Early word segmentation in naturalistic environments: Limited effects of speech register

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Abstract

We examined 7.5-month-old infants' ability to segment words from infant- and adult-directed speech (IDS and ADS). In particular, we extended the standard design of most segmentation studies by including a phase where infants were repeatedly exposed to target word recordings at their own home (extended-exposure) in addition to a laboratory-based familiarization. This enabled us to examine infants' segmentation of words from speech input in their naturalistic environment, extending current findings to learning outside the laboratory. Results of a modified preferential-listening task show that infants listened longer to isolated tokens of familiarized words from home relative to novel control words regardless of register. However, infants showed no recognition of words exposed to during purely laboratory-based familiarization. This indicates that infants succeed in retaining words in long-term memory following extended-exposure and recognizing them later on with considerable flexibility. In addition, infants segmented words from both IDS and ADS, suggesting limited effects of speech register on learning from extended-exposure in naturalistic environments. Moreover, there was a significant correlation between segmentation success and infants' attention to ADS, but not to IDS, during the extended-exposure phase. This finding speaks to current language acquisition models assuming that infants' individual attention to language stimuli drives successful learning.

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Introduction

One of the many challenges facing the young language learner is the task of acquiring an inventory of words in their native language. However, this task is not as simple and straightforward as it might seem since infants are rarely presented with words in isolation (Woodward & Aslin, 1990; Johnson, Lahey, Ernestus, & Cutler, 2013). Instead, infants are presented with a stream of acoustic input without knowing what the individual words in their language are and without explicit information about where the boundaries between words occur in this continuous stream (Cole & Jakimik, 1980). Understanding the factors that influence infants' development of the ability to segment words from fluent speech has, therefore, been a central focus of the literature on infant language acquisition.

The aim of the current study was to further examine these factors. In particular, we compare the extent to which infants are able to extract and store words in long-term memory through repeated exposure to words in a naturalistic setting at home versus a brief laboratory-based familiarization. Furthermore, we compare infants' ability to segment words from speech presented in two different registers, the infant- and the adult-directed speech register, in both naturalistic and laboratory settings, given that previous research reports differences in infants' ability to segment words from infant- and adult-directed speech (Thiessen, Hill, & Saffran, 2005; Singh, Nestor, Parikh, & Yull, 2009).

Infants' segmentation of words from fluent speech

Two decades ago, Jusczyk and Aslin (1995) investigated American infants' ability to detect words in a continuous fluent speech stream. Familiarizing 7.5-month-old infants with isolated tokens of words and testing them on their recognition of these words in passages, they found that infants listened significantly longer to passages containing the previously familiarized words compared to passages containing novel control words. This pattern was also observed when infants were familiarized with passages containing target words and tested on isolated tokens of either the familiarized target words or novel control words, thereby providing stronger evidence for the finding that infants can detect words and word boundaries in fluent speech.

The fact that younger infants at 6 months of age did not show such a preference was initially taken to suggest that the ability to detect words in fluent speech develops around 7.5-months of age. However, more recent studies report segmentation success in different contexts at younger ages as well (Johnson, Seidl & Tyler, 2014; Altvater-Mackensen & Mani, 2013; Shukla, White & Aslin, 2011; Thiessen & Erickson, 2013), suggesting that the context in which segmentation abilities are tested is critical to segmentation success.

One factor, in particular, that has been shown to impact infants' segmentation skills and retention of words is the kind of exposure to words that infants receive. Most segmentation studies to-date have focused on exposing infants to isolated tokens or short streams of continuous speech in a laboratory-based situation and then immediately examining their recognition of the previously presented words. While such studies are critical to examining the kinds of cues that infants use to segment words from fluent speech, it is difficult to evaluate the extent to which these findings allow conclusions regarding infant learning from more naturalistic environments and their retention of words heard over extended periods of time in such environments.

Studies examining infants' learning in more naturalistic environments and/or their later retention of learned words provide more information on this issue: Jusczyk and Hohne (1997) familiarized 8-month-old infants with words embedded in stories across an extended two-week period and tested their retention and recognition of these words after a further two weeks had passed. They found that infants listened significantly longer to the isolated tokens of the previously familiarized words relative to novel control words, suggesting that extended-exposure to words at home aids in the retention of lexical tokens in long-term memory. Furthermore, Mandel, Jusczyk, and Pisoni (1995) report that even 4.5-month-olds are able to detect their own names in fluent speech, while Bortfeld and colleagues (2005) find that 6-month-olds can use their knowledge of a limited set of words, e.g., their own names, to segment adjacent words from the speech stream. These findings suggest that even very young infants are learning from speech presented in their naturalistic environment and are able to retain words acquired through such exposure and use these early words to help them segment other words from the speech stream (see also Altvater-Mackensen & Mani, 2013 for similar findings)[1].

However, as suggested in the Jusczyk and Hohne (1997) study, such findings might be restricted to circumstances where infants are sat down in a chair and made to listen to pre-recorded stories while a research assistant engaged the infants by flipping through a picture book related to the stories. While story-telling sessions have repeatedly been shown to improve infants' learning of words (e.g., Horst, Parsons, & Bryan, 2011), they constitute only a small portion of the caregiver-child interactions. The findings by Jusczyk and Hohne (1997) do not, therefore, inform us with regard to infants' learning from overheard speech without additional contextual support (i.e., a storybook).

Against this background, the current study examined the extent to which infants are able to detect words in fluent speech through repeated-exposure to stories containing these words in their everyday environment at home. In particular, we compare infants' segmentation of words from fluent speech across different learning contexts, i.e., repeated exposure to the stories at home versus a brief laboratory familiarization phase (to examine the additional benefit of extended exposure in a naturalistic setting on infant segmentation.

We further extended the findings of Jusczyk and Hohne (1997) in one important respect, namely, by manipulating the kind of speech presented to infants in the different learning contexts. Infants are exposed to different kinds of speech in their naturalistic environment. On the one hand, infants in many cultures are addressed in an exaggerated register, typically referred to as infant-directed speech or motherese (see Soderstrom, 2007 for a complete review). On the other hand, infants are also exposed to communication between other members of their household, e.g., either to speech between two experienced users of their native language, typically referred to as adult-directed speech, or speech between their caregivers and other siblings. While Jusczyk

[1] It is worth highlighting that the benefits of extended-exposure at home are not only limited to the language domain. For instance in the field of face processing infants show different brain activity to familiar and unfamiliar faces depending on whether they have been familiariized with a face at home or only in the laboratory (e.g., Moulson, Shannon, & Nelson, 2011). This suggests that a) the kind of exposure infants are given to novel stimuli can dramatically influence their response to these stimuli and also that b) even very young infants are beginning to extract and store information from their environment in sufficient detail so as to be able to detect novel tokens of these stimuli later on.

and Hohne (1997) examine infant segmentation of infant-directed speech stimuli, the current study explores infant segmentation of words from speech in naturalistic and laboratory settings in two different speech registers, namely, infant- and adult-directed speech. This allows us to examine the extent to which infants are able to learn from the variety of input available to them in their naturalistic home environments.

Infants' processing of infant- and adult-directed speech

The acoustic characteristics of infant-directed speech (henceforth referred to as IDS) differ from the kind of speech that adults typically use when speaking to one another, i.e., adult-directed speech (henceforth, ADS; Ferguson, 1964; Grieser & Kuhl, 1988). Some of the main differences between IDS and ADS lie in their prosodic characteristics[2]: speech addressed to infants is slower, higher in pitch, with longer pauses between words, and with greater variation in pitch within utterances and enhancement in the articulation of the vowels and consonants (e.g., Kuhl et al., 1997; Bernstein Ratner & Luberoff, 1984; McRoberts & Best, 1997; Papousek, Papousek, & Symmes, 1991; van de Weijer, 2002; Fernald et al., 1989; see Soderstrom, 2007 for a comprehensive review; but see Martin et al., 2015; Benders, 2013 who call the hyperarticulation hypothesis, i.e., the enrichment of input through hyperarticulation of phonemes, into question).

