Acta Linguistica Academica 70 (2023) 3, 372–396
DOI: 10.1556/2062.2023.00633

AKADÉMIAI KIADÓ

Acquisition and processing of word formation in German

SABINE SOMMER-LOLEI[1,2*], VERONIKA MATTES[3], KATHARINA KORECKY-KRÖLL[1] and WOLFGANG U. DRESSLER[1,4*]

[1] Austrian Academy of Sciences, University of Vienna, Austria

[2] Recipient of a DOC-team fellowship of the Austrian Academy of Sciences, Austria

[3] University of Graz, Austria

[4] Hungarian Academy of Sciences, Hungary

Received: October 31, 2022 • Revised manuscript received: June 7, 2023 • Accepted: June 7, 2023
Published online: August 25, 2023
© 2023 The Author(s)

Check for updates

ABSTRACT

Cognitive processing strategies can explain general word-formation preferences that influence the structures and their developments. They are based on simplicity, transparency, iconicity, salience, and frequency. We present and discuss evidence from our data on first language acquisition for how these cognitively based general preferences can explain the course of development of word formation and how they interact or compete. The analysis is based on the development of distributions of word formations in longitudinal data and panel data of child speech and their input from high and low socio-economic status families. In order to evaluate the productivity of a word-formation pattern in child speech, we applied the mini-paradigm criterion. Age-of-acquisition effects will be presented according to our own processing studies and to literature.

KEYWORDS

cognitive preferences, first language acquisition, processing strategies, word-formation patterns, productivity, socio-economic status

* Corresponding authors. E-mail: wolfgang.dressler@univie.ac.at, to.sabine@gmail.com

AKJournals

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

1. INTRODUCTION

In this paper we address the question of how to explain the development of morphological structures in terms of cognitive principles of language processing by providing evidence from natural language acquisition data on word formation. Cognitive processing strategies can explain general word-formation preferences that influence the structures and their developments. These preferences should by their nature hold even more for child speech than for adult speech. They are based on simplicity, transparency, iconicity, salience, and frequency as has been discussed widely in the realm of Natural Morphology and usage-based approaches.

The aim of the present paper is to present evidence from our data on first language acquisition for how these cognitively based general preferences can explain the course of development of word formation, but also how they interact or compete, especially in the early phases, in which language specific factors such as productivity and conventionality do not have much influence due to the still minor language experience of children. As the properties of the linguistic input play a central role for children's language development, we pay special attention to child-directed speech (CDS) and relate its features to those of child speech (CS).

Concerning the processing of morphological structure, one major question arises: are morphological constructions accessed holistically or are they decomposed? Several studies with adults have shown that they are processed in both ways – as whole words and via accessing their morphological elements, even if the construction is semantically opaque (Smolka et al. 2014, 2019; Creemers et al. 2020). This duality is claimed to be a central property of all morphological structures, but compound structure is more easily accessible than derivational structure due to its transparent sub-elements. Furthermore, the domain of derivation is much more in transition to the lexicon of simplex words. Citing Libben, Gagné & Dressler (2020, 339), "multimorphemic words exist as morphological superstates, which have the 'potential' to assume a variety of actual morphological states, depending on situational and processing demands".

2. WORD FORMATION IN ACQUISITION AND PROCESSING

2.1. First language acquisition of word formation

When we take a usage-based perspective to investigate how children detect and use the system of multimorphemic words, we assume that children treat the first word formations they meet as whole lexical items, and only later do they start to recognize the word constituents and the combinatorial processes and link the roots (or other bases) and affixes to a specific meaning – this can only result from repeated experience with complex words and their bases, such as *play, team* & *work* → *team play, teamwork*, *play-er, work-er, team play-er* (cf. Clark 2014; Libben 2015; Dressler, Ketrez & Kilani-Schoch 2017; Mattes et al. 2021).

As compounds are the easiest word-formation structures to process (Clark & Hecht 1982; Clark 1993; Swan 2000; Libben, Gagné & Dressler 2020) they are as such expected to be acquired

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

before other word-formation structures (derivation, synthetic compounds, conversion[1]). Within the domain of compounds, word-based compounds (Ger. *Milch-flasche* 'milk bottle', *Welt-reise* 'world tour') are expected to be mastered before root-based compounds (Ger. *Trink-flasche* 'drinking bottle', from the verbal base *trink-* 'to drink'; *Sprach-reise* 'language trip', from the noun *Sprache* 'language' which is again derived from the verbal base *sprech-* 'to speak'), and compounds that require an interfix (Ger. *Schiff-s-reise* 'boat trip') after interfixless compounds (Ger. *Haus-boot* 'house boat').

What we know very generally from studies on the development of morphology in several languages is that acquisition of inflection and compounding usually starts before the second birthday and that it is well-developed before school age (Bittner, Dressler & Kilani-Schoch 2003; Stephany & Voeikova 2009; Dressler, Ketrez & Kilani-Schoch 2017). The acquisition of derivation starts rather slowly before or at least after the second birthday (Mattes et al. 2021) and it significantly accelerates during pre-school age (Anglin 1993; Clark & Berman 2004; Mattes 2018), however, a major part of derivatives is still acquired during school age (Anglin 1993; Levin & Rappaport Hovav 1998; Ravid & Avidor 1998; Nippold 2008). The course of development is also influenced by the degree of morphological richness of a morphological subsystem (cf. McWhorter 2005; Sommer-Lolei, Korecky-Kröll et al. 2021; see also Xanthos et al. 2011, for inflection). In German, this would facilitate the acquisition of nominal compounds and particle verb constructions, which are dominant in the word-formation system (see e.g., Korecky-Kröll, Sommer-Lolei & Dressler 2017; Korecky-Kröll et al. 2022).

2.2. Cognitive processing preferences

Many of the developments in word formation in language acquisition relate to different types of complexity enhancement, demonstrating the important role played by the factors transparency, iconicity, salience and frequency.

For cognitive reasons, simpler constructions are preferred over more complex ones. Complexity can be formal and/or conceptual (Slobin 1973, 1985; Arkadiev & Gardani 2020). Formal complexity is related to allomorphy, morphotactic opacity, combinations of word-formation patterns in one lexeme (i.e., the number of constituents or word-formation patterns applied). Conceptual complexity is a feature of polysemous or morphosemantically opaque word forms or word forms with abstract meanings (Schwanenflugel 1991; Gleitman et al. 2005).

When we look at one of the components of simplicity, namely transparency, we must distinguish between morphotactic transparency, i.e., easy formal decomposition of derivatives and compounds, and morphosemantic transparency, i.e., easy recoverability of the meaning of constituents of derivations and compounds from the holistic meaning of the whole complex word (cf. Dressler & Kilani-Schoch 2016). This predicts a preference for concatenative morphology over (root vowel) modification or conversion and a preference for morphosemantically transparent over opaque word formations. Morphosemantic transparency "has been shown to influence processing in both comprehension and production tasks" (Libben, Gagné

[1]In this analysis the term conversion (zero-derivation) includes the following word-formation patterns: syntactic conversion, i.e., nominalized infinitives e.g., *(das) Essen* 'food' from *ess-en* 'eat-INF'; morphological conversion, e.g., verb or adjective stems to nouns: *(der) Fall* 'fall' from *fall(en)* 'to fall', *(das) Tief* 'low' from *tief* 'deep', in verbs: *angel(n)* 'to fish' from *Angel* 'fishing rod', *trommel(n)* 'to drum' from *Trommel* 'drum'.

Brought to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

& Dressler 2020, 341), as in opaque word formations we have to cope with a conflict between whole-word and constituent meanings, see also Baayen's (1993) dual processing race model.

The principles of iconicity and avoidance of ambiguity are best fulfilled in a one-to-one correspondence ("biuniqueness") of formal morphemes and their functions, or in head-non-head relations, when the formal head of a derivative and compound is also its semantic head. For example, this holds for endocentric vs. exocentric compounds, such as the agents *jewel-thief* vs. *pick-pocket*, derivatives such as *teach-er,* where the suffix is overtly responsible for the whole word being an agent vs. agent *cook* (Ungerer 1999; Dressler & Kilani-Schoch to appear). This predicts for example a preference for compounds and overt derivations over conversions. But another type of iconicity intervenes: the meaning of the lexical base is semantically and prosodically stronger than an affix.

Salience, in the framework of Natural Morphology, very generally refers to the relative prominence of a morpheme in a morphologically complex word (see Giraudo & Dal Maso 2016). Segmentation usually proceeds from the periphery to the center of a word, and positional salience facilitates word-final and word-initial elements ("bathtub effect" Aitchison 1994, 134). Due to the recency effect, suffixation should be preferred over prefixation in young children (e.g., Peters 1997), who have a limited working memory capacity (e.g., Verhagen & Leseman 2016; Sumner et al. 2019), whereas prefixation should be preferred by adults due to the primacy effect (e.g., Gupta et al. 2005).

Prosodic salience predicts a preference for stressed over unstressed morphemes (e.g., *weg#-gehen* 'to go away' with primary stress on the particle *weg* vs. *ent-gehen* 'to escape' with an unstressed prefix *ent-*). As affixes are often prosodically non-salient, this can lead to a preference for compounding over affixation in word formation and, within affixation, a preference for stressed over unstressed affixes (e.g., *nomin-ee vs. nominat-or*). However, this universal preference is contradicted by what Wurzel (1984) has called "language-specific system adequacy" or "normalcy", i.e., that in many languages affixes are normally unaccented.

Finally, frequency of a morphological structure in the language plays an essential role in language processing and use in general, and, especially in acquisition (Ambridge et al. 2015; Libben 2015). Whereas high token frequency of word forms enhances entrenchment and activation, high type or lemma frequency of word-formation patterns promotes their productivity. This leads to the prediction that words and constructions with a high frequency in the child's input will, all else being equal, be acquired earlier than words and constructions with a low input frequency (Behrens 2006; Gülzow & Gagarina 2007; Ambridge et al. 2015). Consequently, this causes age-of-acquisition effects in adult processing (cf. Bonin et al. 2004; Juhasz 2005; Veríssimo et al. 2018), which means that earlier acquired words, constructions and structures are more robust than later acquired ones.

