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ARTICLE

Frequency-based salience of dual meanings in conventional metaphor acquisition: Evidence from toddlers in Urban England

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Abstract

This study investigates claims that metaphor acquisition is rooted in the words' concrete meanings: to be able to use metaphors and other non-literal languages, the child needs to 'go beyond' meanings that are conventional and so presumably concrete (e.g., Falkum, 2022: 97). To test if metaphor-related words emerge via their concrete senses and how this reflects child-directed speech, I examined 594 hours of interactional data for three English-speaking toddlers from urban middle-class England, whose speech was densely sampled between the ages of 2;00 and 3;01. The data show that 75%–82% conventional metaphors were acquired via their concrete senses and that the order of acquisition of concrete and abstract senses corresponded with their input frequencies. Overall, when hearing conventional metaphors, 81%–89% of the time children were exposed to their concrete meanings. Contrary to the generic argument that children's pragmatic reasoning with non-literal uses is impeded by meaning conventionality (Falkum, 2022), my preliminary data suggest that it is influenced by the frequency of exposure to the concrete meanings of conventional metaphors, which leads to a generalised prediction that the most probable interpretation of any new metaphor is concrete (literal). Qualitative analyses further reveal that abstract meanings, when acquired first, were learned in highly emotive contexts.

Keywords: concrete; abstract; meaning; metaphor; usage-based; acquisition

1. Introduction

Metaphoric expressions are built around polysemous words with distinct but related meanings, whose interpretation out of context is different from the one they may evoke when surrounded by contextual clues (Steen et al., 2010). When out of context, metaphor-related words tend to evoke a core meaning (e.g., *sunshine*, i.e., the light coming from the sun). When a rich explicit context is used, however, the same linguistic form (i.e., *sunshine*) may invite an alternative interpretation when it is

directed lovingly at a child to say they brighten up our day. Each encounter with the word form, be it heard or used, reinforces memory traces that link the form (e.g., the word *sunshine*) and its distinct meaning (e.g., a happy child), allowing the link to become progressively more entrenched or 'conventionalised' in the mind. Over 99.5% of all metaphors used in child-directed speech (CDS) belong to the category of such conventional items frequently recycled in the speech community, while novel metaphoric creations, which have not been encountered before (e.g., Your hair is *worms*), are exceptionally rare (Gaskins et al., 2023; Gaskins, 2024).

Having been studied from different perspectives, metaphors invite both fairly broad and narrow definitions (Holyoak & Stamenković, 2018). Conceptual metaphor theory (CMT), for example, sees metaphorical concepts as inscribed into a broad range of lexical items, including highly frequent adjectives (e.g., I'm feeling *down*) and delexicalised verbs (e.g., *Come* on). Developmental work conducted from this theoretical perspective is limited (but, see, e.g., Keil, 1986; Ozcaliskan, 2005). However, in theory, the use of linguistic metaphors reflects a complex system of underlying conceptual mappings, developed by observing correlations of experience, which support the processing of conventional and novel metaphors alike (Grady, 2005; Kövecses, 2020; Lakoff & Johnson, 2008). For example, when having hunched shoulders and a slouched posture, children learn to associate sadness with a downward movement, and their subsequent use of expressions such as *I'm feeling down* taps into their embodied experience, helping them to process the metaphorical meaning. This approach suggests that the acquisition of the vast majority of metaphors is rooted in, and preceded by, the sensory experience of the world.

By strong contrast, proponents of pragmatic accounts view metaphors through a relatively narrow lens: as conventional metaphors are accessed and retrieved in comprehension instantly just like any other lexical items, it is only novel metaphors that can tell us something about the pragmatic skills involved in metaphor processing (e.g., Bowdle & Gentner, 2005; Camp, 2006). Developmental work conducted from this theoretical perspective has demonstrated that increases in children's accurate processing of novel metaphors are positively correlated with increases in their vocabulary size (Pouscoulous & Perovic, 2023), skills of analogy and alternative naming (Di Paola et al., 2019), relational verbal reasoning and executive function (Carriedo et al., 2016) and the ability to take the perspective of another person (Del Sette et al. 2020), to mention but a few factors.

To investigate metaphor production rather than comprehension, I adopt a different, usage-based (UB) theory, which takes a broad perspective on metaphor use, encompassing both conventional and novel expressions used in spontaneous speech (Gaskins et al., 2023). This approach examines metaphors produced during children's interactions with their caregivers, systematically eliminating examples of pretence and overextensions, which may seem metaphorical but are more likely a feature of developing child language (e.g., Falkum, 2019). Contrary to CMT, the UB approach sees the acquisition of metaphors as driven largely by linguistic rather than embodied experience. Contrary to pragmatic accounts, it sees even the most frequent conventional metaphors as distinct from any other lexical items. My decision to view highly frequent conventional metaphors as a group with a unique role to play in the development of more complex pragmatic skills is supported by studies that demonstrate that some conventional metaphors (e.g., a *sweet* compliment) lead to a greater activation of amygdala (the brain centre for emotions) compared to monosemous

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paraphrases (e.g., a *nice* compliment) (Citron & Goldberg, 2014); likewise, they elicit greater pupil dilation in reading tasks (Mon et al., 2021).

In line with this work, I argue that conventional metaphors should be given a special place in developmental research, and this is for at least three reasons[1]. First of all, conventional metaphoric expressions of all kinds are likely to be seen as novel by very young children, who have not come across them before; thus, acquiring them is likely to enhance children's proficiency with the skills required in the process. Second, examining conventional metaphors (e.g., You are my *sunshine*) is likely to tell us more about children's abilities to process novel metaphoric expressions than examining any other lexical items (e.g., You are my *child*): both conventional and novel metaphors reflect links between notions representing two distinct domains (here: sunshine and child). Third, even though high usage frequencies of some conventional expressions may have bleached them of salient semantic content (Sweetser, 1988), these metaphoric creations do satisfy the criteria for inclusion in the metaphor category, i.e., they invite at least two possible interpretations, which are both distinct and linked by some form of similarity (Gaskins et al., 2023; Steen et al., 2010). To capture as much of children's experience with conventional metaphors as possible, the method used in my study thus throws the net very wide, seeing metaphors through the lens of CMT (Grady, 2005; Lakoff & Johnson, 2008) and including even the highly frequent grammatical metaphors (e.g., *Before* Monday, Do it this *way*) as they are part of language use in a similar way to their less frequent counterparts. Crucially, when heard in CDS, just like any other types of metaphors, they give children repeated opportunities for noticing the duality of meanings related by some form of similarity and for making generalised predictions about how such words tend to behave in speech.