Studies show that, from a very early age, infants attend preferentially to IDS relative to ADS, with important implications for language learning success from speech presented in the infant- as opposed to the adult-directed register. For instance, even two-day-old infants prefer to listen to IDS relative to ADS (Cooper & Aslin, 1990) while electrophysiological studies find differences in the brain activity to IDS and ADS in 6- and 13-month-old infants (Zangl & Mills, 2007). Furthermore, it has been shown that IDS facilitates infants' detection of words from fluent speech (Thiessen, Hill, & Saffran, 2005) and that even after 24 hours, infants are able to recognize previously familiarized words

2 Note that IDS and ADS also differ from one another in other respects; critically, IDS is directed to the infant while ADS is not. Similarly, there are likely to be situations where speech consistent with the acoustic characteristics of IDS are not directed towards the infant, e.g., in the case of speech addressed to a sibling infant. While these factors are likely to influence infants' attention to and learning from IDS and ADS in naturalistic environments, our study focuses on the influence of the varying acoustic characteristics of the two speech registers on segmentation success.

if they were familiarized with these words in IDS (Singh, Nestor, Parikh, & Yull, 2009), but not if they were familiarized with these words in ADS. Infants also show improved learning of word-object associations when the words are presented in IDS relative to ADS (Song, Demuth, & Morgan, 2010; Graf-Estes & Hurley, 2013; Ma, Golinkoff, Houston, & Hirsh-Pasek, 2011).

On the one hand, the linguistic and acoustic properties of IDS may foster learning given that repetitive structures like those found in IDS facilitate infant word recognition (Fernald & Cummings, 2003) and given that the simplified phrasal structure, exaggerated prosodic markings and consistencies found in IDS may facilitate vocabulary growth (Fisher & Tokura, 1996; Weisleder & Fernald, 2013; Vosoughi, Roy, Frank, & Roy, 2010) and are a predictor for later vocabulary size (Shneidman, Arroyo, Levine, & Goldin-Meadow, 2013). Alternatively, it is also possible that the facilitatory effect of IDS may lie in its focusing infants' attention on language (e.g., Rose, Feldman, & Jankowski, 2003), thus speeding learning from speech presented in this register. While we cannot, at this point, draw strong conclusions as to the reasons why IDS may preferentially foster learning, it remains to be seen whether there is a similar facilitatory effect of IDS in learning from speech input presented in naturalistic environments, as has been suggested in laboratory-based studies.

So the current study compares German infants' detection of words from fluent speech presented in both the infant and adult-directed register. In particular, infants were exposed to words embedded in stories in a naturalistic setting at home, presented in either IDS or ADS. Parents were asked to play the stories to their infants but not otherwise draw their attention to the stories or give additional contextual support for the stories, e.g.,such as a picture-book as in Jusczyk and Hohne (1997). Following six weeks of familiarization, infants were invited to the lab, where we tested their recognition of words they had heard before in the stories at home (hereafter, extended-exposure at home condition), words they heard for the first time in sentences in a laboratory familiarization phase (hereafter, lab-familiarization condition) – similar to standard segmentation studies – and control words they had never heard before. This enables us to study infant word segmentation outside of the standard laboratory setting in their everyday environment allowing for generalizations on early language acquisition in real life. Based on the findings reviewed above, we predict that infants ought to show improved recognition of words embedded in stories in IDS relative to ADS, regardless of whether they were familiarized with the words at home or in the laboratory alone. Furthermore, we suggest that infants may show improved learning and retention of words they were also exposed to in a naturalistic home environment relative to words they heard only in the laboratory-based setting, thereby examining how experiences outside the laboratory may shape the path of language learning.

Method

The study consisted of three different phases: an extended-exposure phase at home, a lab-familiarization phase and a test phase (see Table 1).

Table 1. Overview of study phases and characteristics of words presented in each phase.

Phase	***Words***	***Speech Register***	***Speaker***
Extended-exposure at home	1 word embedded in 6 stories	ADS or IDS (between-subject)	Speaker A
Lab-familiarization	Word from extended exposure phase and 1 additional novel word embedded in passages	moderate IDS	Speaker B
Test	Word from extended exposure phase, laboratory familiarization phase and 2 novel control words presented in isolation	moderate IDS	Speaker B

Participants

48 monolingual German infants at the age of 7.5 months were recruited for the study. Half of the infants were familiarized with the stimuli in infant-directed speech (IDS condition) while the other half of the infants were familiarized with the same stimuli in adult-directed speech (ADS condition). At the start of the extended home familiarization period, infants ranged in age from 7 months 3 days to 7 months 26 days (mean age 231 days) for the IDS condition and 7 months 3 days to 7 months 25 days (mean age 232 days) for the ADS condition. Infants were then invited to the lab for testing when they

were aged between 8 months 20 days to 9 months 15 days (mean age 275 days) in the IDS condition and from 8 months 22 days to 9 months 16 days (mean age 276 days) in the ADS condition. For each condition, exactly half of the children were boys and half were girls. An additional three children had to be excluded from the study (not completing the test phase, n=1; no data saved, n=1; fussiness, n=1).

Material and Design

Six different short narratives from the Brothers Grimm were used for the study (see Appendix). The protagonist of each of the narratives was replaced by a monosyllabic pseudo-word, i.e., Fend (fɛnt), Mieck (mi:k), Nohl (no:l), and Kulb (kʊlp). We created eight versions of each story such that two versions of each story contained the same protagonist. Thus, the story "Der Fend und das Pferd" was recorded twice with Fend as the main protagonist (once in typical German IDS, and once in ADS), and similarly for each of the other three protagonists.

Acoustic analysis ensured the validity of the stimuli for German infants. Independent samples t-test revealed that there were significant differences between ADS and IDS with respect to mean pitch (ADS, M = 180.84 Hz; IDS, M = 230.65 Hz, $t(484) = -32.80$, $p < 0.001$), maximum pitch (ADS, M = 227.71 Hz; IDS, M = 348.15 Hz, $t(484) = -37.41$, $p < 0.001$), pitch range (ADS, M = 13.24 Hz; IDS, M = 19.73 Hz, $t(484) = -13.94$, $p < 0.001$), and duration (ADS, M = 4.70 sec; IDS, M = 8.30 sec, $t(484) = -11.96$, $p < 0.001$). There was a near-significant difference for minimum pitch (ADS, M = 111.97 Hz; IDS, M = 116.98 Hz, $t(484) = -1.83$, $p = 0.068$). The acoustic characteristics of the stimuli were similar to typical infant- and adult-directed German speech (Fernald et al., 1989).

In addition, we created four different passages with six different grammatically and syntactically correct sentences for the lab-familiarization . As in Jusczyk and Aslin (1995), we ensured that the target word occurred systematically in different positions in the sentence: each novel monosyllabic word occurred twice in the beginning, twice in the middle and twice towards the end of the sentences of its passage. The number of words in each sentence was identical across the four different passages. The passages presented to infants in the lab- familiarization were recorded by a different speaker to the one who recorded the stories presented to infants at home. This ensured a) that lab-familiarization was not influenced by infants' prior familiarity with the speakers' voice for comparability with previous segmentation studies and b) that performance for the extended-exposure at home words was not influenced by children having heard the same speaker say the words before. Furthermore, we ensured that the stimuli presented in the lab-familiarization were recorded in moderate German IDS, a speech style in between ADS and IDS, with a mean pitch of 222 Hz in order to exclude results being driven exclusively by potential facilitatory effects of IDS. Thus, the task also examines how infants generalize learning from stimuli presented in ADS to recognition of the same stimuli in moderate IDS in the laboratory.

