but,* the coordinated proposition will remain true. The truth of (7) is independent of there being a contrast between hating cucumbers and eating them.

Kartunnen and Peters (1979) allocate the contrastive nature of *but* to its *implicature expression,* defined in (11).

(11)   An *implicature expression* of a proposition includes all those ideas associated with an expression, truth-conditional and otherwise.

Thus, the *implicature expression* for *but* includes both the implicature expression of *and* and the additional contrastive element. This element is a scalar implicature associated with *but* as shown in (12).

(12) scalar implicature associated with *but:*
given p-but-q, the likelihood of p ? ? q is greater than the likelihood of p ? q.

In case of our example (7): the likelihood of hating cucumbers and not eating them is greater than the likelihood of hating cucumbers and eating them.

We can then derive the implicature expression for *but* as in (13).

(13) implicature expression of *but* (after Kartunnen and Peters, 1979):
p^i ? q^i ? (p^e? [***exceed****^{e}*(***likelihood****^{e}* (? q^e)), (***likelihood****^{e}* (q^e))])

In our case (7), if the man hates cucumbers then there is a relationship of 'exceed' existing between the ordered pair of 'the likelihood of not eating cucumbers' and 'the likelihood of eating cucumbers.'

Winter and Rimon (1994) consider this contrastive element of meaning as a presupposition, given in (14).

(14)   presupposition of *but*:
p implies *not* (**r**) and **q** implies **r**

For our man who hates but eats cucumbers this means: the man hates cucumbers (p) implies that he will not eat them (r) and he eats them (q) implies that he eats them. (Note: p same as r.)

Winter and Rimon further specify a contrastive presupposition condition for the use of *but,* and other contrastive connectives, appearing here in (15).

(15) contrastive presupposition condition:
'**q**'s implication of **r** is 'stronger than'/ 'cancels' **p**'s implication of *not* (r)'

Again in terms of our example (7): 'if the man eats cucumbers then he eats cucumbers' is stronger than/cancels 'if the man hates cucumbers then he doesn't eat them'.

And finally, they propose that a contrast relation is established by the implied proposition Their definition of a contrast relation is found in (16).

(16) contrast relation:
A proposition **r** *establishes contrast* between two (ordered) propositions **p** and **q** iff ?(p?? r) ? (q? r) is true.
This relation is denoted by Θ_r(p,q)

Thus for (7), the proposition 'the man eats cucumbers' establishes contrast between the ordered propositions 'the man hates cucumbers' and 'the man eats cucumbers' iff it is

possible that 'if the man hates cucumbers then he doesn't eat cucumbers' and 'if the man eats cucumbers then the man eats cucumbers' is true.

The above three analyses share several features. Those relevant to the discussion here are firstly, the contrastive meaning of *but* is conventional, context independent and always obligatory. In terms of the language model presented in the introduction, this then is part of the grammar, part of the semantic knowledge of the language user.

A second relevant feature of the analyses presented above is the relative complexity of the models of the world required in order to interpret these analyses. Both the analyses of Winter and Rimon and of Kartunnen and Peter require models of the world where comparisons and probability are included. These models, at least on face value, appear to be far more complex that the models required to interpret extensional, truth-dependent meanings. Grice's analysis being less formal, is perhaps less directly related to a complex model.

2.2.2   *Pragmatic analyses of contrastive meaning of* but:

However, not all researchers agree with the assumption that the contrastive nature of *but* is obligatory and context independent.

Bach (1999) argues that this contrastive element is not a conventional implicature as Grice claims , but rather a 'conversational impliciture'; a presupposition acting as 'utterance modifier'. The speaker comments that there is a contrast between the propositions cooordinated by *but.*

Once again returning to example (7), according to Bach, the speaker comments that there is a contrast between 'the man hates cucumbers' and 'the man eats cucumbers'. Yet, it is crucial to note, that even according to Bach's analysis, the speaker will always be commenting that there is a contrast. So that although the context plays a role in the contrastive meaning, this meaning does not vary with context and I argue remains context independent.

Similarly, Blakemore (1989) considers the contrastive element a cancellation of a contextual proposition understood from the first proposition by the second proposition.

Considering example (7): 'the man hates cucumbers' leads us to understand a contextual proposition, 'he doesn't eat cucumbers.' The following proposition, 'he eats them,' cancels this contextual proposition.

Again, context plays a role, but a consistent role.

These analyses appear to view the contrast as obligatory. They do not suggest instances where *but* is used non-contrastively.

2.3   aval *as Hebrew parallel for* but

The relevance of the above theoretical summary to the current study on Hebrew *aval* is dependent on *aval* in fact being the Hebrew equivalent of 'but'.

