The *cum-sine* Pattern in German Child Language: An Argument for Antonym Decomposition

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Abstract

German speaking children between ages 2 and 3 mostly use the preposition *ohne* (*"without"*) in an adult-like way, to express the absence of something. In this paper we present surprising results from a corpus study suggesting that in this age group, absence can also be expressed using the sequence *mit ohne* (*"with without"*). We argue that this pattern becomes much less surprising if we assume that there is a conceptual representation independent of linguistic structure, and that antonymic concepts such as that of absence (which we call SINE in this paper) are not represented as primitive concepts at this level – contrary to what might be suspected on the basis of mono-morphemic prepositions such as German *ohne* (*"without"*). Instead, we argue that antonymic concepts like that of absence (SINE) are composed of at least two units. Children's non-adult like patterns then result from difficulties in acquiring the morphological realization of this complex concept as the monomorphemic preposition *ohne*. To our knowledge, our results constitute the first evidence for antonym decomposition in the case of prepositions from child language.

1 Introduction

The study of antonyms has been a topic of great interest in the linguistic literature since at least the work of Bierwisch (1967). Bierwisch points out that in antonymic adjective pairs such as *tall* and *short*, the antonyms exhibit several asymmetries. For example, the question *How tall is John?* is perceived to be more neutral than *How short is John?*, which suggests that John is short. Similarly, *She is taller than Mary* is more neutral as to the individuals' heights compared to *She is shorter than Mary* ((Rett, 2014),(Ruytenbeek et al., 2017), (Gotzner et al., 2018),(Moracchini, 2019), and others).

The central question in the study of antonym pairs is whether their relation to each other is transparent in their linguistic representation. A number of influential accounts propose that one member is always structurally derived from the other (Heim, 2006, 2008; Büring, 2007; Bobaljik, 2011). Such decomposition is transparent in languages such as Hixkaryana, which exhibits antonym pairs such as *kawo* – *kawo-hra* ('long' – 'short') and *tiyoke* – *iyo-hra* ('sharp' – 'blunt') (Derbyshire, 1985). Heim (2006), Büring (2007), Bobaljik (2011), and Moracchini (2019) argue that this schema should be generalized across languages, and propose an abstract negative morpheme ANTI corresponding to Hixkaryana *-hra*. In any given antonym pair, one member will then be derived from the other through application of ANTI.[1] To illustrate, *short* would be analyzed as ANTI-*long*, and *blunt* as ANTI-*sharp*. This account entails that English antonymic adjectives should be analyzed as portmonteau morphemes decomposed into ANTI and the corresponding positive adjective.

In this paper we look beyond the adjectival domain and instead focus on the German prepositions *mit* ('with') and its antonym *ohne* ('without'). We present a decompositional analysis within the Meaning First framework of Sauerland and Alexiadou (2020) and present novel acquisition data in support of our account.

1.1 Background: Meaning First approach

Within the Meaning First approach, conceptual representations are primary, whereas linguistic representations are derived from conceptual representations by a process called *compression*. During compression, concepts are mapped to morphemes through lexical realization and linearization. Crucially, not all parts of a *conceptual representation* (in the following abbreviated as CR) have

[1] Heim (2006) calls the morpheme LITTLE, but reduces its semantics to negation. Bobaljik (2011) uses the symbol '↔'.

to be mapped to lexical material; if a concept can be reconstructed from context,[2] it may remain unrealized in the linguistic representation. Applied to antonyms in general, at the CR level an antonym pair would then be represented as A – [ANTI A] (or equivalently [A ANTI] because the CR is not linearly ordered).

Concepts can be either complex or primitive, and the primitive concepts are further divided into innate core concepts and experience-based concepts.[3] We follow Heim (2006) in assuming that ANTI is a type-shifted version of negation. This makes ANTI a likely candidate for being a primitive concept which is either innate, or acquired early on, with the first antonymic relationship (Austin et al., 2014; Feiman et al., 2017). On the other hand, the concept A would in most cases not be an innate concept, and in many cases not even a primitive.

The concept A, therefore, will generally be present in a child's mind only after the ANTI concept. In some cases, both ANTI and A may be primitives—specifically, this is plausible for the antonym pair *with* – *without* (see also footnote 4 below). We also follow Sauerland and Alexiadou (2020) in assuming that the ability to compose concepts into complex concepts is innate. Therefore children will be able to form the complex concept ANTI-A (or A-ANTI) as soon as they have learned the concept A. On the linguistic side, however, children will first have to acquire how adults compress these concepts into linguistic representations in the relevant language.

1.2 Predictions about the acquisition of *ohne* ('without')

This decompositional Meaning First account of antonyms makes testable predictions about the acquisition of antonym pairs. Namely, we expect there to be a stage during which children realize both concepts ANTI and A transparently, as represented at the CR level, even in languages in which this complex concept is compressed in adult language (see also Guasti et al. (2023)).