Furthermore, the same female speaker who recorded the stimuli for the lab-familiarization was asked to record a number of isolated tokens of all four novel monosyllabic words. Three different isolated tokens were selected for each novel monosyllabic target word to be presented to infants in the test phase.

Procedure

Extended-Exposure at Home Phase. Parents of 7.5-month-old infants (n = 48) were sent CDs with six different stories containing one and the same novel pseudoword in either German infant- or adult-directed speech and were asked to ideally play one story to their child every day over a six-week period (extended-exposure at home). Thus, each child heard only one novel word in all of the stories at home. Across children it was counterbalanced which of the four novel words occurred in the stories so that an equal number of children (n = 12) heard each of the four novel words in the stories. Parents were instructed to have their child lie or sit in a room near the loudspeakers and play a story every day for one week and then move to the next story on the CD. Thus, when children were invited to come to the laboratory after six weeks, at the age of 9 months, they had listened to all six different stories. Each child heard all six stories in either IDS or ADS, with children randomly assigned to each condition. Thus, half the children heard the stories in only IDS and the other half of the children heard the stories in ADS.

In addition, parents were given a diary to track the frequency with which they played the stories to their babies at home, as well as their infants' attention to the stories for each day the story was played. Parents were told not to attract the child's attention to the stories but rather to rate the individual infant's attention on a scale of 1 to 5 (with 1 being inattentive and 5 being very attentive). So the total number of stories listened to and the degree of attention paid to the stories was collected for each child. Parents did not report their infants to be familiar with any of the stories presented to them.

Lab-Familiarization Phase. Following the extended-exposure at home phase, children were invited to the laboratory. Each child was tested individually in a separate, quiet room. The child either sat by herself strapped into a car seat or on the parents' lap about 60 cm away from a large monitor, which presented infants with a blinking checkerboard. The auditory stimuli were presented via loudspeakers that were situated above the television screen. Two cameras mounted directly above the TV screen recorded children's eye-movements during the experiment. Synchronized signals from the cameras were routed via a digital splitter to provide two separate time-locked images of the child, which were used for both online and offline scoring.

Stimuli were presented using the Look software (Meints & Woodford, 2008). Each trial presented infants with the blinking checkerboard on the screen paired with an auditory stimulus. A trained experimenter controlled the experiment from an adjacent room. Based on the video image of the child, she started a trial when the infant was looking to the screen and continued to indicate throughout the trial whether the infant was looking to the screen or away by pressing the corresponding button on a keyboard.. In between trials the screen remained blank. However, if infants lost interest and did not look back at the screen, the experimenter initiated a flashing light paired with the sound of a ringing bell to reorient infants towards the screen (see Altvater-Mackensen & Mani, 2013, for a similar procedure).

Infants listened to alternating blocks of two passages containing six sentences spoken in an infant-directed manner. We only presented infants with IDS in this phase, since we know from previous work that infants have difficulties segmenting words from ADS based on brief-laboratory based exposure (Thiessen, Hill, & Saffran, 2005; Singh, Nestor, Parikh, & Yull, 2009; Mani & Pätzold, accepted). One passage contained sentences including the word that children had been exposed to in the stories at home[3], while the second passage contained sentences including another pseudo-word that the

[3] It is important to note that parents were asked to not pronounce the extended-exposure at home word at any time before the experiment. Hereby, we prevented additional exposure to the target word by a familiar speaker.

children had not heard before. Each passage was repeated either for a total of six times or until the child had listened to both passages for a total of 100 seconds. Each trial contained one passage, consisting of six sentences with 1 second of silence between sentences, adding up to a trial length of approximately 23 seconds. Each trial lasted until completion or until the infant looked away for more than 2 consecutive seconds. Trial order was randomized.

Test Phase. The test phase started directly after the laboratory-familiarization phase. Infants were presented with isolated tokens of the word they had heard in stories at home during the extended-exposure phase, the word they heard only in the laboratory during the lab-familiarization phase and two novel control words. Each child received three trials each containing isolated tokens of the extended-exposure, the lab-familiarized and the two control words, i.e., 12 trials in total. As in the lab-familiarization phase, the experimenter waited until the child fixated the center of the monitor where the blinking checkerboard was located to initiate the playing of the isolated words. Each trial presented 15 repetitions of the word alternating between three different tokens, with each token being repeated five times, separated by 500 milliseconds of silence, leading to a trial length of approximately 18 seconds. Each trial lasted until completion or until the infant looked away for more than 2 consecutive seconds. Trial order was randomized.

Across infants, we counterbalanced which words were presented during the extended-exposure, the lab-familiarization and as novel control words in the test phase. Thus, any differences in listening times to isolated tokens of the words could not be a result of a preference for the sounds of one word relative to the other, but rather due to infants' previous exposure to the words alone.

Coding and Reliability

The looking behavior of the infants was assessed online using the digital stimulus presentation and scoring system (Present; Meints & Woodford, 2008). A trained coder indicated whether the child was looking at the screen or away at any point during the experiment. The experimenter was blind to the experimental condition: there were no information on the condition provided by the computers and the experimenter could not hear the stimuli as she sat in the adjacent room to the booth where the stimuli were presented and wore Philipps SHN9500 noise cancelling headphones that cover the entire ear during the whole experiment.

A second independent coder assessed a random sample of 15% of each condition offline to confirm the reliability of the online-coded data with a high degree of inter-rater reliability (r = .99). The coding output was later aligned with information about the phase of the experiment and the auditory stimulus presented. For each infant we calculated the summed listening times during the lab-familiarization and test phase separately for sentences containing extended-exposure and lab-familiarization words as well as for the isolated tokens of extended-exposure, lab-familiarization and novel control words.

Results

Familiarization phase

First, we analyzed infants' listening times to passages containing the words in the laboratory familiarization phase. Note that infants had heard the extended-exposure words before in the stories at home but had not heard the lab-familiarized words before. A repeated-measures ANOVA on mean listening time with the within-subject factor *familiarity* (extended-exposure, lab-familiarization) and the between-subject factor *condition* (IDS; ADS) revealed a significant main effect of *familiarity* ($F(1, 47) = 11.15$, $p = .002$), but no main effects of *condition* or interactions between *condition* and *familiarity*. Thus, infants listened longer to passages containing the extended-exposure word (M = 14.79, SD = 4.71) relative to the novel lab-familiarized word (M = 12.69, SD = 5.09), already in the lab-familiarization phase, regardless of whether they had heard the stories in IDS or ADS at home (see Figure 1).

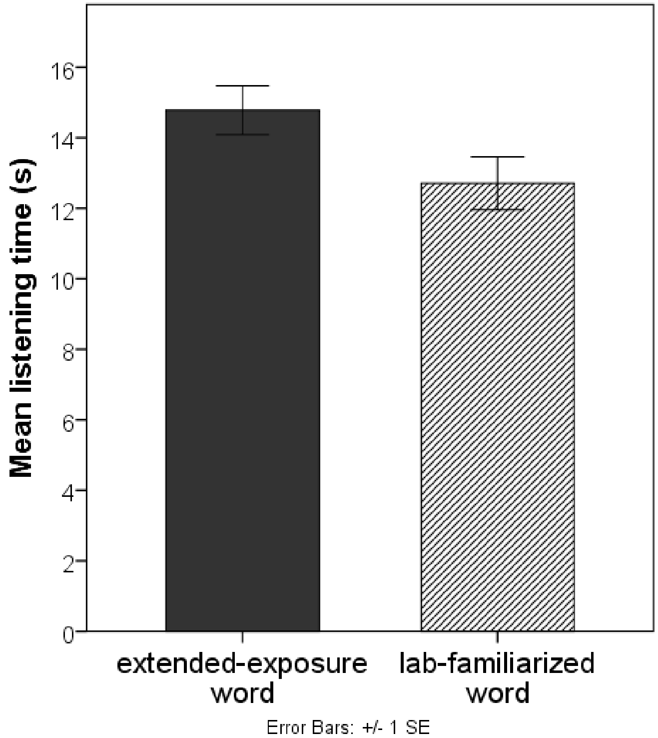

Figure 1. **Mean listening times during the laboratory familiarization phase to sentences containing the words presented during extended-exposure at home and novel lab-familiarized words.**