The current study is positioned within the context of the debate about children's growing ability to process abstract information. We know, for example, that children's ability to explain metaphors verbally emerges fairly late, with children continuing to provide concrete interpretations for abstract notions (e.g., Dryll, 2009; Falkum, 2022; Gentner & Stuart, 1983; Levorato & Cacciari, 2002; Noveck, 2001; Vosniadou, 1987; Winner, 1997; Winner, Rosenstiel & Gardner, 1976). For example, when asked to explain the abstract/non-literal meanings of conventional animal-based words in the context (e.g., If we say someone is *an eagle*, what are they like?), six-year-old speakers of Polish continue to provide interpretations that are concrete/literal (e.g., She has lots of feathers); eight-year-olds supply ambiguous interpretations, and it is only ten-year-olds who start to use metaphorical reasoning (e.g., She is very perceptive).[2]

Falkum (2022) provides a possible explanation for these early difficulties by relying on the notion of meaning conventionality: the challenges in explaining abstract concepts are driven by children's sensitivity to sense conventions, which impedes

[1]A case for studying conventional metaphors is built here because some theorists argue that such metaphors have little to do with thought but are simply a matter of lexical semantics which can be historically explained (Glucksberg 2001; Jackendoff 2002). While it may be argued that the term "polyseme" would be more appropriate for this group of words, they also meet the criteria for metaphor highlighted at the start of this paper as they rely on abstract and concrete meanings being distinct but similar.

[2]The notion that children find abstract meanings challenging is reinforced by a wealth of developmental data, which shows that the ability to use word forms denoting abstract concepts is emergent: in their first 50-word lexicons, children tend to prioritise concrete nouns (e.g., Caselli et al., 1999 for English and Italian; Jackson-Maldonado et al., 1993 for Spanish; Zarębina, 1965 and Szuman, 1968 for Polish but see Tardif, 1996. Tardiff et al., 1997 and Kim et al., 2000 for a verb preference in Mandarin and Korean, respectively).

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their pragmatic reasoning with non-literal uses during pre-school years. Falkum seems to hint that children might see the core meanings of metaphor-related words (e.g., eagle, i.e., a bird) as more widely accepted[3], and this explains why they are drawn to these meanings when they encounter less conventional uses of the same linguistic forms (e.g., *eagle*, i.e., a perceptive individual). However, at present, this argument still requires empirical support and clarification as to why certain types of meanings may be perceived as more conventional. If concrete meanings are indeed more accepted, is their embodiment-driven concreteness the most obvious reason for this?

Following the UB notion that usage frequency supports linguistic conventionality (Schmid, 2020), my study examines whether the notion of sense conventionality may instead be driven by how often concrete and abstract meanings are heard in CDS. To measure the frequencies of conventional metaphors' dual meanings in daily speech, I derive children's metaphors from casual interactions between children and their caregivers, sampled on a dense recording schedule. Using data of such density comes at the expense of being able to study only a small number of children, all acquiring the same language and all coming from the same region of the country, all of which compromise their generalizability. While this approach lacks statistical power, it shows that concrete meanings may be more relatable because they are more frequent, and not necessarily because they are more open to embodied experience. In the case of the three children studied, the associative links between the manner in which metaphors are heard in the input and that in which they are acquired are too striking to be overlooked.

1.1. Metaphor acquisition

In recent years, child-friendly experimental designs consistent with young children's skills and world knowledge have been able to elicit some novel metaphor comprehension just after children's third birthday (Almohammadi et al., 2024; Deamer, 2013; Di Paola et al., 2019; Pouscoulous & Tomasello, 2019). This early ability to interpret context-driven meanings has also been confirmed for other figurative devices, such as metonyms (Falkum et al., 2017; Köder & Falkum, 2020; Zhu, 2021; Zhu & Gopnik, 2024) and hyperboles (Deamer, 2013). In a binary object selection task, for example, Pouscoulous and Tomasello (2019) asked three-year-old speakers of German to hand over an object referred to by a novel metaphoric expression (e.g., The carrot with the *hair*) and demonstrated that children chose the correct toy significantly above chance. In a more recent study, which mitigated the randomness of the two-way selection task, Almohammadi et al. (2024) showed that Arabic-speaking three-year-olds were able to choose the correct picture when it was referred to by means of a novel metaphor: when hearing a story with the phrase His head is *cement* embedded into it, they would correctly point at a picture of a stubborn person (Gaskins et al., 2024, see also Deamer, 2013, Di Paola et al., 2019).

[3]Although it is not explicitly stated what types of meanings are seen as more conventional, this can be inferred from Falkum's article. When talking of children's difficulties with 'non-literal uses of language', she explains that these are cases where, in order to understand the intended meaning, they [children] have to go beyond the conventional senses of the words and sentences the speaker has used' (Falkum, 2022: 97). As in this context, the 'intended' meaning is taken as non-literal (abstract) meaning, by extension, it has to be inferred that the 'conventional' meaning must therefore be concrete.

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In the same study, children performed even better when the picture was being described by means of a conventional metaphoric expression (e.g., His head is a *rock*).

Such findings have challenged the earlier sweeping verdict that children's 'literalism' results from poor pragmatic abilities (e.g., Dryll, 2009; Gentner & Stuart, 1983; Levorato & Cacciari, 2002; Noveck, 2001; Vosniadou, 1987; Winner, 1997; Winner, Rosenstiel & Gardner, 1976). Instead, it has been argued that children's difficulties in providing correct interpretations of abstract metaphoric concepts must be an outcome of elicitation tools that are simply too complex and inaccessible to young research participants. Explaining what an expression means (e.g., If we say someone is an *eagle*, what are they like?) involves a three-step procedure: settling for one of the two possible interpretations of the word (i.e., *eagle* is an animal versus *eagle* is a person), projecting inferences across the concepts via skills of analogy and communicating abstract meanings through fairly complex vocabulary (An *eagle* is someone perceptive). The multi-step nature of this task is bound to be more difficult than mere pointing at pictures and lead to more erroneous explanations. In addition, considering an abstract notion associated with a rare animal (e.g., Helen is an *eagle*; Dryll, 2009) is surely more demanding than reflecting on notions built around high-frequency items consistent with what children know about the world, which rely on one domain of concrete entities to illustrate other entities, which are also concrete (e.g., The carrot with the *hair*; Pouscoulous & Tomasello, 2019).

