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Cat or horse? Exploring children's morphological awareness in the naming of animals

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Abstract

Our study examines the use of English morphology by native English-speaking children across the developmental span in the midwestern region of the United States. We used a task elicitation methodology in which 100 children were asked to name three pictures in English: one of a real horse, one of a real cat, and one with a real cat wearing a horse mask. We tabulated the types of responses generated across the age span and analyzed when native speaking children began to demonstrate the use of English derivational morphology and diminutive morphology, and how children chose L1 lexicon to describe the three animal pictures such as the use of compounding and semantic shifting. We saw evidence of overextension, misnaming, ambiguity, and the linguistic creativity inherent in the playful use of morphology.

Keywords: derivational morphology, diminutive morphology, task elicitation, compounding, developmental span

1. Introduction

The purpose of this study is to examine native English speaking children's language development across the age span, specifically children's morphological awareness in English and their understanding of word structure at the lexical level. Once a lexeme is determined, two different types of morphology can be determined in English: 1) morphological devices can be used to deduce a lexeme's paradigm based on its root such as how we can add the -s morpheme to make SING a third-person, singular present word and 2) morphological devices that can be used to deduce new lexemes from existing ones such as how SINGER has a root verb lexeme SING and an -er morpheme which changes the lexeme to now an agentive nominal lexeme (Spencer & Zwicky, 2007). Our study, therefore, is at the lexical level of morphology and does not address the phonological and syntactic aspects of morphology. We also focus on the English language and its morphological rules in which morphemes are often added before and after the root word.

Morphology is the study of word structure and how words are composed of smaller meaningful parts called morphemes which can be classified in different categories within the English language: productive and generative;

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inflectional and derivational; and free and bound morphemes. Bound morphemes are added to a free morpheme or root word, and in English, are either inflectional or derivational morphemes (Aronoff & Fudeman, 2011). Inflectional morphemes do not change the meaning of the root words; instead, inflectional morphemes are productive and are often attached at the end of the root word and serve to change the tense of the verb (e.g., -ing morpheme for present progressive and the –ed morpheme for past tense), pluralize the root word (e.g., -s plural morpheme in "cats"), and for comparison and gradation such as the –er comparative morpheme in "bigger" and the –est superlative morpheme in "biggest" for signifying a change in gradation. Morphemes in English are also derivational and can change the meaning of root words (un-, re-, -ment, de-, aqua-, -man) through a generative process, shift and change the category of words ("happy" an adjective becomes "happiness"—a noun with the –ness derivational morpheme).

Morphological awareness, in turn, is a child's understanding of how morphemes work in their native language and how words can be broken down into discrete morphemes such as roots, prefixes and suffixes in English and how these very same units can come together to make new words. The famous Wug test conducted by Jean Berko Gleason (1958) presented a young child with an imaginary creature drawn on a piece of paper and then the child is told, "This is a wug"—a pseudoword. Next, the child is shown two imaginary creatures on paper and is asked what the two are called now. The correct answer is "wugs", which has a -s plural morpheme and is now pronounced with a voiced /z/ sound at the end, which 91% of preschool children were able to articulate orally into a tape recorder. The Wug task demonstrated that young children could demonstrate an implicit, unconscious knowledge and use of morphology even though they had never been exposed to the word "wug" before the experimental task nor had formally learned about the role of morphemes through a grammar lesson (Gleason Berko & Ratner, 2009). The "wug" is an unknown creature and the children had never been exposed to this word before but were able to add the -s morpheme to create the plural noun through a process of deduction.

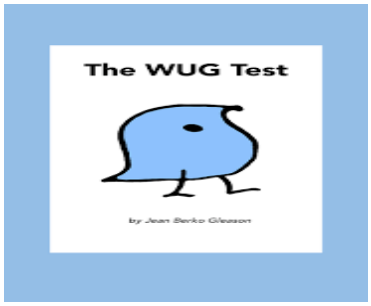

Figure 1. The Wug Test

Noam Chomsky's (1965) linguistic work also focused on how children learn morphological rules within their native language. The research concluded that very young children use the same process of deduction to produce overgeneralizations, such as "buyed" (instead of "bought"),

especially for irregular verbs like “eated”, which are also orthographically and phonologically incorrect, to demonstrate how they took statistics and understood the rules of morphology in their language without any formal grammar lesson. The production of these errors suggests a gradual development in understanding the rules of inflectional morphology without the pure imitation of words since parents do not walk around making morphological errors (e.g., I eated my breakfast). Nonetheless, the boundary between tacit knowledge of morphological processes as demonstrated by Berko Gleason (1958) and conscious morphological awareness has not been sufficiently investigated, which is addressed in this study. Much of the work on morphological awareness was conducted in the 1960s and 1970s and our study takes a fresh look at the construct of morphological awareness in English and how it changes across the developmental span for native English-speaking children through the naming of animals.