2.3. Interaction of preferences and other factors

In early language acquisition, principles such as simplicity might interact with other preferences, such as transparency and iconicity, which may explain Clark's (1993) finding that converted verbs emerge before affixed verbs in English and German. Conversion is the simplest option, but it is a non-iconic operation since there is no formal change corresponding to a change in meaning, i.e., preferences of simplicity come into conflict with those of iconicity and transparency.

Brought to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

Productivity (in the language) refers to the affix category size as 'realized productivity' (Baayen 2009), i.e., with regard to derivation, lemma frequency reflects the relative success with which the affix produces new derivatives over time (Smolka, Libben & Dressler 2019). For German word formation this can be easiest tested by checking whether recent English loan words are used in German word formation: this occurs every day in compounding and inflection. Derivational examples are the diminutives *Computer-chen* / *Computer-l* 'little computer', or the particle verbs *ein#scann(en)* 'to scan in' or *rüber#mail(en)* 'to mail across'. Further evidence can be provided by compounding and derivation from abbreviations such as *ÖVP-ler* 'member of the Austrian people's party Ö(sterreichische) V(olks)p(artei)' (Dressler 2007). However, productivity is overruled by lemma frequency and transparency in early language acquisition, cf. sections 3.4 & 3.5 below (see also Mattes et al. 2021).

A further factor is that the morphological type of the language to be acquired determines the amount of morphological richness. High richness of a word-formation subsystem (e.g., of diminutives) facilitates processing and acquisition (McWhorter 2005; Dressler, Merlini Barbaresi et al. 2019; Sommer-Lolei, Korecky-Kröll et al. 2021). Additionally, morphological richness can also vary in the children's input, depending on the socio-economic status (SES) of their families, which is most often related to parents' educational levels, professions and family income (e.g., Hoff 2006). SES has been reported to influence children's speed of language development, as has been extensively demonstrated for the acquisition of vocabulary (e.g., Hart & Risley 1995; Arriaga et al. 1998), but it also holds for the acquisition of morphology: lower SES parents are less likely to provide their children with morphologically rich input and, as a consequence, their children lag behind their higher SES peers (e.g., Ravid & Zimmerman 2017; Levie, Ben-Zvi & Ravid 2017; Korecky-Kröll et al. 2022; Sommer-Lolei 2022).

3. EMPIRICAL STUDY ON THE DEVELOPMENT OF WORD FORMATION IN FIRST LANGUAGE ACQUISITION OF GERMAN

3.1. Hypotheses

Based on the principles presented in section 2.2, we pose the following hypotheses for the acquisition of word formation:

- Word-formation patterns gradually increase in complexity during the course of acquisition.
- The speed of this increase and the degree of complexity reflect the degree of morphological richness in the input.
- Frequencies of word-formation patterns in child speech (CS) reflect frequencies in their input (child-directed speech, CDS) and influence their order of emergence and productivity.
- As compounds are more descriptive and as such morphosemantically more transparent than derivations, compounds are acquired before and preferred over other word-formation patterns.
- Particle verbs are acquired before prefixed verbs because they are prosodically and, due to their variation in positions, positionally more salient.
- Within the domain of derivation, transparent derivations are acquired before opaque ones, concrete before abstract ones and suffixes before prefixes.

Brought to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

3.2. Acquisition data

In this paper we analyze the longitudinally recorded data of three children and their mothers with higher socio-economic status (HSES). Their spontaneous speech was recorded 1 to 4 times per month in their family environment in varying daily situations. In total we analyze 90.9 h of recording and 317,052 transcribed word tokens in child speech (CS) and child-directed speech (CDS), as presented for each child in Table 1.

In addition, we investigate panel data of 29 children and their main caretakers of the INPUT-project.[2] Their spontaneous speech was recorded at 4 data points at mean ages 3;1, 3;4, 4;4 and 4;8 at their homes in Vienna in interaction with their main caretaker in everyday situations. 15 children (8 girls/7 boys) come from families with higher socio-economic background and 14 children (6 girls/8 boys) from families with lower socio-economic status (LSES). Overall, the panel data consist of 58 h of recording and 286,623 word tokens in CS and CDS, as shown in Table 2. For a more extensive presentation of the panel data see Sommer-Lolei (2022, 62–65).

All participants of the corpora acquire Standard Austrian German as spoken in Vienna as their native language. All data were transcribed and coded using an adapted German version of CHILDES (cf. MacWhinney 2000).

Table 1. Longitudinal spontaneous speech data (CS & CDS) (cited from Sommer-Lolei 2022, 61)

Corpus	Period[a]	No. utterances		No. word tokens		No. rec.	No. hours of rec.
		CS	CDS	CS	CDS		
JAN (m/HSES)	1;3–4;11	19,166	40,849	47,701	187,178	114	57.3
KAT (f/HSES)	1;6–3;0	3,417	6,917	6,366	25,660	34	13.6
LEN (f/HSES)	1;7–3;0	6,064	11,877	12,087	38,060	40	20.0
Total		**28,647**	**59,643**	**66,154**	**250,898**	**188**	**90.9**

Table 2. Panel data (CS & CDS)

Corpus	Data points	No. utterances		No. word tokens		No. hours of rec.
		CS	CDS	CS	CDS	
HSES	3;1 | 3;4 | 4;4 | 4;8	19,105	30,109	58,172	108,990	30.0
LSES	3;1 | 3;4 | 4;4 | 4;8	16,587	21,627	44,603	74,858	28.0
Total		**35,691**	**51,736**	**102,775**	**183,848**	**58.0**

[2]INPUT = "Investigating Parental and Other Caretakers' Utterances to Kindergarten Children" (SSH11-027) financed by the Vienna Science and Technology Fund (WWTF), headed by Wolfgang U. Dressler at the University of Vienna. For further information see URL: https://comparative-psycholinguistics.univie.ac.at/projects/input [16.10.2022].

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

3.3. Theoretical approach

The theoretical background for the empirical studies that are reported in the present paper is the Usage-based Approach to language acquisition (Clark 1993; Tomasello 2003; Berman 2004) and the framework of Natural Morphology (Dressler et al. 1987; Dressler 2005; Dressler & Kilani-Schoch 2016). Based on these theories, the model of Pre- and Protomorphology had been developed in many publications starting with Dressler & Karpf (1995) up to Mattes et al. (2021) and Korecky-Kröll et al. (2022). In a nutshell, the premorphological phase refers to the phase before the child detects morphological segmentability and composition. Therefore, the child produces only isolated rote-learned word formations without recurrence of either their lexical bases in other words or of their affixes. The proto-morphological phase, which is much more relevant for questions discussed in this paper, is the one in which the child explores the morphological structure of the language and starts to use it productively. This phase begins when a child detects, due to the expanding lexicon and language experience, morphology as a means of decomposing and composing the meaning and form of word formations.

When and how children build up a repertoire of word-formation devices strongly depends on input factors and cognitive processing preferences (cf. section 2.2), but also on language specific properties and typological features of the language.

3.4. Methods

We examined the distributions of word-formation patterns in our longitudinal data and panel data, by counting and comparing lemma and token frequencies in CS and CDS. For the investigation of productivity, or at least "potential productivity" of a pattern in child speech, we applied the mini-paradigm criterion. It was first developed by Dressler, Kilani-Schoch & Klampfer (2003), based on previous studies on the emergence of mini-paradigms (Bittner et al., 2000; Kilani-Schoch & Dressler 2002) and was applied in numerous studies for the acquisition of inflectional morphology (Bittner, Dressler & Kilani-Schoch 2003, xvi; Dressler, Kilani-Schoch & Klampfer 2003; Kilani-Schoch & Dressler 2005). Later the concept of the mini-paradigm criterion was adapted to word formation as a criterion for the acquisition of a pattern (first for compounding in Dressler, Ketrez & Kilani-Schoch 2017, 7, 26–27; Korecky-Kröll, Sommer-Lolei & Dressler 2017; then for derivation in Mattes et al. 2021; Sommer-Lolei, Mattes et al. 2021; Sommer-Lolei 2022), of course before attaining Berman's (2004) full mastery.

The mini-paradigm criterion for derivational morphology is fulfilled, when a child spontaneously produces at least three derivatives, i.e., applies a morphological process (affixation, conversion, stem/root vowel modification) to at least three different bases, with each base occurring in at least three different types (other derivatives, compounds, uninflected or inflected words). As posited by Jackendoff & Audring (2020, 225), a language learner might propose a "tentative schema" as soon as s/he identifies a relationship between two word forms, but this schema can only "be 'verified' by a third instance".

For our analysis, we considered spontaneous speech of the main caretaker and the child, excluding adult- and pet-directed speech, direct spontaneous imitations of the children as well as citations (e.g., literary language, song lyrics). Furthermore, we excluded auxiliary and modal verbs, proper nouns and diminutives.

Brought to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

3.5. Early acquisition of German word formation

German is a compounding rather than a derivational language, but nevertheless, derivational morphology is rich in various types of affixation and makes use of some root modification. Very dominant in verb formation are particle verb constructions. German also uses conversion to derive nouns and verbs, but to a lesser degree than English. Latinate derivational morphology is much less important than in English and plays no role in toddlers' and preschool children's acquisition.

The following sections present the course of acquisition of simplex vs. derived nouns and verbs in lemmas and tokens in all corpora up to almost five years of age and show differences in the developmental course of children with higher and lower socio-economic background. The Tables in Section 3.5.1 and 3.5.2 present mean values of the children, whereas the longitudinal recorded spontaneous speech data was additionally normalized for an equal number of recordings per month to take variations of the frequency of recordings into account, whereas the panel data were normalized for equal numbers of children.

For a direct comparison of the course of acquisition of simplex vs. derived verbs and nouns in lemmas and tokens see Sommer-Lolei, Mattes et al. (2021, 125). In a nutshell, we found that "derived verbs tend to emerge earlier and develop faster than derived nouns" and that "derived nouns do not show the same steady development as verbs and have lower frequencies in both lemmas and tokens throughout the course of development" (Sommer-Lolei, Mattes et al. 2021, 125).

A comparison of the distribution of word-formation patterns in CS and CDS up to age 3;0 showed that all children produced significantly fewer derived noun and verb lemmas than their caretakers (whereas we did not find such a consistent difference with regard to verb tokens). (For details see Sommer-Lolei, Mattes et al. 2021, 117–122).