Tobin (1986) describes the characteristics of *aval.* He found that *aval* has the lowest potential level of exclusiveness (as opposed to *ax, ela*)and is the unmarked of the Hebrew contrastive options. In fact, he argues that *aval* allows for both contrastive and non-contrastive meaning.

Furthermore, *aval* was the most frequently occurring of the contrastive coordinators in his corpus.

On the basis of this description, *aval* appears as the most appropriate candidate for Hebrew parallel of contrastive 'but'.

Tobin does point out that there is interlanguage variation of non-truth-conditional elements of meaning. This point, also noted by Levinson, (1983) supports these elements of meaning as being non-universal, and therefore outside UG.

Another analysis of the Hebrew *aval* is found in Dascal and Katriel (1977). Their analysis combines both conversational and coventional aspects of meaning. They argue that the conjoined propositions may refer to the same or different layers of meaning. One of the conjoined propositions involves acceptance of one layer of meaning while the other involves rejection of another layer of meaning. These layers of meaning are hierarchically arranged. The layer of meaning rejected is as, or more 'external' than the one accepted.

Thus, the Hebrew *aval* arguably functions both semantically and pragmatically.

Having argued for *aval* as the Hebrew parallel of 'but', we are left with the problem of the classification of its contrastive element. For both 'but' and *aval* we a commitment to a semantic versus a pragmatic classification will determine our predictions regarding child language acquisition of this meaning element.

2.5   Classification

Horn (1991) suggests a definition of 'semantic' given here in (17).

(17)   *Definition of term 'semantic'* (Horn, 1991):
        'meaning proper'; meaning arbitrarily assigned to a term, not context dependent.

Note that all given definitions claim that the contrast of 'but' and *aval* is arbitrary and not context dependent (including those that claim to see context as crucial, see 2.2). Thus, following Horn's criterion, the contrastive element of 'but' (even by the apparently pragmatic analyses) is semantic.

Furthermore, by exclusion, the contrastive element of 'but'/*aval* cannot be considered 'pragmatic', according to, for example, Chierchia and McDonnell-Ginet's (1990, 2000) definition of pragmatic. This definition is given in (18).

(18)   *Definition of term 'pragmatic'* (Chierchia and McConnell-Ginet, 1990;2000):
        '... the study of situated uses of language, and it addresses such questions as the status of utterances as actions with certain kinds of intended effects.'

The contrast of 'but'/*aval* is not dependent on usage according to any of the analyses given above. Thus, by (17) and (18), the non-truth-conditional contrast of *aval* is semantic. We may consider it part of the language-specific grammatical knowledge a speaker has about the grammar of his/her particular language.

2.6   Hypotheses and predictions.

Having reached a classification of the contrastive element of *aval* as being a non-truth-conditional semantic element of meaning requiring a complex model for interpretation, we can now revisit the experimental hypotheses and the predictions following from them.

Truth-conditional meaning is argued to be universal and as such to be part of UG appearing in even the earliest child language across languages. We should find evidence of knowledge of the truth-conditional meaning of coordinators even on very young children. This is expressed in *Hypothesis 1*, shown here as (19) and in *Prediction 1* following from it (20).

> (19)   *Hypothesis 1* - Truth-conditional meaning
>   Truth-conditional meaning is innate and part of UG (Chierchia, et al., 1998; Gualmini, et al.,1999)

> (20)   *Prediction 1*
>   From the youngest ages children should demonstrate knowledge of truth conditions.[2]

Regarding the contrastive meaning of 'but'/*aval*, this is a non-truth-conditional, probably non-universal element of meaning. Its interpretation requires the building of complex models, involving comparison and probability. From this summary, *Hypothesis 2* (found in (21)) is derived.

> (21)   *Hypothesis 2* - Non-truth-conditional meaning
>   Non-truth-conditional meaning is semantic (grammatical) but requires extra-semantic developmental knowledge.

The 'extra-semantic' developmental knowledge required for interpretation and use of the contrastive element of *aval,* may be in two areas. The first possibility is that the crucial knowledge required is pragmatic knowledge. The contrast is a semantic element but it is used to make felicity decisions. Felicity decisions are pragmatic decisions based on pragmatic knowledge which is argued to be developmental, outside of UG (see Figure 1.).Thus, even if the child has knowledge of the contrastive element of *aval,* appropriate use and interpretation will be delayed until a child has developed the knowledge about the pragmatic decisions to be made.

A second possibility is that the complex models which are required to interpret the contrastive element of *aval* can be built only when the child has developed general cognitive proficiency in non-language areas of comparison and probability.