Test phase

We then analyzed infants' listening times to the different types of isolated words in the test phase (see Figure 2). A repeated-measures ANOVA on mean listening time with the within-subject factor *familiarity* (extended-exposure, lab-familiarized, control word) and the between-subjects factor *condition* (IDS versus ADS) found no significant main effect of *condition* ($F(2, 92) = 1.25$, $p = .270$) but again a significant main effect of *familiarity* ($F(2, 92) = 6.69$, $p = .002$). There was no significant interaction between *familiarity* and *condition* ($F(2; 92) = 0.15$, $p = .860$). Three further repeated-measures ANOVA examined the differences between the three different familiarity levels. A repeated-measures ANOVA with the within-subject factor *familiarity* (extended-exposure at home and control word) revealed that there was a significant main effect of *familiarity* ($F(1, 46) = 11.93$, $p = .001$), with increased listening times to extended-exposure words ($M = 10.57$, $SD = 3.82$) relative to novel control words ($M = 8.88$, $SD = 3.35$). This pattern was shown by 15 of 24 infants in the ADS condition and by 18 of 24 infants in the IDS condition. Similarly, a repeated-measures ANOVA with the factor *familiarity* (extended-exposure at home and lab-familiarization) also showed a significant main effect of *familiarity* ($F(1, 46) = 5.17$, $p = .028$) with increased listening times to extended-exposure words relative to lab-familiarized words ($M = 9.46$, $SD = 3.98$). This pattern was shown by 16 of 24 in the ADS condition and 16 of 24 in the IDS condition. There was no significant main effect of *familiarity* with the two levels lab-familiarized and control word ($F(1, 46) = 1.84$, $p = .182$). Neither were there any significant main effects of *condition* or significant interactions between *familiarity* and *condition* for the three different two-leveled repeated-measures ANOVAs conducted ($p_s > .248$), suggesting similar performance in IDS and ADS. Importantly, there was also no significant main effect of the between-subjects factor *word* (Fend, Kulb, Nohl, Mieck), suggesting that successful segmentation was not driven by infants' preference for one word over the others ($F(3, 40) = 0.77$, $p = .518$). Table 2 provides a summary of the results.

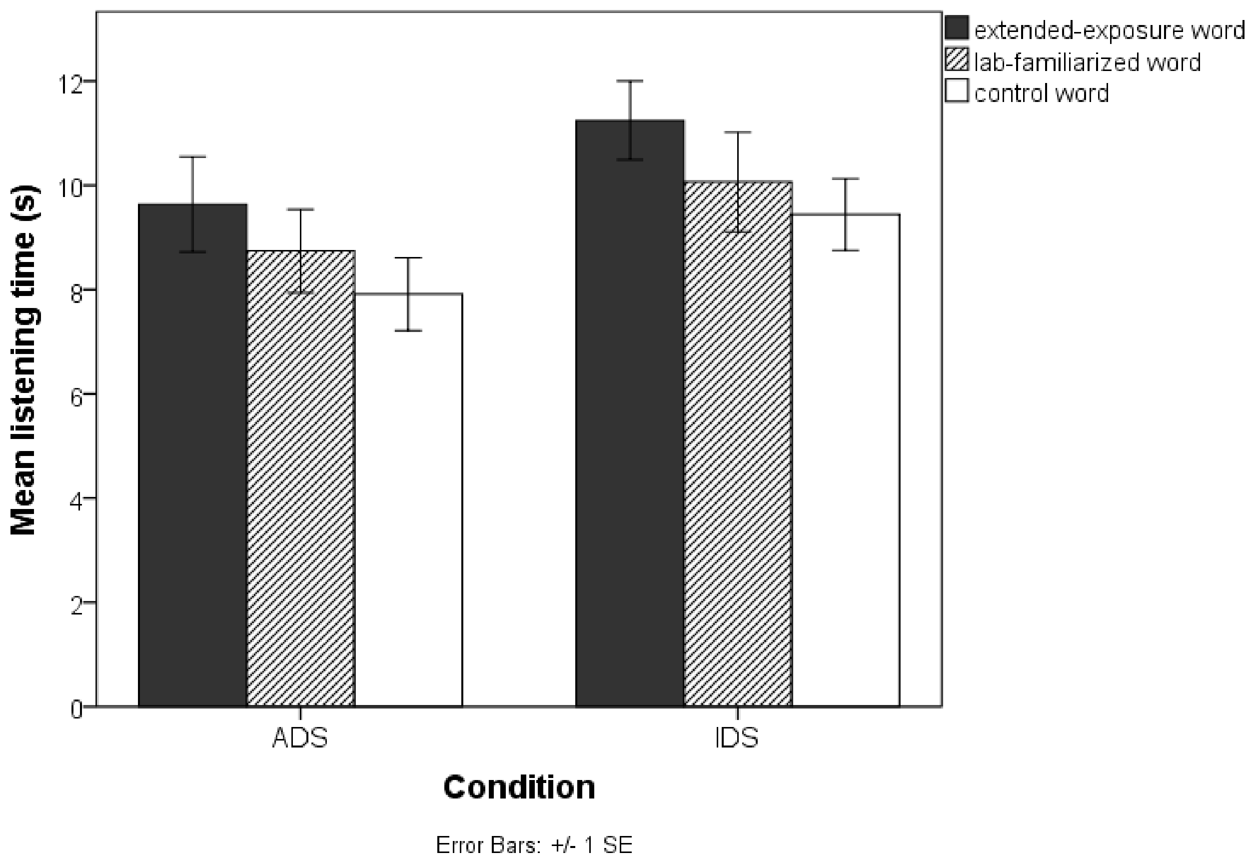

Figure 1. **Mean listening times for the extended-exposure, the lab-familiarized and the control word in the ADS and IDS condition.**

Table 2. Summary of results.

Phase	*Condition*	*Results (listening times)*
Lab-familiarization	IDS and ADS	extended-exposure > lab-familiarized
Test	IDS and ADS	extended-exposure > lab-familiarized extended-exposure > novel control lab-familiarized = novel control

Bivariate correlations were conducted to assess whether (a) the total amount of listening to the stories during the extended-exposure phase and (b) infants' mean attention to the extended-exposure stories correlated with infants' recognition of isolated tokens of the extended-exposure words (indexed by the difference in listening times to extended-exposure and control words). On average, parents reported that their children attended to the stimuli with a score of 2.4 (ranging from 1.0 to 3.9) and that they played the stories to the children an average of 37 times (ranging from 22 to 42). There was no significant difference in mean attention between the two speech register conditions (ADS: $M = 2.33$, $SD = 0.68$, IDS: $M = 2.47$, $SD = 0.72$; $t(45) = -0.68$, $p = .5$). Similarly, there was no significant difference in the total number of times the stories were listened to between the IDS and ADS group ($t(45) = -0.56$, $p = .577$).

However, children's attention to the stories during extended-exposure correlated significantly with their segmentation of the extended-exposure words for those children who had listened to the stories in ADS ($r(24) = 0.45$, $p = .028$). Thus, those children who were presented with the stories in ADS were better able to segment the words from the stories if they were reported to have attended more to the stories. This was not the case for children who were presented with the stories in IDS (see Figure 3).