3.5.1. Nominal derivation in child speech. Figures 1 and 2 present mean values of simplex and derived nouns as well as synthetic compounds in lemmas and tokens in child speech in the course of acquisition in the corpora of JAN, KAT and LEN up to age 3;0 and in JAN up to 4;11.

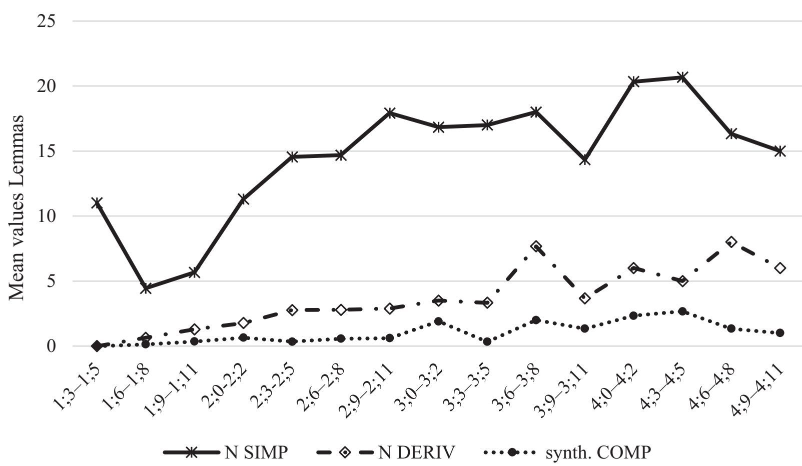

Figure 1. Course of acquisition (mean values of lemmas) of simplex vs. derived nouns vs. synthetic compounds in the corpora of JAN, KAT and LEN up to age 3;0 and in JAN up to 4;11 (CS)

Brought to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

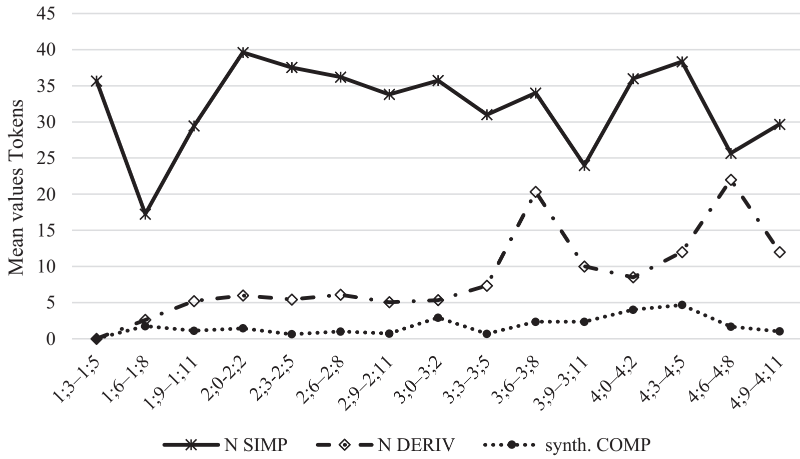

Figure 2. Course of acquisition (mean values of tokens) of simplex vs. derived nouns vs. synthetic compounds in the corpora of JAN, KAT and LEN up to age 3;0 and in JAN up to 4;11 (CS)

Mean values of the three children were calculated after normalizing for equal number of recordings. Simplex nouns are only presented in the longitudinal data to show the development from early on in comparison to derived nouns (including all cases of suffixation, prefixation, circumfixation, morphological and syntactic conversion, root vowel modification)[3] and synthetic compounds.

The three children show a clear preference for simplex nouns (N SIMP) in lemmas and tokens up to age 4;11 (see Figures 1 and 2). The variety of derived nouns increases with age but does not show the same steady development that we find in derived verbs (see Figures 5 and 6). Low frequencies of synthetic compounds are due to their higher complexity, since they combine compounding and derivation.

Derived nouns (N DERIV) increase in lemma and token frequency from their first emergence, but we find a sharper increase from age 3;5 onwards, in synthetic compounds (synth. COMP) between 3;8 and 4;3 in JAN (see Figure 1 for lemmas, Figure 2 for tokens). This tendency is also visible in the HSES children of the INPUT corpus, whose lemma and token frequencies (N DERIV, synth. COMP) increase from the first to the fourth data point (DP1–DP4), with some variation in between (see Figures 3 and 4). The lemmas and token frequencies of derived nouns and synthetic compounds in the LSES children, however, remain approximately the same in both word-formation patterns, with exception of derived noun tokens that show highest numbers already at data point 1, which shows that the children use the few lemmas more often (see Figure 4).

3.5.2. Verbal derivation in child speech.

Figures 5 and 6 present mean values of simplex and derived verbs as well as the categories of particle and prefixed verbs in lemmas and tokens in child speech and their developmental course of acquisition in JAN, KAT and LEN up to age 3;0

[3]E.g., *Fahr-er* 'driver', *Heiz-ung* 'heating' (suffixation), *Un-tier* 'beast' (prefixation), *Ge-flech-t* 'mesh', *Fall* '(the) fall' (morphological conversion), *Lesen* '(the) reading' (syntactic conversion), *Fund* 'discovery' (root vowel modification), see also Table 4.

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

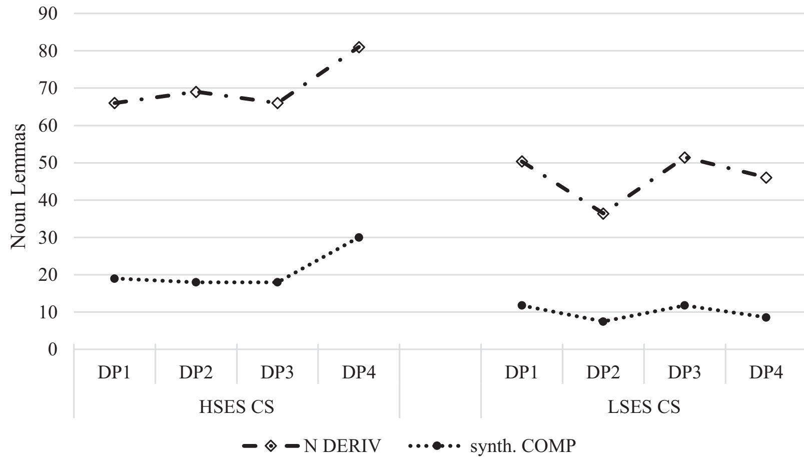

Figure 3. Course of acquisition (mean values of lemmas) of derived nouns and synthetic compounds in the INPUT corpus (HSES- and LSES-CS) at four data points up to 4;8

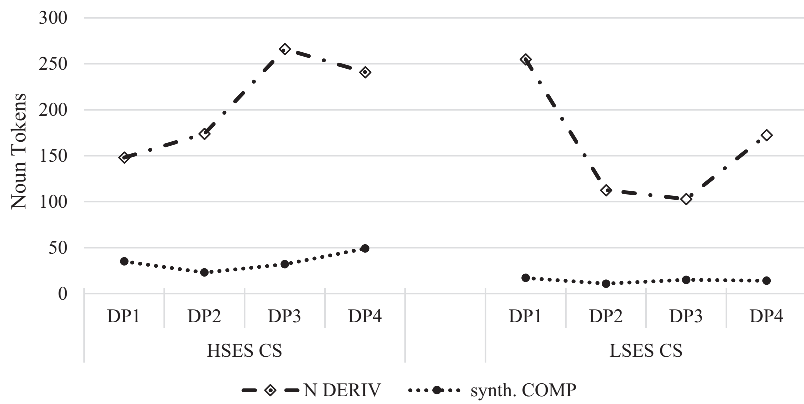

Figure 4. Course of acquisition (mean values of tokens) of derived nouns and synthetic compounds in the INPUT corpus (HSES- and LSES-CS) at four data points up to 4;8

and in JAN up to 4;11. Mean values of the three children were calculated after normalizing the data for equal number of recordings. Simplex verbs are presented in the longitudinal data only to show the development from the beginning in comparison to particle and prefixed verbs (or derived verbs in general, respectively, which include all prefixed and particle verbs, circumfixations, suffixations, morphological conversions).[4]

[4]E.g., *be-such(en)* 'to visit, *ver-steh(en)* 'to understand' (inseparable prefixation), *ab#steh(en)* 'to stick out' (particle verb formation), *ent-schuld-ig(en)* 'to apologize' (circumfixation), *prob-ier(en)* 'to try', *streich-el(n)* (suffixation), *angeln* 'to fish' (morphological conversion), see also Table 4.

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

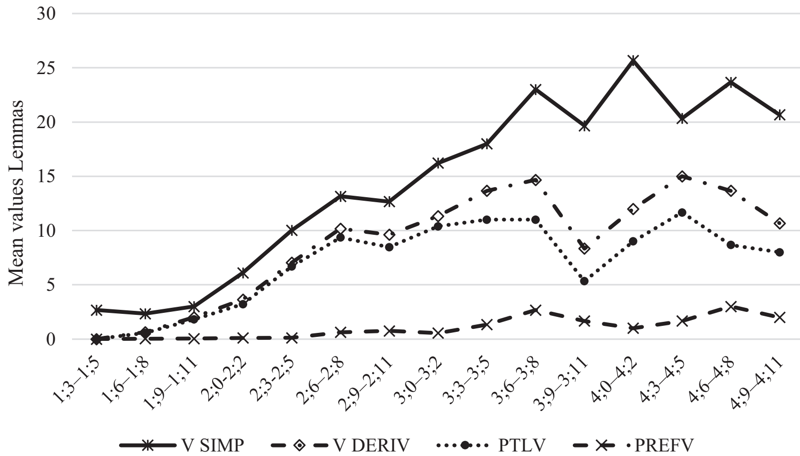

Figure 5. Course of acquisition (mean values of lemmas) of simplex vs. derived verbs (total) and of particle and prefixed verbs in Lemmas in JAN, KAT and LEN up to age 3;0 and in JAN up to 4;11 (CS)

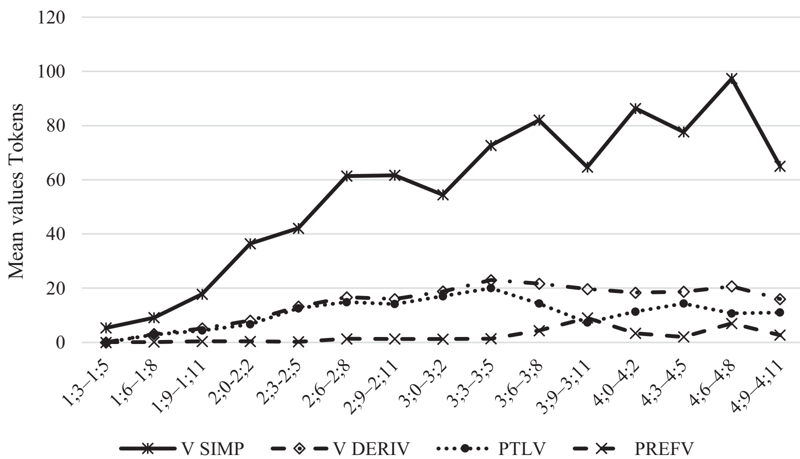

Figure 6. Course of acquisition (mean values of tokens) of simplex vs. derived verbs (total) and of particle and prefixed verbs in Lemmas in JAN, KAT and LEN up to age 3;0 and in JAN up to 4;11 (CS)

As with nouns, we also find a preference for simplex verbs especially in tokens (Figures 5 and 6). All children show a steady increase of particle verbs (PTLV) that starts early (see Table 4) and continues up to age 4;11.

