

**Emotional Words, Emotional Contexts: Investigating Emotional Valence in Children's
Writing and Word Learning**

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Research Highlights

- We investigated whether children could learn the valence of novel adjectives from independently reading emotional narratives.
- Corpus and experimental work show that children's writing reflects word-context valence correlation, and reading emotional narratives supports valence learning.
- Narrative reading provides an important vehicle for emotion vocabulary development and learning emotional valence and abstract concepts.

Abstract

There is a relationship between the emotional valence of a word and its surrounding context in adult language, and context valence predicts how well adults learn new words. We asked whether this extends to children. Using a large corpus of stories written by children ($N=103,541$; ~55 million words, ages 7–13), we found a positive correlation between word and context valence ($r=0.46$), which was stable across age. We then conducted a pre-registered word learning experiment investigating how emotional narrative context shapes learning of novel adjectives during independent reading. Children ($N=120$, age 7–11 years, 59 girls, ethnic information not collected) read 15 novel words embedded in 30 short narratives of either neutral, negative, or positive valence. We found that children inferred word valence from narrative context, demonstrating that context valence is an effective cue for word learning. Children learned novel adjectives, and older children outperformed younger children in word recognition and valence judgment. Novel adjectives read in more emotional (positive/negative) contexts were recognised more accurately than those in neutral narratives (Odds Ratios = 1.39-1.60). We discuss how affective associations build from children's experience of words in emotional contexts, consistent with affective embodiment supporting children's learning of abstract concepts.

Keywords: Language, Emotion, Development, Reading, Narratives, Children

Introduction

In language, emotional valence refers to the pleasantness of a word (Warriner et al., 2013). Large-scale studies have established valence norms by asking adult participants to rate on a scale how they feel while reading a word in isolation. Rated valence is associated with lexical processing, where positive and negative words are responded to more quickly in lexical decision tasks than neutral words (e.g., Kousta et al., 2009). Children also show this effect and more generally, valence predicts age-of-acquisition ratings, with positive and negative words being acquired earlier in development than neutral words (e.g., Ponari et al., 2018). But how do children learn the valence of a new word? One possibility is via the language context it appears in. Emotional context influences word learning in adults (e.g., Dong et al., 2024; Lana & Kuperman, 2023; Snefjella et al., 2020) and complementing this evidence, Snefjella and Kuperman (2016) found that the valence of an individual word correlated with the valence of the contexts in which it occurs across a large corpus of adult language. Given these findings, it is plausible that as children experience a new word, they acquire its valence from the valence of the language contexts in which it occurs. However, no existing work has investigated this in children, or considered whether the emotional valence of narrative context serves as a meaningful cue for children's word learning. To address these gaps, we first conducted a corpus analysis of written language produced by children to establish whether there is a correlation between word valence and the valence of the context in which it occurs. Following this, we used a word-learning experiment to test whether context valence is an effective cue as children learn new words.

We focused on school-aged children and written language for several reasons. Previous work on the connections between emotion and language has focused mainly on early acquisition (e.g., Nencheva et al., 2023; Ogren & Sandhofer, 2021), yet emotion and language both continue to co-develop beyond the preschool years through childhood and adolescence (e.g., Baron-Cohen et al., 2010; Doost et al., 1999). The onset of literacy in mid-childhood heralds the opportunity to learn via reading (Nagy et al., 1985, 1987). Indeed, reading may provide distinctive learning opportunities, given the decontextualised nature of written language. As readers cannot benefit from cues such as facial expressions, gestures, and tone of voice in the way that conversational partners can (e.g., Mumford &

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Kita, 2013), written language itself needs to be crafted so that the situation intended by the writer can be reconstructed in the mind of the reader. As a result, written language tends to be more complex than spoken language, a finding that extends even to books written for young children (Nation et al., 2022). Children's books are lexically richer than day-to-day conversational language and therefore reading (or being read to) allows children to experience a more diverse range of vocabulary, including less frequent and more complex words (e.g., Dawson et al., 2021; Korochkina et al., 2024).

Particularly relevant for our investigation, children's books contain more words that are emotionally arousing (Dawson et al., 2021) and more words that are considered to tap emotions and mental states (Dong & Nation, 2025) than child-directed speech. This means that written language provides a rich substrate from which children have the opportunity to learn emotion vocabulary and word valence.

While there is evidence for a general association between reading and socio-emotional development (e.g., Batini et al., 2021), whether and how valence influences word learning via independent reading has not been investigated directly.

Emotional Valence Facilitates Word Learning and Word Processing

As noted above, emotionally valenced words, whether positive or negative, tend to be acquired earlier than neutral words, especially abstract ones such as *great* and *sad* (Kousta et al., 2011; Ponari et al., 2018; Reggin et al., 2021). This earlier acquisition may be facilitated by emotional valence acting as a bootstrapping mechanism, where children use existing knowledge and experiences to help them understand and learn new abstract concepts, as described in the affective embodiment account (Vigliocco et al., 2014). Ponari et al. (2020) taught children new abstract written words that were either valenced (negatively or positively, e.g., *tyranny*, *insight*) or neutral (e.g., *trend*), according to Warriner et al.'s (2013) word valence norms. They found that 7- to 9-year-olds showed better learning of the valenced words compared to the neutral words, consistent with the affective embodiment account that emotional experience grounds the learning of abstract words and concepts. These findings align with auditory lexical decision data showing that children respond more accurately to high-valence abstract words (Ponari et al., 2018).

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There is some evidence that this emotionality advantage might interact with the age of the children. Ponari et al. (2018) tested three age groups: 6-7, 8-9, and 10- to 11-year olds, with 20 children in each group. The processing advantage for emotionally valenced abstract words was most pronounced in the 8- to 9-year-olds. In contrast, another auditory lexical decision experiment (Lund et al., 2019) tested children aged 5 to 7 years and found a facilitatory effect of valence only in 6- to 7-year-olds. It is difficult to draw conclusions across these studies due to methodological differences. For example, Lund et al. (2019) included words that were less abstract than those used by Ponari et al. (2018). Other studies have shown diminished effects of valence in words that are less abstract, and for older children (Vigliocco et al., 2018). Vigliocco et al. (2018) suggested that the changing emotionality effect with age might indicate a shift from an affective embodied mechanism to a more language-based one for children's abstract word acquisition. On this view, as children's language becomes more sophisticated, familiarity with its distributional properties might play an increasingly important role in complementing affective embodiment to support the learning of abstract words and concepts. However, the affective embodiment account has been questioned due to inconsistencies and methodological challenges, such as the inconsistent valence effect, and the absence of an interaction between valence and concreteness (Bireta et al., 2023). For example, Kim et al. (2020) found an effect of emotional valence in children but not in adults, with no interaction between valence and concreteness in either group. Additionally, dimensions such as arousal and dominance are not always controlled, making interpretation and comparisons across studies difficult (Bireta et al., 2023).

When there is an effect of valence on abstract word learning, there is further lack of clarity as to whether positive or negative valence better promotes learning (Kauschke et al., 2019). Some studies (e.g., Ponari et al., 2018) reported a positivity effect. This might be explained by the Pollyanna Hypothesis (Boucher & Osgood, 1969), also known as the linguistic positivity bias where people tend to use more positive language and remember positive things better (Dodds et al., 2015). Yet, Silk et al. (2009) found that children and adolescents show no clear advantage for positive or negative words, and some studies reported a negativity effect, where children demonstrate better recall for negative words (Kim et al., 2020). A negativity effect could be due to people allocating greater attention to

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negative concepts, which might serve to enhance memory (Vaish et al., 2008). Together, this mixed evidence suggests that children's emotional word processing is complex and likely to be influenced by age, emotional context, and task demands.

Word Valence and Context Valence

In adult language, there is a positive correlation between the valence of individual words and the emotional nature of the contexts in which they appear. For example, Snefjella and Kuperman (2016) analysed the valence, arousal, and concreteness of words and their contexts, using text samples taken from a large corpus of email newsgroup postings (USENET, Shaoul & Westbury, 2013). A word's context was defined as the five content words immediately before and after the word. Snefjella and Kuperman (2016) correlated valence, arousal, and concreteness ratings for a given word (taken from established norms) with the aggregated valence, arousal and concreteness values for the word's contexts, sampled across the corpus. They found medium-to-strong correlations of these affective properties across words and the contexts in which they occurred. To further corroborate this finding, Kuhlmann et al. (2017) used corpus-derived co-occurrence statistics as a measure of association strength and asked whether a neutral word would be judged more as positive or negative based on its association strength with valenced words. Using a valence decision task, they found that if a neutral word more frequently appeared with positive words in language experience, participants were faster in judging this word as positive than negative. This suggests that valence may function as a "semantic super-feature" that is represented in the patterns of association in semantic networks (Kuhlmann et al., 2017). For adults at least, this implies that a word's emotional valence can be inferred from its contextual experience.