1.1. Theoretical Framework

In terms of the developmental age span, the morphological processes of understanding grammatical inflections like –ing and -ed at the end of verbs and productive derivation from morphemes like prefixes and suffixes seem to follow a similar but non-simultaneous developmental progression in English. Evidence shows that awareness of inflectional morphology is acquired in the first school years (Kuo and Anderson, 2006), whereas children’s awareness of derivational morphology makes a transition from an implicit to an explicit level at the ages of kindergarten and first grade and continues to grow throughout formal schooling and until adulthood (Anglin, 1993; Carlisle, 1995). As children get older, they often demonstrate an understanding of derivational morphology and use prefixes and suffixes that change the category of the lexeme and its meaning to create brand new coined words: Youtubers, Chiraq, Chiberia, Gamer, etc. Preschoolers can understand simple derivational affixes such as adding the –er agentive morphemes to words (e.g., teacher); however, they have more difficulty applying derivational affixes to words that undergo orthographic and/or phonological shifts such as going from “beauty” to “beautiful” (Anglin, 1993; Apel, 2014; Apel & Henbest, 2016).

Researchers have used morphological awareness receptive tasks that require children to demonstrate their implicit morphological awareness and skills such as deciding whether two words are related or not (Deacon et. al., 2008). However, most studies have focused on explicit morphological awareness demonstrated through productive tasks (Carlisle, 2000). Our study also focuses on a productive task that requires native English-speaking children to demonstrate explicit skills in the domain of derivational morphology. The task will require the children to physically voice a response to a specific prompt on paper or on a screen; older children will also be able to write a response on a screen or paper. Our goal is to examine how this performance changes with age and how this developmental path varies across the age span. Will the production of derivational awareness show distinctions among age levels? We have also chosen a specific production task that requires children to derive a word and/or create a new lexeme from an image.

Most languages have derivation of some sort, although there are languages that rely more heavily on compounding than on derivation to build their lexicon such as the Chinese language (Swan, 2001). We will be looking to see if this derivation changes across the age span and whether the processes of derivation such as affixation, reduplication, subtraction, or internal modification of various sorts are demonstrated differently across the age span (Lieber, 2019). Most studies of morphological awareness have focused exclusively on inflected morphology in younger children or exclusively on derivational morphology in older children; however, to understand morphological awareness as a broader construct, it is important to incorporate one aspect of morphology (here it is derivational) across the developmental age span within a single study, which is the rationale behind this study.

2. Methodology

2.1. Participants

Data for an elicitation task was collected from 107 children from ages 3.0 to 12.6, male and female, and predominantly white (52%), Mixed Race (20%), Black (12%), Asian (13%) and Latinx (2%). All the children are native English-speaking children and their L1 is English. There is no reporting of second language acquisition in the child participants. Groups of children of several ages were interviewed on either Zoom or in person, one at a time by the authors and asked to produce responses in the English language. We began with Zoom interviews due to the COVID pandemic and then transitioned to in person interviews as COVID restrictions lifted. The parents were always physically present at the side of the children during the interviews. As the experimenters, we had a list of questions and instructions for each child in the various age groups. We also observed non-linguistic responses and actions on the part of each child, which we recorded and analyzed as data. Lyster et al. (2021) show that morphological awareness is a critical component of language that directly impacts reading development as early as kindergarten and that children as young as age three demonstrate morphological awareness in their early oral language skills.

Ideally, we wanted to solicit responses from close to 10 children from age 3 to 12 and across the 10 age groups for a total of 100 children in the study. However, some age groups were smaller than the 10 projected subjects and some larger than 10 due to imperfect data collection methods and missing target populations. Nonetheless, the purpose of the study is to compare data across age, gender, and race/ethnicity; however, most children in the study identify as white and English-only.

Table 1
Features of the participants

	Female	Male	White	Black	Latinx	Asian	Mixed Race
Age 3.0 to 3.10	5	5	6	0	0	0	4
Age 4.0 to 4.11	9	5	11	1	0	0	2
Age 5.0 to 5.9	4	6	6	2	0	1	1
Age 6.0 to 6.9	6	9	8	2	0	1	4

Age 7.0 to 7.6	6	4	4	0	0	6	0
Age 8.0 to 8.8	5	8	7	2	0	1	3
Age 9.0 to 9.11	7	6	4	1	0	4	4
Age 10.0 to 10.3	3	2	4	1	0	0	0
Age 11.0 to 11.3	5	4	3	1	1	1	3
Age 12.0 to 12.6	3	5	3	3	1	0	1
TOTAL	53 Female	54 Male	56 White	13 Black	2 Latinx	14 Asian	22 Mixed Race

We petitioned families from our social networks on Facebook in our racially diverse, middle class, suburban community outside of Chicago. We set up a table at the local public library in this suburb and solicited families with children entering the library and collected data right then and there. Lastly, we also worked with white families from a Jewish early childhood center in the northern suburbs of Chicago where one of the researchers works as a classroom teacher.