Derived verbs (V DERIV) appear earlier in children's speech production compared to derived nouns (see Table 4). Moreover, derived verbs develop faster than derived nouns, as shown by the steeper increase in lemmas and tokens (see Figures 5–8). Lemma and token frequencies of derived verbs are directly related to those of particle verbs, since they display a subcategory and account for the vast majority of derived verbs.

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

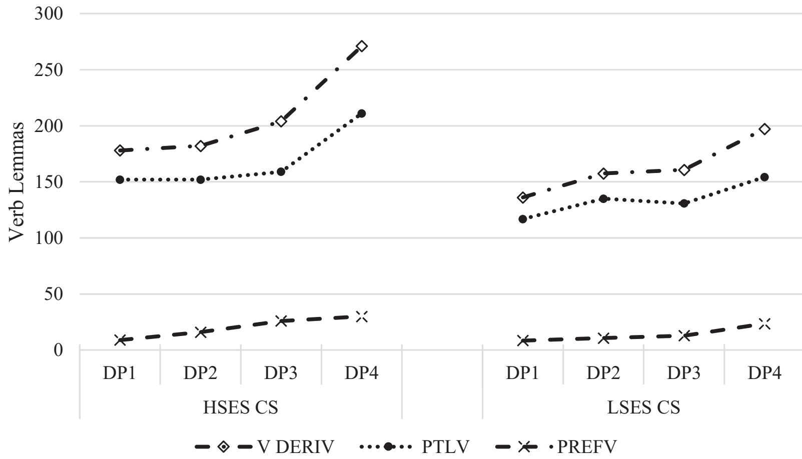

Figure 7. Course of acquisition (mean values of lemmas) of derived verbs, particle and prefixed verbs in the INPUT-corpus (HSES- and LSES-CS) at four data points up to 4;8

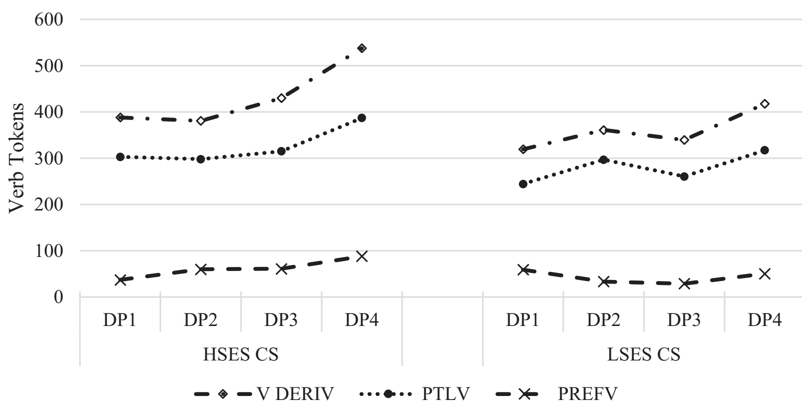

Figure 8. Course of acquisition (mean values of tokens) of derived verbs, particle and prefixed verbs in the INPUT-corpus (HSES- and LSES-CS) at four data points up to 4;8

With respect to the course of development of prefixed verbs (PREFV) we observe that prefixed verbs increase in lemmas in JAN from age 3;4 onwards and in token frequency from age 3;8 onwards (see Figures 5 and 6), which we also find in the HSES children in both, lemmas and tokens (see Figures 7 and 8). In the LSES children the lemma frequency of prefixed verbs increases, while their token frequency remains about the same up to 4;8.

The course of acquisition differs for verbs and nouns, when investigating the course of simplex vs. derived verbs and nouns. There is a tendency in our three longitudinal corpora (Table 1) that verb derivation emerges earlier and develops faster than noun derivation, especially in contrast to the increase of simplex nouns. There is a constant increase of simplex and

Brought to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

derived verbs, at least in lemmas, whereas lemma and token frequency of derived nouns remains rather low up to the age of 4;11.

3.5.3. Complexity of word formations. As mentioned in section 2.2 we analyze the formal complexity of derivatives in verbs and nouns in children's output and input in the course of acquisition. Therefore, the degree of complexity as presented in Figures 9–12 is determined by the number of word-formation processes involved. In case of a single word-formation process, e.g., affixation, conversion,[5] root vowel modification, compounding, as in *fahr(en)*

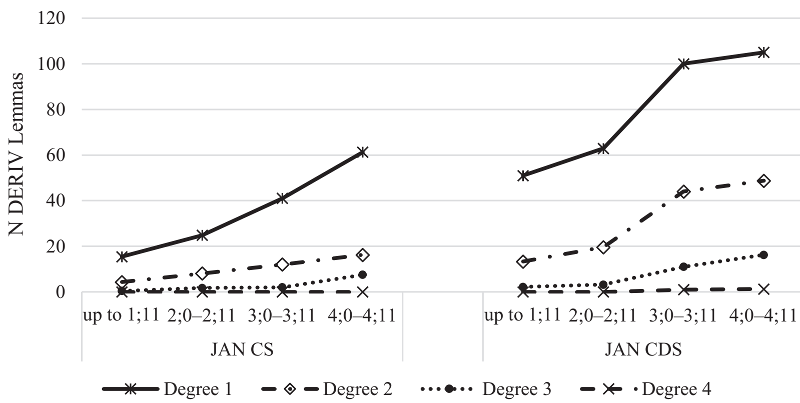

Figure 9. Degrees of complexity of derived noun lemmas in the JAN corpus at yearly intervals up to 4;11 (CS and CDS)

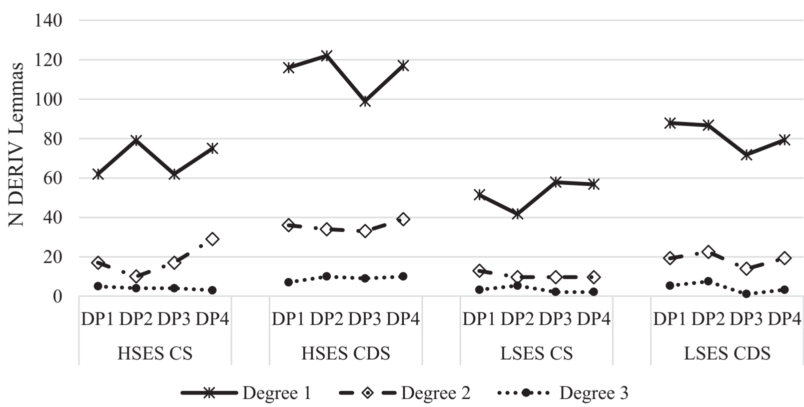

Figure 10. Degrees of complexity of derived noun lemmas in the INPUT corpus (HSES and LSES) at four data points (DP1–4) up to 4;8 (CS and CDS)

[5]We grade conversions as more complex than Simplicia due to non-iconicity and therefore assign it degree 1.

Brought to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

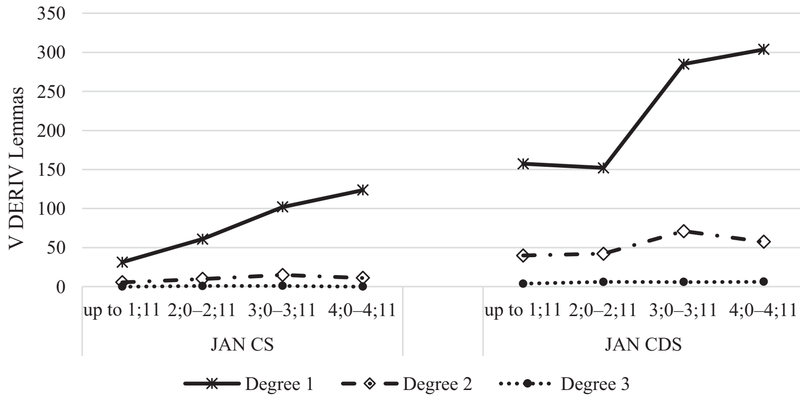

Figure 11. Degrees of complexity of derived verb lemmas in the JAN-corpus at yearly intervals up to 4;11 (CS and CDS)

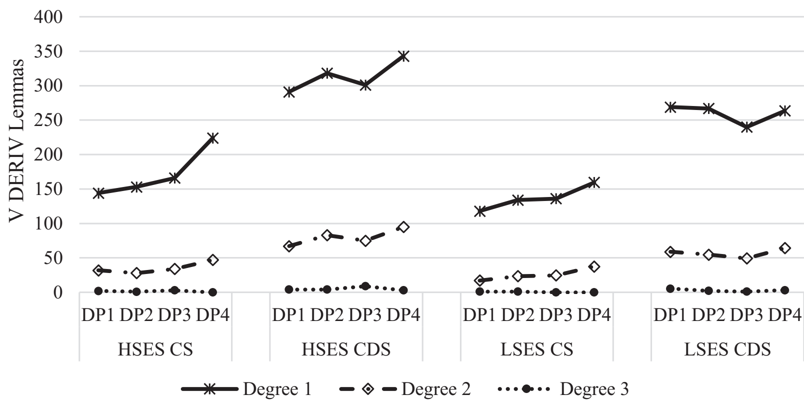

Figure 12. Degrees of complexity of derived verb lemmas in the INPUT-corpus (HSES and LSES) at four data points up to 4;8 (CS and CDS)

'drive' → *Fahr-er* 'driver', *stoß(en)* 'to thrust' → *Stoß* 'thrust', *Kamm* 'comb' → *kämm(en)* 'to comb' it is degree 1. In case of two or more word-formation processes it is degree 2, 3 or 4 respectively. For the assignment of the degrees of complexity with examples see Mattes (2018, 123). All lexemes, including lexicalized and morphosemantically opaque ones, in the JAN and INPUT corpora were categorized. Experimental studies with adults for complex German verbs have shown that opacity has no detrimental effect on their processing (cf. Smolka et al. 2014, 2019).