Turning to implications for development, as children learn to read, and as reading experience builds, so do opportunities to encounter new words. Books do not usually provide explicit definitions of new words. Instead, the meaning (and valence) of new words needs to be inferred from context. We conducted two studies to investigate context valence in children's language. While word- and context-level affective statistics correlate in adult language, the extent of these correlations have not been

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established in children's language. There might be differences. For example, Wild et al. (2013) noted that the linguistic context in children's books often focuses on more tangible aspects such as physical descriptions and object locations, as distinct from the abstract and temporal elements that are prevalent in adult language. Our aim for Study 1 was to establish the correlation between word valence and context valence across a large sample of children's language, using the methodology of Snefjella and Kuperman (2016).

Having established a positive correlation between context and word valence in Study 1, Study 2 took an experimental approach to test the causal hypothesis that children are sensitive to context valence such that this serves as an effective cue for word learning, building on previous studies with adults. There is consistent evidence that adults infer valence for new words based on the context in which they are embedded (e.g., Dong et al., 2024; Driver, 2021; Frances et al., 2020; Lana & Kuperman, 2023; Snefjella et al., 2020). For example, Snefjella et al. (2020) asked native speakers of English to learn nine novel nouns (e.g., *plurk*), each embedded in five short passages that were designed to be neutral, negative, or positive. Participants showed clear evidence of word learning, with the positive condition resulting in the best learning outcomes, and the novel nouns acquired emotional connotations corresponding to the contexts in which they appeared. Dong et al. (2024) extended these findings to adjectives. While an overall emotionality advantage relative to neutral contexts holds across studies, differences between positive vs negative contexts are inconsistent across studies. This might reflect differences in experimental design, and whether the learning is incidental or via explicit teaching.

A study by Ponari et al. (2020), introduced earlier, investigated similar themes in children. They taught 7- to 10-year-olds new abstract words that were neutral, negative or positive. One group of children were taught the new words in a condition that emphasised emotional information, while the other group were taught the new words via more encyclopaedic, non-emotional information. Abstract words with emotional valence were better learned, consistent with the idea that emotional valence serves as a bootstrapping mechanism for acquiring abstract concepts. While they found no overall difference in learning for the two types of teaching approach, context was operationalised very

differently to the method used in the adult word learning studies reviewed above, and even their “non-emotional” condition included many valenced words, thereby creating a valenced context from which children could potentially learn, regardless of the teaching strategy. In addition, Ponari et al. (2020) focused on explicit and direct teaching, repeated in multiple sessions across a week. This is different to the incidental learning targeted in some word learning experiments with adults, and from how children experience new words when reading independently. To address these gaps, in Study 2, we used a word learning paradigm to discover whether children learn the emotional properties of new words when reading independently and without explicit definitions being provided.

Study 1: Word Valence and Context Valence in Children's Narrative Writing

In adult language, the rated valence of an individual word correlates with the valence of its context, defined as the aggregate emotional tone of the surrounding context it occurs in and more generally, studies utilising large language corpora have confirmed that words that occur in similar emotional contexts tend to share semantic properties (Kuhlmann et al., 2017; Snefjella & Kuperman, 2016). These studies used email newsgroup corpora, comprising postings written by adults (USENET, Shaoul & Westbury, 2013). To extend these findings to children's language, we analysed a large corpus of stories written by children. We focused on valence, in preparation for Study 2 which investigated valence and word learning but for completeness and future reference, Study 1 also investigated arousal and concreteness (see also Snefjella and Kuperman, 2016).

Method

Materials

We used a large corpus of stories written by 7- to 13-year-old children and submitted to BBC 500 Words, an annual children's writing competition in the UK. Each year, children across the UK are invited to submit a story on any theme or topic, so long as the word count is not greater than 500 words. This resource therefore provides a naturally occurring language sample not generated for assessments or in response to prompts or cues, and this allows us to analyse children's own language,

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free from constraints on time, instruction, or topic. For this study, we selected all stories submitted in 2019 ($N = 107,273$; approximately 55 million word tokens). We excluded stories written by children aged 6 years and under as the number of entries was relatively low. The analysed corpus comprised 103,541 stories, 46,697,930 word tokens and 218,914 word types in total ($M_{\text{words/story}} = 451.01$, $SD_{\text{words/story}} = 92.16$). Figure 1 shows the distribution of stories by age and gender. More girls (59.44%) contributed stories than boys (40.56%), and most stories came from 9- to 11-year-olds.

Following Snefjella and Kuperman (2016), affective and semantic properties of words and their contexts in the corpus were taken from existing mega-study norms. Valence and arousal ratings for English lemmas (the base forms of words; $N = 13,915$) were taken from Warriner et al. (2013) and concreteness ratings for words ($N = 40,000$) from Brysbaert et al. (2014). We enhanced the set of affective norms by assigning the value of valence and arousal given to the lemma (e.g., sing) to all its inflected word forms (i.e., sang, sung, singing), based on the word form-lemma matching data in the Child and Young People's Lexicon (CYP-LEX; Korochkina et al., 2024). This increased the number of unique word forms with associated valence scores to 30,872.

Procedure

Our analysis procedure closely followed the procedure outlined in Snefjella and Kuperman (2016). A word's context was defined as the five content words immediately before and after the word, sampling across the 103,541 stories. For each occurrence of a word, the valence, arousal and concreteness of its context was formed from the average of the context words. A context was only included if it contained more than three words for which affective ratings were available, up to a maximum of ten and not including the word itself ($N = 25,348$ words). We further excluded 965 words (4%) whose overall context valence, context arousal, or context concreteness were more than 3 SDs above or below the mean of the respective variable, leaving 24,383 words for which we had affective estimates for both individual words and their contexts.

Results and Discussion

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Summary statistics for the words and their associated contexts are presented in Table 1. The context variables are normally distributed, as seen in Figure 2. Valence was rated from 1-9, with 1 being very negative and 9 being very positive. Both mean word valence (5.13) and mean context valence (5.69) were slightly above the midpoint of 5.

The Pearson correlations between context-level and word-level variables are shown in Table 2. The values for individual words were moderately correlated with the contexts in which they occurred across all three properties (valence $r = 0.46^{***}$, 95% CI [0.45, 0.47]; arousal $r = 0.32^{***}$, 95% CI [0.31, 0.33]; concreteness $r = 0.48^{***}$, 95% CI [0.47, 0.49])¹.

We also explored if the correlations between word valence and context valence varied as a function of children's age, plotted in Figure 3. The x-axis represents the different age groups, from 7 to 13 years old. The y-axis is the correlation coefficients between the three pairs of word- and context-level semantic variables (represented in three colours) at each age group. The figure shows that the pattern of correlations is similar across age groups, although the correlation within each age group is a little lower than overall correlation coefficients reported in Table 2, perhaps due to smaller sample sizes.

While the correlation patterns observed in children's writing mirrored those in adult writing as sampled by Snefjella and Kuperman (2016), an important direction for future work will be to analyze the language that adults write for children to read on the basis that children's books provide opportunities for children to learn language and discourse patterns that are very rare in child-directed speech (Nation et al., 2022). This would also allow comparisons to be made between the written language that children read (or hear in the context of share reading) and the language they themselves write. Unfortunately, such analyses were not feasible in the context of this investigation as full-text data are not readily available in children's book corpora, noting that both the CPB-Lex (Green et al., 2024) and CYP-Lex (Korochkina et al., 2024) corpora provide data at the lexical or bigram level only. We also note that we calculated context valence using valence, arousal, and concreteness ratings from

¹ For comparison, the correlations for adult language reported in Snefjella and Kuperman (2016) are: Word_Valence-Context_Valence: 0.58; Word_Arousal-Context_Arousal: 0.48; Word_Concreteness-Context_Concreteness: 0.72

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adult English speakers due to the absence of large-scale child norms. Our findings patterned those reported by Sneffjella and Kuperman (2016) suggesting some cross-age consistency but future work should establish child-specific ratings to examine potential developmental differences. Cross-linguistic comparisons could further clarify whether these effects are language-specific or reflect universal mechanisms in emotion language learning.

To sum up the results of Study 1, we found that the correlations between word- and context-level valence, arousal, and concreteness in children's writing were similar to those observed in adult language in terms of pattern albeit slightly smaller in size (Sneffjella & Kuperman, 2016). This might be due to differences between corpora and their associated registers, or it might reflect greater variability in children's language. We also note that the pattern of correlations between word and contextual properties was similar across the ages sampled. This suggests that the word-context relationship is stable. It also motivates the question investigated in Study 2.

Study 2: Children's Learning of Novel Adjectives from Emotional Narrative Context

Having established a correlation between word valence and context valence in children's language, we now address whether 7- to 11-year-olds infer the valence of novel words from narrative context during reading. This age range coincides with an increase in emotion vocabulary (Baron-Cohen et al., 2010; Dong & Nation, 2025) and sensitivity to word valence in lexical decision (Ponari et al., 2018); it also aligns with when most children can read independently.