Recall our prepositional pair from German, *mit* ('with') and its antonym *ohne* ('without'). We assume that the morpheme *mit* realizes a concept we represent as CUM.[4] The morpheme *ohne* in the adult language expresses the complex concept [ANTI CUM] or [CUM ANTI] (recall

[2]The relevant context can be purely linguistic in the form of an antecedent, but context may also include conventions within the linguistic community (Guasti et al., 2023).

[3]Sauerland and Alexiadou (2020) use the term *primitive* meaning *not complex* as in formal logic. They furthermore assume that the concept expressed by an open class word like *pencil* or *road* is generally complex consisting of at least a category concept (for example nominality or verbality) and a concept capturing the root's idiosyncratic meaning following much work in morphology ((Alexiadou et al., 2014) and others).

[4]While this nomenclature might suggest that CUM is a primitive concept, we can remain agnostic as our account would not be affected if CUM was internally complex.

that we assume CR's are not linearly ordered). Thus German doesn't transparently express the two concepts CUM and ANTI as two separate morphemes. In English, on the other hand, CUM and ANTI are transparently expressed by *with-out*. Our assumptions for English and German adult language are summarized below:

(1) *German:* *ohne* *einen* *Hut*
English: with- out a hat
CR: [[CUM ANTI] [a hat]]
'without a hat'

The difference between German and English has a functional justification, as it minimizes the number of morphemes while accomplishing a similar granularity of disambiguation in the two languages. In English, *out* expresses not only ANTI in the context of *with*, but is also the antonym of *in*.[5] As a consequence, there are minimal pairs like (2) where *out* and *without* in English differentiate two different meanings relying on the bimorphemic expression. In German, however, the antonym of *in* is *aus*, and therefore the two monomorphemic expressions *aus* and *ohne* suffice to distinguish the two interpretations in (2).

		English	German
(2)	a.	She is going out.	Sie geht aus.
	b.	She is going without.	Sie geht ohne.

In German, the transparent (and redundant) way to realize the complex concept [CUM ANTI]/[ANTI CUM] would be *mit ohne*, which is marked. It can be used only in a special 'baby talk' register in imitation of child speech for rhetoric effect, as in the translated book title *Schutzengel mit ohne Flügel* ('Guardian angel with without wings', by Arto Paasilinna). Another humorous use of *mit ohne* is possible in response to alternative questions that contrast *with* and *without* as illustrated in (3):

(3) *Möchtest Du den Kaffee mit oder ohne Zucker? – Mit ohne Zucker, bitte.*
want you the coffee with or without sugar? – with without sugar please
Do you want your coffee with or without sugar? – (With) Without sugar, please.

[5]Note that *without* in English can also express a meaning similar to *outside* (in Scottish English, the order *outwith* is used in this case), while in German *ohne* does not exhibit this ambiguity and only the word *auSSerhalb* expresses this meaning of *without*.

How do children acquire *ohne* ('without'), the antonym of *mit* ('with')? As far as we are aware, the Meaning First framework is the only approach which makes specific predictions for this case. To see what these are, note first that within a Meaning First account, the question amounts to how children acquire the compression of the complex concept [CUM ANTI]/[ANTI CUM] into the corresponding linguistic structure. Secondly, children have to acquire that the compression of [CUM ANTI] into *ohne* is *obligatory*; before they do, they are expected to at least sometimes articulate both of the two concepts [CUM ANTI]/[ANTI CUM] – if they have the morphological resources to do so. Guasti et al. (2023) discuss other examples from production illustrating that children produce less compressed structures that are absent or marked in the adult language. Furthermore, the Meaning First approach predicts a corresponding difference in comprehension (Guasti et al., 2023): invoking only one concept should be faster than invoking two. However, the prediction concerning comprehension is shared with some other proposals, in particular that of van Hout (1998) who proposes the following: *Learning should be easier for overt and unambiguous mappings (one-to-one) than for covert and/or conflated ones (many-to-one).*

In the example at hand, this leads us to expect that German-speaking children will undergo a developmental stage at which they express the complex concept [CUM ANTI]/[ANTI CUM] using two morphemes that they understand to express CUM and ANTI, respectively. The specific prediction depends on the child's morphological understanding of *ohne*. Following distributed morphology ((Halle and Marantz, 1993), and others), we assume that lexical insertion targets terminals of the conceptual structure, i.e. primitive concepts. Then *ohne* ('without') can be understood either as exponing CUM whenever it appears in the context of *anti* at CR. Alternatively, *ohne* could expone ANTI whenever it appears in the context of *cum* at CR. Under both analyses, the remaining concept (either [anti] or [cum]) would not be overtly exponed.