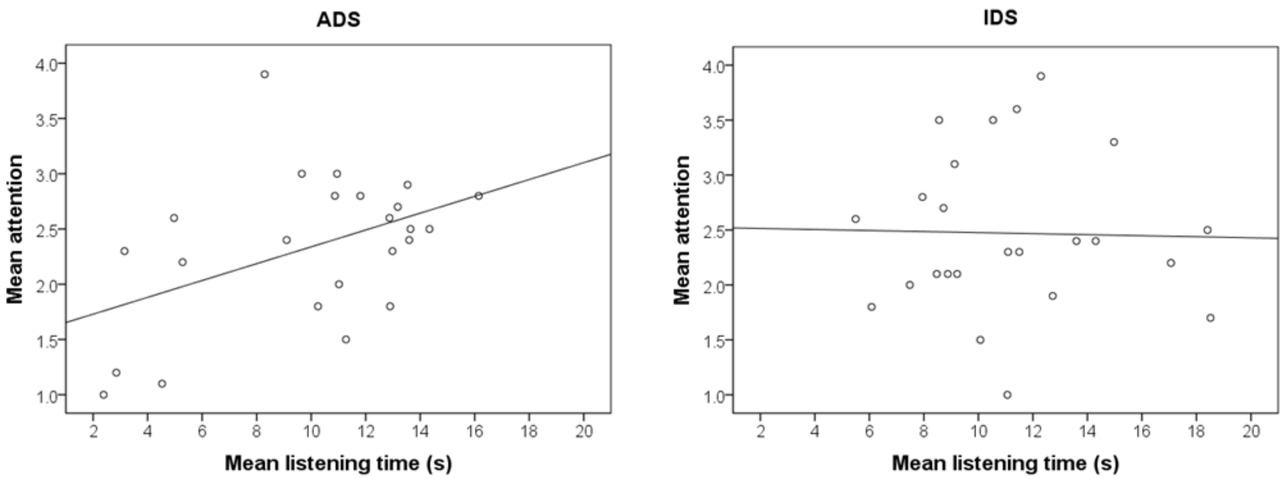

***Figure 3*. Mean listening times for the extended-exposure at home words and children's mean attention while listening to the stories at home for the ADS and IDS condition.**

Discussion

The aim of the current study was to investigate infants' segmentation abilities from fluent speech outside of the laboratory in infants' everyday environment. In particular, we examined whether German infants' ability to segment words from fluent speech is influenced by (a) the type of exposure to the words they receive (lab-familiarization versus extended-exposure at home), and (b) the register of speech the words are presented in (IDS versus ADS).

Half of our infants were exposed to target words embedded in stories in IDS while the other half were exposed to the same stories in ADS over an extended six-week period. We found that German 9-month-olds successfully recognized the words they had been exposed to previously at home – regardless of whether this exposure was in the infant- or adult-directed register. In contrast, infants did not recognize isolated tokens of words they were familiarized with in a brief laboratory-based exposure phase (for similar findings in German 7-month-olds see Altvater-Mackensen & Mani, 2013). In the following sections, we will examine the findings in more detail, outline future implications and address limitations of the present study.

Infants' learning from extended exposure to IDS and ADS at home

The main finding of the study was that infants listened longer to words they had previously been familiarized with through the extended-exposure phase relative to novel control words. These results suggest that infants were able to recognize these words based on either their previous extended exposure to these words at home and/or through their recent familiarization with these words in the brief laboratory-based familiarization phase. We suggest that the results are based on infants' prior extended exposure to the words for the following reasons. First, we note that the preference for the extended-exposure words was already present in the lab-familiarization phase, i.e., infants listened longer to the passages containing the extended-exposure word relative to the passages containing the lab-familiarized word which was presented to them for the first time in the laboratory. This suggests that even before the test phase infants displayed recognition of the words from the extended-exposure phase. Second, we note that infants showed no evidence of learning from the lab-familiarization phase (discussed in further detail below), i.e., in the test phase, infants did not listen longer to words they had been exposed to only in the lab-familiarization phase relative to novel control words. Hence, infants' discrimination of extended-exposure words from lab-familiarized and novel control words (in the lab-familiarization phase and the test phase) suggests that infants had segmented these words from the stories during the period of extended exposure at home and were able to retain these words in long-term memory, e.g. in their proto-lexicon (Swingley, 2005), in order to successfully segment and recognize them later on in the lab-familiarization phase as well as during the test phase. This finding is in line with our predictions.

Our study further indicates that German 7.5- to 9-month-old infants are already able to extract and retain words in long-term memory regardless of whether their exposure to these words was in IDS or ADS. That is, both groups of infants showed discrimination of the extended-exposure at home words from the lab-familiarized words in the lab-familiarization phase as well as discrimination of the extended-exposure at home words from novel control words in the test phase. Based on previous findings demonstrating differences in infants' segmentation of words from infant- and adult-directed speech (Thiessen, Hill, & Saffran, 2005), we predicted that infants would benefit from hearing the stories in IDS in the extended exposure phase. Nevertheless, our current findings suggest that infants do attend to and learn from exposure to language in the adult-directed register, even when their attention is not extrinsically drawn to the stimulus. Thus, not only are young infants capable of learning from speech presented in the background, i.e., overheard speech, but they are also able to learn from overheard speech in different speech registers. This has enormous implications for our understanding of the language input presented to infants. Typically, studies have focused on infants' learning from speech presented directly to infants in the infant-directed register and the benefits of such interactions with children. Whilst not underplaying the benefits of infant-directed interactions, our findings suggest that infants are, from an early age, also capable of learning from overheard speech in the adult-directed register. This dramatically expands the repertoire of language input that the child is able to learn from and, as we discuss below, has important implications for our understanding of the learnability from infant language interactions.

Note that despite being given at least 100s of exposure to sentences containing the lab-familiarized words, this exposure was not adequate for German infants to extract these words from the speech stream and recognize them when presented in isolation later. This is similar to the findings reported by Altvater-Mackensen and Mani (2013), who found that German infants were only able to segment a word from a speech stream (based on laboratory-familiarization) when this word sounded similar to a previously heard word. Thus, at least for German-learning infants, speech register alone, in this case IDS, does not provide sufficient cues to attract infants' attention and drive learning in a lab-familiarization context (see also Höhle & Weissenborn, 2003 for similar results with 9-month-old German infants; albeit with commonly occurring function words which infants were likely to have heard earlier).

German-learning infants appear, therefore, to require additional support to extract words from the speech stream, either through extended-exposure to stories containing the words to be learnt (current study), prior exposure to similar-sounding words (Altvater-Mackensen & Mani, 2013) or experience hearing words in isolation before recognizing these words in fluent speech (Höhle & Weissenborn, 2003). This is consistent with the findings of a number of recent studies showing considerable language-specific differences in infants' speech segmentation abilities (Nishibayashi, Goyet, & Nazzi, 2015; Nazzi, Mersad, Sundara, Iakimova, & Polka, 2014; Altvater-Mackensen & Mani, 2013; Junge, Cutler, & Hagoort, 2014).

Ongoing studies in our group are currently examining the reasons for this difficulty, with one potential reason being the quality of IDS presented to German infants (Fernald et al., 1989). German caregivers typically do not exaggerate their speech as much as

American caregivers: the prosodic characteristics of German IDS and ADS are less distinct, in that mean pitch, maximum pitch, minimum pitch and pitch range are more similar across the two registers in German relative to American English or French (Fernald et al., 1989). We suggest, therefore, that one reason German-learning infants may face difficulties with segmenting words from fluent speech is because of the less exaggerated nature of infant-directed speech presented to them. We note that this may also be one reason why we find successful learning from ADS in the current study. In other words, given that German IDS is more similar to ADS, German-learning infants may show a reduced preference for IDS over ADS relative to American English infants (see Dunst, Forman, & Hamby, 2012 for a meta-analysis of the IDS preference) and may therefore be more tuned to learning from both speech registers.