We reviewed the IRB form with a parent either in person or online, collected signed parent consent forms and child assent forms, set up a time to conduct the study with the child and parent in the same shared space, and then asked clarification questions at the end. We reminded the adults to not provide hints, clues or cues for the questions and to remain silent when we posed the questions to their child. We did not ask for a child's name and each response was anonymous. The average time needed to complete the entire elicitation task ranged from 5 minutes to 15 minutes. Both researchers work and teach at a child development institute and used insights from their previous body of work to inform this experimental design. One researcher identifies as cisgender female and South Asian American, and the second researcher identifies as a white female from the LGBTIQA+ community. We did not discuss our positionality with the children and families.

2.2. Data collection and processing

We used a clinical interview design for our study in which the experimenter has a list of prepared set of questions which is given out to each child in the study in the exact same manner to control the variables. As the experimenters, we talked freely to each child but also watched for reactions and replies on the part of the child to follow up with interesting leads on the spot (Elliot, 1981). In addition to recording the oral responses from each child, we also recorded non-linguistic behaviors, gestures, and cues from the adult caretaker in the room. For our elicitation task, children looked at the sequenced pictures below on a shared screen on Zoom for online subjects or on a piece of paper for in person subjects. The children answered the three questions orally while we wrote down the answers in our documents. All questions and answers were conducted in English.

Figure 2. Q1 What would you call this?

Figure 3. Q2: What would you call this?

Figure 4. Q3: What would you call this?

Prior to conducting this formal study, we had completed a smaller pilot study with our own children and a few of their friends using these same images. We noticed the responses varied according to the age of the child and predicted that we would find this same pattern with a larger number of children across the developmental span with gradual, quantitative, and qualitative changes noted. Here are some responses from the pilot study to Question 3:

Children ages 3 to 4: a zebra, a dino beaver, a puppet, a beaver, a horse, a mouse, a horsy.

- Reed (age 5): Platypus
- A horse cat because it has a horse's head and a cat's body: (Benicio, age 8; Harrison, age 8; Carla, age 7)
- Nikhil (age 8): A horse cat, a mutant cat
- Mads (age 9): "Ok. I would call it 'Batcher Hat'. 'Hat' because 'Hat' has the /h/ in 'horse' and the /at/ in 'cat.'"
- Rob (age 10): A horcat or catorse

Young children gave responses that focused on the concrete object in front of them in Figure 3 and identified a type of similar animal such as a beaver, horse, cat, mouse, etc. Children ages 8-10 combined the two animals to make one word (e.g., horse cat) while children ten and older derived a truly new word (e.g., catorse) using derivational morphology. Older children in Piaget's concrete operational stage often discover the performative nature of language and use language to achieve their goals and begin to understand how language can be used for agency and symbolic functions, as displayed above. Nelson (1977) stated that young children may be more interested in what objects did or what they could do with them and perhaps form a functional concept of objects that are action-based at the core such as a moving animal.

Older children can identify new examples of concepts and use the perceptual features of Figure 3 to answer the question "Tell me what you think of Figure 3." Young children might instead be hearing and perceiving Question 3 as "Tell me what Figure 3 is" due to this lack of conceptual understanding and derivational thinking. The outlier response of "platypus" is an example of the private meanings that children may have about the words in their vocabulary that are unique to them as individuals. In this example, "platypus" is a response that may be more commonly found amongst adult responders since this is a rare animal. In the end, a child talks about the things that are informative for them at that specific time of development (Elliot, 1981).

We replicated this same elicitation task in our current study with 100 native English-speaking subjects, which in turn assessed both the comprehension of language and the production of language during this task. The nature of language development can be illuminated by carefully watching children across the developmental span responding to a specific task. However, Question 3 emphasizes the central importance of linguistic creativity and morphological awareness as well as the ability of the child to produce and understand a question which they have never heard before. The child can produce novel responses to Question 3 even though the responses to Questions 1 and 2 are familiar. Furthermore, the child has access to the accumulation of previously heard utterances from Question 1 and 2 to formulate the answer to Question 3. We would argue that the children in our study have access to prior knowledge about the structure of the English language and this structure guides their language use in our elicitation task, which Carol Chomsky (1969) defined as linguistic competence.

Our elicitation task also focused on the production of words in English and investigating the relationship between language and thought. We asked children to name the three pictures in accordance with the semantic custom of their community. We listened and observed children as they formed hypotheses about the categorical nature of the three figures. The child then tested the hypothesis by trying to name the new figure in Question 3 correctly. Children test their hypotheses in relation to word meaning in their everyday natural lives as a part of their semantic development (Elliot, 1981). Furthermore, in our elicitation task, the child may apply the same names from Questions 1 and 2 to Question 3 in such a way that now Figure 2 and Figure 4 have something in common so that there is similarity between

Questions 1 and 3 and similarity between Questions 2 and 3. Vygotsky (1986) defined this phenomena as chain complexity and how children can determine if these three figures share associative features together and what they have in common with each other conceptually.