These two possibilities lead to two alternative predictions following from *Hypothesis 2*. These appear in (22) and (23).

> (22)   *Prediction 2A*

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[2] Professor Yitschak Shlesinger has commented to me that Prediction 1 does not necessarily follow from Hypothesis 1, given the time lag required for a child to find the appropriate lexical item to match the theorized innate truth-conditions, and giving consideration to maturational accounts of language acquisition. Still, the prediction that from the time that the relevant lexical items appear in the children's repertoire, they should be well fitted to their truth-conditions remains. Since coordinators appear in the speech of very young children, I leave this prediction as is.

The contrastive meaning of *aval/but* is semantic but will be absent from early child language because it is driven by pragmatics (which is developmental).

(23)   *Prediction 2B*
The contrastive meaning of *aval/but* is semantic but will be absent from early child language because it requires complex non-language cognitive skills (which are developmental).

3.   The current experiment

The current study is a study in progress of children's (and adults') knowledge of the conventional and non-conventional meaning associated with the Hebrew coordinators, *ve, aval,* and *o*.

3.1   Method

3.1.1   Participants

Results here will be given for a total of twenty-six participants. Group I consisted of six adult participants, five female and one male. Mean age for this group was 26.8 years with a range of 22 to 35 years. Group I acted as a control group. Group II consisted of ten children, five female and five male. Mean age was 4 years 4 months with a range of 4;1 to 4;6. Group III consisted of ten children, three females and seven males. Mean age was 3;7 with a range of 3;3 to 4;0. The participant information is summarized in Table 1 (24).

As this is a report of a study in progress, the groups are not balanced for sex and number per group.

(24)   Table 1 - Participants

	Mean Age	*Age Range*	*N*	*Females*	*Males*
Group I	26.8 years	(22-35)	6	5	1
Group II	4;4	(4;1-4;6)	10	5	5
Group III	3;7	(3;3-4;0)	10	3	7

3.1.2   Experimental task

The experimental task was an Appropriateness Judgment Task, similar to the Truth Value Judgment Task, described by McDaniel, McKee and Cairns (1996). Participants were administered the experimental task individually. A hand puppet who likes to describe pictures was introduced. The participants were asked to reinforce the puppet for appropriate descriptions and to correct inappropriate descriptions. Participants were shown stimulus pictures. These were first described by an adult investigator. If a participant challenged the investigator's description, the adult accepted the participant's correction. (For instance if the participant called a green apple *agas* (pear), for that participant for that item, the green apple

was called *agas* (pear).) The puppet was then asked to describe the picture. The participants then judged the puppet's description and rewarded her or corrected her accordingly.

A single investigator presented the task to the adults. The adults recorded their own responses while the investigator noted that the responses were recorded for the appropriate experimental item and noted interruptions, or other relevant comments. The adults participated in the experiment in their own homes or the investigator's home, as they chose. The adults completed the experiment in one session of up to half an hour.

For the child participants, the experiment was carried out by two investigators in the child's kindergarten or day care center. The investigator taking the adult role also recorded the child's responses on-line. Children participated in up to four sessions within one calendar month. Sessions were video-recorded for verification.

3.2   Materials

Fifteen items were prepared for each of three experimental conditions. Ten items were target items and five filler items. Conditions I and II addressed truth conditional meaning of coordinators *ve* (and) and *o* (or), respectively. Condition II addressed non-truth-conditional conventional meaning of *aval* (but).

The target items for Condition I were sentences coordinated with *ve* in which the first conjunct (three items), the second conjunct (three items) or both conjuncts (four items) were false. The five filler sentences were true sentences coordinated with *ve*. An example of a stimulus item appears in (25).

> (25) *Condition I*
> Picture stimulus: Big Bird stands and drinks.
> Background information provided by investigator:
> *hine tsiporet. hi shota .hine kise tsiporet lo joshevet bakise.hi omedet.*
> here Big Bird. she drinks. here chair. Big Bird no sits in the chair. she stands.
> Here's Big Bird. She's drinking. Here's a chair. Big Bird's not sitting on the chair.
> She's standing.
> Stimulus sentence to be judged provided by hand-puppet:
> *tsiporet joshevet ve shota.*
> Big Bird sits and drinks
> Big Bird is sitting and drinking.

The target items for Condition II were sentences coordinated with *aval* where the sentences were true but there was no contrast between the conjuncts. The filler sentences were true sentences coordinated with *aval*, having contrast between the conjuncts. A sample item appears in (26).