We chose to focus on adjectives as they tend to be more abstract and their meanings more context-dependent (Davies et al., 2020; Dawson et al., 2021). Adjectives are an important grammatical class to investigate, not least because they make-up 7.45% of all content words in children's own writing (see Supplementary Materials). Following the paradigm developed by Dong et al. (2024), we used a naturalistic reading procedure to investigate the effect of context valence on adjective learning in children. We compared word learning after reading novel adjectives embedded in narratives that provided neutral, negative, or positive contexts. Based on Dong et al.'s (2024) findings with adults,

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and the results of Study 1, we tested the hypothesis that context valence facilitates word learning, and we predicted that:

1. Children would learn novel words from reading short narratives and older children will learn better than younger children.
2. Words experienced in emotional (positive and negative) contexts would be learned better than words experienced in neutral contexts.
3. Children would infer a valence for the newly learned words from the linguistic context in which they appeared.

Method

Design

The experiment was based on a scenario of an alien learning and practising English who occasionally included some “alien” words in its diary. These served as the novel words in the experiment. In the reading phase, children read 15 novel words embedded in 30 short narratives. The short narratives were either neutral, negative, or positive in valence. In the test phase, children completed several tasks to assess their learning of the novel words.

There was one categorical independent variable, context valence, with three levels: neutral, negative, and positive. This was manipulated within-participant. Age (treated as a continuous variable) served as a covariate. Responses to each post-test served as the outcome measure. The study, including the sample size, hypotheses, exclusion criteria, and analysis plan, was pre-registered ahead of data collection (<https://osf.io/mvzs4>). Data and analysis scripts are available on OSF (<https://osf.io/r6hx9>).

Participants

Children ($N = 120$; 59 girls, 61 boys) were recruited from Year 3 to 6 classrooms in seven primary schools across 5 urban cities the UK. Their ages ranged from 7 to 11 years ($M_{age} = 9.70$, $SD_{age} = 1.12$), and all had English as the language of instruction. Fifty-five children (45.8%) had at least one family

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member who spoke to them in a language additional to English. While participant-level socioeconomic and ethnic data were not collected, we compiled school-level statistics to provide community and demographic context. The schools represented a wide socioeconomic spectrum, with Index of Multiple Deprivation rankings (Ministry of Housing, Communities & Local Government, 2019a, 2019b) spanning from the most affluent (Decile 10) to more deprived areas (Decile 4). The proportion of pupils eligible for Free School Meals ranged from 5% to 41%. This spans the national average of 25.7%. Similarly, the proportion of pupils with English as an Additional Language ranged widely from 5% to 52%, encompassing the national average of 21.4% (Department for Education, 2025). A more comprehensive summary of these school-level characteristics is available in the Supplementary Materials.

Informed opt-in or opt-out consent (based on the preference of each participating school) was obtained from parents or guardians, and children provided verbal assent before starting the experiment. Following our pre-registered exclusion criterion, two children were excluded on the basis of poor reading, defined as 1.5 SD or more below the mean of the standardised sample on the Test of Word Reading Efficiency Second Edition (TOWRE-2; Torgesen et al., 2012). The final sample comprised 118 children (57 girls, 61 boys; $M_{age} = 9.71$, $SD_{age} = 1.12$). There were 30 children from Year 3, 34 from Year 4, 27 from Year 5, and 27 from Year 6. The study has been approved by Central University Research Ethics Committee (Ethics Approval Reference: R83682/RE003).

Materials

We created 30 short narratives ($M_{word\ count} = 18.00$, $SD_{word\ count} = 2.58$) of either neutral, negative, or positive valence (10 narratives in each condition). These were adapted from a pool of 70 narratives devised by Dong et al. (2024). The sentiment of each narrative was estimated in two ways. First, we used a *Bidirectional Encoder Representations from Transformers (BERT)* model, a transformer-based machine learning technique for natural language processing (Devlin et al., 2019). *BERT* considers the entire context of words in a sentence, rather than one word at a time, allowing it to capture emotional nuances in a narrative. The 70 narratives were also rated by 19 native English adult speakers who

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were asked how positive or negative each narrative made them feel. Both approaches showed that context valence differed significantly across the three valence conditions, with narratives in the positive condition showing the most positive valence, followed by neutral, and then by negative. Narratives were matched across conditions for total word count and mean length of utterance. From the pool of 70 narratives, we selected 30 that were age-appropriate and adapted them after discussing with four native English speakers (including one parent and one speech language therapist) who have extensive experience working with children. A sample set of narratives is shown in Table 3 (see Supplementary Materials for all narratives and novel words used).

There were 30 novel words, 15 of which served as target novel words and the others as foils in the post-tests. Each of the 15 target novel words was embedded twice in two different narratives in the same valence condition (see Table 3). The novel words were all six letters long and did not have a base meaning. They were created to have a nonword stem plus an adjective suffix, for example, the nonword stem *roif-* and the adjective suffix *-ic* led to the novel word *roific*. We chose five suffixes that are highly predictive of adjective status, as reported by Ulicheva et al. (2020). The novel words had no replacement orthographic neighbours, according to *NWatch* (Davis, 2005). Assignment of novel words to the context valence condition was counterbalanced such that a novel word appearing in the positive context for one child appeared in the neutral or negative context for other children. The post-test foils were the same across children.

Procedure

Consent forms were distributed by schools, and children who had parental consent (or absence of opt-out consent) were invited to take part. The experiment was conducted in a one-to-one setting in a quiet room, adjacent to the main classroom. The experiment was programmed and hosted on Gorilla (www.gorilla.sc). It was completed in a single session taking approximately 30 minutes. Study-themed stickers were used to keep children's attention and engagement.

After providing verbal assent, the child was introduced to the background of the study, which was structured around the premise of an alien attempting to learn English who, when writing their diary,

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occasionally replaced English words with words from its own language. Before they read the alien's diary, they completed the word reading efficiency component of the TOWRE in which they read as many words from a card as they could in 45 seconds, according to the manual instructions.

Next, they read the alien's diary, presented via Gorilla on the experimenter's laptop. They saw novel words in neutral, negative, or positive narratives, presented in a random order. Each child experienced 15 novel words embedded in 30 short narratives, evenly split into two blocks of 15 narratives. They were told to pay attention to these novel words, but no further instruction was provided.

Immediately after the second block of trials, word learning was assessed via three outcome measures, administered in a fixed order: *word recognition*, *valence judgment*, and *meaning generation*. Several practice items were provided before each task began, but otherwise no feedback was provided.

For *word recognition*, modelled after lexical decision, children identified whether they had previously seen a presented letter string. Each trial began with a fixation cross displayed for 250 ms, followed by the letter string, during which the children pressed marked keyboard keys to make a judgment (the keys M and Z were marked with a tick and a cross respectively). The next trial began immediately after a response was made, with no timeout imposed. Accuracy of the response was recorded. Each child responded to 30 items in total (15 target novel words and 15 foils), presented in a random order in a single block.

They then completed a *valence judgment* task in which they made a categorical judgment to indicate whether the meaning of a novel word (experienced in the reading phase) was neutral, negative, or positive. Each word was first displayed for 300 ms before the three options appeared. Children made a judgment by clicking on what they thought was the most suitable option. The next trial started as soon as a response was recorded, with no timeout. Accuracy was scored and there were 15 trials in total, presented in a random order in a single block.

The final task was *meaning generation*. In each trial, children were shown the 15 newly learnt words (one at a time, presented in a random order) along with the diary narrative context in which each

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appeared. They were invited to say one English word that they considered to correspond with the meaning of the novel word. This was typed into the interface by the experimenter and the words produced were later cross-referenced with norms of valence for English lemmas (Warriner et al., 2013) to provide a valence score for each response.

At the end of the session, children completed the phonemic decoding subtest of TOWRE, and they reported their basic demographic information, including age and gender.

Statistical Analyses

As set out in the pre-registration, we fitted mixed-effect models with random effects of participants and stimuli for each dependent variable, using the *lme4* package (Bates et al., 2015) in R (R Core Team, 2022). For all full models $DV \sim \text{Context_Valence} + \text{Age} + (1 + \text{Context_Valence} \mid \text{participant}) + (1 + \text{Context_Valence} \mid \text{item})$ that failed to converge, we followed Mak et al. (2023) by simplifying the random-effect structure using the R package *buildmer* (Voeten, 2023). The reduced model followed the structure of $DV \sim \text{Age} + (1 \mid \text{participant}) + (1 \mid \text{item})$. A likelihood ratio test was used to compare the full model to the reduced model to assess whether including the fixed factor *Context_Valence* significantly improved model fit.