Question 3 allows for several hypotheses. The child may assume that Question 3 refers to the images in Question 1 and 2 and that they all share particular features, so that meaning can be represented as a set of semantic features which can be seen as present in an all-or-none sense or in varying degrees. Question 3 is or is not an example of a cat or a horse, two named categories from Question 1 and 2 respectively, and whether a cat is more central than a horse or a better example, although both a cat and a horse could share lexical space within the coined word in Question 3, which was evident in our results. Although the image in Figure 4 shares perceptual qualities with Figures 2 and 3, the concept underlying Question 3 may not simply consist of a list of perceptually based features from Figures 2 and 3 (Elliot, 1981).

At the same time, we wanted to decrease the cognitive load by first priming the children with Questions 1 and 2 rather than start by asking Question 3 first. A cat and a horse are also "unmarked" words and therefore often common in a child's English lexicon while Question 3 requires a "marked" word in the child's response and therefore functioned as a contrastive pair and opposite of Questions 1 and 2 (Clark, 1970). The unmarked words "cat" and "horse" function as neutral concepts that do not require recall memory while Question 3 is posing a charged question that was not static since it asks the child to imagine and carry out symbolic transformations from an unmarked cat and an unmarked horse, shifting between the wholes and parts of these two animals.

The overall result is that children found the semantic analysis in Question 3 more challenging than Questions 1 and 2; therefore, Question 3 caused considerable difficulty for younger children because it is abstract in concept and does not match their understanding of the immediate physical world. The younger children in our study, ages 3 to 6, often gazed at Figure 4 much longer, sometimes glancing at the adults nearby for confirmation. Across the developmental span, children acquire unmarked terms such as "cat" and "horse" before marked or rare terms such as "Siamese cate" and "Shetland pony." In terms of cultural variations, the unmarked cat and horse also function as potential universals of cognition and children from a variety of cultural backgrounds can answer Questions 1 and 2 due to their familiarity with these common animals, their schema, and shared experiences with cats and horses.

However, the connection between the linguistic competence a child brings to the task and the performance required to answer the three questions can be elusive. There were a few children at the age group of three who could not answer Question 3 at all and remained silent, even after adults prodding them but without any hints and cues from us or the parents. Perhaps the silence is due to the frustration of not knowing the answer and seeing this task as an obstacle and not having a full grasp of verbal thought. The older children understood the task much better and became more voluble. Yet the clinical interview method does not consider the

intralinguistic difficulties the child can be experiencing during the interview itself and perhaps we misinterpreted the data from the younger children who did not produce an answer for Question 3. Observations cannot ever be completely exhaustive, and even when we are studying children and their behaviors, we cannot accurately know what the child is thinking and feeling internally.

Question 3 also requires a child to test hypotheses in a deductive manner and invent new words. The child is not using direct experience as the source of knowledge for Question 3 but rather linguistic creativity and making judgements about an image using their foundational knowledge of the English language, since they have never seen this image before. We created a novel question for the child to respond to without relying on explicit rules and grammatical categories. At the same time, responding to a novel experience may be enhanced in our later stages of development rather than when we are young children and may develop in some cultures more so than others. For example, the few children who remained silent for Question 3 nonetheless produced responses to Questions 1 and 2 and communicated fluently. The task in Question 3 also required lexical manipulation and pushed the child to use language to find a solution. In our data set, we saw older children providing a more mature response for Question 3 but not necessarily a response rich in linguistic complexity. Yet, to answer Question 3, a child needs to use their cognitive understanding to make sense of this imaginative creature.

We chose this image of an imaginary object/creature in Figure 4 because it is a compounding of two animals: a cat and a horse. This image of a compounded animal and its strange combination lent itself to derivational morphology in which children created new words using roots, prefixes, and suffixes for Question 3 (Berko Gleason, 1958). The first two images of a cat and horse are most likely grounded in a child's previous experience and a "known, known" while the third image can be classified as a "known, unknown" with no obvious precursor in the child's accumulated experience and therefore a novel combination without any prior context. Figure 4 was an unknown referent without any deictic reference to a known object and therefore communication between the younger child and the researchers did not go as smoothly as we hoped since we could not easily attend to the "known, unknown."

At the same time, we can question whether language precedes thought or vice versa when looking at this last question. Can a child have a conceptual understanding of this imagined creature even if they cannot find the words to respond to the question? Do they need to arrive at a linguistic discovery within themselves to provide a conceptual response to us? Vygotsky (1986) would argue that thought and language have separate roots that then converge as the child grows and develops. However, to arrive at a correct answer for Question 3 that uses compounding as a concept in the response, one would need to use derivational morphology, which is specific to the English language here and with the process of derivation rooted in cognition. Therefore, when a child answers Question 3, we can probe whether that response reflects either their cognitive or language development or an intersection of both forms of development. We would need to replicate

our study in other languages and cultures to determine the interlinguistic differences for Question 3 and how other languages arrive at derivation and through what forms of cognition.