> (26)   *Condition II*
> Picture stimulus: Elmo swimming in the sea.
> Background information provided by investigator:
> *hine elmo. hu soxe bayam. Betax hu ratuv.*
> here elmo. he swims in the sea. surely he wet.
> Here's Elmo. He's swimming in the sea. Surely, he's wet.
> Stimulus sentence to be judged provided by hand-puppet:
> *elmo soxe aval hu ratuv*
> elmo swims but he wet

Elmo is swimming but he's wet.

The target items for Condition III were ten sentences coordinated with *o* in which both disjuncts were false. Filler items were true sentences coordinated with *ve.* A sample item appears in (27).

(27)   *Condition III*
Picture stimulus: Ernie jumping rope.
Background information provided by investigator:
Hine arik. Hu kofets ba xevel. Hu lo oxel tapuax. Hu lo shote mits.
here Ernie. he jumps with the rope. he no eats apple. he no drinks juice.
Here's Ernie. He's jumping rope. He's not eating an apple. He's not drinking juice.
Stimulus sentence to be judged provided by hand-puppet:
Arik oxel o shote.
Ernie eats or drinks.
Ernie's eating or drinking.

A summary of the stimulus items appears in Table 2. (28).

(28)   Table 2 - Stimuli

Condition	Coordinator	10 Targets	5 Fillers
I	*ve* (and)	false	true
II	*aval* (but)	no contrast	contrast
III	*o* (or)	false	true (with *ve*)

The forty five stimulus items were presented in two different random orders in order to reduce order effects. A yes-bias suspected of resulting in the children's acceptance of the target items in Condition II was probably avoided by the fact that the overall ratio of yes to no responses for the forty-five items was about 1:1.

3.3   Results

The adult subjects rejected the false sentences in Conditions I and III 97% of the time. The older children rejected these sentences 91% for Condition I and 96% for Condition III. The younger children rejected the false sentences of Condition I 66% of the time and 73% for Condition III.

For Condition II the adults rejected the true non-contrastive sentences 100% of the time. The older children rejected these sentences only 9% of the time, while the younger children rejected these sentences 13% of the time.

The results are summarized in Table 3 (29).

(29)   Table 3 -?Proportions of correct judgments

Group	Age	Condition I (*ve*)	Condition II (*aval*)	Condition III (*o*)
I	adults	97% (58/60)	100% (60/60)	97% (58/60)
II	4;1-4;6	91% (91/100)	**9% (9/100)**	96% (96/100)
III	3;3-4;0	66% (66/100)	**13% (13/100)**	73% (73/100)

4.   Discussion

4.1   Children's knowledge of truth-conditions.

The children's performance on Conditions I and III approached adult like behavior. Even the youngest children rejected false sentences coordinated with *ve* and *o* the majority of the time. Thus, Prediction 1, repeated here as (30) was partially borne out.[3]

(30)   *Prediction 1*
From the youngest ages children should demonstrate knowledge of truth conditions.

There was a notable difference between the children's and adult's performance. As this is a study in progress and only about half of the participants have been tested, conclusions about the lack of clear knowledge of truth-conditions in the youngest children should be delayed until more data has been collected.

4.2   Children's knowledge of non-truth-conditional meaning.

There was a clear difference between the children's and the adult's behavior on Condition II. The adults consistently rejected the non-contrastive sentences

(30)   *Predictions 2A and 2B*
Young children will not demonstrate knowledge of the contrastive meaning of *but*.

This prediction was clearly borne out, with the children's rejection of only 9% and 13% of the sentences in Condition II as opposed to the adults consistent (100%) rejection of these sentences. The result however does not however, indicate what causes this difference. It is not clear form the results whether the differences between the child and adult responses stem from the children's immature pragmatic system or from an immaturity in a model building capacity.

4.3   Summary and explanation.

For children there was a striking difference between truth-conditional and non-truth-conditional meaning. This difference represents a qualitative difference between truth-conditional and non-truth-conditional meaning as developmental phenomena.

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[3] I thank Arik Cohen for insisting that evidence of knowledge of the truth-conditions for *ve* and *o* is not adequate evidence of knowledge of the truth-conditions of *aval*. However, preliminary results from an experiment specifically testing truth-conditional knowledge of *aval* has yielded similar results in children as young as 2;6.

Truth-conditional meaning clearly appears earlier. This supports the truth-conditional meaning being a better candidate for inclusion in UG, as an innate, or at least early developing capacity.

The later developing non-truth-conditional meaning is less likely to be included in UG and more likely to represent later, language specific grammatical knowledge. The fact that for adults there was no apparent difference between the tasks testing truth-conditional and non-truth-conditional knowledge suggests that the differences found in children are due to a selective immaturity in one type of knowledge.