Implications for theories of early language acquisition

As noted earlier, studies suggest that infants show a preference for IDS over ADS from an early age (Cooper & Aslin, 1990; Zangl & Mills, 2007). This finding has been taken to support social gating models of learning, which suggest that infants must be attracted to speech in order to learn from the input (e.g., Kuhl, 2007). Similarly, curiosity-based theories of learning suggest that infants seek the sources from which they wish to learn (O’Regan, 2011) and that infants prioritize contexts which are easier to learn from (Gottlieb, Oudeyer, Lopes, & Baranes, 2013). Our finding that infants were able to learn from speech presented in the infant- and adult-directed register might, then, be viewed as contrary to such approaches, given that infants appear to be able to learn from a register that they typically attend less to (at least as suggested by studies showing a preference for listening to IDS versus ADS).

On the contrary, however, we suggest that our findings may be taken to support precisely such socially gated models of learning. In particular, we note that infants’ recognition of previously familiarized words (and their discrimination of these words from novel control words) correlated significantly with the amount of attention they were reported to have paid to the stories at home (as indexed by parental reports). This, however, was only true for those infants who heard the stories in ADS. Thus, when the stories were presented in IDS, the amount of overt attention that children paid to the stories did not impact their learning success but in ADS, individual children’s attention to the stories impacted their success in learning the words from the stories. We interpret these results in the following manner. IDS, as noted in the Introduction, may drive infants' attention to the relevant aspects of a speech stream without any modulation of overt attention to the stories. ADS is, in contrast, child-exploitable: given reduced cues, overt attention helps infants to find the relevant aspects of the speech signal (Dominey & Dodane, 2004). We suggest these findings support socially gated models assuming that infants must be attracted to IDS in order to learn (Kuhl, 2007, p.116), while extending such models from the processing of IDS to speech in general. Thus, while not being able to adjudicate between the role of the linguistic features of IDS and increased attention to IDS as a determining factor in infants' improved learning from IDS relative to ADS, our findings highlight an important role for attention to language in infants' learning from ADS.

We also note that our results may appear contrary to previous studies reporting differences in infants' segmentation of words from IDS and ADS (Thiessen, Hill, & Saffran, 2005; Singh, Nestor, Parikh, & Yull, 2009). One possible explanation for the difference in the results is likely the extended exposure to the words that infants received in both registers. Thus, given additional exposure, infants appear to be able to extract words from speech presented in IDS and ADS. Furthermore, studies examining infant learning from artificial language stimuli find that even young infants are able to segment an artificial language speech stream, when it is presented in a monotonous, non-infant-directed style of speech (e.g., Saffran, Aslin, & Newport, 1996). While studies touting the beneficial nature of IDS may stand in apparent contrast to these studies with artificial language stimuli, infants may utilize and require different cues when attending to naturalistic language stimuli relative to artificial language stimuli. Thus, for instance, when presented with a nonsense speech stream, the novelty of the speech stream may be sufficient to maintain infants' attention despite it being presented in ADS, thus promoting learning. Alternatively, the stimuli might be so different to what the infant is used to that the infant must listen more attentively to the information being presented in order to learn anything, thereby being better able to track regularities in the stream compared to naturalistic language stimuli. Thus, this explanation – again – puts the focus on infant-driven learning from ADS.

Infants' flexibility in recognizing words

The flexibility of early representations of extended-exposure words displayed in the current study is worth further discussion. First, we note that infants received early exposure to the words in sentence contexts alone (embedded in stories). Despite never hearing the words in isolation, infants displayed considerable flexibility in recognizing these words when presented in novel sentence contexts (lab-familiarization phase) and in isolation. This is particularly impressive since studies on older children's word referent mapping finds that 17-month-olds find it difficult to recognize a word (and its referent) in unfamiliar sentence contexts due to coarticulation with the surrounding sounds (Plunkett, 1997). When not required to access the meanings of the words, however, our studies show that young infants, given adequate exposure to the sounds of the words, can recognize these words in unfamiliar sentence contexts despite differences in the surface form of the words due to coarticulation (see Junge et al., 2014, for similar results with older children).

Second, we note that infants displayed successful recognition of these words even when the register at test did not match that of the extended-exposure at home phase. Thus, infants who had been presented with the stories in ADS were able to recognize these words in sentence contexts and isolation in IDS. It would be interesting to see whether the change in register would impact recognition in the reverse direction, namely, going from IDS to ADS. We anticipate that this would negatively impact recognition given the findings of previous studies showing differences in infants' segmentation of IDS and ADS (Thiessen, Hill, & Saffran, 2005; Singh, Nestor, Parikh, & Yull, 2009). This is especially so given that German infants appear to have difficulties segmenting and recognizing words even from fluent IDS at an early age (lab-familiarization phase, this study; Altvater-Mackensen & Mani, 2013; Höhle & Weissenborn, 2003).

Finally, we note that the extended-exposure at home phase and the lab-familiarization phase were recorded by two different female speakers. Thus infants were able to recognize the previously familiarized words despite the lexically irrelevant acoustic differences caused by a change in the speaker (see Schmale & Seidl, 2009 for similar results; Houston & Jusczyk, 2000, 2003). Hence, infants in the current study successfully accomplished a generalization task, which required them to recognize target words despite changes in register and speaker. Taken together, these findings highlight the flexibility in infants' representations of the extended exposure words and supports the notion that phonological representations of words have become more resistant to variation by the age of 9 months (Johnson, Westrek, Nazzi, & Cutler, 2011; Van Heugten & Johnson, 2012; Schmale, Christia, Seidl, & Johnson, 2010; Johnson, Seidl, & Tyler, 2014).

Conclusion

In conclusion, the current study suggests that being exposed to a word in fluent speech over an extended period of time helps infants to segment this word from the continuous input, to retain this word in long-term memory and to recognize this word with remarkable flexibility. Two aspects of our results stand out. First, given lengthy exposure to words in a naturalistic setting outside of the laboratory, infants are able to segment words from either speech register, IDS and ADS. As we have explained above, this has important implications for our understanding of the kind of language input that infants can learn from in daily life. Second, we found that the amount of attention infants paid to ADS, but not to IDS, correlated with their segmentation success. This finding is compatible with, and extends, models of language acquisition that view the infant as an active participant in learning, whose attention to different kinds of stimuli drives successful learning.

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APPENDIX. Stories of the extended-exposure at home phase

Story 1: Der *1* NOVELWORD und das Pferd
[NOVELWORD 1: 477 words, 14 NOVELWORD tokens, ratio 1:34]

1 Es hatte ein Bauer ein treues Pferd, das war alt geworden und konnte keine Dienste mehr tun; da wollte ihm sein Herr nichts mehr zu fressen geben und sprach: "Brauchen kann ich dich freilich nicht mehr, indes mein' ich es gut mit dir, zeigst du dich noch so stark, dass du mir einen Löwen hierher bringst, so will ich dich behalten; jetzt aber mach dich fort aus meinem Stall", und er jagte es damit ins weite Feld.

2 Das Pferd war traurig und ging auf den Wald zu, um dort ein wenig Schutz vor dem Wetter zu suchen.

3 Da begegnete ihm der ***2*** **NOVELWORD** und sprach: "Was hängst du so den Kopf und gehst so einsam herum?" -

4 "Ach", antwortete das Pferd dem ***3*** **NOVELWORD**, "Geiz und Treue wohnen nicht beisammen in einem Haus, mein Herr hat vergessen, was ich ihm für Dienste in so vielen Jahren geleistet habe, und weil ich nicht recht mehr ackern kann, will er mir kein Futter mehr geben und hat mich fortgejagt." -

5 "Ohne allen Trost?" fragte der ***4*** **NOVELWORD**.