3. Findings

In terms of data analysis, we transcribed each child's response along with our notes on the child and parent's behaviors. We then used an Excel spreadsheet to catalog each child's response according to age and then labeled the child's age, race, and gender. The last column in the spreadsheet had the transcription and notes. We then looked for patterns across the transcriptions and notes and quantified the amount and type of responses for each question through frequency counts which were then graphed.

3.1. Misnamings and Overextensions

When the younger children misnamed Figure 4, we argue that younger children overextended meaning and interpreted this imaginary creature as a familiar animal such as a lion or a beaver, a single lexical item which shares certain animal characteristics and properties with Figure 4 such as roundness, stripes, colors, and tails.

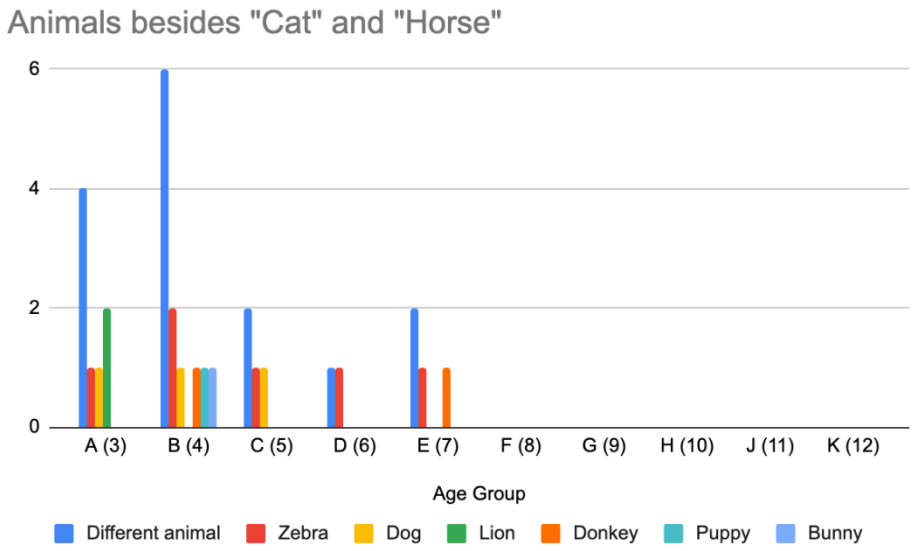

Figure 5. Reactions by different age children to figures 2, 3 and 4

Here the younger children are applying their hypotheses according to associative complexes as opposed to the chain complexes in older children who combined Figures 2 and 3 and created a new word for Figure 4 based on this chaining as displayed in Figure 6 below.

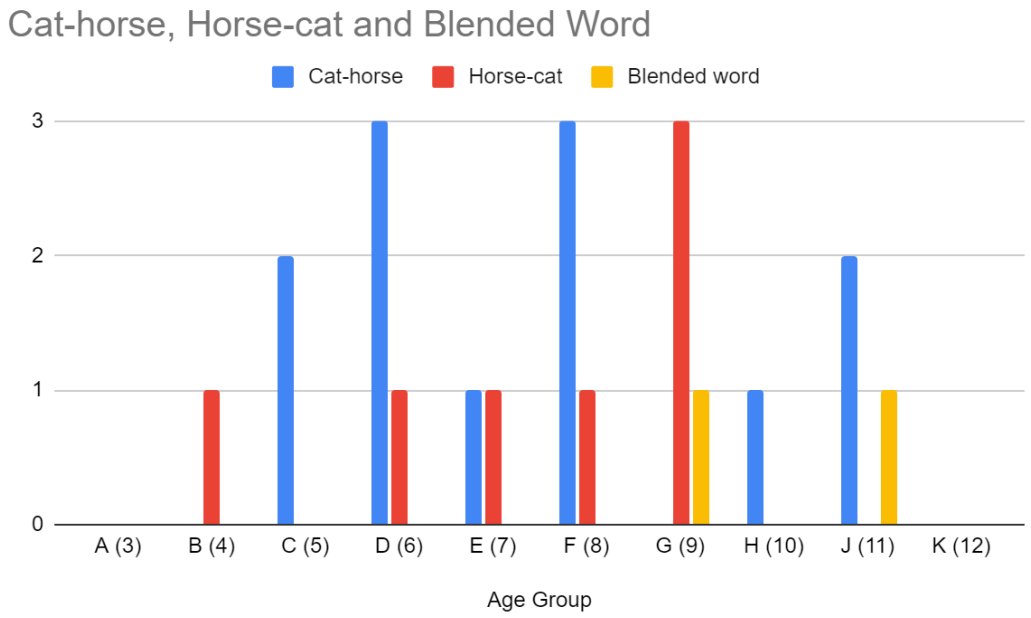

Figure 6. Cat-horse, horse-cat, and blended word

We can state that the younger child sees Figure 4 through the lens of perceptual overextension, which the older child does not demonstrate in our study perhaps due to the strange and unfamiliar labeling of Figure 4 as another animal: "A child may overextend a lexical item, not because he thinks it is the correct name, but because he has no better word in his vocabulary for the occasion, or because he is unable to remember the correct name," (Elliot, 1981, p. 87). Essentially, the child is stating to us that Figure 4 is "like" a bear, lion, and beaver. Overextensions demonstrate the child's inclusive thinking and how these two figures share similar colors and shapes which is known as the Semantic Feature Acquisition approach. The errors that young children displayed in Question 3 suggest that children are learning semantic features of these animals one at a time and start off with inclusive categories and apply those semantic features to many different objects in that category such as "animals" (Clark, 1973). On the other hand, older children realize that the animal in Figure 4 is probable, and therefore, a word to describe this probable animal is also equiprobable.