Recent research has also demonstrated an early onset of metaphor production. Experimental studies have shown that three-year-olds can produce conventional (Gaskins & Rundblad, 2023) and novel metaphoric expressions (Gottfried, 1997) in response to structured elicitation tasks; meanwhile, corpora of naturalistic interactions between English-speaking children and their primary caregivers have revealed some use of conventional metaphors already from the age of two (Gaskins et al., 2023). Being based on corpus data, the current study continues to explore metaphor production in children as young as two to three, asking how they come to exploit conventional metaphor frequencies in CDS to guide their own metaphor acquisition.

1.2. Concrete and abstract meanings

1.2.1. Processing of concrete and abstract meanings

The study operationalises the notion of concrete (or literal) meanings as those grounded in embodiment, i.e., the type of world experience that is acquired through the senses of sight, smell, taste, touch and hearing (Lakoff & Johnson, 2008; Kövecses, 2020). For example, the word *eagle* is taken as an instance of a concrete word if it denotes our experience of seeing a predatory bird with a black body, white head and yellow beak and activates this image when the form *eagle* is heard. By contrast, abstract (or non-literal) meanings are those which capture nebulous domains of thought, with the word *eagle* standing for a feature of personality. As metaphor knowledge is argued to be rooted in our knowledge of, and experience with, the concrete world around (Coulson & Matlock, 2001; Coulson & Oakley, 2005; Lakoff & Johnson, 2008), theorists tend to agree that the full knowledge of metaphoric expressions requires not only knowing that the given word can take both abstract and concrete meanings; it also entails making a 'mental connection' between the two. For example, when being called *an eagle*, such a connection allows the listener to

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interpret the expression by viewing their own qualities in light of those of a predatory bird with strong perceptive abilities.

Evidence from adult speakers, however, challenges the notion that metaphors are processed via their concrete meanings. For instance, by using eye-tracking technology, Coulson et al. (2015) demonstrated that the activation of literal meanings encoded in conventional metaphors is not obligatory for the processing of their abstract equivalents: adult speakers of American English commit to the preferred interpretation relatively early and show little evidence for the activation of the dispreferred alternative until after the onset of disambiguating information. Similar studies with metaphor comprehension in children are sorely missing from the research landscape. There is, however, some recent work, which relies on eye-tracking to investigate children's understanding of metonymy: Köder and Falkum (2020) showed that Norwegian-speaking children are sensitive to abstract meanings from the age of three, and their performance continuously improves with age, despite a certain dip around the age of four and five, which sees a preference for literal interpretations of target metonymic utterances. This does not necessarily mean, however, that children interpret abstract meanings (e.g., His head is *cement*, i.e., stubborn) through analogy with their concrete counterparts (i.e., hard powdery substance); in theory, it could merely indicate that they are drawn towards the concrete interpretation of the metaphorically used word merely because the link between its form (i.e., cement) and its abstract sense (i.e., stubborn individual) is insufficiently entrenched to allow easy access and retrieval.

1.2.2. The acquisition of concrete and abstract meanings

The current study aims to build on the research in processing of concrete and abstract meanings to develop an understanding of their acquisition. Abstract meanings are often seen as metaphorical 'extensions' of concrete notions (e.g., Cienki, 1998; Meir, 2010); across developmental literature, there are claims that they allow children to take a step 'beyond' the concrete world and to contemplate more complex domains of thought (e.g., English, 2013: 135; Falkum, 2022: 97). However, such claims require rigorous empirical investigation. Is the use of 'extended' non-literal senses (e.g., *sunshine*, i.e., a happy child) only possible once children have acquired their concrete word equivalents (*sunshine*, i.e., light from the sun) for which they can create such extensions?

This initial investigation can set the stage for further corpus-based analyses. One type of analysis could determine whether conventional metaphoric speech arises through world knowledge (Grady, 2005; Kövecses, 2020; Lakoff & Johnson, 2008) or lexical acquisition (e.g., Gentner et al., 2001). If children always acquire concrete senses first, the sensory foundations of metaphorical knowledge can be hard to challenge. However, if children learning metaphors sometimes prioritise concrete and sometimes abstract meanings, this order of acquisition should then be examined in light of CDS to determine if it is sensitive to the salience resulting from their input frequencies. Such an outcome would be expected in light of the Graded Salience Hypothesis, which posits that the processing of concrete and abstract senses depends on their salience, which is shaped by frequency, amongst several other factors (Giora, 1997).

Additional analysis can confirm whether the statistical distribution of concrete and abstract meanings in CDS can be considered as a factor contributing to such concrete or abstract meanings being seen as conventional. Falkum (2022) argues that

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in their acquisition of meanings, children are guided by at least two assumptions: each specific meaning is assigned to a word or construction that speakers simply "expect" to be used in a language community (Clark, 2007) and word senses are shared by all members of a linguistic community (Diesendruck & Markson, 2001; Henderson & Graham, 2005). This "expectation" of conventional word use then acts as a filter helping children to assess whether the newly encountered word form is right or wrong (Koenig et al., 2004; Sabbagh and Baldwin, 2001). In UB terms, such an expectation could be established through corpus data as a result of word entrenchment based on the frequencies of their concrete and abstract meanings.

Currently, we suspect that concrete meanings are more conventional (Falkum, 2022), but are they also more frequent? While it is quite possible that conventionality is driven by frequency, this has not been made explicit in the current literature. If metaphors in CDS are used more frequently with abstract referents, then the frequency of use cannot be seen as a determinant of meaning conventionality. However, if they are used more frequently with concrete meanings, this could explain how such frequencies predetermine children's perception of novel metaphors. This type of investigation can help us to understand whether children's experience with conventional metaphors maps out directly onto their abilities to deconstruct novel ones, as predicted specifically by UB accounts of metaphor acquisition (Gaskins & Rundblad, forthc.).