For the dependent variable sensitivity d' in *word recognition*, a one-sample t-test compared the sample mean to the population mean 0, to test for the overall learning effect. For the dependent variable accuracy for valence judgment, a one-sample t-test compared the sample mean to the chance level, which is 0.33, to test for the overall learning effect.

The fixed effect was context valence (neutral, negative, positive). This was dummy-coded, with the neutral condition serving as the reference level. This yielded two comparisons: neutral vs. positive and neutral vs. negative. Models were fit using maximum likelihood estimates. Following these confirmatory analyses that compared neutral versus emotional contexts (both positive and negative), we explored whether there was a difference between positive and negative contexts, and how this might interact with children's age.

Results

Descriptive statistics are provided in Table 4. We first present the confirmatory analyses based on the hypotheses, and then the exploratory analyses.

Confirmatory Analyses

We computed overall sensitivity from raw responses to the *word recognition* task (number of hits, false alarms, correct rejection, and misses) using the *dprime* function in *psycho* package (Makowski, 2018). A one-sample *t*-test provided clear evidence that children discriminated between learned items and foils, $M_d' = 1.04$, 95% CI = [0.91, 1.17], $t(117) = 15.87$, $p < .001$. Having established the overall sensitivity to distinguish targets from foils, we then compared the accuracy of response in each valence condition. Figure 4 shows the mean recognition accuracy by context valence. A binary logistic mixed effect model was built with context valence and age as the predictors and included the random intercepts for participant and item. From the likelihood ratio test, context valence was a significant predictor of recognition accuracy, $\chi^2(2) = 12.40$, $p = .002$. As compared to words in the neutral context ($M = 0.67$, $SD = 0.47$), children were more accurate in recognising words experienced in the negative context ($M = 0.75$, $SD = 0.43$) and the positive context ($M = 0.73$, $SD = 0.44$; negative vs. neutral: $\beta = 0.47$, $SE = 0.14$, $z = 3.41$, $p < .001$; positive vs. neutral: $\beta = 0.33$, $SE = 0.13$, $z = 2.46$, $p = .01$). We used odds ratio (OR) to estimate effect size. Relative to neutral context, negative context increased the odds of correct recognition by 60% (OR = 1.60), and positive context increased odds by 39% (OR = 1.39). Age was also a significant predictor for recognition accuracy, $\chi^2(1) = 26.38$, $p < .001$, with older children performing better on the task than younger children, $\beta = 0.40$, $SE = 0.07$, $z = 5.36$, $p < .001$. Keeping context valence constant, each one-unit increase in age was associated with 49% higher odds of correct recognition (OR = 1.49).

Novel word valence learning was first assessed via *valence judgment*. A one-sample *t*-test provided evidence that children performed above chance, $M_{accuracy} = 0.37$, 95% CI = [0.35, 0.39], $t(117) = 4.48$, $p < .001$. We then compared across the different valence conditions, as illustrated in Figure 5, using a binary logistic linear model with context valence and age as the predictors. Context valence was a

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significant predictor of valence judgment accuracy, $\chi^2(2) = 7.67, p = .02$. As compared to novel words learned in the neutral contexts ($M = 0.36, SD = 0.20$), there was no significant difference in the performance for novel words learned in the negative condition ($M = 0.42, SD = 0.22$), or the positive ($M = 0.34, SD = 0.29$) condition; negative vs. neutral: $\beta = 0.22, SE = 0.12, z = 1.85, p = .06$; positive vs. neutral: $\beta = -0.10, SE = 0.12, z = -0.85, p = .39$. Age was a significant predictor for valence judgment accuracy, $\chi^2(1) = 4.03, p = .02$, with older children performing better on the task than younger children, $\beta = 0.09, SE = 0.04, z = 2.01, p = .04$.

The *meaning generation* data also tested novel word valence learning. Of the 1770 responses, 1642 (93%) had associated valence scores listed in Warriner et al.'s (2013) norms. Figure 6 shows the mean valence score of generated meaning per participant by context valence. We built a linear mixed effect model with the valence score as the dependent variable and included the fixed effects of context valence and age, and random intercepts for participant and item. The likelihood ratio test showed that context valence was a significant predictor of estimated valence scores, $\chi^2(2) = 153.22, p < .001$. Compared to novel words appearing in the neutral context ($M = 5.90, SD = 0.82$), children assigned more negative meanings to novel words experienced in the negative context ($M = 3.27, SD = 0.64$), and more positive meanings to novel words experienced in the positive ($M = 7.31, SD = 0.50$) context (negative vs. neutral: $\beta = -2.69, SE = 0.12, t = -22.65, p < .001$; positive vs. neutral: $\beta = 1.37, SE = 0.12, t = 11.59, p < .001$). These differences reflect large effects, with children's ratings shifting by more than two scale points (out of 9) in the negative direction and by more than one scale point in the positive direction relative to neutral. Age was also a significant predictor for estimated meaning valence, $\chi^2(1) = 7.06, p = .008$. Older children generated word meanings that were less positive than younger children, $\beta = -0.08, SE = 0.03, z = -2.68, p = .009$. While significant, the estimated effect of age was small, with each additional year associated with a decrease of only 0.08 in meaning ratings.

Exploratory Analysis

For valence judgment accuracy, confirmatory analysis revealed a significant effect of context valence, but the comparisons between negative vs neutral and positive vs neutral were not significant. To

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further explore what might be driving the significant fixed effect of context valence, we conducted a post hoc comparison between positive and negative contexts. This exploratory analysis showed that words read in the negative contexts were judged more accurately compared to words read in the positive contexts, $\beta = -0.33$, $SE = 0.12$, $z = -2.70$, $p = .007$ (see Figure 5). For completeness, we also conducted the same post hoc comparison for the other two tasks. In *word recognition*, there was no significant difference between positive and negative contexts, $p = .34$ (see Figure 4). In *meaning generation*, children assigned a more positive meaning to novel words encountered in the positive condition compared to those experienced in the negative narratives, $\beta = 4.06$, $SE = 0.12$, $t = 41.76$, $p < .001$ (see Figure 6).

Moreover, the confirmatory analyses showed that a significant age effect for *word recognition* and *valence judgment*, where older children performed better than younger children; however, it is unclear whether this held across the different emotional contexts. To do this, we performed a median split based on age (median age = 9.67) with 60 children in the younger age group ($M = 8.79$, $SD = 0.61$) and 58 children in the older age group ($M = 10.67$, $SD = 0.60$). We chose to present descriptive interpretations based on the visual inspection of the graphs (i.e., whether the confidence intervals overlap) rather than conducting statistical analyses, mindful that our exploratory analyses might be underpowered to test for an interaction, and that some models might not converge when the interaction term was included. Speculatively therefore, Figure 7(a) shows that older children recognised novel words read in neutral and positive contexts better than younger children, but there were no age differences for words read in negative contexts. Figure 7(b) shows that older children were more accurate in judging a word read in the negative context as negative, but there were no age differences for words read in positive or neutral contexts.

Discussion

This pre-registered word learning experiment investigated the influence of emotional narrative context on children's learning of novel adjectives. We found that children can learn novel words from reading short narratives, which corroborates and extends previous research with adults (e.g., Dong et al.,

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2024). This seems plausible, given that more generally, reading supports vocabulary acquisition, and that books contain a greater diversity of emotion words than age-matched conversations (Dawson et al., 2021; Dong & Nation, 2025). Our results also revealed an emotion advantage in *word recognition*. Words embedded in emotional contexts, be they positive or negative, were recognised more accurately than words presented in neutral contexts. This supports the affective embodiment account, which posits that emotional content enhances cognitive processing and memory retention. Additionally, we observed an age effect in *word recognition*, with older children outperforming younger children. This age effect could be attributed to a combination of factors, including increased proficiency in reading, language, and cognitive skills.

Children were also able to infer word valence from contextual experience. In *valence judgment*, performance was above chance, though it is worth noting that performance was relatively low. The task was challenging as no narrative context was provided during the test. A categorical judgment as to whether a word is either neutral, negative, or positive may be particularly complex for children, who might not have a fully developed understanding of these valence terms or may interpret them differently compared to adults. That said, evidence of valence learning was also seen in the meaning generation task. Here, children were asked to provide an English word that they thought best represented the meaning of each novel word in context. There was a close correspondence between the emotional valence of a generated meaning and the relative emotional valence of the context in which the novel word had appeared, consistent with emotional valence having been inferred.

General Discussion

We found that children's writing contains reliable patterns of association between word valence and the valence of the contexts that a word appears in (Study 1), and that narrative valence is an informative cue for word learning (Study 2). Context might be especially important for learning emotional and valenced words as they tend to be more abstract and their meanings more context-dependent (Davies et al., 2020; Dawson et al., 2021). Therefore, experiencing words in narrative context might enhance children's understanding of emotional concepts. Previous work has shown the

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value of context for emotional language. For example, in an analysis of infant-directed speech, Nencheva et al. (2023) found that the language used by caregivers not only communicated information but also reflected the emotional valence of the situation being described. For instance, when describing joyful events, caregivers tend to use positively charged words. This alignment between language and emotional context helps infants not only understand the meaning of the words but also connect those words to the emotional atmosphere. This creates a shared language environment that can support children's emotional development, and their ability to associate emotions with specific words and contexts. Our study extends the importance of context for emotional language to older children in the context of written language.