In the 1970s, the Same and Different studies on young children analyzed how they used semantic perception to distinguish terms, objects, and images and whether children picked up differences more than similarities and what categories they used to sort objects (Graham, Namy, Gentner, & Meagher, 2010). When children chose "donkey", "lion" and "zebra" for Figure 4 in our study, they were naming animals that were "maximally similar" and that there was some degree of sameness noted here. They did not pick up on how this image was different, a construct that comes later in their development. Researchers would argue that a maximally similar animal like "lion" would be a form of discrimination noting a positive stimulus rather than a negative stimulus (Trehub & Abramovitch, 1978). In a more recent semantic perception study, Bovet, Vauclair, & Blaye (2004) tested 3-year-old children on perceiving same and different objects, because

at that age they are able to use concrete vocabulary, and had them classify the same and different foods and nonfoods, demonstrating that young children can demonstrate the understanding of analogies (i.e., apple and banana are the same but different from a cup and teddy bear). The young children in our study were looking for a semantically similar animal, and a striped cat was not indistinguishable from a zebra. However, if we had changed our methodology and had children describe the animal instead in Figure 4 rather than name it, then perhaps the young children would have displayed greater cognitive insight into that last image. We would have asked them to observe the image more carefully and tune into the details and allowed time for the child to incorporate our training and assimilate it into their final response. We can also see how Figure 4 can be seen as an object with a part and whole relation and asymmetrical in nature. Young children first attempt to understand their physical and social world and then seek language to best represent that understanding; however, Figure 4 is a conceptual grouping that is hard to describe using language for young children.

Only a few children added descriptive words for Question 1 and Question 2: the cat [orange cat] and horse [brown horse]. Most children responded with a single lexeme, "cat" and "horse". A few outliers include two male subjects' responses at the phrasal level that were more selective but without accompaniment to action using gestures and motions: "a real live horse" at age 7 and "that would be a galloping horse" at age eight. Both examples show how children in this stage of development can make use of the context of the utterance to expand their expressive power (Elliot, 1981). At the same time, older children looked quizzical and seemed to ask whether this was a trick question, responding with a rising pitch of uncertainty: "a horse?"

We did have one child who was 11 years old and who produced an outlier for Question 3. He simply said "horse" and perhaps he did not know what answer to give and therefore offered a deliberate "misnaming" during this production task. This 11-year-old managed to resist the contextual manipulation in Question 3 to the extent of being incorrect even though they should have used derivation in this question, while also following the linguistic rule in a very determined manner. We can argue that the different responses for Figure 4 are also due to the peculiarities of the child's own experience of animals as well as exposure to linguistic input. In addition, the children had to identify and verify the animal in Figure 4 as quickly as possible, leading to nuance.

3.2. The role of memory

We can also argue that older children can "store" the images in Figures 2 and 3 and use the storage pictures for Figure 4, which can be defined as a "retrieval" picture; however, this elicitation task was not a recall test (Turner & Rommetveit, 1968). The role of Figure 4 as a retrieval picture may have produced stronger effects in the older children. Older children have a better memory and can produce a description for Figure 4 that considers Figures 2 and 3 and makes a contrastive analysis. Another hypothesis is that Figure 4 is inherently an ambiguous image and therefore will inevitably cause error in

the responses to the task itself. We would need to use another matching figure to Figure 4 to see if the ambiguity variable plays a role in the responses of young children. At the same time, we saw evidence of young children using unique strategies for deciphering this novel construction of language in Question 3 and trying to undo the ambiguity.

Age 4 Participants:

B4: Uhhhh. *(tilts head back and forth and leans closer to device.)* Mm. I don't know. What's that, a cat body and a horse head?

Age 5 Participants:

C6: I don't know what that animal is! *(laughs)*
Author: There's no right or wrong answers, I'm just wondering what you think. C6: *(5 second pause)* I think it might - it's like a cat having a horse head-a horse thing on it.

Age 6 Participants:

D1: ...A...
Author: It's kind of a silly one.
D1: A...
Author: Any words you say to describe what you see here are good. There's no right or wrong answers here.
D1: A cat.

Age 7 Participants:

E2: Hmm. A mix between a horse and a cat? With a horse head and a cat body, or something? It's weird!