Of course, corpora of naturalistic speech cannot offer any insights into the mental connections children make between the newly acquired and existing concepts. For example, studying corpora cannot help us to understand whether children who use the metaphor *sunshine* have made a mental connection between its abstract meaning (i.e., loved individual) and that of the already established meaning (i.e., light coming from the sun). However, they can at least tell us what kinds of metaphoric expressions and related concepts are part of their lexicons. The first step in this direction was taken by Gaskins et al. (2023), who investigated metaphors' dual meanings on a sample of only seven metaphors identified in a corpus of one child aged two to three. Their preliminary study revealed two important findings. First, the child could use some metaphors without having concrete word equivalents in her productive lexicon. Second, she acquired concrete and abstract senses of the metaphors in the order consistent with their frequencies in the input.

The current study will quantify these findings with reference to a more robust dataset containing a wide range of metaphors produced by three children between the ages of two and three; as such, the study will generate some preliminary data to address four research questions. First, when all metaphors are examined, do children tend to prioritise metaphors' concrete meanings in early acquisition? Second, to what extent does the order of acquisition of metaphors' concrete and abstract meanings correspond with the properties of the language addressed to them? Third, when all the concrete and abstract meanings are quantified in CDS, how do they translate into children's generalised expectation of metaphors having concrete and abstract meanings?

In addition to its quantitative element, the study will present qualitative aspects of interaction that children exploit in situations where they first acquire the abstract meanings of metaphor-related words. Within this context, I ask how children come to associate the linguistic form of the metaphor (e.g., *sunshine*) with its abstract meaning (i.e., a dear individual) if its concrete word equivalent is missing from their mental representation of the word's meaning. Which features of words' meaning do they exploit to acquire the conventional word use? Do they build the link between the

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metaphor's form and meaning directly or extract it from connotative (e.g., positive and negative) uses of the word across different contexts? Having access to longitudinal data can reveal how the word's abstract meanings are modelled in the input and whether this affects children's own metaphor use.

2. Methods

2.1. Participants

The three children whose language is examined in this study are known under the pseudonyms of Eleanor, Thomas and Fraser. They came from middle-class backgrounds, lived in large urban areas in the north of England and were all monolingual speakers of English. At the time of data sampling, Eleanor and Thomas were the only children in the family and Fraser had one sibling. The study captures the children's language development in the early 2000s, at a time when they had not yet started formal education. The children's speech was sampled between their second and third birthdays to capture the emerging metaphors and to determine how they reflect those of their caregivers. This is because input–output relations are expected to be most striking at a young age, as later on children's learning is likely to be guided by their existing knowledge. We also know that children aged three are already sensitive to metaphors and can use them to facilitate their further thinking and reasoning (Zhu & Gopnik, 2023), which suggests that they should be able to draw information from metaphors in CDS to inform their learning of any new metaphors.

The CDS of these children comprises that of their parents and immediate family members, as well as occasional visitors. Overall, 12 speakers contributed to the CDS of Eleanor, seven to that of Fraser and five to that of Thomas. Focusing on only three children in interactions with their primary caregivers offers an advantage: even though the data is gathered from a small number of participants, it is densely sampled and, unlike experimental tools, it is likely to capture a very broad picture of their metaphor use. However, at the same time, it must be pointed out that the homogeneity of the sample (urban, middle-class) currently restricts the applicability of the findings to a wider population.

2.2. Data

Data were collected from densely sampled naturalistic interactions in the CHILDES database. Eleanor and Fraser were recorded between the ages of 2;00–3;01 (e.g., Lieven, Salomo & Tomasello, 2009); Thomas was recorded between 2;0–5;0 (e.g., Dąbrowska & Lieven, 2005), but his speech was only analysed up to the age of 3;1 to allow comparisons with those of Eleanor and Fraser.

In the first, and in the last, four weeks of the data sampling period, Eleanor and Fraser were recorded on a dense sampling schedule for one hour a day, five times a week, interacting with their mother, and for another hour wandering around the house, and engaging with other family members; for the rest of the year, they were recorded for two hours each week. There are 147 recordings available for Eleanor and 198 for Fraser. Meanwhile, Thomas was recorded on a dense sampling schedule throughout the data collection period, generating 249 recordings for the same developmental stage. The dense data sampling procedure followed in the original studies that generated the transcripts (e.g., Lieven, Salomo & Tomasello, 2009)

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increases the likelihood of capturing input–output effects in children's metaphor development.

2.3. Metaphor identification procedure

Given the theoretical underpinnings discussed, a UB approach to metaphor identification and analysis in child speech was employed for metaphor coding (Gaskins et al., 2023). In the process, a given word (e.g., *eagle*) was deemed as metaphorical as long as its contextual meaning (e.g., a perceptive person) stood in contrast with its basic dictionary meaning (i.e., a large bird of prey) and where the two were seen as distinct (eagle versus person are two separate entities) but at the same time related by some form of similarity (in both cases, *eagle* refers to perceptive animals).[4] In addition, the word was not being used in situations of pretend play (e.g., Daddy's being an *eagle* – he's wearing a costume) or as an overextension (e.g., I call it an *eagle* because I do not know the word for a falcon), and the link between the concrete and abstract form was not obscured by some kind of modification reflective of children's difficulties in producing the phonological form of the word. After all the data had been first-coded by the author of this article, 25% of all data was also double-coded for reliability by a PhD student, who worked independently from the first coder but remained in regular contact about the coding procedure (i.e., unclear definitions in the code book were discussed without reference to examples from the corpus). The final agreement reached 0.97.

As metaphorical meanings are not accessed and retrieved via their concrete meanings (Coulson et al., 2015), words and expressions for which children did not have concrete sense equivalents also counted as metaphors and were highlighted in the results: as long as children recalled them accurately in appropriate communicative contexts, they were considered as productive elements of their lexicon. In addition, to ensure that only concrete-to-abstract mappings were included in the study, my procedure excluded three metaphors, where the mapping proceeded from one concrete meaning to another (e.g., Eleanor's *Face* of the Clock).