Many studies have examined how context influences word learning through reading (e.g., Bolger et al., 2008; Hulme et al., 2023; Mak et al., 2021; Rosa et al., 2022), but most have focused on nouns, particularly in relation to object-referent mapping. In contrast, adjectives have received far less attention, especially in the context of incidental learning. More broadly, relatively few studies have investigated the affective aspects of word learning at all, with existing research primarily focusing on adults (e.g., Snefjella et al., 2020) and no studies examining how children learn adjectives through reading. Our findings suggest that children as young as 7 years old can infer the emotional valence and meaning of novel adjectives through reading in context, even without explicit definitions or scaffolding by adults. This highlights that word learning occurs incidentally and incrementally during reading. In our study, although we did ask children to pay attention to the novel words, they were not informed about any upcoming tests. While we acknowledge that our approach might not fully resemble natural reading, where children are not typically instructed to focus on unfamiliar words, our approach is a step closer to incidental learning. Future research could eliminate this instruction to assess whether children infer valence spontaneously. Moreover, in line with our aim to simulate incidental learning, we chose not to provide predefined meanings for the made-up words. This allowed children to engage with the novel words more naturally. Consequently, we did not control for whether the novel adjectives were used in prenominal (before nouns) or postnominal (predicative) positions. Yet, real words sometimes have positional constraints (e.g., Davies et al., 2020); for

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example, "afraid" can only be used predicatively. Future studies could explore adjective position and more generally, the syntactic, semantic, and pragmatic dimensions of adjectives to provide a more comprehensive understanding of children's acquisition of adjectives via reading.

Our results support the affective embodiment account that emotional valence facilitates the acquisition of abstract words, but the account does not specify whether positive or negative valence is more effective in supporting word learning. Indeed, our exploratory analysis showed no significant difference between positive or negative contexts in *word recognition*. Interestingly, however, when looking at children's own language production, there was evidence for a linguistic positivity bias in both Study 1 and Study 2. This is in line with the Pollyanna hypothesis that human language demonstrates a universal tendency to use more positive terms (Boucher & Osgood, 1969; Dodds et al., 2015). In *meaning generation* in Study 2, the overall valence of all generated words is 5.49 out of 9, which is also above the midpoint of 5. Specifically, the estimated valence rating for words in the neutral context (5.90) is also slightly more positive than neutral, a finding also seen in adults (Dong et al., 2024). Consistent with experimental findings, both the analysis of children's writing in Study 1 and that of adults' writing (Snefjella & Kuperman, 2016) showed that the mean word valence and context valence exceeded the midpoint of 5, indicating a greater usage of positive words and contexts. These provide additional evidence for the Pollyanna hypothesis and universal linguistic positivity. While both positive and negative contexts support learning, when it comes to language usage, both adults and children tend to use more positive language.

While in line with the affective embodiment account, alternative language learning mechanisms, such as statistical learning and distributional semantics, may also contribute to the observed effects (Lenci et al., 2018; Mak et al., 2025; Seidenberg & MacDonald, 2018). Results from Study 1 suggest that children are sensitive to co-occurrence patterns and the distributional properties of words in context, which can facilitate word learning independent of emotional valence. Factors such as semantic richness or predictability of linguistic structures may also support learning through mechanisms beyond affective embodiment. Moreover, emotional narratives may enhance attention and engagement, indirectly supporting learning through more general cognitive processes rather than

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affective grounding. These possible alternative explanations suggest that affective embodiment is likely one of multiple interacting factors in word learning from emotional context. Future research should aim to disentangle these mechanisms by more systematically manipulating both emotional and statistical properties of linguistic input, such as word co-occurrence frequencies, semantic richness, and predictability. As noted at the end of Study 1, detailed analyses of text-level data in books written for children to read are needed to fully map how language input varies across registers and modalities, and with targeted age. Future work that blends such analyses with more experimental approaches to assess causality should inform theoretical debates. Additionally, assessing children's ability to use novel words in new, unrelated contexts would clarify whether emotional contexts support deeper semantic integration of word meaning beyond potential influences of valence-based associative learning based on co-occurrence patterns. Finally, future work is needed to consider how emotional valence may interact with factors known to influence learning and memory more generally. To extend the current findings, a productive avenue would involve implementing a multi-day training paradigm to examine the longer-term retention of novel words. Such an approach would provide valuable insights into the role of offline consolidation in this process (e.g., Lam et al., 2025).

In conclusion, we combined a data-driven and an experimental approach to understanding emotional context in children's language. We first demonstrated through analysing children's own writing that context valence correlates with word valence. We then tested whether children could infer the emotional valence of novel words when reading them in context, and found that words read in emotional contexts were learned better than those experienced in more neutral contexts. As the first study of its kind with children, questions remain for future research to address. For example, assessing word knowledge after a delay would reveal whether the learning effects seen in our experiment maintain over time, and introducing a frequency manipulation could test how learning unfolds through multiple exposures. We focused on valence, and it would be interesting to consider other emotion attributes such as arousal. Together, this will deepen our understanding of the interplay between words and the contexts in which they appear, and how affective associations build from children's experience of words in emotional contexts.

References

- Baron-Cohen, S., Golan, O., Wheelwright, S., & Granader, Y. (2010). Emotion Word Comprehension from 4 to 16 Years Old: A Developmental Survey. *Frontiers in Evolutionary Neuroscience, 2*. <https://www.frontiersin.org/articles/10.3389/fnevo.2010.00109>
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software, 67*, 1–48. <https://doi.org/10.18637/jss.v067.i01>
- Batini, F., Luperini, V., Cei, E., Izzo, D., & Toti, G. (2021). The Association Between Reading and Emotional Development: A Systematic Review. *Journal of Education and Training Studies, 9*(1), Article 1. <https://doi.org/10.11114/jets.v9i1.5053>
- Bireta, T. J., Guitard, D., Neath, I., & Surprenant, A. M. (2023). Valence and concreteness in item recognition: Evidence against the affective embodiment account. *Psychonomic Bulletin & Review. https://doi.org/10.3758/s13423-023-02442-8*
- Bolger, D. J., Balass, M., Landen, E., & Perfetti, C. A. (2008). Context variation and definitions in learning the meanings of words: An instance-based learning approach. *Discourse Processes, 45*(2), 122–159. <https://doi.org/10.1080/01638530701792826>
- Boucher, J., & Osgood, C. E. (1969). The Pollyanna hypothesis. *Journal of Verbal Learning & Verbal Behavior, 8*, 1–8. [https://doi.org/10.1016/S0022-5371\(69\)80002-2](https://doi.org/10.1016/S0022-5371(69)80002-2)
- Brybaert, M., Warriner, A. B., & Kuperman, V. (2014). Concreteness ratings for 40 thousand generally known English word lemmas. *Behavior Research Methods, 46*(3), 904–911. <https://doi.org/10.3758/s13428-013-0403-5>
- Davies, C., Lingwood, J., & Arunachalam, S. (2020). Adjective forms and functions in British English child-directed speech. *Journal of Child Language, 47*(1), 159–185. <https://doi.org/10.1017/S0305000919000242>
- Davis, C. J. (2005). N-Watch: A program for deriving neighborhood size and other psycholinguistic statistics. *Behavior Research Methods, 37*(1), 65–70. <https://doi.org/10.3758/BF03206399>