Regardless of their opacity, less complex lexemes (degree 1) are easier for a child to pick up and process than more complex ones (e.g., degree 2 *jag(en)* 'to hunt' → *Jäg-er* 'hunter', involving a suffix plus a vowel change, degree 3 *Last-wagen-fahr-er* 'truck driver'). This is supported by the findings of Sommer-Lolei & Dressler (in print) for the acquisition of agent and instrument nouns.

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

Therefore, less complex word formations are an important starting point for the development of more complex forms. Thus, morphotactic complexity plays an essential role in language acquisition since the increasing complexity of grammatical structures leads to longer processing times. Synthetic compounds show a special kind of complexity, as they combine derivational with compositional word-formation processes (see Dressler, Sommer-Lolei et al. 2019).

Figures 9 and 10 illustrate the distribution of lemma frequency of derived nouns by degree of complexity in CS and CDS given in yearly intervals (JAN) or per data point (INPUT). The data were normalized for equal numbers of children (N = 15, INPUT) or equal numbers of recordings per year (JAN).

In general, we find a strong correlation throughout the entire period investigated between input and output frequencies in all degrees of complexity in all corpora for derived verbs and nouns (see Figures 9 and 10 for nouns; Figures 11 and 12 for verbs), and a clear preference for less complex derivations up to age 4;11 in both word classes. Less complex derivatives occur always before more complex ones in nouns and verbs, with derived verbs emerging first in CS, e.g., in JAN: *Schleck-er* 'lollipop' from *schleck(en)* 'to lick' (at 1;8, degree 1) before *Stieg-e* 'staircase' from *steig(en)* 'to step' (at 1;8, degree 2) and *An#fäng-er* 'beginner' from *an#fang(en)* 'to begin' (at 2;8, degree 3); *an#halt(en)* 'to stop' from *halt(en)* 'to hold' (at 1;6, degree 1) before *drauf#setz(en)* 'sit on' from *sitz(en)* 'to sit' (at 1;9, degree 2) and *hin-ein#leg(en)* 'belong in' (at 2;5, degree 3). The majority of derived verb lemmas with degree 1 in CS and CDS are particle verbs.

In the child Jan (1;3–4;11, displayed in yearly intervals) we find a constant increase of derived noun and verb lemmas in all degrees of complexity in the course of acquisition, with exception of the most complex degree 4 in nouns (see Figure 9) and degree 3 in verbs (see Figure 11) that we also find in his CDS. The INPUT children, whose recordings start at mean age 3;1, use nominal derivatives up to degree 3 in all recordings (see Figures 10 and 12). All children show notable increases especially in derived verbs from data point 3 to 4. Moreover, we find a strong increase of different noun lemmas (degree 2) between data point 2 & 4 (from mean age 3;3 to 4;8) in the HSES children that is not visible in the LSES children.

There is a gap between the HSES and the LSES children, showing that HSES children produce more different derived noun lemmas especially in degrees 1 & 2. They also show an increase of derived noun and verb lemmas from data point 3 to 4 in comparison to their LSES peers.

This finds a parallel also in their input frequencies, where we find an even greater difference between lemma frequencies of HSES and LSES main caretakers, with LSES CDS producing fewer word formations.

HSES children tend to have an advantage because of higher input lemma frequencies from early on in derived nouns and verbs, which not only leads to higher productive usage that results in a more diverse lexicon and vocabulary growth, but moreover to a greater ability in word formation later in life (see the study of Sommer-Lolei 2022, with the same children at age 8;0).

3.5.4. Frequencies and order of emergence. Table 3 presents age and order of emergence of all simplex and derived nouns and verbs in CS in relation to the percentages of lemmas and tokens in CDS of the corpus of the boy Jan. High frequencies in lemmas and tokens of simplex words correspond with their early emergence. This also holds for the high input lemma

Brought to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

Table 3. Age and order of emergence of all simplex and derived nouns and verbs in relation to the percentages of lemmas and tokens in CDS in the JAN corpus (modified cited from Sommer-Lolei et al. 2021, 131)

CHILD	Age of emergence	Derivation pattern	CDS % Lemmas	CDS % Tokens
JAN	1;3	simplex nouns	41.3	69.8
	1;4	simplex verbs	22.8	80.1
	1;6	particle verbs	63.8	15.5
	1;6	conversion (verbs)	3.1	0.6
	1;6	diminutive suffixes (nouns)	3.8	1.7
	1;8	compounds (nouns)	43.3	21.3
	1;8	*-er* (nouns)	2.4	1.4
	1;8	conversion (nouns)	2.7	2.0
	1;8	prefixed verbs	6.5	2.2
	1;8	root vowel modification (verbs)	1.8	0.6
	1;9	*-e* (nouns)	2.2	1.6
	1;9	suffixed verbs	1.7	0.9
	2;0	*-ung* (nouns)	1.0	0.6

frequency of particle verbs resulting in their very early emergence in CS at 1;6 and for the emergence of compounds at 1;8 that also corresponds with input lemma frequency. But for verb conversion, e.g., *Fisch* 'fish' → *fisch(en)* 'to fish' which emerges simultaneously with particle verbs there is no correspondence to input frequency (3.1% lem./0.6% tok.).

Given the comparably higher percentage of prefixed verbs in lemmas in CDS with 6.5% it would be expected that this pattern emerged earlier than conversion, but, in fact, they emerge two months after the first verb conversions. This might be due to the low prosodic and semantic salience of verb prefixes and to the lower complexity and therefore greater simplicity of conversions. Furthermore, other derivational patterns that emerge up to 2;0 in Jan are related to low input lemma and token frequencies (see Table 3).

Therefore it seems that emergence of a morphological category just depends on a critical mass of it in CDS (Van der Schuit et al. 2011; Serra i Raventós 2014), and that high lemma (or token) frequencies are not reliable predictors either for age or for the order of emergence in CS.

3.5.5. Emergences and productivity of derivations. In all children we find that the patterns that emerge first are also the first ones to become productive, as shown by particle verbs and *-er*-derived agent and instrument nouns.

Conversion of nouns emerges in one child (JAN) simultaneously with *-er*-suffixation and conversion of verbs in two children (JAN & KAT) at the same time with particle verbs (see Table 4).

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

Table 4. Emergences (Em.) and age of fulfilment of the mini-paradigm criterion (MC) of the most relevant noun and verb derivation patterns in CS up to 3;0 (modified cited from Sommer-Lolei, Mattes et al. 2021, 127–128)

Child Derivation	JAN		KAT		LEN		Example
	Em.	MC	Em.	MC	Em.	MC	
-er (agent nouns)	1;8	**1;10**	1;11	**2;10**	1;9	**2;3**	*Reit-er* '(horseback) rider'
-er (instr. nouns)	1;8	**1;10**	2;3	**2;10**	1;9	**2;3**	*Flitz-er* 'speedster' *Last-er* 'truck'
Conversion	1;8	**1;10**	2;8	**3;0**	2;4	–	*Sitz* 'seat', *Fall* 'fall'
-e	1;9	**2;0**	2;6	**2;6**	2;5	–	*Rutsch-e* 'slide'
Particle verb	1;6 (*an*)	**1;9**	2;3 (*ein*)	**2;6**	1;8 (*auf*)	**2;1**	*auf-heb(en)* 'pick up'
Conversion	1;6	**2;1**	2;3	**3;0**	2;2	–	*stempel(n)* 'stamp'
Prefix verb	1;8 (*ver-*)	**2;6**	2;6 (*ge-*)	–	2;6 (*ge-*)	–	*ver-steck(en)* 'hide'
	1;11 (*ge-*)	**2;9**	2;9 (*be-*)	–	2;7 (*ver-*)	–	*be-komm(en)* 'get'
	2;10 (*be-*)	**3;0**	2;10 (*ver-*)	–	2;8 (*be-*)	–	*ge-fall(en)* 'like'

The criterion for children's potential productivity of verbal conversion and nominal *-e*-suffixation is fulfilled only shortly after the much more frequent and productive *-er*-suffix and particle verb formation respectively. *-e*-suffixation is frequent and transparent in German, but not (very) productive in adult speech (in the sense that they are not used synchronically to derive new lexemes) but it is productive in early CS.

All children fulfil the mini-paradigm criterion for particle verbs before any other verb derivations. For noun-to-verb conversions (e.g., *schaukel(n)* 'swing' JAN 1;6) only Jan (2;1) and Kathi (3;0) meet the necessary requirements up to 3;0. Again, although prefixed verbs are more frequent in CDS in lemmas and tokens (see Table 3), the criterion is only met by Jan at 2;6.

For noun derivation, the three children fulfil the criterion for *-er* at 1;10 (Jan), at 2;3 (Lena) and at 2;10 (Kathi). The first noun derivation pattern that fulfils the criterion in Kathi's data (at 2;6) is the suffix *-e*. Productivity of conversion greatly varies among the children: Jan fulfils the criterion at 1;10, Kathi at 3;0 and Lena not at all within her data corpus.