In our data set, children at age 4 started to use derivational morphology for Question 3 (e.g., "Ummm...Hmm...Uhhh. A horse cat?") but full control of derivation processes began at age 9 in our data set (e.g., "A horse-a-cat").

3.3. Derivational Morphology

Using the Derivational Theory of Complexity, we can state that a derivation that is more complex (as in Figure 4 versus Figures 2 and 3) would appear later in the child's speech than the less complex one: Given two or more figures, F2 and F3 and F4, such that F4 is shown to be more complex linguistically and cognitively than F2 and F3, it can be predicted that F4 will be psychologically more complex (Elliot, 1981). It can also be said that young children will make greater errors for F4 due to this complexity while older children can add more transformational semantic thinking to this complex figure. For Figures 2 and 3, younger children used their assimilated knowledge to answer the posed questions. The language they used (cat and horse) is compatible with the non-linguistic images. We

can also argue that young children did not have a correct answer for Q3 because it could not have been statistically calculated or derived in their linguistic repertoire like Q1 and Q2.

In the third image of the cat wearing a horse's mask, younger children hesitated more and paused. They also looked to their parents; many of the 3-year-olds did not provide an answer at all for the third image which seemed too abstract for them. They did not know what to make of this strange creature but many children responded with a one-word animal with concrete features such as a "dog", "bunny", "zebra" and "lion." They looked at the holistic shape of the animal and named something slightly different from a cat. Some picked up on the stripes and called it a "zebra" while others picked up on the feline nature and called it a "lion." A few young children were outliers such as a 4-year-old who said, "pretend cat" or the five-year-old who said, "toy horse."

Figure 7 below reveals the relative speed with which the subjects answered the third question, and whether they required reassurance from their adult guardian. We can see that the younger participants much more frequently needed prompting or encouragement from their parents, or simply needed more time to process the image and think about their response than the older participants. Within the "Says 'I don't know'" section, only two participants did not follow the "I don't know" with a response. Both of those two participants were in the 3-year-old group. The other participants who said, "I don't know," all followed it with a response, either independently or with encouragement from their parent and/or guardian, meaning the "I don't know" was possibly used to stall for more time to think or, like laughing, was a reaction to an unexpected image.

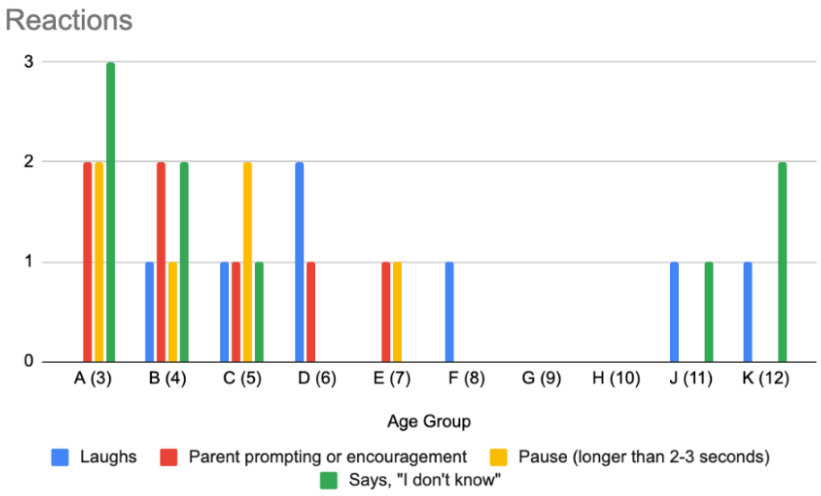

Figure 7. Reactions by children to the figures 2, 3 and 4

The use of derivational morphology for the third image began at age 5 and continued in complexity with larger phrases and sentences by age twelve. From ages 6 to 11, you can see how the cognitive compounding of the two physical animals (cat and horse) turns into the linguistic compounding with phrases and words like "cathorse" and "corse." One male student at age 12 decides not to use the word "horcat" that he first derived for the response

because it sounds too much like "whore." The phonology of "horcat" caused shame in this male student when giving his response and here you can see the connection between morphology and semantics. However, stress rules and boundary affixes did not arise in our data analysis. Yet, the choice of the combined "cat-horse" was more common in children ages 6 to 9 while older children ages 10 to 12 used "horse-cat" more often, perhaps due to phonetic production with the /k/ sound being mastered more easily than the more challenging /h/ initial sound.

The general morphology trend in Question 3 is that [Affixation > Compounding] is the pattern of development with young children using affixation more and older children using compounding more for the creative response [e.g., "a cat horsie" using affixation v. "a cathorse" using compounding]. The same can be said of [Synthetic formation > Analytic formation] with younger children displaying synthetic formation while older children displaying more analytical formation [e.g., "a lion" v. "A cat, with a fake horse head on top of the cat's head."] However, these examples reflect the general trends in our study, but more systematic research is needed, involving many more different languages and children for the claims made in this hierarchy.