But CUM in other environments in German is exponed by *mit* ('with') and ANTI can be exponed by negation *nicht* ('not') and other expressions of antonymity (see below). Because German children furthermore may have no evidence for the linear order of ANTI and CUM, at least the four non-adult patterns *mit ohne* ('with without'), *ohne mit* ('without with'), *nicht ohne* ('not without'), and *ohne nicht* ('without not') may be produced by children.[6]

[6]Three of the four bimorphemic patterns with *nicht* in table (4) are possible sequences in the adult language, but cannot convey the meaning of *ohne* ('without'): two convey contrastive negation as in *mit nicht Zucker, sondern Salz* ('with not sugar but salt'), and *nicht mit Zucker, sondern ohne* ('not with sugar, but without'), and one conveys double negation as in *nicht ohne Gefahr* ('not without danger'). The fourth sequence, *ohne nicht* ('without not'), is not acceptable in modern Standard German, but a preliminary search (Google) shows that

(4)

exponent of … / allomorphy	CUM	ANTI	CUM-ANTI	ANTI-CUM
yes	*ohne*	*nicht*	*ohne nicht*	*nicht ohne*
yes	*mit*	*ohne*	*mit ohne*	*ohne mit*
no	*mit*	*nicht*	*mit nicht*	*nicht mit*

Above we assumed that children use *ohne* as a contextual allomorph to either express ANTI or CUM whenever they want to expone the complex concept [cum anti]/[anti cum]. The third row of table (4) shows the articulations children are predicted to produce if no allomorphy is assumed. Both of the predicted patterns, however, are also possible in the adult language with constituent negation, which receive the same interpretation as is predicted for child language except for the contrast requirement of constituent negation. Hence it would be difficult to establish whether child uses of *mit nicht* or *nicht mit* are non-adult like on the basis of corpora. We therefore focus on the patterns with allomorphy in what follows.

Because child language is frequently probabilistically converging towards the target adult grammar (Yang, 2002), we expect children to initially produce one or several of these patterns in addition to the adult pattern (just *ohne*). In sum, our account predicts that German speaking children undergo a developmental stage where both parts of the [ANTI CUM]/[CUM ANTI] concept are articulated, potentially alongside adult-like productions. In the following, we show that corpus data from German-speaking children corroborates this prediction.

1.3 Relevance of Acquisition data: previous studies

Though the use of *mit ohne* by children is readily apparent to those having been in contact with German speaking two-year old children such as the first author of this paper, the phenomenon has not been explained, nor investigated in detail. According to our literature search, there has only been non-quantitative work on the antonym pair *mit-ohne* so far. The first report comes from Stern and Stern (1907), which is based on anecdotal observations of the authors' own three children. Stern and Stern report that around age 2;6, one of their children uses *ohne* as if it

ohne nicht ('without not') was used about 200 years ago with the meaning of plain *ohne* ('without'). For example, *Man legt keinen Garten an ohne nicht vorher einen Plan darüber gesehen, ohne den Boden untersucht zu haben* (Carl von Proff. 1803. Ideen über die Organisation einiger untern Staatsgewalten, und verschiedene darauf Bezug habenden Gegenstände, mit Rücksicht auf das Herzogthum Berg. p. 108). The existence of the transparently decomposed pattern in at least a historical stage of German adult language corroborates our contention that *ohne* ('without') is structurally complex, but we leave serious historical work for future research.

were a generic negation.[7] But for a different child of theirs, they observe that at age 2;9–3;0, she uses *ohne* both adult-like and together with *mit*, and provide the example (5).

(5) *ach, dann kann ich mit ohne Seife waschen.*
ah, then can I mit ohne soap wash
'Ah, then I can wash without soap.' (Stern and Stern, 1907, p. 69)

Grimm (1975, p. 117) reports on data from an observational study of over 100 children. She writes that *mit ohne ('with without') is consistently used for a long time instead of 'ohne'*. She reports "2-3 year-olds demand *ein Brot mit ohne Honig* 'a bread with without honey' or go into the street *mit ohne Schuhe* 'with without shoes.' Neither Stern and Stern nor Grimm provide any quantitative data or theoretical account of the phenomenon.

From a theoretical viewpoint, we are only aware of Durkin (1978), who carried out a comprehension study looking for an asymmetry between English *with* and *without*, which revealed no evidence for such an asymmetry. However, the study is of limited value because only children aged 5 years and older were tested, and the 8 children whose results could be analyzed all performed at ceiling.

In the next section, we report on a corpus study of the German *with-without* antonymic pair. Our study investigates different combinations that children use *ohne*, at which age, and frequencies, providing the quantitative data that previous studies that mention the acquisition of *ohne* lack. We return to the theoretical interpretation of the findings in the conclusion.

2 Methods

We report data from German-speaking children's use of *ohne* ('without') in all relevant transcripts collected in the Childes database (MacWhinney, 2000). The transcripts are listed in table 1. The many/Sza-corpus includes data from children with a cochlear implant, while all others only include typically developing children. We saw no reason to exclude children with cochlear implants, although do not intend a systematic comparison with typically developing children, either. We accessed the transcripts via the LuCiD Language Researcher's Toolkit (Chang, 2017), extracting all utterances containing the string *ohne* from all relevant German corpora.