3.6. Discussion of the cognitive preferences

3.6.1. Complexity. The finding that simplex words always emerge before derivational patterns within each category (nouns in 1;3 vs. 1;7, verbs in 1;4 vs. 2;0) supports our view that early emergence of a derivative is not simply due to chance or to lemma frequency in CDS: each child produces a higher percentage of simplex words than their mothers, as well as more simplex than derived verbs and nouns. These findings on the rise of complexity in derivation are parallel to those in other, also typologically different languages (cf. Mattes et al. 2021) and they are also parallel to those on compounding (Dressler, Ketrez & Kilani-

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

Schoch 2017; Dressler, Sommer-Lolei et al. 2019). In German, interfixless compounds are processed more easily and acquired earlier than interfixed compounds (Korecky-Kröll, Sommer-Lolei & Dressler 2017; Libben et al. 2020, 2021). Viennese children have been even observed to develop so-called weak blind alley developments (Dressler, Christofidou et al. 2019; Dressler et al. in print) in producing for a certain time ungrammatical interfixes in *-e-* and ungrammatical compounds to whose first constituents ending in *e* no *-n*-interfix is added, as in *Bank-e-sache* instead of neologistic *Bank-sache* 'bank thing' and *Lippe-stift* instead of *Lippe-n-stift* 'lipstick' (Dressler, Christofidou et al. 2019). Such forms have no base in children's inputs and children do not slowly approach the CDS targets but develop temporarily away from them. This represents young children's most independent course of acquisition in word formation.

The analysis of the panel data that allows a comparison between CS and CDS of different socio-economic status reveals a major gap in the domain of the complexity of word-formation patterns. Children with a HSES background hear many more derivations with higher degrees of complexity in their input than children with a LSES background. This influences the amount and increase of complexity in their own productions (see Figures 9–12).

3.6.2. Transparency and iconicity. All derivational affixes that are acquired early by the children (in the sense of documented or potential productivity) are indeed transparent in both senses (*-er*-nouns, e.g., *Fahr-er* 'driver'; *-e*-nouns, e.g. *Rutsch-e* 'playground slide', particle verbs, e.g., *auf#mach(en)* 'open, lit. make open'). For example, the deverbal nominal suffix *-e* is virtually unproductive in adult speech (lexicalized examples are *Wieg-e* 'cradle', *Würz-e* 'seasoning' etc.), but children use it quite frequently to form neologistic instrument and action or result nouns, e.g., *Lutsch-e* 'sth. to lick' for candy, *Eintauch-e* 'a dip', etc. (Mattes 2018; cf. also Elsen 1999; Rainer 2010). This can be explained by the relatively high input frequency and the morphotactic (and in many cases also morphosemantic) transparency of *-e* suffixation.

Morphotactically opaque, i.e., less iconic, derivations are acquired after transparent ones, i.e., more iconic. Conversion however, which is a non-iconic operation, since there is no formal change corresponding to a change in meaning, e.g., *trommel(n)* 'to drum', *frühstück(en)* 'to breakfast', is used and acquired earlier than expected, obviously due to its simplicity.

Opaque affixes which are more difficult to identify and interpret, only appear later, mainly after the acquisition of initial reading skills (also Clark 1993). One example is the late emergence and productivity, i.e., not earlier than school age, of the very frequent and most productive deverbal adjectival suffix in German *-bar*, as in *mach-bar* 'feasible' and *hör-bar* 'audible' (cf. Mattes 2018; Sommer-Lolei, Mattes et al. 2021). As *-bar*-derived adjectives have a "passive mode" interpretation, as e.g., *ess-bar* 'eat-able' is something that can be eaten, not someone who eats or can eat, and refer to possible and not to observable states, their conceptualization requires advanced cognitive developments.

3.6.3. Salience. Positional and prosodic salient constituents are acquired before less salient ones. In our data we find that suffixes are acquired before prefixes, and the very salient verb particles emerge and become productive in CS before their prefix counterparts (e.g., *weg#mach(en)* vs. *ent-fern(en)* 'remove', *unter#halt(en)* 'to hold under' vs. *unter-halt(en)* 'entertain'). In both cases, of course, their lemma and token frequency in the input plays a fundamental

Brought to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

role (see Table 3), but for all patterns and across languages, we find that frequency alone is not a reliable predictor for emergence and productivity in child speech, but that it only takes effect in combination with transparency (see also Mattes 2019; Stephany 2021).

The findings in our German data with respect to the cognitive principles of language processing also hold in other languages, even typologically different ones (cf. studies in Mattes et al. 2021): for example, the preference for compounding over derivation, due to higher semantic transparency and simplicity, has also been confirmed in much less compounding languages than German, for example Turkish, where noun-noun compounding is more productive than nominal derivation in the early stages of acquisition (Ketrez & Aksu-Koç 2021).

Gaps between HSES and LSES children and main caretakers are found in all categories of word formation investigated. However, the salient particle verbs (see also Korecky-Kröll et al. 2022) are also used quite frequently by LSES children (with mean lemma frequencies between 100 and 150 per recording), which shows that high salience may be helpful for this disadvantaged group. In less salient word-formation patterns (e.g., conversion) the data reveal an increase of the gap regarding derived noun lemmas between the HSES and LSES children over the study period (age 3;1–4;8). The LSES children do not catch up over time (up to 4;8), but rather fall behind (see Sommer-Lolei 2022, 99). This difference between the two SES-groups shows that the socio-economic status of a family not only influences the speed of acquisition of word-formation patterns, but moreover that the whole developmental course is affected.

4. CONCLUSIONS AND OUTLOOK

Our data analyses have clearly confirmed that the factor frequency, which is the central factor to usage-based accounts, plays the major role in the acquisition of word formation, but we also see that, much more than for inflection, it competes with other cognitive factors. These factors themselves might either accumulate and enhance acquisition (as in particle verbs) or come in conflict with each other (as in conversion or verb prefixation).

Morphological simplicity, morphotactic and morphosemantic transparency, besides frequency and lexical diversity are the main factors for emergence and productivity in early CS, in which the child does not yet have enough language experience to consider the productivity of a word-formation pattern (Clark 1993; Goldberg 2006). As a consequence, child speech is more transparent and more iconic than adult speech (Mayerthaler 1981; Dressler et al. 1987; Dressler & Kilani-Schoch to appear). Cognitive development and language experience, especially when contextual diversity is high, are a prerequisite for conceptually complex word-formation patterns.

Our analysis is based on data up to age 4;11. The aim for future research is to investigate the further acquisition of word formation in older children and adolescents. With advancing cognitive development and growing language experience, including the acquisition of written language and orthography, competence in word formation is expected to expand and change considerably.

Moreover, it would be valuable to reanalyze other existing German data and especially data from other typologically different languages, in the perspective of our results to control them.

The findings of blind-alley developments (see section 3.6.1) that most impressively point towards a course of acquisition in word formation that does not depend directly on children's input deserve closer attention as they reveal self-organization processes of cognitive structures.

Brought to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

This means that we should also look for examples of blind-alley developments in other languages.

Finally, Čamber & Dressler (2022) have found for the first time mutual influences in homophonous inflectional suffixation (in this case: plural formation) which develops partially and temporarily against input distributions in each of the two languages, but we are not aware of similar developments, which represent a new subtype of blind-alley developments, in word formation.

ACKNOWLEDGEMENT

The project "Investigating Parental and Other Caretakers' Utterances to Kindergarten Children (INPUT)" (SSH11–027) was supported by the Vienna Science and Technology Fund (WWTF). Sabine Sommer-Lolei is a recipient of a DOC-team fellowship of the Austrian Academy of Sciences.

REFERENCES

Aitchison, Jean. 1994. Words in the mind: An introduction to the mental lexicon, 2nd edn. Oxford & Cambridge, MA: Blackwell.

Ambridge, Ben, Evan Kidd, Caroline F. Rowland and Anna L. Theakston. 2015. The ubiquity of frequency effects in first language acquisition. Journal of Child Language 42(2). 239–253. https://doi.org/10.1017/S030500091400049X.

Anglin, Jeremy M. 1993. Vocabulary development: A morphological analysis. Monographs of the Society for Research in Child Development 58(10). 1–166. https://doi.org/10.2307/1166112.

Arkadiev, Peter and Francesco Gardani. 2020. Introduction: Complexities in morphology. In P. Arkadiev and F. Gardani (eds.) The complexities of morphology. Oxford: Oxford University Press. 1–19. https://doi.org/10.1093/oso/9780198861287.003.0001.

Arriaga, Rose I., Larry Fenson, Terry Cronan and Stephen J. Pethick. 1998. Scores on the MacArthur communicative development inventory of children from low- and middle-income families. Applied Psycholinguistics 19(2). 209–223. https://doi.org/10.1017/S0142716400010043.

Baayen, R. Harald. 1993. On frequency, transparency and productivity. Yearbook of Morphology 1992. 181–208.

Baayen, R. Harald. 2009. Corpus linguistics in morphology: Morphological productivity. In A. Lüdeling and K. Merja (eds.) Corpus linguistics, Vol. 2. Berlin & New York, NY: Mouton de Gruyter. 899–919. https://doi.org/10.1515_9783110213881.2.899.

Behrens, Heike. 2006. The input-output relationship in first language acquisition. Language and Cognitive Processes 21(1–3). 2–24. https://doi.org/10.1080/01690960400001721.

Berman, Ruth Aronson. 2004. Between emergence and mastery: The long developmental route of language acquisition. In R. A. Berman (ed.) Language development across childhood and adolescence. Amsterdam: John Benjamins. 9–34. https://doi.org/10.1075/tilar.3.05ber.

Bittner, Dagmar, Wolfgang U. Dressler and Marianne Kilani-Schoch (eds.). 2000. First verbs: On the way to mini-paradigms, Vol. 18 (ZAS Papers in Linguistics). Berlin: ZAS.

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

Bittner, Dagmar, Wolfgang U. Dressler and Marianne Kilani-Schoch (eds.). 2003. Development of verb inflection in first language acquisition: A cross-linguistic perspective (Studies on Language Acquisition 21). Berlin & New York, NY: De Gruyter Mouton. https://doi.org/10.1515/9783110899832.

Bonin, Patrick, Christopher Barry, Alain Méot and Marylène Chalard. 2004. The influence of age of acquisition in word reading and other tasks: A never ending story? Journal of Memory and Language 50(4). 456–476. https://doi.org/10.1016/j.jml.2004.02.001.