The overall numbers of conventional metaphors captured in the corpora are presented in the first and third columns of Table 1. Excel worksheets with all the metaphors coded in child speech and in CDS have been deposited on the CHILDES database in the section on derived corpora and are available at https://childes.talkbank.org/derived/.

2.4. Data reduction

When coding metaphors used by children, it was essential to focus on the first productive use of the concrete and abstract referents of the given word and eliminate any metaphors that would have been merely repeated after the caregiver. Therefore, first and foremost, the key word was only considered productive if it had been used spontaneously, without being primed, for a second time in a new context. All the words primed through one of the previous ten utterances were excluded from analysis (see Gaskins et al., 2023). Therefore, I also excluded any words that had

[4]This aspect of the procedure reflects earlier metaphor identification tools (Pragglejaz, 2007; Steen et al., 2007).

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Table 1. The total number of metaphors identified in child and child-directed speech

	Overall child speech	Child speech after data reduction	Overall child-directed speech
Eleanor	90 types/3,171 tokens	59 types/2,532 tokens	59 types/4,429 tokens
Fraser	101 types/3,369 tokens	46 types/2,353 tokens	46 types/5,243 tokens
Thomas	104 types/3,804 tokens	49 types/2,997 tokens	49 types/24,302 tokens

occurred in the first ten utterances of each recording, and those which had been used only once, or in the context of one and the same recording. Second, if the child used the word on its own in a vague context or if they used it within the context of words that had not been transcribed due to their unintelligibility, the word could not be considered as productive. Third, productivity was associated separately with concrete and abstract metaphorical meanings: only the second occurrence of the same form with a concrete meaning counted as productive, and the same applied to the second occurrence of the same form with an abstract metaphorical meaning.

In addition, when analysing the data of Eleanor and Fraser, metaphors that emerged in the first ten days of interactions were eliminated from the analyses as the lack of data prior to this point made it difficult to determine their precise status in the children's lexicon. For example, in Eleanor's recordings, both *Come on* (meaning: *Do it*) and *Come* (meaning: approach me) were first recorded at the age of 2;03 but as the data recording only started when Eleanor was 2;02, it is impossible to say which had emerged first. As Thomas' lexicon only started to grow after the age of 2;10, the same procedure was not necessary in his case. The final numbers of metaphors identified in child speech are presented in the second column of Table 1.

2.5. Data organisation

In the final dataset, the same word form (e.g., *brilliant*) was coded under one category if it contained a pairing with a concrete meaning (e.g., *brilliant*, i.e., vibrant, light) and under another if it contained a pairing with an abstract meaning (e.g., *brilliant*, i.e., excellent). The information sampled about each form-meaning pairing included the day when the child used the pairing of the form and its concrete (or abstract) meaning productively for the first time and the frequency of the concrete (and abstract) meanings in CDS.

2.6. Data analysis

All the analyses performed in this project were exploratory rather than pre-registered. To address *question one*, the analysis focused on identifying the first instance of productive word use in the speech of children (Gaskins et al., 2023). I aimed to show how many metaphors in each child's lexicon are first used to refer to concrete, or abstract, notions. Children's spontaneous production of the metaphoric expression was taken as evidence of its acquisition.

To address *question two*, the analysis shifted onto caregiver speech, with the aim of capturing the overall frequencies of the subset of metaphors that each child had prioritised for acquisition. When calculating the frequencies of concrete and abstract words in CDS, several steps were taken to ensure consistency. First of all, the

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frequencies of several related grammatical forms were counted as contributing collectively to the common emerging meaning while the frequencies of the key words were also highlighted as the primary contributor. For example, once the metaphor *Come on* was first identified as used productively in Eleanor's speech, CDS was then examined for forms such as *come*, *comes*, *came* and *coming*, whose frequencies were added up, with the form *come* highlighted as the key contributor. Meanwhile, time-related expressions such as *last* were only counted as adjectives, not as verbs, as their meaning in these two different parts of speech seemed unrelated.

Second, frequencies were calculated only on the basis of relevant word uses. For example, words such as *for* and *to* were treated as metaphors TIME IS SPACE only when used in time-related expressions, and as concrete counterparts, which might have contributed to the understanding of the metaphor only if they were used in space-related expressions, such as *for* miles and *to* the shop. If they had occurred in expressions such as *for you*, or *to speak*, their use was disregarded. All occurrences of the same linguistic form were added up for concrete and abstract referents and compared to demonstrate their 'typical' profile in CDS. Finally, each of the metaphors that the children acquired was evaluated in light of CDS to demonstrate whether the salience of meanings is responsible for their order of acquisition.

To address *question three*, all the concrete and abstract meanings of metaphors recorded in CDS were added up to demonstrate the chances of the child encountering concrete versus abstract meanings when dealing with metaphorical meanings. Additional qualitative analyses allowed me to trace metaphor use longitudinally in caregiver and child speech to demonstrate what aspects of CDS the child focused on to develop conventional use of words with abstract referents (*question four*).

While the current study provides preliminary evidence on how the three children acquire metaphors' dual meanings, before we proceed to the results, it must be noted, however, that future research should include experimental validation to establish causality, which could provide a deeper understanding of the relationship between the frequencies of metaphors' dual meanings in the input and their acquisition order.

3. Results

3.1. Quantitative analysis of concrete and abstract meanings

3.1.1. Metaphors acquired via concrete and abstract meanings

To address *question one*, the study aimed to determine whether children always prioritise concrete meanings of metaphors in early acquisition. After data reduction, Eleanor's transcripts returned 60, Fraser's 46 and Thomas' 49 conventional metaphors, most of which already had a concrete meaning equivalent established in the children's lexicon (Table 2). In Eleanor's lexicon, there was also one word, whose two meanings were captured in productive use on the same day.