EMOTIONAL VALENCE IN CHILDREN'S LANGUAGE CONTEXT

- Dawson, N., Hsiao, Y., Tan, A. W. M., Banerji, N., & Nation, K. (2021). Features of lexical richness in children's books: Comparisons with child-directed speech. *Language Development Research, 1*(1), Article 1. <https://doi.org/10.34842/5we1-yk94>
- Department for Education. (2025). Schools, pupils and their characteristics. <https://explore-education-statistics.service.gov.uk/find-statistics/school-pupils-and-their-characteristics/2024-25>
- Devlin, J., Chang, M.-W., Lee, K., & Toutanova, K. (2019). *BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding* (arXiv:1810.04805). arXiv. <https://doi.org/10.48550/arXiv.1810.04805>
- Dodds, P. S., Clark, E. M., Desu, S., Frank, M. R., Reagan, A. J., Williams, J. R., Mitchell, L., Harris, K. D., Kloumann, I. M., Bagrow, J. P., Megerdooimian, K., McMahon, M. T., Tivnan, B. F., & Danforth, C. M. (2015). Human language reveals a universal positivity bias. *Proceedings of the National Academy of Sciences, 112*(8), 2389–2394. <https://doi.org/10.1073/pnas.1411678112>
- Dong, Y., Mak, M. H., Hepach, R., & Nation, K. (2024). Learning New Words via Reading: The Influence of Emotional Narrative Context on Learning Novel Adjectives. *Quarterly Journal of Experimental Psychology, 78*(10), 2167-2180. <https://doi.org/10.1177/17470218241308221>
- Dong, Y., & Nation, K. (2025). Charting the frequency and diversity of emotion words in children's language: Written language matters. *First Language, 45*(4), 457-475. <https://doi.org/10.1177/01427237251339788>
- Doost, H. T. N., Moradi, A. R., Taghavi, M. R., Yule, W., & Dalglish, T. (1999). The development of a corpus of emotional words produced by children and adolescents. *Personality and Individual Differences, 27*, 433–451. [https://doi.org/10.1016/S0191-8869\(98\)00253-0](https://doi.org/10.1016/S0191-8869(98)00253-0)
- Driver, M. (2021). EMOTION-LADEN TEXTS AND WORDS: THE INFLUENCE OF EMOTION ON VOCABULARY LEARNING FOR HERITAGE AND FOREIGN LANGUAGE LEARNERS. *Studies in Second Language Acquisition, 1–24*. <https://doi.org/10.1017/S0272263121000851>

EMOTIONAL VALENCE IN CHILDREN'S LANGUAGE CONTEXT

- Frances, C., Bruin, A. de, & Duñabeitia, J. A. (2020). The effects of language and emotionality of stimuli on vocabulary learning. *PLOS ONE*, *15*(10), e0240252.
<https://doi.org/10.1371/journal.pone.0240252>
- Green, C., Keogh, K., Sun, H., & O'Brien, B. (2024). The Children's Picture Books Lexicon (CPB-LEX): A large-scale lexical database from children's picture books. *Behavior Research Methods*, *56*(5), 4504–4521. <https://doi.org/10.3758/s13428-023-02198-y>
- Honnibal, M., & Montani, I. (2017). *spaCy 2: Natural language understanding with Bloom embeddings, convolutional neural networks and incremental parsing*.
- Hulme, R. C., Begum, A., Nation, K., & Rodd, J. M. (2023). Diversity of narrative context disrupts the early stage of learning the meanings of novel words. *Psychonomic Bulletin & Review*, *30*(6), 2338–2350. <https://doi.org/10.3758/s13423-023-02316-z>
- Kauschke, C., Bahn, D., Vesker, M., & Schwarzer, G. (2019). The Role of Emotional Valence for the Processing of Facial and Verbal Stimuli—Positivity or Negativity Bias? *Frontiers in Psychology*, *10*. <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01654>
- Kim, J. M., Sidhu, D. M., & Pexman, P. M. (2020). Effects of Emotional Valence and Concreteness on Children's Recognition Memory. *Frontiers in Psychology*, *11*, 615041.
<https://doi.org/10.3389/fpsyg.2020.615041>
- Korochkina, M., Marelli, M., Brysbaert, M., & Rastle, K. (2024). The Children and Young People's Books Lexicon (CYP-LEX): A large-scale lexical database of books read by children and young people in the United Kingdom. *Quarterly Journal of Experimental Psychology*, 17470218241229694. <https://doi.org/10.1177/17470218241229694>
- Kousta, S.-T., Vigliocco, G., Vinson, D. P., Andrews, M., & Del Campo, E. (2011). The representation of abstract words: Why emotion matters. *Journal of Experimental Psychology: General*, *140*(1), 14–34. <https://doi.org/10.1037/a0021446>
- Kousta, S.-T., Vinson, D. P., & Vigliocco, G. (2009). Emotion words, regardless of polarity, have a processing advantage over neutral words. *Cognition*, *112*(3), 473–481.
<https://doi.org/10.1016/j.cognition.2009.06.007>

EMOTIONAL VALENCE IN CHILDREN'S LANGUAGE CONTEXT

- Kuhlmann, M., Hofmann, M. J., & Jacobs, A. M. (2017). If You Don't Have Valence, Ask Your Neighbor: Evaluation of Neutral Words as a Function of Affective Semantic Associates. *Frontiers in Psychology, 8*. <https://www.frontiersin.org/articles/10.3389/fpsyg.2017.00343>
- Lam, N., Hayiou-Thomas, M. E., Mak, M. H. C., & Henderson, L. (2025). Developmental differences in the timecourse of word learning: Greater improvements for children, semantic benefits for adults. *Journal of Experimental Child Psychology, 255*, 106225. <https://doi.org/10.1016/j.jecp.2025.106225>
- Lana, N., & Kuperman, V. (2023). Learning concrete and abstract novel words in emotional contexts: Evidence from incidental vocabulary learning. *Language Learning and Development, 20*(2), 158-173. <https://doi.org/10.1080/15475441.2023.2246438>
- Lenci, A., Lebani, G. E., & Passaro, L. C. (2018). The Emotions of Abstract Words: A Distributional Semantic Analysis. *Topics in Cognitive Science, 10*(3), 550–572. <https://doi.org/10.1111/tops.12335>
- Lund, T. C., Sidhu, D. M., & Pexman, P. M. (2019). Sensitivity to emotion information in children's lexical processing. *Cognition, 190*, 61–71. <https://doi.org/10.1016/j.cognition.2019.04.017>
- Mak, M. H. C., Ball, L. V., O'Hagan, A., Walsh, C. R., & Gaskell, M. G. (2025). Involvement of episodic memory in language comprehension: Naturalistic comprehension pushes unrelated words closer in semantic space for at least 12 h. *Cognition, 258*, 106086. <https://doi.org/10.1016/j.cognition.2025.106086>
- Mak, M. H. C., Curtis, A. J., Rodd, J. M., & Gaskell, M. G. (2023). Episodic memory and sleep are involved in the maintenance of context-specific lexical information. *Journal of Experimental Psychology. General, 152*(11), 3087–3115. <https://doi.org/10.1037/xge0001435>
- Mak, M. H. C., Hsiao, Y., & Nation, K. (2021). Anchoring and contextual variation in the early stages of incidental word learning during reading. *Journal of Memory and Language, 118*, 104203. <https://doi.org/10.1016/j.jml.2020.104203>

EMOTIONAL VALENCE IN CHILDREN'S LANGUAGE CONTEXT

- Makowski, D. (2018). The psycho Package: An Efficient and Publishing-Oriented Workflow for Psychological Science. *Journal of Open Source Software*, 3(22), 470.
<https://doi.org/10.21105/joss.00470>
- Ministry of Housing, Communities & Local Government. (2019a). *English indices of deprivation 2019*. GOV.UK. <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019>
- Ministry of Housing, Communities & Local Government. (2019b). *Indices of Deprivation 2019 postcode search*. Open Data Communities. <https://imd-by-postcode.opendatacommunities.org/imd/2019>
- Mumford, K. H., & Kita, S. (2014). Children use gesture to interpret novel verb meanings. *Child Development*, 85(3), 1181-1189. <https://doi.org/10.1111/cdev.12188>
- Nagy, W. E., Anderson, R. C., & Herman, P. A. (1987). Learning Word Meanings From Context During Normal Reading. *American Educational Research Journal*, 24(2), 237-270.
<https://doi.org/10.3102/00028312024002237>
- Nagy, W. E., Herman, P. A., & Anderson, R. C. (1985). Learning Words from Context. *Reading Research Quarterly*, 20(2), 233-253. <https://doi.org/10.2307/747758>
- Nation, K., Dawson, N. J., & Hsiao, Y. (2022). Book Language and Its Implications for Children's Language, Literacy, and Development. *Current Directions in Psychological Science*, 31(4), 375-380. <https://doi.org/10.1177/09637214221103264>
- Nencheva, M. L., Tamir, D. I., & Lew-Williams, C. (2023). Caregiver speech predicts the emergence of children's emotion vocabulary. *Child Development*. <https://doi.org/10.1111/cdev.13897>
- Ogren, M., & Sandhofer, C. M. (2021). Emotion words in early childhood: A language transcript analysis. *Cognitive Development*, 60, 101122. <https://doi.org/10.1016/j.cogdev.2021.101122>
- Ponari, M., Norbury, C. F., & Vigliocco, G. (2018). Acquisition of abstract concepts is influenced by emotional valence. *Developmental Science*, 21(2), e12549. <https://doi.org/10.1111/desc.12549>
- Ponari, M., Norbury, C. F., & Vigliocco, G. (2020). The role of emotional valence in learning novel abstract concepts. *Developmental Psychology*, 56(10), 1855-1865.
<https://doi.org/10.1037/dev0001091>