Čamber, Marina and Wolfgang U. Dressler. 2022. Simultan-bilingualer Pluralerwerb von Deutsch und Kroatisch [Simultaneous bilingual acquisition of plural forms in German and Croatian]. Zagreber Germanistische Studien 31(1). 199–224. https://doi.org/10.17234/ZGB.31.12.

Clark, Eve V. 1993. The lexicon in acquisition. (1st publ. edn.) (Cambridge Studies in Linguistics). Cambridge: Cambridge Univ. Press.

Clark, Eve V. 2014. Acquisition of derivational morphology. In R. Lieber and P. Štekauer (eds.) The Oxford handbook of derivational morphology. Oxford: Oxford University Press. 424–439. https://doi.org/10.1093/oxfordhb/9780199641642.013.0024.

Clark, Eve V. and Ruth A. Berman. 2004. First language acquisition. In G. Booij, C. Lehmann, J. Mugdan and S. Skopeteas (eds.) Morphologie/Morphology: Ein internationales Handbuch zur Flexion und Wortbildung/An international handbook on inflection and word formation, Vol. 2 (Handbücher zur Sprach- und Kommunikationswissenschaft/Handbooks of Linguistics and Communication Science [HSK] 17.2). 1795–1805. Berlin & New York, NY: Walter de Gruyter. https://doi.org/10.1515_9783110172782.2.

Clark, Eve V. and Barbara F. Hecht. 1982. Learning to coin agent and instrument nouns. Cognition 12(1). 1–24. https://doi.org/10.1016/0010-0277(82)90027-0.

Creemers, Ava, Amy G. Davies, Robert J. Wilder, Meredith Tamminga and David Embick. 2020. Opacity, transparency, and morphological priming: A study of prefixed verbs in Dutch. Journal of Memory and Language 110. 104055. https://doi.org/10.1016/j.jml.2019.104055.

Dressler, Wolfgang U. 2005. Word-formation in natural morphology. In P. Štekauer and R. Lieber (eds.) Handbook of word-formation. Dordrecht: Springer. 267–284.

Dressler, Wolfgang U. 2007. Productivity in word formation. In G. Jarema and G. Libben (eds.) The mental lexicon: Core perspectives. Amsterdam: Brill. 159–183. https://doi.org/10.1163/9780080548692_009.

Dressler, Wolfgang U., Anastasia Christofidou, Natalia Gagarina, Katharina Korecky-Kröll and Marianne Kilani-Schoch. 2019. Morphological blind-alley developments as a theoretical challenge to both usage-based and nativist acquisition models. Italian Journal of Linguistics 31(2). 107–140. https://doi.org/10.26346/1120-2726-138.

Dressler, Wolfgang U., Anastasia Christofidou, Natalia Gagarina, Katharina Korecky-Kröll and Marianne Kilani-Schoch. In print. Blind alley developments (BADs): In defense of our approach. Italian Journal of Linguistics.

Dressler, Wolfgang U. and Annemarie Karpf. 1995. The theoretical relevance of pre- and protomorphology in language acquisition. Yearbook of Morphology 1994. 99–122.

Dressler, Wolfgang U., F. Nihan Ketrez and Marianne Kilani-Schoch (eds.). 2017. Nominal compound acquisition. Amsterdam: John Benjamins.

Dressler, Wolfgang U. and Marianne Kilani-Schoch. 2016. Natural Morphology. In A. Hippisley and G. T. Stump (eds.) The Cambridge Handbook of Morphology. Cambridge: Cambridge Univ. Press. 356–389. https://doi.org/10.1017/9781139814720.014.

Dressler, Wolfgang U. and Marianne Kilani-Schoch. To appear. Iconicity in word formation. In O. C. Fischer and P. Perniss (eds.) Handbook of iconicity in language. Oxford: Oxford University Press.

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

Dressler, Wolfgang U., Marianne Kilani-Schoch and Sabine Klampfer. 2003. How does a child detect morphology? Evidence from production. In R. Harald Baayen and R. Schreuder (eds.) Morphological structure in language processing (Trends in Linguistics: Studies and Monographs 151). Berlin & New York, NY: De Gruyter Mouton. 391–425. https://doi.org/10.1515/9783110910186.391.
Dressler, Wolfgang U., Willi Mayerthaler, Oswald Panagl and Wolfgang Ullrich Wurzel. 1987. Leitmotifs in Natural Morphology (Studies in Language Companion Series 10). Amsterdam: John Benjamins Publishing Company.
Dressler, Wolfgang U., Lavinia Merlini Barbaresi, Sonja Schwaiger, Jutta Ransmayr, Sabine Sommer-Lolei and Katharina Korecky-Kröll. 2019. Rivalry and lack of blocking among Italian and German diminutives in adult and child language. In F. Rainer, F. Gardani, W. U. Dressler and H. C. Luschützky (eds.) Competition in inflection and word-formation (Studies in morphology 5). Cham: Springer. 123–143. https://doi.org/10.1007/978-3-030-02550-2_5.
Dressler, Wolfgang U., Sabine Sommer-Lolei, Katharina Korecky-Kröll, Reili Argus, Ineta Dabašinskienė, Laura Kamandulytė-Merfeldienė, Johanna Johansen Ijäs, Victoria V. Kazakovskaya, Klaus Laalo and Evangelia Thomadaki. 2019. First-language acquisition of synthetic compounds in Estonian, Finnish, German, Greek, Lithuanian, Russian and Saami. Morphology 29(3). 409–429. https://doi.org/10.1007/s11525-019-09339-0.
Elsen, Hilke. 1999. Ansätze zu einer funktionalistisch-kognitiven Grammatik: Konsequenzen aus Regularitäten des Erstspracherwerbs [Approaches to a functionalist-cognitive grammar: consequences from regularities of first language acquisition] (Linguistische Arbeiten 403). Tübingen: Niemeyer. https://doi.org/10.1515/9783110915976.
Giraudo, Hélène and Serena Dal Maso. 2016. The salience of complex words and their parts: Which comes first? Frontiers in Psychology 7. 1778. https://doi.org/10.3389/fpsyg.2016.01778.
Gleitman, Lila R., Kimberly Cassidy, Rebecca Nappa, Anna Papafragou and John C. Trueswell. 2005. Hard words. Language Learning and Development 1(1). 23–64. https://doi.org/10.1207/s15473341lld0101_4.
Goldberg, Adele. 2006. Constructions at work: The nature of generalization in language. Oxford & New York, NY: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199268511.001.0001.
Gülzow, Insa and Natalia Gagarina. 2007. Frequency effects in language acquisition: Defining the limits of frequency as an explanatory concept (Studies on Language Acquisition (SOLA) 32). Berlin & New York, NY: De Gruyter Mouton. https://doi.org/10.1515/9783110977905.
Gupta, Prahlad, John Lipinski, Brandon Abbs and Po-Han Lin. 2005. Serial position effects in nonword repetition. Journal of Memory and Language 53(1). 141–162. https://doi.org/10.1016/j.jml.2004.12.002.
Hart, Betty and Todd R. Risley. 1995. Meaningful differences in the everyday experience of young American children. Baltimore, MD: Paul H. Brookes Publishing Co.
Hoff, Erika. 2006. How social contexts support and shape language development. Developmental Review 26(1). 55–88. https://doi.org/10.1016/j.dr.2005.11.002.
Jackendoff, Ray and Jenny Audring. 2020. The texture of the lexicon: Relational morphology and the parallel architecture. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198827900.001.0001.
Juhasz, Barbara. 2005. Age-of-acquisition effects in word and picture identification. Psychological Bulletin 131(5). 684–712. https://doi.org/10.1037/0033-2909.131.5.684.
Ketrez, F. Nihan and Ayhan Aksu-Koç. 2021. Noun and verb derivations in early Turkish child and child-directed speech. In V. Mattes, S. Sommer-Lolei, K. Korecky-Kröll and W. U. Dressler (eds.) The acquisition of derivational morphology: A cross-linguistic perspective (Language Acquisition and Language Disorders 66). Amsterdam & Philadelphia, PA: John Benjamins. 263–287. https://doi.org/10.1075/lald.66.11ket.

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

Kilani-Schoch, Marianne and Wolfgang U. Dressler. 2002. The emergence of inflectional paradigms in two French corpora: An illustration of general problems of pre- and protomorphology. In M. D. Voeikova and W. U. Dressler (eds.) Pre- and protomorphology: Early phases of morphological development in nouns and verbs (Lincom Studies in Theoretical Linguistics 29). Lincom Europa, Munich, pp. 45–59.

Kilani-Schoch, Marianne and Wolfgang U. Dressler. 2005. Morphologie naturelle et flexion du verbe français [Natural Morphology and Inflection of the French verb]. Tübingen: Narr.

Korecky-Kröll, Katharina, Sabine Sommer-Lolei and Wolfgang U. Dressler. 2017. Emergence and early development of German compounds. In W. U. Dressler, F. N. Ketrez and M. Kilani-Schoch (eds.) Nominal compound acquisition (Language Acquisition & Language Disorders 61). Amsterdam: Benjamins. 19–37. https://doi.org/10.1075/lald.61.

Korecky-Kröll, Katharina, Sabine Sommer-Lolei, Veronika Mattes and Wolfgang U. Dressler. 2022. Morphological verb families in German-speaking children and parents of two SES backgrounds according to a groundbreaking model by Dorit Ravid and colleagues. In R. Levie, A. Bar-On, O. Ashkenazi, E. Dattner and G. Brandes (eds.) Developing language and literacy: Studies in honor of Dorit Diskin Ravid. Cham: Springer. 495–514.

Levie, Ronit, Galit Ben-Zvi and Dorit Ravid. 2017. Morpho-lexical development in language impaired and typically developing Hebrew-speaking children from two SES-backgrounds. Reading and Writing 30(5). 1035–1064. https://doi.org/10.1007/s11145-016-9711-3.

Levin, Beth and Malka Rappaport Hovav. 1998. Morphology and lexical semantics. In A. Spencer and A. M. Zwicky (eds.) The handbook of morphology. Oxford & Malden, MA: Blackwell. 248–271. https://doi.org/10.1002/9781405166348.ch12.