The vast majority of these metaphors were high-frequency functional words associated with conceptual mappings. These were encoded in prepositions (e.g., *at* seven o'clock, *after* breakfast, *for* ages, *on* Saturday), adjectives (e.g., *big* girl, *little* rest), verbs of perception (e.g., *see* what you think, *feel* tired) and other common verbs, many of which were delexicalised (e.g., *gone* yellow, *turn* pink). These metaphor types constituted 95% of all Eleanor's (n = 4,220), 96% of Fraser's (n = 5,019) and 97% of Thomas' metaphors (n = 23,494). Only a small portion of metaphors was encoded in either nouns (e.g., you are a *pest*, you are a *parrot*) or low-frequency verbs

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Table 2. The proportions of metaphors whose concrete and abstract meanings emerged first

	Concrete meaning emerged first	Abstract meaning emerged first
Eleanor	45 (75%)	14 (23%)
Fraser	36 (82%)	10 (18%)
Thomas	40 (82%)	9 (18%)

with clear semantic content (e.g., *hold on*, I *bet* you are, my stomach is going to *pop*). These metaphor types constituted 5% of all Eleanor's (n = 209), 4% of Fraser's (n = 224) and 3% of Thomas' metaphors (n = 808).

3.1.2. Correspondence of input frequency to acquisition order

To address *question two*, caregiver input was examined to determine the extent to which usage frequencies of metaphors' concrete and abstract meanings corresponded with their order of acquisition in children. Table 3 demonstrates that in all cases except five, whenever the concrete meaning was more frequent than its abstract equivalent in the input, it was acquired sooner. For example, in Eleanor's speech, the verb *go* was recorded 8,114 times in its concrete sense of moving physically through space, but only 2,743 times in its abstract sense of a non-physical activity (e.g., I'm *going* to do it) and 19 times in the sense of a changing state (e.g., It's *gone* yellow), which was in line with the order of acquisition of the three senses. The same was true of the abstract meaning. When words such as *fight* were used more frequently in their abstract sense (fight = argue, 18 times), they were acquired sooner than their less frequently heard concrete sense equivalents (fight = combat, 3 times).

In the five cases where the usage frequencies could not account for the order of acquisition, in four cases concrete meanings emerged earlier in use even though they were less frequent in caregiver speech than their abstract equivalents (Eleanor: *pop, listen*, Fraser: *pop*, *last*); also, in Eleanor's corpus, one lexeme (*hold on*) was heard more frequently in its abstract sense, but both its abstract (wait) and concrete use (grasp) were captured on the same day in Eleanor's speech.

3.1.3. Proportions of all metaphors' concrete versus abstract meanings in the input

To address *question three*, all the concrete and abstract meanings of selected metaphors were quantified in CDS to show how they translate into children's generalised expectation of metaphors that they hear in CDS having concrete and abstract meanings. Table 4 illustrates the total number of word tokens, which were identified with concrete versus abstract meanings in the CDS of each of the three children, and confirms that concrete meanings were heard in overwhelming proportions.

Table 3. Input frequencies versus the order of acquisition of basic and abstract meanings

	Higher frequencies of concrete meanings correspond with their earlier acquisition	Higher frequencies of abstract meanings correspond with their earlier acquisition
Eleanor	45/45	11/14
Fraser	36/36	8/10
Thomas	40/40	9/9

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Table 4. The overall number of tokens heard with concrete and abstract meanings in CDS

	Total concrete meanings	Total abstract meanings
Eleanor's CDS	35,966 (89%)	4,429 (11%)
Fraser's CDS	40,328 (88%)	5,243 (12%)
Thomas' CDS	102,056 (81%)	24,302 (19%)

3.2. Qualitative analysis of children's preferential acquisition of abstract meanings

At the following step, the focus shifted exclusively onto those metaphors, in which children had first acquired their abstract meanings (e.g., *feel*, i.e., have emotions), with the words' concrete meanings (e.g., *feel*, i.e., touch) either being captured later in development or not at all during the data sampling period (Table 5). The majority of such words belonged to the latter category: even though they appeared metaphorical to an adult coder, before their third birthday, children had only acquired their abstract meanings. The category included words such as *after* 5 pm, *before* 5 pm, once *upon* a time, that's not *fair*, that's *brilliant*, I *bet*, You're a *cool* dude and You're a *pest*, to mention but a few.

In what follows, extracts from children's conversations with their primary caregivers illustrate how in their acquisition of three metaphors the children came to acquire first their abstract meanings. The specific examples were selected from the pool of metaphors with both a high semantic content and low frequencies so that they could be fully illustrated through reference to appendices included in the article. The snippets that show the context of use are presented only up to a point when the child has acquired the word's conventional meaning.

3.2.1. That's not fair (Eleanor)

The word *fair* occurred 26 times in Eleanor's CDS, 22 times with an abstract and four times with a concrete meaning. When applied to abstract notions, it was often used by her parents in situations of disappointment rather than justice (Appendix 1). For example, when Eleanor was 2;03.00, her father built a tower, which dropped down in pieces. His comment (That's not *fair*) seemed to refer to an outcome, which resulted from disappointing external circumstances rather than an unjust situation. In another example, when Eleanor was 2;08.11 and pointed at a picture showing a doll and a dog not being happy, her mother used the word *fair* to indicate her sympathy for the two characters' unhappiness rather than the lack of justice. Consequently, when Eleanor came to use the word independently for the first time (3;00.09), like her parents, she used it to express her disappointment with a situation (i.e., receiving an unwanted gift) rather than to comment on the preferential treatment of one person

Table 5. Metaphors' abstract meanings which were (not) extended upon by the addition of concrete senses

	Did the child acquire the concrete meaning before the end of data sampling?	
	Yes	No
Eleanor	3	11
Fraser	3	7
Thomas	3	6

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over another. It was only at 3;00.29 that Eleanor used the word in a more conventional manner that had also sometimes been modelled in her parents' speech. When the mother had eaten her chocolate button, Eleanor used the word to show her dissatisfaction with the distribution of her favourite snack.

Overall, the abstract meaning of the word seems to have been derived from the connotative interpretation of external stimuli. Following her parents' speech, the child extracted a negative application of the word to situations in which outcomes for individuals were deemed as negative; subsequently, its use was narrowed down to those situations in which negative outcomes had been brought by some individuals upon others. The production data show, however, that the meaning of the word could not have been clear to the child merely due to the underlying knowledge of the world; all along the word's acquisition continued to be guided by the way its meaning was presented in CDS.