[7] The two examples provided – *ohne Hanschuh* ('without gloves') and *ohne Vater* ('without father') (Stern and Stern, 1907, p. 104) – could also be analyzed as bare prepositional phrases.

child/corpus	age(s)	source
Leo	1;11–4;11	Behrens (2006), doi:10.21415/T5N01B
Caroline	0;10–4;3	doi:10.21415/T5NS5S
Kerstin	1;9–4;0	Miller (1979), doi:10.21415/T56592
Simone	1;3–3;4	Miller (1979), doi:10.21415/T56592
many/Sza	2;1–5;9	Szagun (2001), doi:10.21415/T5KG7T
many/Wei	7;0–11;0	Weissenborn (1986), doi:10.21415/T5301C
many/Wag	1;5–14;10	Wagner (1985), doi:10.21415/T5ZC8K
Corinna	2;8–7;6	Lieven and Stoll (2013), doi:10.21415/T50S34
Cosima	1;9–7;2	Lieven and Stoll (2013), doi:10.21415/T50S34
Pauline	1;10–7;11	Lieven and Stoll (2013), doi:10.21415/T50S34
Sebastian	2;1–7;5	Lieven and Stoll (2013), doi:10.21415/T50S34

Table 1: List of transcribed corpora of child spontaneous speech used

After extraction, we manually categorized each utterance into one of the four categories in table 2 and added the corresponding codes to the data points.[8] Category 0 was assigned to cases of the string 'ohne' occurring not as the word 'ohne, but, for example, as part of *wohnen* ('reside'). Category 0 was excluded from analysis. Utterances where *ohne* was used in an adult-like way were assigned to Category 1. Category 2 was assigned to data points where *ohne* was immediately preceded by *mit*. All other data points were assigned to Category 3. This included occurrences of *ohne* other than category 2 that we judged either to be ungrammatical to an adult and occurrences we judged to have a double expression of negation where only one negation was intended.

number	code	category	count
0	–	irrelevant	159
1	ohne	*ohne* used adult-like	306
2	mit ohne	*mit ohne*	52
3	ohne+	*ohne mit*, *ohne kein*, *nicht ohne*	7

Table 2: Categories for occurrences of the string *ohne* ('without') by number and code as explained in the text, with the count of items in each category

We decided on this categorization given our intuition and the prior anecdotal reports that the category 2 'mit ohne' would be frequent, while the other non-adult patterns we listed in table (4) have not been reported. All utterances in category 2 'mit ohne' corroborate our hypothesis. But utterances from category 3 'ohne+' may also corroborate our hypothesis though that category may also contain other non-adult uses of *ohne* ('without'). We expected this category to yield fewer data points than category 2 of which each would warrant individual discussion. Including non-adult uses of *ohne* other than the predicted ones is important in order to evaluate our

[8]The categorization was done initially by the first author and checked by the other two authors.

predictions since it would weaken the support for our hypothesis if such patterns were frequent in child speech.

The categorization of a few items gave rise to some difficulty. Of the category 0/irrelevant utterances, only (6) could not be clearly categorized because the word *mohne* does not exist, but might be a contraction of *mit ohne*, a mispronunciation of *ohne*, or something else we couldn't reconstruct.

(6) *na das Kleid mohne*
well the dress xxx
'the dress without' (Sza/Lara, 4;09, CI)

Among the adult-like uses of *ohne*, we classified as adult-like many fragments without taking into account whether the context would actually license the use of a fragment for an adult speaker. Furthermore, we included 9 utterances where *ohne* was repeated. Most such repetitions (see (7) and (8)) were produced by very young children, but also a 10 year old produced the repetition in (9). As repetitions are abundant in adult language as well, we regarded them as adult-like speech errors throughout.

(7) *die Schokolade ohne Eis ohne ohne ohne ohne Schokolade krieg ich*
the chocolate without ice without without without without chocolate get I
'I get the chocolate without ice.' (Caroline, 2;4)

(8) *ohne ohne sich zu stossen*
without without self to bump
'without bumping into something' (Sza/Laura, 2;01, CI)

(9) *[…] und der der da was tut ohne ohne was*
[…] and he he there something does without without something
'… and he does something without something' (Wag/Regina, 10;07)