6 "Der Trost war schlecht.

7 Er hat gesagt, wenn ich noch so stark wäre, dass ich ihm einen Löwen brächte, wollt' er mich behalten, aber er weiß wohl, dass ich das nicht vermag." antwortete das Pferd dem ***5*** **NOVELWORD**.

8 Und der ***6*** **NOVELWORD** sprach: "Da will ich dir helfen, leg dich nur hin, strecke dich aus und rege dich nicht, als wärest du tot."

9 Das Pferd tat, was der ***7*** **NOVELWORD** verlangte.

10 Der ***8*** **NOVELWORD** aber ging zum Löwen, der seine Höhle nicht weit davon hatte und sprach: "Da draußen liegt ein totes Pferd, komm doch mit hinaus, da kannst du eine fette Mahlzeit halten."

11 Der Löwe ging mit dem ***9*** **NOVELWORD**, und wie sie bei dem Pferd standen, sprach der ***10*** **NOVELWORD**: "Hier hast du's doch nicht nach deiner Gemächlichkeit, weißt du was?

12 Ich will's mit dem Schweif an dich binden, so kannst du's in deine Höhle ziehen und in aller Ruhe verzehren."

13 Dem Löwen gefiel der Rat des ***11*** **NOVELWORDes**.

14 Er stellte sich hin, und damit ihm der ***12*** **NOVELWORD** das Pferd festknüpfen könnte, hielt er ganz still.

15 Der ***13*** **NOVELWORD** aber band mit des Pferdes Schweif dem Löwen die Beine zusammen und drehte und schnürte alles so wohl und stark, dass es mit keiner Kraft zu zerreißen war.

16 Als der ***14*** **NOVELWORD** nun sein Werk vollendet hatte, klopfte er dem Pferd auf die Schulter und sprach: "Zieh, Schimmel, zieh."

17 Da sprang das Pferd mit einmal auf und zog den Löwen mit sich fort.

18 Der Löwe fing an zu brüllen, dass die Vögel in dem ganzen Wald vor Schrecken aufflogen, aber das Pferd ließ ihn brüllen, zog und schleppte ihn über das Feld vor seines Herrn Tür.

19 Wie der Herr das sah, besann er sich eines besseren und sprach zu dem Pferd: "Du sollst bei mir bleiben und es gut haben", und gab ihm satt zu fressen, bis es starb.

Story 2: Der *1* NOVELWORD und die Katze
[NOVELWORD 2: 280 words, 14 NOVELWORD tokens, ratio 1:20]

1 Es trug sich zu, dass die Katze in einem Walde dem Herrn ***2*** **NOVELWORD** begegnete, und weil sie dachte: Der ***3*** **NOVELWORD** ist gescheit und wohl erfahren und gilt viel in der Welt, sprach sie ihm freundlich zu.

2 "Guten Tag, lieber Herr ***4*** **NOVELWORD**, wie geht's? wie steht's?

3 wie schlagt Ihr Euch durch in dieser teuren Zeit?"

4 Der ***5*** **NOVELWORD**, alles Hochmutes voll, betrachtete die Katze von Kopf bis zu Fuß und wusste lange nicht, ob er eine Antwort geben sollte.

5 Endlich sprach der ***6*** **NOVELWORD**: "Du armseliger Bartputzer, du buntscheckiger Narr, Hungerleider und Mäusejäger, was kommt dir in den Sinn?

6 Du unterstehst dich zu fragen, wie mir's gehe, dem ***7*** **NOVELWORD**?

7 Was hast du gelernt?

8 Wie viel Künste verstehst du?" –

9 "Ich verstehe nur eine einzige", antwortete die Katze dem ***8*** **NOVELWORD** bescheiden.

10 "Was ist das für eine Kunst?" fragte der ***9*** **NOVELWORD**.

11 "Wenn die Hunde hinter mir her sind, kann ich auf einen Baum springen und mich retten." antwortete die Katze dem ***10*** **NOVELWORD**.

12 "Ist das alles?" sagte der ***11*** **NOVELWORD**,

13 "ich bin Herr über hundert Künste und habe überdies noch einen Sack voll Listen.

14 Du jammerst mich, komm mit mir, ich will dich lehren, wie man den Hunden entgeht."

15 Da kam ein Jäger mit vier Hunden daher.

16 Die Katze sprang behend auf einen Baum und setzte sich in den Gipfel, wo Äste und Laubwerk sie völlig verbargen.

17 "Bindet den Sack auf, Herr ***12*** **NOVELWORD**, bindet den Sack auf", rief ihm die Katze zu, aber die Hunde hatten den ***13*** **NOVELWORD** schon gepackt und hielten ihn fest.

18 "Ei, Herr ***14*** **NOVELWORD**", rief die Katze, "Ihr bleibt mit Euern hundert Künsten stecken.

19 Hättet Ihr heraufkriechen können wie ich, so wär's nicht um Euer Leben geschehen."

Story 3: Der *1* NOVELWORD und der Ziegenbock
[NOVELWORD 3: 294 words, 14 NOVELWORD tokens, ratio 1:21]

1 Der ***2*** **NOVELWORD** ging an einem heißen Sommertag mit seinem Freund, dem Ziegenbock, spazieren.

2 Der ***3*** **NOVELWORD** und der Bock kamen an einem Brunnen vorbei, der nicht sehr tief war.

3 Der muntere Bock kletterte sofort auf den Brunnenrand, blickte neugierig hinunter und sprang, ohne zu zögern, in das kühle Nass.

4 Der ***4*** **NOVELWORD** hörte ihn herumplatschen und genüsslich schlurfen.

5 Da der ***5*** **NOVELWORD** selber sehr durstig war, folgte er dem Ziegenbock und trank sich satt.

6 Dann sagte der ***6*** **NOVELWORD** zu seinem Freund: "Der Trunk war erquickend, ich fühle mich wie neugeboren.

7 Doch nun rate mir, wie kommen wir aus diesem feuchten Gefängnis wieder heraus?"

8 "Dir wird schon etwas einfallen, ***7*** **NOVELWORD**", blökte der Bock zuversichtlich und rieb seine Hörner an der Brunnenwand.

9 Das brachte den ***8*** **NOVELWORD** auf eine Idee.

10 "Stell dich auf deine Hinterbeine, und stemme deine Vorderhufe fest gegen die Mauer", forderte der ***9*** **NOVELWORD** den Ziegenbock auf, "ich werde versuchen, über deinen Rücken hinaufzugelangen."

11 "Du bist wirklich schlau, ***10*** **NOVELWORD**", staunte der ahnungslose Bock, "das wäre mir niemals eingefallen."

12 Er kletterte mit seinen Vorderfüßen die Brunnenwand empor, streckte seinen Körper, so gut er konnte, und erreichte so fast den Rand des Brunnens.

13 "Kopf runter!" rief der ***11*** **NOVELWORD** ihm zu, und schwupps war der ***12*** **NOVELWORD** auch schon über den Rücken des Ziegenbocks ins Freie gelangt.

14 "Bravo, ***13*** **NOVELWORD**!" lobte der Bock seinen Freund, "du bist nicht nur gescheit, sondern auch verteufelt geschickt."

15 Doch plötzlich stutzte der Ziegenbock.

16 "Und wie ziehst du mich nun heraus?"

17 Der ***14*** **NOVELWORD** kicherte.

18 "Hättest du nur halb soviel Verstand wie Haare in deinem Bart, du wärest nicht in den Brunnen gesprungen, ohne vorher zu bedenken, wie du wieder herauskommst.