Libben, Gary. 2015. Word-formation in psycholinguistics and neurocognitive research. In P. O. Müller, I. Ohnheiser, S. Olsen and F. Rainer (eds.) Word-formation: An international handbook of the languages of Europe, Vol. 1 (Handbücher zur Sprach- und Kommunikationswissenschaft/Handbooks of Linguistics and Communication Science (HSK) 40.1). Berlin & Boston, MA: De Gruyter Mouton. 203–217. https://doi.org/10.1515/9783110246254-015.

Libben, Gary, Christina L. Gagné and Wolfgang U. Dressler. 2020. Representation and processing of compound words. In V. Pirrelli, I. Plag and W. U. Dressler (eds.) Word knowledge and word usage: A crossdisciplinary guide to the mental lexicon (Trends in Linguistics: Studies and Monographs [TiLSM] 337). Berlin & Boston, MA: De Gruyter Mouton. 336–352. https://doi.org/10.1515/9783110440577-009.

Libben, Gary, Jordan Gallant and Wolfgang U. Dressler. 2021. Textual effects in compound processing: A window on words in the world. Frontiers in Communication 6. 646454. https://doi.org/10.3389/fcomm.2021.646454.

MacWhinney, Brian. 2000. The CHILDES Project: Tools for analyzing talk. Mahwah, NJ: Lawrence Erlbaum.

Mattes, Veronika. 2018. Derivationsmorphologie und Wortarten im Erstspracherwerb des Deutschen: Mit einem Fokus auf dem Schuleintrittsalter [Derivational morphology and lexical categories in first language acquisition of German: Focussing on the transition from preschool to school age]. Graz: Universität Graz Habilitationsschrift.

Mattes, Veronika. 2019. What do children know about German verb prefixes? A study on the development of verb derivation from preschool age to school age. The Mental Lexicon 14(2). 274–297. https://doi.org/10.1075/ml.00007.mat.

Mattes, Veronika, Sabine Sommer-Lolei, Katharina Korecky-Kröll and Wolfgang U. Dressler (eds.). 2021. The acquisition of derivational morphology: A cross-linguistic perspective (Language Acquisition & Language Disorders 66). Amsterdam & Philadelphia, PA: John Benjamins. https://doi.org/10.1075/lald.66.

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

Mayerthaler, Willi. 1981. Morphologische Natürlichkeit [Morphological naturalness]. Wiesbaden: Athenaion.
McWhorter, John H. 2005. Defining creole. Oxford: Oxford University Press.
Nippold, Marilyn A. 2008. Later language development: School-age children, adolescents and young adults. 3rd edn. Austin, TX: Pro-Ed.
Peters, Ann M. 1997. Language typology, prosody, and the acquisition of grammatical morphemes. In D. I. Slobin (ed.) The crosslinguistic study of language acquisition: Expanding the contexts, Vol. 5. Hillsdale, NJ: Erlbaum. 136–197.
Rainer, Franz. 2010. Carmens Erwerb der deutschen Wortbildung [Carmen's acquisition of German word formation]. Vienna: Verlag der Österreichischen Akademie der Wissenschaften.
Ravid, Dorit and Avraham Avidor. 1998. Acquisition of derived nominals in Hebrew: Developmental and linguistic principles. Journal of Child Language 25(2). 229–266. https://doi.org/10.1017/S0305000998003419.
Ravid, Dorit and Anael Zimmerman. 2017. Maternal input at 1;6: A comparison of two mothers from different SES backgrounds. In F. Nihan Ketrez, A. C. Küntay, Ş. Özçalışkan and A. Özyürek (eds.) Social environment and cognition in language development: Studies in honor of Ayhan Aksu-Koç (Trends in Language Acquisition Research 21). Amsterdam: Benjamins. 35–52. https://doi.org/10.1075/tilar.21.03rav.
Schwanenflugel, Paula J. 1991. Why are abstract concepts hard to understand? In P. J. Schwanenflugel (ed.) The psychology of word meanings. Hillsdale, NJ: Erlbaum. 223–250.
Serra i Raventós, Miquel. 2014. Interfaces between language components: Bootstrapping in sensitive periods after reaching a critical mass of usage. Anuario de Psicología/The UB Journal of Psychology 44(1). 85–93.
Slobin, Dan I. 1973. Cognitive prerequisites for the development of grammar. In C. A. Ferguson and D. I. Slobin (eds.) Studies of child language development. New York, NY: Holt, Rinehart & Winston. 175–208.
Slobin, Dan I. 1985. Crosslinguistic evidence for the language-making capacity. In D. I. Slobin (ed.) The crosslinguistic study of language acquisition. Hillsdale, NJ: Erlbaum. 1157–1256. https://doi.org/10.4324/9780203781890.
Smolka, Eva, Gary Libben and Wolfgang U. Dressler. 2019. When morphological structure overrides meaning: Evidence from German prefix and particle verbs. Language, Cognition and Neuroscience 34(5). 599–614. https://doi.org/10.1080/23273798.2018.1552006.
Smolka, Eva, Katrin H. Preller and Carsten Eulitz. 2014. 'Verstehen' ('understand') primes 'stehen' ('stand'): Morphological structure overrides semantic compositionality in the lexical representation of German complex verbs. Journal of Memory and Language 72. 16–36.
Sommer-Lolei, Sabine. 2022. Der frühe Erwerb der deutschen Derivationsmorphologie: Eine korpuslinguistische Untersuchung der Kindersprache in Interaktion mit dem elterlichen Input [Early acquisition of derivational morphology in German: A corpuslinguistic study of child speech in interaction with parental input]. Doctoral dissertation. Universität Wien, Vienna.
Sommer-Lolei, Sabine and Wolfgang U. Dressler. In print. First-language acquisition of agent and instrument nouns in German as (non-)prototypical derivational categories. In M. Werner and W. U. Dressler (eds.) Derivation and inflection. Vienna: Verlag der Österreichischen Akademie der Wissenschaften.
Sommer-Lolei, Sabine, Katharina Korecky-Kröll, Markus Christiner and Wolfgang U. Dressler. 2021. Acquisition and processing of (mor)phonotactic consonant clusters in German. In W. U. Dressler, B. Calderone, S. Sommer-Lolei and K. Korecky-Kröll (eds.) Experimental, acquisitional and corpus linguistic approaches to the study of morphonotactics (Veröffentlichungen zur Linguistik und Kommunikationsforschung 32). Vienna: Verlag der Österreichischen Akademie der Wissenschaften. 77–100.

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC

Sommer-Lolei, Sabine, Veronika Mattes, Katharina Korecky-Kröll and Wolfgang U. Dressler. 2021. Early phases of development of German derivational morphology. In V. Mattes, S. Sommer-Lolei, K. Korecky-Kröll and W. U. Dressler (eds.) The acquisition of derivational morphology: A cross-linguistic perspective (Language Acquisition & Language Disorders 66). Amsterdam & Philadelphia, PA: John Benjamins. 109–140. https://doi.org/10.1075/lald.66.05som.

Stephany, Ursula. 2021. The development of derivation in early Greek first language acquisition. In V. Mattes, S. Sommer-Lolei, K. Korecky-Kröll and W. U. Dressler (eds.) The acquisition of derivational morphology: A cross-linguistic perspective (Language Acquisition & Language Disorders 66). Amsterdam & Philadelphia, PA: John Benjamins. https://doi.org/10.1075/lald.66.02ste.

Stephany, Ursula and Maria D. Voeikova (eds.). 2009. Development of nominal inflection in first language acquisition: A cross-linguistic perspective. Berlin & New York, NY: De Gruyter Mouton.

Sumner, Emily, Erika DeAngelis, Mara Hyatt, Noah Goodman and Celeste Kidd. 2019. Cake or broccoli? Recency biases children's verbal responses. Plos One 14(6). e0217207. https://doi.org/10.1371/journal.pone.0217207.

Swan, Deanne W. 2000. How to build a lexicon: A case study of lexical errors and innovations. First Language 20(2). 187–204. https://doi.org/10.1177/014272370002005904.

Tomasello, Michael. 2003. Constructing a language: A usage-based theory of language acquisition. Cambridge, MA: Harvard University Press.

Ungerer, Friedrich. 1999. Diagrammatic iconicity in word-formation. In M. Nänny and O. C. Fischer (eds.) Form miming meaning: Iconicity in language and literature. Amsterdam: John Benjamins.

Van der Schuit, Margje, Eliane Segers, Hans Van Balkom and Ludo Verhoeven. 2011. How cognitive factors affect language development in children with intellectual disabilities. Research in Developmental Disabilities 32(5). 1884–1894. https://doi.org/10.1016/j.ridd.2011.03.015.

Verhagen, Josje and Paul Leseman. 2016. How do verbal short-term memory and working memory relate to the acquisition of vocabulary and grammar? A comparison between first and second language learners. Journal of Experimental Child Psychology 141. 65–82. https://doi.org/10.1016/j.jecp.2015.06.015.

Veríssimo, João, Vera Heyer, Gunnar Jacob and Harald Clahsen. 2018. Selective effects of age of acquisition on morphological priming: Evidence for a sensitive period. Language Acquisition 25(3). 315–326. https://doi.org/10.1080/10489223.2017.1346104.

Wurzel, Wolfgang Ullrich. 1984. Flexionsmorphologie und Natürlichkeit: ein Beitrag zur morphologischen Theoriebildung [Inflectional morphology and naturalness: a contribution to morphological theory building]. Berlin: Akademie Verlag.

Xanthos, Aris, Sabine Laaha, Steven Gillis, Ursula Stephany, Ayhan Aksu-Koç, Anastasia Christofidou, Natalia Gagarina, Gordana Hrzica, F. Nihan Ketrez, Marianne Kilani-Schoch, Katharina Korecky-Kröll, Melita Kovačević, Klaus Laalo, Marijan Palmović, Barbara Pfeiler, Maria D. Voeikova and Wolfgang U. Dressler. 2011. On the role of morphological richness in the early development of noun and verb inflection. First Language 31(4). 461–479. https://doi.org/10.1177/0142723711409976.

Open Access. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited, a link to the CC License is provided, and changes – if any – are indicated. (SID_1)

t to you by MTA Könyvtár és Információs Központ olvasók | Unauthenticated | Downloaded 09/29/23 08:30 AM UTC