3.2.2. Cool dude (Fraser)

The word *cool* occurred 46 times in Fraser's CDS, 31 times with an abstract and 15 times with a concrete meaning. Its first record dates back to the time when Fraser was 2;00.12 and put sunglasses on, which was met with his mother's enthusiasm (Appendix 2). The mother then continued to use the word whenever she was overwhelmed by his looks, especially when he was wearing sunglasses. As a result, when Fraser was 2;03.03 and was complemented on finding a missing jigsaw piece, he used the phrase (I *cool* dude) in a way that shows he had grasped the positive meaning of the word in relation to himself in general though not his appearance or laid-back attitude. Eventually, at the age of 3;00.30, his use of the word *cool* (Is my hat *cool*?) demonstrates he had grasped the aspect of the meaning which relates to physical appearance.

Overall, Fraser had not once used the word *cool* with reference to temperature, which suggests he may not have known its concrete meaning. His use of the word, as captured through longitudinal recordings, suggests that initially, he had acquired its positive connotative meaning from situations in which the word was surrounded by a rich emotive context, such as admiration for the person being addressed. Following this, the different facets of the word's core meaning were extracted in a piecemeal fashion through exposure to, and association with, different contexts of use.

3.2.3. You're a pest (Fraser)

The word *pest* (i.e., a person who behaves like an irritating small animal) occurred 67 times in Fraser's CDS, each time with an abstract meaning. Its earliest occurrence was documented when Fraser was 2;00.02 (Appendix 3): after he had repeated the same phrase (*What's up?*) ten times in the course of the same conversation, his mother called him a *pest* and laughed (Appendix 3). The word *pest* then continued to be used by her in frustrating situations, where he did not comply with her requests, and it was sometimes repeated verbatim by the child. At the age of 2;02.05, he trialled the word *pest* on his teddy (You a *pest*), which shows that he knew the word can be addressed to another individual in the context of name calling. The context of the monologue directed at the toy does not reveal, however, whether or not the connotative meaning of the word had been acquired at this stage. Yet, at the age of 2;06.01, when Fraser was explaining to his mother why he did not like snow (The snow is *pest*), it seems that had definitely grasped the negative connotations surrounding the use of

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the word. Eventually, at the age of 2;06.02, Fraser used the word in a way that suggests he had combined several aspects of the word's meaning, such that it can be aimed at another individual in a negative way. He demonstrates this first by complaining that his brother does not love him and is therefore a *pest* and then saying that his mother is not his friend and is also a *pest*.

Overall, neither Fraser's mother nor Fraser had ever used the word *pest* in relation to small household animals; therefore, there are reasons to believe that Fraser acquired it holistically and deduced its negative connotative meaning from contexts, which inspired the use of strong emotions, such as annoyance with the person being addressed.

4. Discussion

This study analysed transcripts of naturalistic interactions between English-speaking children aged two to three and their primary caregivers to investigate how metaphors' dual meanings, which children hear daily in CDS and come to use as a result, shape their sense of meaning conventionality.

To address the *first question*, the three children examined in the study did tend to prioritise the concrete meanings of metaphors in early acquisition: between 75%–82% of metaphor-related words emerged via their concrete meanings. This shows that a concrete foundation was often (but not always) necessary for a metaphor to be acquired. Based on these findings, I argue that abstract metaphoric concepts may arise as 'extensions' of concrete notions (e.g., Cienki, 1998; Meir, 2010) in phylogenetic language development; ontogenetically, however, extensions can proceed both from concrete to abstract concepts, and the other way round. I also argue that the preference for acquiring metaphors' concrete meanings is likely to act as an early trigger of the conventionalisation of concrete meanings (Falkum, 2022). The meanings that emerged first had a temporal advantage over their competitors as, for some time, they would have been used as the only established meanings for a given linguistic form. Considering lower cognitive flexibility in children below the age of four (e.g., Blakey et al., 2015) and their reluctance to accept alternative labels for well-known objects and events (Rubio-Fernández & Grassmann, 2016), three-year-olds would be expected to cling onto the meanings they already know for familiar expressions. As a result, the growing time lag between the established concrete sense of the word and the emerging abstract sense would be predicted to lead to an even greater entrenchment of the former.

To address the *second question*, the order of acquisition of conventional metaphors' dual meanings corresponded with their properties in CDS: all of the concrete meanings that emerged first in use were those with higher frequencies compared to their competitors, and the same was true of most of the abstract meanings. By and large, this detracts from the well-established belief that metaphors are rooted solely in the sensory experience of the world (e.g., Grady, 2005; Kövecses, 2020; Lakoff & Johnson, 2008). It may be that in the acquisition of metaphoric expressions, linguistic input is more important than the sensory experiences; however, it may also be that the way concrete and abstract meanings are used in the linguistic environment 'reinforces' a sensory experience that is also there. In the case of these children, however, conventional metaphors seem to have been acquired in an order that suggests input–output effects (e.g., Gentner et al., 2001), as the route they followed in

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acquisition corresponded with the salience of their meanings in CDS (see also Gaskins & Rundblad, forthc.). These findings also challenge the theories that language acquisition proceeds from concepts that are more concrete and thus more conceptually accessible to those that are abstract and more challenging to acquire (Gentner, 1982; Gentner & Boroditsky, 2001).

To address the *third question*, when all the concrete and abstract meanings of the metaphors were quantified in CDS, Eleanor, Fraser and Thomas heard concrete meanings between 81% and 89%, and their abstract equivalents 11%–19% of the time, excluding any metaphors children may have heard but not acquired. If we consider metaphor acquisition as a product of distributional learning, the fact that the children were largely exposed to the concrete meanings of metaphors could not have been inconsequential to their acquisition of novel metaphors. Statistically speaking, the daily CDS of these children provided them with evidence that the probability of any new metaphor having a concrete versus abstract meaning is at least 8 to 2 (or even 9 to 1). If statistical evidence does lead to the creation of schematic knowledge, which guides children's future learning (Ambridge & Lieven, 2011; Dorfman et al., 2019), in this case, it would have gradually created a generalised prediction that the most 'likely' interpretation of any new metaphor children encounter in CDS is literal (as evidence to the contrary is limited). This can explain why children reported across research literature are drawn to concrete explanations for metaphorical concepts (Asch & Nerlove, 1960; Dryll, 2009; Levorato & Cacciari, 1995, 2002; Winner, 1988/1997; Winner et al., 1976).