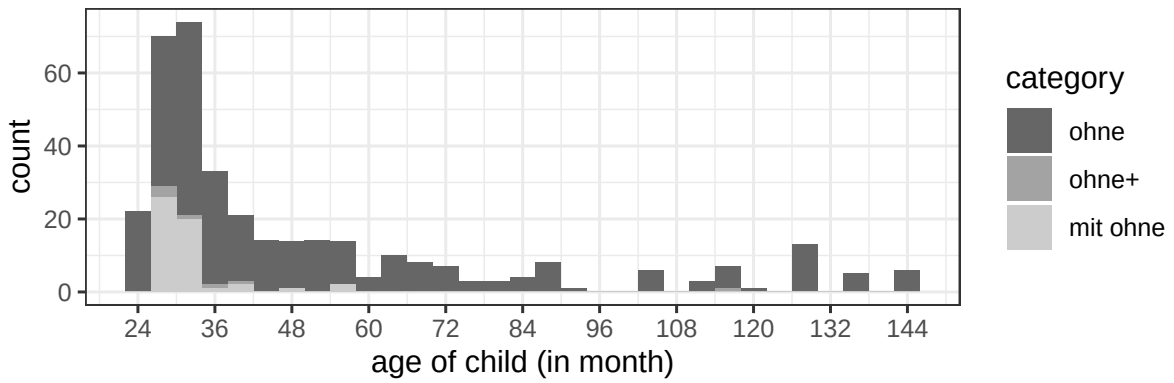

Figure 1: Number of occurrences of *ohne* ('without') in German child language by age and category (see table 2). Adult-like occurrences are in green, non-adult ones in blue. Ages are binned into 4-month intervals from 22–25 months (youngest) to 142–146 months (oldest).

3 Results

The theoretical prediction of the the Meaning First approach (Sauerland and Alexiadou, 2020) we set out to test is that children, even if they only hear *ohne* ('without') as a single morpheme, should nevertheless form a complex mental representation of the meaning of *ohne* as [ANTI CUM]. Following Guasti et al. (2023), we assume that evidence for such a complex representation is provided by child production where *ohne* ('without') is not used in an adult way, but in one of the predicted non-adult patterns of table (4). Category 2 'mit ohne' of our data classification corresponds to one of these predicted patterns, while the other three predicted patterns would all be classified in category 3 'ohne+'. The hypothesis that we test can be formulated as follows:

- Young children are more likely to undercompress and produce one of the predicted forms more frequently than older children.

We will test our hypothesis by comparing the ratio between adult-like vs. non-adult like use of *ohne* between two age groups (using Chi-squared test).

Figure 1 shows the distribution of the different uses of *ohne* ('without') by age from age 22 month (1;20) and up. No utterances including *ohne* occurred in younger children in our sources. Data from children older than 5;00 are sparse in our sources (see table 1), but are adult-like with only one irrelevant exception.[9]

The histogram shows that the prediction that children decompose *ohne* overtly into two pieces is confirmed by the high number of 'mit ohne' occurrences. Three examples illustrating

[9]The exceptional utterance was *mit was ohne* ('with something without') by Teresa/Wag at age 9;07, which seems meaningless to us even in the context of the transcript. Since the child is classified as typically developing and the data point is not predicted by our hypothesis, we have to put it aside as a speech error.

the 'mit ohne' category from three different children are shown in (10).

(10) a. *ich ein Brötchen haben mit ohne Käse drauf*
1SG.NOM a roll have with without cheese on it

'I (want) to have a roll without cheese.' (Sza/Falko 2;09;15)

b. *und die hatte auch ein Schokoladenbus mit ohne Räder*
and DEF.3SG.NOM had also a chocolate bus with without wheels

'And she also had a chocolate bus without wheels.' (Leo 2;07;12)

c. *schmeckt mir nicht mit ohne Butter*
tastes 1SG.DAT not with without butter

'I don't like it without butter.' (Caroline 2;07;14)

Figure 1 also shows that most of the uses of *mit ohne* ('with without') (47 out of 52) occur between ages 2;03 and 2;09. Two of the later five occurrences of *mit ohne* are from a child that had received a cochlear implant. One of these utterances is shown in (11), while the other was a partial repetition of (11). We include these two occurrences in our analysis with the child's chronological age, though Szagun (2000) uses the post-implant age in her comparisons. If we made this adjustment, Eileen's age would be reduced by 2;03 (Szagun, 2000, p. 41) to 2;05 which is in the age range typically developing children mostly use *mit ohne*.

(11) *ich kann auch mit ohne Stützräder steh'n bleiben*
I can also with without support wheels stand stay

'I can also stop without support wheels.' (Eileen 4;08)

The remaining three utterances containing *mit ohne* ('with without') by children older than 3 years are the following: one utterance of *mit ohne Brille* ('with without glasses') by Rig/Cosima at age 4;00;01, and the utterance (12), which was furthermore partially repeated and therefore counted twice.

(12) *nur ganz kleines Schneckenhaus mit ohne Schnecke drin*
only very small snail house with without snail inside

'only a very small shell without a snail inside' (Sebastian 3;03;09)

Only seven utterances were assigned to category 3, one of which was outside the age-range of up to 7;02 (see footnote 9). As mention above, our hypothesis predicts that at least one pattern of undercompression should occur. The pattern *mit ohne* represent this pattern, and hence, their occurrences support our hypothesis, which is borne out by the occurrence of *mit ohne*. But given our uncertainty about the young children's morphosyntactic knowledge, at least three other patterns of undercompression may also occur (see table (4) above). Namely the opposite order *ohne mit* and the patterns *ohne nicht* and *nicht ohne* with the interpretation of a single negative like adult *ohne*.