EMOTIONAL VALENCE IN CHILDREN'S LANGUAGE CONTEXT

- R Core Team. (2022). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. <https://www.r-project.org/>
- Reggin, L. D., Muraki, E. J., & Pexman, P. M. (2021). Development of Abstract Word Knowledge. *Frontiers in Psychology, 12*, 686478. <https://doi.org/10.3389/fpsyg.2021.686478>
- Rosa, E., Salom, R., & Perea, M. (2022). Contextual diversity favors the learning of new words in children regardless of their comprehension skills. *Journal of Experimental Child Psychology, 214*, 105312. <https://doi.org/10.1016/j.jecp.2021.105312>
- Seidenberg, M. S., & MacDonald, M. C. (2018). The Impact of Language Experience on Language and Reading: A Statistical Learning Approach. *Topics in Language Disorders, 38*(1), 66. <https://doi.org/10.1097/TLD.0000000000000144>
- Shaoul, C., & Westbury, C. (2013). *A reduced redundancy USENET corpus (2005-2011) Edmonton, AB: University of Alberta*. Downloaded from <https://www.psych.ualberta.ca/~westburylab/downloads/usenetcorpus.download.html>
- Silk, J. S., Siegle, G. J., Whalen, D. J., Ostapenko, L. J., Ladouceur, C. D., & Dahl, R. E. (2009). Pubertal Changes in Emotional Information Processing: Pupillary, Behavioral, and Subjective Evidence during Emotional Word Identification. *Development and Psychopathology, 21*(1), 7–26. <https://doi.org/10.1017/S0954579409000029>
- Snefjella, B., & Kuperman, V. (2016). It's all in the delivery: Effects of context valence, arousal, and concreteness on visual word processing. *Cognition, 156*, 135–146. <https://doi.org/10.1016/j.cognition.2016.07.010>
- Snefjella, B., Lana, N., & Kuperman, V. (2020). How emotion is learned: Semantic learning of novel words in emotional contexts. *Journal of Memory and Language, 115*, 104171. <https://doi.org/10.1016/j.jml.2020.104171>
- Torgesen, J. K., Wagner, R. K., & Rashotte, C. A. (2012). *TOWRE-2 Test of Word Reading Efficiency*. New York: Pearson.
- Ulicheva, A., Harvey, H., Aronoff, M., & Rastle, K. (2020). Skilled readers' sensitivity to meaningful regularities in English writing. *Cognition, 195*, 103810. <https://doi.org/10.1016/j.cognition.2018.09.013>

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- Vaish, A., Grossmann, T., & Woodward, A. (2008). Not all emotions are created equal: The negativity bias in social-emotional development. *Psychological Bulletin*, *134*(3), 383–403.
<https://doi.org/10.1037/0033-2909.134.3.383>
- Vigliocco, G., Kousta, S.-T., Della Rosa, P. A., Vinson, D. P., Tettamanti, M., Devlin, J. T., & Cappa, S. F. (2014). The neural representation of abstract words: The role of emotion. *Cerebral Cortex*, *24*(7), 1767–1777. <https://doi.org/10.1093/cercor/bht025>
- Vigliocco, G., Ponari, M., & Norbury, C. (2018). Learning and Processing Abstract Words and Concepts: Insights From Typical and Atypical Development. *Topics in Cognitive Science*, *10*(3), 533–549. <https://doi.org/10.1111/tops.12347>
- Voeten, C. C. (2023). *Using 'buildmer' to automatically find & compare maximal (mixed) models*.
<https://cran.r-project.org/web/packages/buildmer/vignettes/buildmer.html>
- Warriner, A. B., Kuperman, V., & Brysbaert, M. (2013). Norms of valence, arousal, and dominance for 13,915 English lemmas. *Behavior Research Methods*, *45*(4), 1191–1207.
<https://doi.org/10.3758/s13428-012-0314-x>
- Wild, K., Kilgarriff, A., & Tugwell, D. (2013). The Oxford Children's Corpus: Using a Children's Corpus in Lexicography¹. *International Journal of Lexicography*, *26*(2), 190–218.
<https://doi.org/10.1093/ijl/ecs017>

List of Tables

Table 1

Summary statistics of word-level and context-level properties in the children's writing corpus ($N = 24,383$ words).

	Mean	SD	Min	Max	Skew	Kurtosis
Word Valence	5.13	1.27	1.40	8.53	-0.35	-0.28
Word Arousal	4.20	0.90	1.60	7.79	0.49	0.05
Word Concreteness	3.46	1.01	1.12	5.00	-0.15	-1.21
Context Valence	5.69	0.25	4.83	6.54	-0.12	0.62
Context Arousal	4.14	0.15	3.62	4.68	0.11	1.08
Context Concreteness	3.40	0.21	2.69	4.09	-0.19	0.27

Note. Valence and arousal were rated from 1-9, with 1 being very negative (or calming) and 9 being very positive (or arousing); Concreteness was rated from 1-5, with 1 being very abstract and 5 being very concrete.

EMOTIONAL VALENCE IN CHILDREN'S LANGUAGE CONTEXT

Table 2

Correlation matrix of word-level and context-level properties in children's language.

	Word Valence	Word Arousal	Word Concreteness	Context Valence	Context Arousal	Context Concreteness
Word Valence	-					
Word Arousal	-0.20***	-				
Word Concreteness	0.08***	-0.16***	-			
Context Valence	0.46***	-0.11***	0.02*	-		
Context Arousal	-0.12***	0.32***	-0.12***	-0.26***	-	
Context Concreteness	0.04***	-0.12***	0.48***	-0.06***	-0.16***	-

Note. $p < .001$ ***, $p < .01$ **, $p < .05$ * based on Pearson's correlation test. Bold values are key correlations of interest, e.g., between context valence and word valence.

EMOTIONAL VALENCE IN CHILDREN'S LANGUAGE CONTEXT

Table 3

An example narrative for each valence condition.

Context	Examples
Valence	

Neutral	I went to the roific library today. To get there, I turned left at the roific house.
Negative	I had a lenful argument with my classmate today. Their lenful words hurt my feelings.
Positive	I won a merous prize in writing today. I love the feeling of writing merous stories.

EMOTIONAL VALENCE IN CHILDREN'S LANGUAGE CONTEXT

Table 4

Descriptive statistics (mean and standard deviation) for each outcome measure.

	Word Recognition	Valence Judgment	Meaning Generation
Variable	Accuracy	Accuracy	Valence score
Neutral	0.67 (0.23)	0.36 (0.20)	5.90 (0.82)
Negative	0.75 (0.22)	0.42 (0.22)	3.27 (0.64)
Positive	0.73 (0.26)	0.34 (0.19)	7.31 (0.50)

Note. Accuracy is a probability from 0 to 1; Valence score is a continuous value between 1-9, with 9 being very positive, and 1 being very negative.

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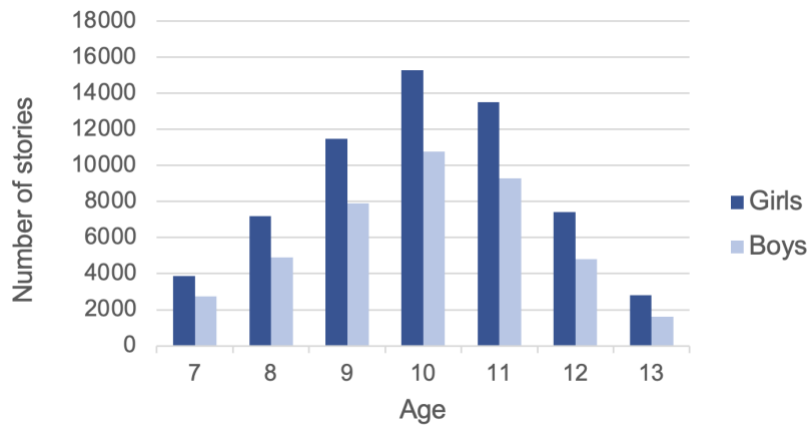


Figure 1. Number of stories analysed by age and gender.

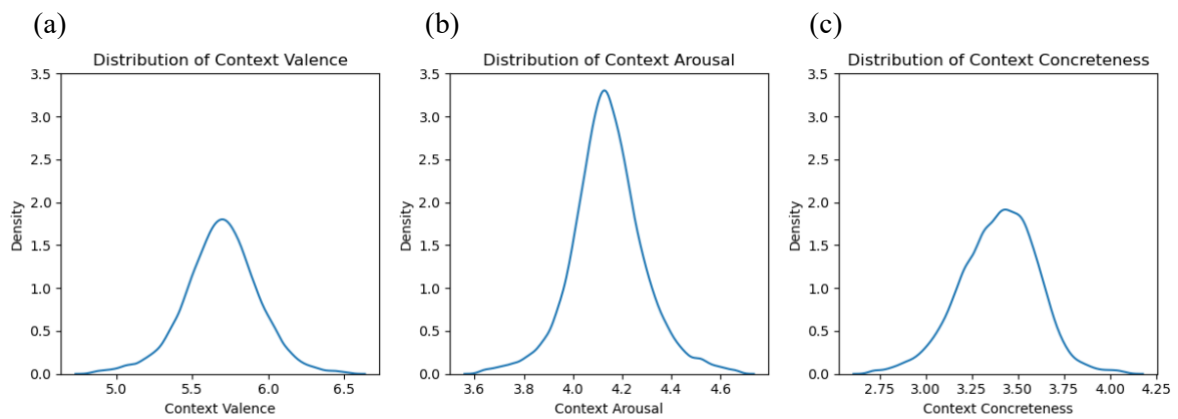


Figure 2. Density plots showing the distribution of (a) Context Valence, (b) Context Arousal, and (c) Context Concreteness.