19 Jetzt hast du sicher Zeit genug dazu.

20 Lebe wohl!

21 Ich kann dir leider keine Gesellschaft leisten, denn auf mich warten wichtige Geschäfte."

Story 4: Der *1* NOVELWORD und der Hahn
[NOVELWORD 4: 350 words, 18 NOVELWORD tokens, ratio 1:19]

1 Ein Hahn saß auf einem hohen Gartenzaun und kündete mit lautem Krähen den neuen Tag an.

2 Ein ***2*** **NOVELWORD** schlich um den Zaun herum und blickte verlangend zu dem fetten Hahn empor.

3 "Einen schönen guten Morgen", grüßte der ***3*** **NOVELWORD** freundlich, "welch ein herrlicher Tag ist heute!"

4 Der Hahn erschrak, als er den ***4*** **NOVELWORD** erblickte, und klammerte sich ängstlich fest.

5 "Brüderchen, warum bist du böse mit mir?

6 lass uns doch endlich Frieden schließen und unseren Streit begraben." sagte der ***5*** **NOVELWORD**.

7 Der Hahn schwieg noch immer.

8 "Weißt du denn nicht", säuselte der ***6*** **NOVELWORD** mit sanfter Stimme, "dass der König der Tiere den Frieden ausgerufen hat?

9 Er hat mich als seinen Boten ins Land geschickt.

10 Komm schnell zu mir herunter, wir wollen unsere Versöhnung mit einem Bruderkuss besiegeln.

11 Aber beeile dich, ich habe noch vielen anderen diese freudige Nachricht zu bringen."

12 Der Hahn schluckte seine Furcht vor dem ***7*** **NOVELWORD** hinunter und sagte sich: "Diesem verlogenen ***8*** **NOVELWORD** komme ich nur mit seinen eigenen Waffen bei."

13 Und mit gespielter Freude rief er: "Mein lieber ***9*** **NOVELWORD**, ich bin tief gerührt, dass auch du des Königs Friedensbotschaft verbreitest.

14 Ja, lass uns Frieden schließen.

15 Es trifft sich gut, denn gerade sehe ich zwei andere Boten auf uns zueilen.

16 Wir wollen auf sie warten und gemeinsam das glückliche Fest feiern.
17 Du kennst sie recht gut, ***10* NOVELWORD**, es sind die Wachhunde des Gutsherrn."
18 Kaum hatte der ***11* NOVELWORD** diese Kunde vernommen, war er aufgesprungen und eiligst davongerannt.
19 "He ***12* NOVELWORD**, warte doch!" krähte der Hahn hinter dem ***13* NOVELWORD** her.
20 "Ich habe noch sehr viel zu tun", keuchte der ***14* NOVELWORD** aus der Ferne, "ich hole mir den Friedenskuss ein andermal von dir.
21 Du kannst dich darauf verlassen."
22 Der Hahn freute sich, dass ihm die List gelungen war.
23 Der ***15* NOVELWORD** aber war verärgert.
24 Er hatte alles so klug eingefädelt, und just in diesem Augenblick mussten seine ärgsten Feinde auftauchen und alles verderben.
25 Aber, wo blieben sie denn?
26 Der ***16* NOVELWORD** verlangsamte seine Schritte und blickte sich um.
27 Niemand folgte dem ***17* NOVELWORD**, auch hatte er kein Bellen gehört.
28 Sollte dieser alte Hahn den ***18* NOVELWORD** reingelegt haben?
29 Ausgerechnet so ein aufgeplusterter, dummer Hahn?

Story 5: Wie der Bär den *1* NOVELWORD teilen lehrte
[NOVELWORD 5: 331 words, 12 NOVELWORD tokens, ratio 1:28]

1 Einst begegneten sich ein Bär, ein Wildschwein und ein ***2* NOVELWORD**.
2 Sie grüßten einander und klagten sich ihr Leid - wie das Leben doch so schwer sei, vor allem, wie schlimm es sei, oft tagelang mit knurrendem Magen herumzulaufen.
3 Der Bär, das Wildschwein und der ***3* NOVELWORD** beweinten gemeinsam ihr Los und schlossen dann Brüderschaft.
4 Sie schworen sich, von nun an alles brüderlich zu teilen, was sie in Zukunft auch erbeuten sollten.
5 Gemeinsam zogen der Bär, das Wildschwein und der ***4* NOVELWORD** auf Fang aus und schnüffelten überall herum, ob es nicht irgendwas zu fressen gäbe.
6 Nach langem Suchen fanden sie ein krankes Reh, das sie leicht erbeuten konnten.
7 Im Schatten wollten der Bär, das Wildschwein und der ***5* NOVELWORD** nun die Beute brüderlich teilen.
8 Dem Wildschwein knirschten vor Hunger schon die Zähne.
9 "Teile du!" sagte der Bär zum Wildschwein.
10 "Den Kopf kriegst du", sagte da das Wildschwein zum Bären, "denn du bist unser Herr und Meister, den Rumpf nehme ich mir, und die Beine kriegt der ***6* NOVELWORD**, der so viel auf den Beinen ist."
11 Das Wildschwein kam mit diesem Satz gar nicht zu Ende, denn der Bär hieb ihm mit der Tatze derart auf den Kopf, dass es von den Bergen widerhallte.
12 Das Wildschwein brüllte auf und sprang mit einem Riesensatz in die Büsche.
13 Da drehte sich der Bär zum ***7* NOVELWORD** um und sagte: "So, lieber ***8* NOVELWORD**, jetzt darfst du einmal teilen."
14 Der schlaue ***9* NOVELWORD** tänzelte heran und begann die Teilung mit schmeichelnder Stimme: "Unser Herr und Meister bekommt den Kopf und den Rumpf dazu, weil er immer so väterlich und gütig zu uns ist - und die Beine soll er auch haben, weil er auf allen Wegen stets um unser Wohl besorgt ist" sagte der ***10* NOVELWORD**.
15 Gerührt fragte da der Bär: "Ach, mein gescheiter ***11* NOVELWORD**, von wem hast du nur so klug und so gerecht zu teilen gelernt?"
16 "Von dir, Herr und Meister", flüsterte der ***12* NOVELWORD** ihm ins Ohr, "als ich sah, wie du das Wildschwein belehrtest."

Story 6: Der *1* NOVELWORD und die Gänse
[NOVELWORD 7: 213 words, 8 NOVELWORD tokens, ratio 1:30]

1 Der ***2* NOVELWORD** kam einmal auf eine Wiese, wo eine Herde schöner fetter Gänse saß.
2 Da lachte der ***3* NOVELWORD** und sprach 'ich komme ja wie gerufen, ihr sitzt hübsch beisammen, so kann ich eine nach der andern auffressen.'
3 Die Gänse gackerten vor Schrecken, sprangen auf, fingen an zu jammern und den **4 NOVELWORD** kläglich um ihr Leben zu bitten.
4 Der ***5* NOVELWORD** aber wollte auf nichts hören und sprach 'da ist keine Gnade, ihr müßt sterben.'
5 Endlich nahm sich eine das Herz und sagte zum ***6* NOVELWORD** 'sollen wir armen Gänse doch einmal unser junges frisches Leben lassen, lieber ***7* NOVELWORD**, so erzeige uns die einzige Gnade und erlaub uns noch ein Gebet, damit wir nicht in unsern Sünden sterben.
6 Hernach wollen wir uns auch in eine Reihe stellen, damit du dir immer die fetteste aussuchen kannst.'
7 'Ja,' sagte der ***8* NOVELWORD** 'das ist billig, und eine fromme Bitte.
8 Betet, ich will so lange warten.'

9 Also fing die erste ein recht langes Gebet an, immer 'ga! ga!' und weil sie gar nicht aufhören wollte, wartete die zweite nicht, bis die Reihe an sie kam, sondern fing auch an 'ga! ga!'

10 Die dritte und vierte folgte ihr, und bald gackerten sie alle zusammen.

11 Und wenn sie nicht gestorben sind, dann gackern sie noch heute.