The six utterances in category 3 by children younger than 7;02 all fit to one of the other three error patterns theoretically predicted. Four of the six exhibit the *ohne mit* sequence,[10] which even occurs twice in (13).[11]

(13) *xxx willst Bohne oder nur Bohne ohne mit Milch ohne mit Zutter*
xxx want bean or only bean without with milk without with sugar

'xxx, do you want bean or only bean without milk without sugar?' (Sebastian, 3;05;04)

One of the two other utterances in category 3 is (14). The utterance is only coherent if the pattern *nich[t] ohne* is understood as exponing on [ANTI CUM]; alternatively, the child may have omitted a negation.

(14) *ich erzähl alleine nich ohne die Oma xxx*
I tell alone not without the grandma xxx

'I will tell it alone, without grandma.' (Corinna 3;01;21)

Finally, (15) exhibits a non-adult use of the sequence *ohne keine* ('without none') that is interpreted as a single negation, even though its negation, specifically ANTI, seems to be articulated twice: *ohne* is the negative antonym of *mit* ('with') and *keine* is the negative antonym of the positive indefinite *ein-e* ('a-FEM'). We therefore analyze (15) as involving the realizations of CUM as *ohne*, ANTI as *k-*, and EXIST as *eine*.[12] Furthermore, the structure [[CUM ANTI] EXIST] of the three concepts is more plausible than [CUM [ANTI EXIST]] since contextual allomorphy

[10] Leo (2;04;25) once produced the sequence *ohne mit ohne* as a fragment utterance which we assigned to category 2 on the assumption that it was a self-correction of Leo's.

[11] The discourse situation in (13) is similar to (3) above, but the order of *ohne* and *mit* is fully ungrammatical for adults.

[12] We assume that the concept EXIST expresses existential quantification.

generally requires a close structural relationship of the allomorph and the trigger of allomorphy (Bobaljik, 2011) and in the structure [[CUM ANTI] EXISTS] the two—CUM and ANTI—are sisters. If this reasoning is correct, (15) essentially amounts to a realization of the predicted non-adult sequence *ohne nicht* ('without not') as predicted in table in (4) with *k-* instead of *nicht*.

(15) *Ohne keine xxx*
without none xxx

'Without any (potatoes)' (Leo 2;02;07)

In sum, we have shown evidence that all four patterns listed in table (4) actually occur, but not with equal frequency. This corroborates our theoretical assumptions, but indicates furthermore not all options we list in table (4) to expone ANTI CUM / CUM ANTI are considered equally likely by German children. Specifically children seem to have some reason to analyze *ohne* not as exponent of CUM, but as exponent of ANTI. Furthermore children seem to assume that the order CUM ANTI conforms better to their environment language than ANTI CUM. At this point, we can only speculate on the causes of the children's behavior, and expect that research on languages other than German will be crucial to understand these better. As for the first behavior of the German children, a possible cause of why *ohne* expones *anti* is that *ohne* can express negative subordination, in cases such as (16) where *mit* cannot occur as its antonym. In such cases, *ohne* expresses an inner negation of *while*, i.e. *while not eating*.

(16) *Sie ist ohne / *mit zu essen 42 km gelaufen.*
she is without / *with to eat 42 km ran

'She ran 42 km without eating.'

As for the order, the children's almost exclusive use of the order *mit ohne* is surprising from a semantic perspective as negation expressed by ANTI must take scope over the possession concept CUM to express not having something. However, in the adult language *mit* displays greater morphosyntactic variability, occurring for example as pre-verbal particle (for example, *mit-arbeiten* – 'co-work', *mit-teilen* – lit. 'co-share', 'communicate'), which are impossible with *ohne*, and therefore children might place *mit* in a higher position. We note that adults also only prefer the order *mit ohne* to *ohne mit* in the cases where they find such child-like uses acceptable, though the acceptability may be entirely in child speech imitation. In the following

analysis of number of occurrences we focus on the pattern *mit ohne* ('with without') because it is the most frequent non-adult pattern.

The overall picture that emerges is that children frequently produce *mit ohne* ('with without') during the third year of life, but hardly ever afterwards. Instead, the older children almost always produce *ohne* ('without') alone, i.e. not preceded by *mit* ('with'). Specifically, the rate of occurrences of *ohne* preceeded by *mit* (category *mit ohne*) of all occurences of *ohne* in the categories *ohne* and *mit ohne* in the children up to 3;00 was 25.3% (47 of 186, while excluding 4 in category *ohne+*) compared to 4.6% (5 of 172 excluding 3 in category *ohne+*) in the older children in our sample. At the peak from 26 to 29 months of age, even 41% (29 of 70) of all utterances of *ohne* are non-adult (category *mit ohne* or *ohne+*). To confirm the significance of the generalization, we performed a chi-squared test with the two binary variables age (below 3 years vs. 3 years and older) and mit-ohne (category 1 '*ohne*' vs. category 2 '*mit ohne*'; see table 2 above). The test indicates that the interaction between the two variables is statistically significant (chi-squared(1) = 22.292, $p < .00001$).