Note. Valence and arousal were rated from 1-9, with 1 being very negative (or calming) and 9 being very positive (or arousing); Concreteness was rated from 1-5, with 1 being very abstract and 5 being very concrete.

EMOTIONAL VALENCE IN CHILDREN'S LANGUAGE CONTEXT

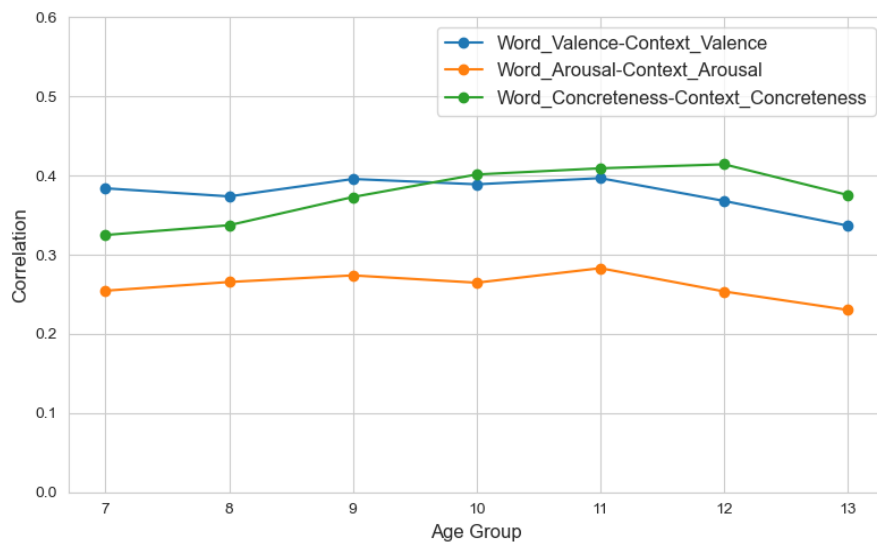


Figure 3. Correlation between word- and context-level semantic variables across age groups.

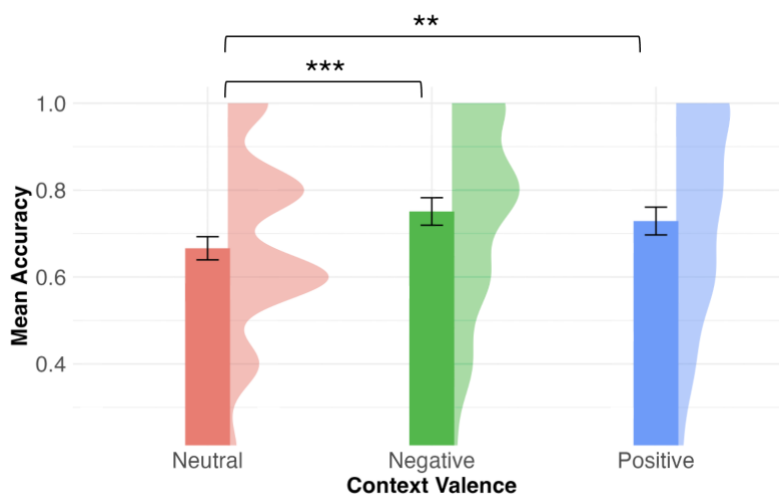


Figure 4. Mean recognition accuracy (proportion correct) of novel words experienced in each context valence condition.

Note. The density plots represent the distribution of the mean accuracy in each condition. Error bars represent 95% within-participant confidence intervals. *** $p < .001$, ** $p < .01$, * $p < .05$.

EMOTIONAL VALENCE IN CHILDREN'S LANGUAGE CONTEXT

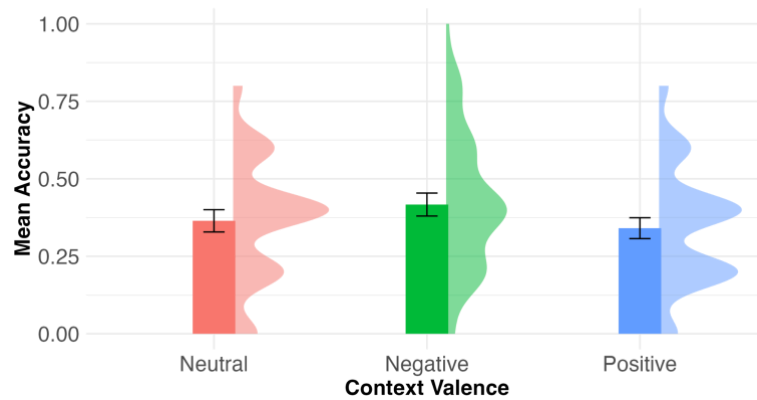


Figure 5. Mean valence judgment accuracy (proportion correct) of novel words experienced in each context valence condition.

Note. The density plots represent the distribution of the mean accuracy in each condition. Error bars represent 95% within-participant confidence intervals.

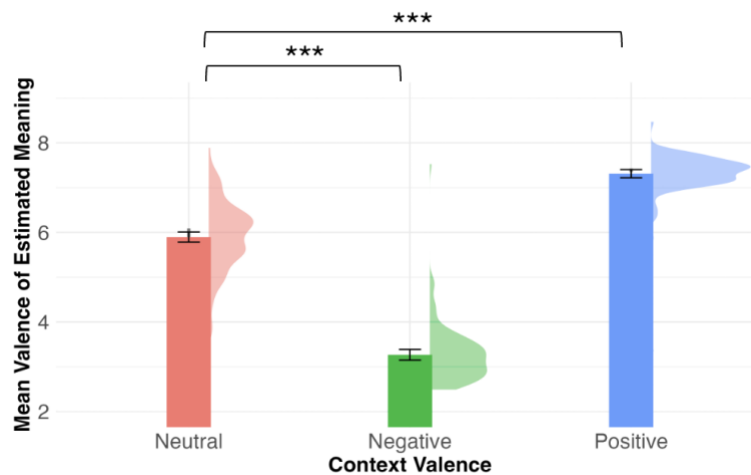


Figure 6. Mean valence scores (as obtained from existing norms) of generated meanings of novel words experienced in each context valence.

EMOTIONAL VALENCE IN CHILDREN'S LANGUAGE CONTEXT

Note. The density plots represent the distribution of the mean valence of the meaning generated. Error bars represent 95% within-participant confidence intervals. $***p < .001$, $**p < .01$, $*p < .05$. Greater valence represents greater positivity.

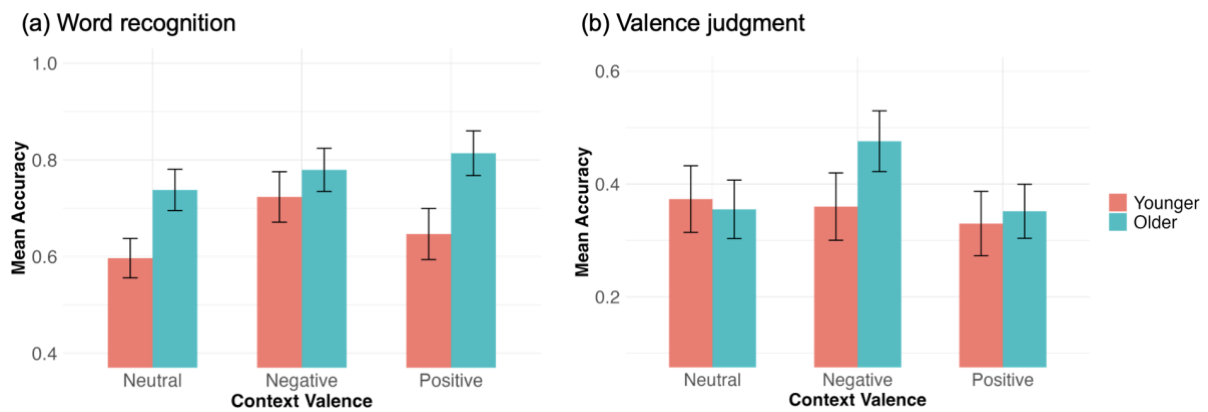


Figure 7. Mean recognition accuracy (a) and mean valence judgment accuracy (b) as a function of Context Valence and Age Group.

Note. Error bars represent 95% within-participant confidence intervals.