At this stage, it is vital to revisit Falkum's hypothesis. Falkum argues that '*children's growing sensitivity to sense conventions, which determine the publicly accepted meaning of words in their language, impedes their pragmatic reasoning with non-literal uses during the pre-school years* (2022: 98). In light of my data, I argue that the public convention of metaphor use is shaped by the sheer frequencies with which we hear their concrete senses. Schmid (2020) would explain this by referring to the construct of a Tinguely machine (whose two ends propel each other): the more often an individual hears a certain linguistic feature, the more entrenched it becomes in their mind and the easier it is to activate it; the more individuals this process affects, the more conventionalised the feature becomes in the speech community, leading to this feature being used (and therefore heard) more frequently. How does this affect the convention of metaphor use? Each time we use verbs *coming* and *going* in their core sense, the memory traces between their form and concrete meaning become stronger, resulting in their easier activation and retrieval. As this process reflects other people's use of the same (and other similar) words, this means that their core meaning becomes more conventionalised in the community than their abstract word equivalent. Children are not immune to these processes: as they grow more sensitive to the fact that concrete meanings are more frequent, this can explain the 'decrease in their spontaneous production of figurative language and a tendency for literal interpretations' (Falkum 2022: 99). Falkum's hypothesis thus acquires a UB dimension: children's pragmatic reasoning with non-literal uses during the pre-school years is impeded by the frequencies with which words that are open to both literal and non-literal interpretation are modelled in CDS.

At the next step of analysis, the focus shifted onto the pool of metaphors, which had not emerged via their concrete meanings. The *fourth aim* of the study was to demonstrate how children come to associate the linguistic form of such metaphors with their abstract meaning when the concrete word equivalent is missing from their lexicon. A handful of examples analysed longitudinally revealed that in all situations,

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the child initially extracted only some (not all) aspects of the word's meaning, as dictated by its context-specific use, and only then slowly arrived at its conventional core interpretation. For example, Eleanor first used the word *fair* with a broad reference to negative situations, in a similar way to that in which it was used in CDS (e.g., That's not *fair*! uttered when a Lego tower collapsed on the floor), and only then narrowed its application down to specific types of negative situations, which arose through individuals mistreating each other (You ate mine – that's not *fair*). The three cases analysed in the study (*fair*, *cool* and *pest*) give evidence of CDS slowly scaffolding children's use of metaphors. What is striking, however, is that the meaning of metaphors is not immediately obvious to the children, as would be expected if they had been acquired via conceptual mappings: their use displays clear parallels with CDS even when it is not entirely precise or broad enough to correspond with how these words are generally used.

As signalled at the start of this article, when considering the data presented in this study, however, we should exercise some degree of caution. As the interactions only capture a portion of the children's input and output, it is possible that some use of the key words had not been captured, both in child speech and in CDS. There are also two limitations of the methodology used in this study. First, the focus on a small pool of children's metaphors provided a narrow lens for examining the metaphors produced in CDS. Parents and other caregivers used many more metaphors than children, but their use was not included in my calculations.[5] Second, the correspondence between the frequencies of abstract and concrete meanings and their order of acquisition is only associative: the corpus data cannot capture causation. Last, while I have shown the order in which children start to use conventional metaphors' dual meanings in production, the picture can be very different for comprehension.

Future research could mitigate the shortcomings of this study. With access to denser recordings of children's daily interactions, we could gain more certainty that most (or all) children's input is being captured. Automated metaphor identification tools could then examine the entirety of parental metaphor use, with a focus on those metaphors that children do acquire and those that they do not. Meanwhile, to gain more certainty that children's 'literalism' is driven by their frequent exposure to polysemous words' concrete meanings, future work in this area should turn to experiments. Such experiments could teach children nonce words with two distinct meanings (concrete and abstract), controlling the number of times children hear such meanings in experiment trials (with either concrete or abstract meanings being heard more frequently). In the testing phase, children would be asked to explain such nonce words in contexts that support their abstract interpretation, and their total accuracy scores would be compared per testing group (i.e., the group where either concrete or abstract meanings are more frequent). Last, experimental work with children tested longitudinally could confirm at what stage in their lives children can understand only concrete (or only abstract) meanings and at what stage alternative senses start to enter their receptive lexicons.

Last but not least, while research in early metaphor acquisition continues to grow, much of it is still dominated by explicit measures, such as picture selection, which

[5]It could be argued, however, that children acquiring the small pool of metaphors is a testament to them paying attention to these specific metaphors, and not the others, which is why only those metaphors should be examined.

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may give rise to a reliance on sense conventions, where children may be ″forced″ to consciously reflect on binary interpretive possibilities. To test children's actual pragmatic competence, future studies should thus rely on more implicit measures, such as eye-tracking. Such studies could confirm, for example, to what extent children process the abstract meanings of metaphors directly like those of metonyms (Köder & Falkum, 2020) or via metaphors' concrete meanings. Similar research should also be extended to languages outside the Anglocentric circle.

5. Conclusion

As existing theoretical frameworks disagree on the role of conventional metaphors in children's metaphor acquisition, a growing body of work (e.g., Gaskins et al., 2023; Gaskins & Rundblad, 2023; Gaskins, 2024; Almohammadi et al., 2024) aims to determine if they are important, how and why. To this end, in my work, I depart from traditional methods used in developmental pragmatics and follow a novel UB theory of metaphor acquisition to examine its premises on densely sampled interactions between children and their caregivers, transcribed and analysed in terms of metaphor usage frequencies. This specific article has arisen in response to a call for empirical research into the sources of children's difficulties with non-literal uses of language (Falkum, 2022). With reference to data from three children, I demonstrate how the preponderance of concrete meanings in the input creates an important lens through which we can explain children's early 'literalism'. I argue that applying UB theory to metaphor acquisition provides a valuable new lens for understanding the development of children's pragmatic skills and that it can offer the missing bricks in building a more coherent theoretical account of metaphor acquisition in early childhood.

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/langcog.2024.66.

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