Since adults may sometimes use *mit ohne* as we mentioned above, we also computed two frequencies that could be compared the child data. First we looked at books published in German since 1800 and digitized by Google. We found that the frequency of *ohne* in our source varied over time from slightly above 0.1% to 0.05%. But the frequency of *mit ohne* was only ever 0.000016%, i.e. less than one in 3000 occurrences of *ohne* was preceded by an occurrence of *mit*, compared to 1 in 4 in speech of the children under 3;00. Secondly we performed a similar ratio computation for two publicly available corpora that represent spoken adult German from DWDS: the corpara *gesprochene Sprache* (spoken language) and also *Filmuntertitel* (film subtitles), since the former is rather small. We found that 0 out of 1541 and 6 out of 32575 occurences of *ohne* were preceded by *mit*, i.e. less than 1 in 5000.

The data in Figure 1 suggests that the use of *ohne* ('without') in child language follows a U-shaped curve similar to over-regularization found with inflectional morphology. A robust finding in the acquisition literature on irregular forms is that children at some stage of development produce over-generalizations of the regular morphological process such as *goed* for 'went' and *heared* for 'heard' ((Ervin and Miller, 1963) and others). In such cases, children's development exhibits a U-shaped trajectory: initial productions are adult-like, then over-regularizations occur, and only later, children return to adult-like productions (Marcus et al., 1992). Figure 1 seems to exhibit three similar stages, an initial adult-like *ohne*-stage up to age 2, then a

six-months stage when *mit ohne* is produced, followed by the adult-like stage starting from age 3 in this case. While the U-shaped pattern is similar for both phenomena, their linguistic character is not comparable: there is no general rule in German grammar of inserting *mit* (or another preposition) before prepositions, while English past tense *-ed* is used to express past tense with almost all verbs. Therefore, children's use of *mit ohne* itself does not constitute an over-regularization. Consequently the observed U-shaped pattern is surprising, and deserves further scrutiny.

We therefore looked more closely at the productions of *ohne* in the 1;8–2;1 (22–25 months) age bin, which we initially categorized as adult-like. These utterances were all from Pauline ($n = 4$) and Leo ($n = 14$), except for one utterance by Laura/Sza (2;01;14), a child with a cochlear implant. All 4 of the relevant utterances by Pauline, and 7 by Leo consisted of only the word *ohne*. These one-word utterances may be due to the child being in a one-word stage of language development where its cognitive resources are too limited to produce sentences consisting of more than a single word. They therefore do not support the claim of a true U-shaped curve since the early, seemingly adult-like utterances of *ohne* can reasonably be explained by independent constraints at the one-word stage.

All eleven other occurrences of *ohne* ('without') by children who are at most 25 months old are listed in (17).

(17) a. so ohne ('so without', Pauline 1;11;06)

b. do ohne ('[s]o without', Pauline 1;11;06)

c. den ohne ('the one without', Pauline 1;11;06)

d. oben ohne ('above without', Leo 2;00;19)

e. oben oben ohne ('above above without', Leo 02;00;26)

f. ohne Gleise ('without tracks', Leo 2;01;10)

g. Glocke läuten ohne Rauch raus ('bells ring without smoke out', Leo 2;00;22)

h. ohne Gleise ('without tracks', Leo 02;01;25)

i. Frösche ohne Auto fahren ('frogs without car drive', Leo 02;01;25)

j. ohne Frösche ('without frogs', Leo 02;01;25)

k. ohne ohne sich zu stoßen ('without without hit oneself', Laura/Sza 2;01;14)

Of these, the first two with the particle *so* (once mispronounced or mistranscribed as *do*) are akin to one word sentences because the *ohne* explicates *so*, as in the English 'Like this – without'. The other nine occurrences of *ohne*, however, constitute genuine sentences of two or more words.

We furthermore checked whether the three children who produced these adult-like occurrences of *ohne* went on to produce the non-adult like *mit ohne* later in their development as expected from a U-shaped developmental curve. For Laura/Sza, there were no other occurrences of *ohne*. For Pauline, there are five additional occurrences of *ohne* between age 2;02 and 2;12 of which all are adult-like.[13] In the Leo corpus, there are 31 occurrences of *mit ohne* between age 2;02 and 2;07. Leo's data does indeed conform to a true U-shaped pattern, with 7 early, adult-like uses of *ohne* followed by 31 uses of *mit ohne*, and only adult uses after age 2;07. Unfortunately, the corpus data is too scarce to establish whether this finding is due to chance; at this point all we can say is that the available data weakly suggest a U-shaped pattern, which would be surprising from a theoretical perspective as discussed above. More data is needed to investigate this issue further, but our main conclusion is unaffected by this uncertainty.