This later development of non-truth-conditional meaning may be explained in two possible ways.

The first explanation retains the semantic nature of the non-truth-conditional meaning argued for above on theoretical grounds. The delay in adult like knowledge of this type of meaning is accounted for by the need to consult two different systems in the judgement of the appropriateness of sentences involving *aval*. First the semantic system must be consulted to determine the presence or absence of contrast. (Is the proposition 'there exists contrast between the conjuncts true or false?') Secondly, the result of this consultation must be compared to the felicity requirements by consultation with the pragmatic system. (There exists no contrast, therefore, is the sentence coordinated with *aval* being used felicitously?). An adult-like judgement will require an adult-like status of both these systems.[4]

Some pragmatic abilities appear to be both outside the grammar, and developmental (consider the 'pragmatic delay model' suggested, for example by Hyams, 1996). Felicity properties belong to general pragmatic abilities (Kasher, 1991). As such they are part of a general cognitive system, not specific to language abilities. As opposed to the theoretically innate language abilities of UG, such general cognitive abilities are theoretically argued to be developmental. Thus, an explanation for the children's apparent lack of non-truth-conditional knowledge can be explained by an immature general pragmatics system. This is summarized as (31).

(31)   Contrastive meaning of *aval/but* is semantic.
       Presence (the proposition of contrast is true)/absence (the proposition of
       contrast is false) of this meaning affects felicity of use of *aval/but*.

An alternative explanation also argues for immaturity this time, outside the language system, as responsible for the children's non-adult-like acceptance of non-contrastive sentences with *aval*. From the analyses of the contrastive element of *aval* it is clear that a complex model is required to interpret this element of meaning. These general cognitive skills (eg. mathematical skills) together with world knowledge are needed to develop this complex

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[4] Professor Schlesinger had pointed out to me that the differences between the adult's and children's behavior may have resulted from the children viewing the task as a truth-judgement (and not appropriateness judgement) task. Or, alternatively, that the adult's judgements involve a two-stage judgement with children stopping after the first stage. However, at least some of the children who judged the non-contrastive sentences with *aval* also used *aval* in non-contrastive coordination spontaneously and in elicited corrections during other experimental tasks, apparently indicating that the differences between adult and child behavior did not result from differences in ability to carry out two-stage serial processes.

model for evaluating the semantic meaning. By definition these skills are outside language. Furthermore, there is no theoretical claim made that these skills are available innately or even early on, rather they are general developmental cognitive skills. This explanation is summarized in (32).

(32)   Contrastive meaning of *aval/but* is semantic.
        Evaluation (reaching a truth-value) of this meaning requires a more complicated model of the world than does evaluation of truth-conditional meaning.

If we recall the model of language and language acquisition of Figure 1, repeated here, we can now revise and expand this model.

Figure 1. Components of language/language acquisition.

A.   Lexicon

B.   Computational System:

Universal Grammar:
- phonology
- morphology
- syntax
- semantics

Processor/Parser

C.   Pragmatic System:

The parts of the model which this study addresses specifically, are the semantic and pragmatic components. Now a distinction may be made between truth-conditional and non-truth conditional semantics. We may hypothesize truth-conditional semantics within the universal component of the grammar with the non-truth-conditional semantics in the grammar but in a non-universal component, varying with the specific language. Detail is added to the pragmatic system, felicity considerations within the pragmatic system. These are outside the grammar, but still within the language apparatus.

The later development of the contrastive element of *aval/but* is partly attributed to its being part of the non-universal semantic component. Furthermore, an explanation relying on the semantic/pragmatic interface requires the general pragmatic component (where felicity judgements are classified) to be developmental, as are other general cognitive capacities.

As yet, we have not found at what age children do show knowledge of the contrastive element. From first investigations with a small number of older children it appears somewhere around eight years old. This requires further investigation. Once the age of acquisition is found, a parallel development of cognitive skills related to the complex models

needed to interpret this contrast could help explain the later development of this phenomenon. This would also aid in deciding in favor of *Prediction 2B* over *Prediction 2A*.

5. Conclusion

The results of the present investigation contribute to linguistic theory by providing empirical support for the distinction between two types of semantic knowledge: truth-conditional and non-truth-conditional knowledge. This support is the clear difference in child responses with truth-conditional knowledge appearing earlier than non-truth-conditional knowledge of coordinators.

The empirical findings support the theoretical argument that there is another non-grammatical factor involved in non-truth-conditional meaning. This factor may be part of the language system but outside the grammar (e.g. pragmatic), or alternatively, outside the language system, related to non-language cognition. Further research is needed to determine the most appropriate explanation.

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