4 Discussion

We argued that child production data provide new evidence for a decompositional analysis of at least some antonyms. Specifically, we argued in favor of such a decompositional analysis for the case of German *ohne* (*'without'*) as the prepositional antonym of *with* (*'with'*); unlike its English counterpart, *ohne* is monomorphemic. We showed that German 2-year olds frequently produce the complex *mit ohne* ('with without') instead of just *ohne*. The children's behavior is creative and non-adult-like, and we find the same behavior across different children that were not in contact to each other. As far as we can see, our data provide strong support for the assumption that *ohne* ('without') cannot correspond to a single mental concept, but must be decomposed into two pieces, one corresponding to what we called the CUM concept (English *with*), and another corresponding to a negation or antonymity concept, which we have denoted as ANTI.

The result of our study also provides evidence for the Meaning First approach of Sauerland and Alexiadou (2020), which views conceptual structure and language as separate, but closely linked by a relation of compression. Under this approach, children are expected to diverge from

[13] Pauline's later uses of *ohne* are also adult-like, which is unsurprising because they are from age 5;07 and older.

adults with respect to how they compress conceptual representations into linguistic structures. Before adult-like compression is fully acquired, children will make errors of both over- and undercompression; the latter in cases where non-pronunciation of a concept is obligatory for adults. We argued that despite being morphologically simple, the German proposition *ohne* (*'without'*) in fact corresponds to the complex concept [ANTI CUM]/[CUM ANTI] at the level of conceptual representation. Undercompression of this complex concept predicts children will produce patterns like *mit ohne* (*'with without'*) – a novel prediction which was corroborated on the basis of corpus data.

In contrast to German *ohne*, English *without* is morphologically complex, thus corresponding more closely to what we assume is a universal conceptual representation across languages, in line with the more general assumption within the Meaning First framework that conceptual representations do not vary across speakers of different languages. Given the universal complex concept [ANTI CUM]/[CUM ANTI], then, the morphological difference between English and German must then be due to the fact that English articulates the CUM concept while German compresses it. This difference seems to be rooted in morphological properties of the two languages. Namely, the exponent of the ANTI concept as part is *out* in English, but *ohne* in German. But while *out* occurs in other contexts as well, *ohne* is restricted to exponing the complex [ANTI CUM]/[CUM ANTI]. The presence of CUM can therefore be directly inferred from any occurrence of German *ohne*, while English *out* does not license this inference. In order for German children to arrive at the adult-like production of *ohne* then, they first have to learn that *ohne* is limited to [ANTI CUM] contexts, and that the realization of the CUM concept in such contexts is therefore redundant and can be left out.

Two general predictions of our result concern other languages and other antonym pairs. We predict that asymmetries in antonym pairs of the type we mentioned in the introduction should be more visible in child language. In particular, we expect that children may produce non-adult overt decomposition of antonyms and that they may find negative antonyms more difficult to acquire or understand than their positive counterparts. Unfortunately, there is relatively little previous work on the acquisition of antonyms in general. Some early studies have found asymmetries in the acquisition of adjectival antonym pairs (Clark, 1972), but more recent work such as Tribushinina et al. (2013) is less conclusive on the matter. Outside of adjectives, some cases exhibit asymmetries which are in line with a decompositional account along the lines outlined above (Kotzor, 2021, among others). Specifically for quantificational determiners,

Katsos et al. (2016) report that across more than 30 languages, five-year old children accomplish higher rates of correct understanding with *some* compared to its negative antonym *no*. Some recent work (Nicolae and Yatsushiro, 2022; Driemel et al., 2023; Bill et al., 2019) indicates that German children seem to sometimes overtly decompose the negative indefinite *kein* ('no') into two pieces though this is absent from the adult Grammar. Secondly, we expect under-compression errors similar to German to arise with the exponent of [ANTI-CUM]/[CUM ANTI] in all other languages where the exponent is not at least bi-morphemic. We have not completed our systematic examination of this prediction yet, but have collected anecdotal evidence in favor of this prediction from several languages including Dutch (Jaqueline van Kampen, p.c.) and Portuguese (Elaine Grolla, p.c.). We plan to explore both predictions in future work.

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A Supplementary Files

The study data and analysis scripts to reproduce the data reported in this paper are available as Sauerland et al. (2024).

B Research Ethics

No ethical review was required since the results we report were achieved by reusing data from the cited sources that are in the public domain.

C Acknowledgments / Funding

We are grateful to Jesse Snedeker, Angeliek van Hout, Elaine Grolla, Jacqueline van Kampen, our colleagues within the LeibnizDream project, our editors, Sudha Arunachalam and Krista Szendroi, and two anonymous reviewers for helpful comments on this paper. A CC BY license is applied to the Author Accepted Manuscript (AAM) arising from this submission. This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 856421).