The syntax becomes more expansive to describe the compounding of "cat and horse" as the children become older and with some preteens using quite a bit of sarcasm in their responses. Children's language changes from being social and communicative at a young age to being individual and self-regulating by the time they start school. School age children are capable of organized reasoning and there is an increased use of logical connectives like "because" closer to ages 6 and 7 (Elliot, 1981). The responses below display this expansive nature in syntax:

- "That would be a cat staring at you. That would be a galloping horse." (age 8)
- "Uh. A cat, with a fake horse head on top of the cat's head" (age 9)
- "A cat with a horse's head on that is trying to look like a stuffed animal on the floor" (age 10)
- "Wow…that is a 'hat.' A horse plus a cat is a 'hat'" (age 11)
- "I call this a 'hat' because it is a 'cat' plus a 'horse', but 'corse' is not a good combination to say. It does not feel good when you say it. (age 12)

As the children increase in age, they display logical reasoning even when the question asked may seem illogical such as the last question we posed. Older children were able to unravel the semantic implications of the third figure and thus demonstrating how language is used strategically to display one's thoughts as we get older.

3.4. Diminutive morphology

In the first and second images of a real horse and a real cat, it is evident from the data set that the younger child more frequently used single words with diminutive morphemes like "kitty" and "horsey" for Questions 1 and 2.

A6: (giggles) A kitty cat
B6: A pretend horsie *(laughs)*
B7: A kitty
E9: A horsie?

Research shows that diminutives like the -y morpheme in English at the end of "kitty" aid in two major language-learning tasks: word segmentation and grammatical gender acquisition (Kempe, Brooks & Gillis, 2007). However, even though contemporary English does not use gender-based morphemes and does not have grammatical gender, the use of diminutives allows children to use their sense of word perception and determine the pattern of metric stress. We also know that young children acquire inflectional morphemes before derivational morphemes and that the use of diminutives allows young children to populate their schema with a variety of nouns and noun-clusters that use inflectional morphemes (i.e., horse and horsey; dog and doggie; duck and ducky; bird and birdy; pig and piggy; etc). In English, the -y inflection (horsey) and the -ie inflection (horsie) both signify the diminutive. The use of the diminutive also demonstrates that a young child is sorting their physical and social world and noting the smallness of objects as well as their endearing, familiar quality.

Pervasive in many languages, child-directed speech from adults during this young age also uses diminutive morphemes as caretakers exclaim, "Look at that cute bunny!" Research shows that diminutives become linguistic bootstrapping devices that allow young children to grow their language skills with support from adults (Gopnik & Meltzoff, 1997). As children get older, they will still use the diminutive construct but now as a derivational morpheme, and often with a tone of sarcasm, such as "Here's my mini-me!"

Diminutives allow children to classify nouns into distinct categories based on size and smallness while also gaining other inflectional morpheme use such as singular versus plural nouns, i.e., dog and dogs. Furthermore, young children often prefer the diminutive form of a noun more so than the original base word. The affix -y also creates a stress boundary with the root word "horse" and changes the tone to a friendly rising pitch at the end. The meaning of the base is merely modified by adding the semantic component SMALL. Both "horse" and "cat" are monosyllabic and end in a consonant sound (/s/ and /t/). We could argue that diminutives often create tone alternation and promote a positive, affectionate tone for the hearer in context.

Yet, the diminutive morpheme does not change the word class since "horse" and "horsie" are both nouns and it does not change the meaning; therefore, attaching the -y affix leads to a diminutive marker: N + suffixdim > Ndim 'small N' (Schneider, 2013). A prototypical diminutive like the -y affix does not result from a process of derivation, which young children do not attain the ability to do so until the ages of 5-8, but from a process of modification, in which word class is retained and the meaning just modified. Finally, this form of conceptual thinking is perfectly compatible with the finding that diminutives are acquired and used very early in life.

Researchers call this act of adding a diminutive marker as "evaluative morphology", which is common among Indo-European languages like Latin, Hindi, and English (Körtvélyessy, 2014). The young children in our study are making meaning when they use the diminutive -y affix to signify SMALL just as they do when they use the word "pony" to signify SMALL. We did not find any child using syntactic diminutives with periphrastic examples as in the A+N pattern found in "a small horse"; however, "horsey" can be glossed as a "small horse."

The use of horsey/horsy/horsie can signify the following: (1) an adjective meaning horse-like; (2) an adjective meaning of or having to do with horses; or (3) a diminutive of horse. Horsy had a brief heyday in the middle of the 20th century, but horsey was unquestionably preferred before 1940 and is again preferred today. This is the case throughout the English-speaking world and here we can see how the use of the -y diminutive morpheme (horsey/horsy/horsie) has many different significations (Grammatist, 2022):

N 'animal' + -y > N 'young animal'
N 'animal' + -y > N 'small animal'
N 'animal' + -y > N 'dear animal'
N 'animal' + -y > N 'sweet animal'
N 'animal' + -y > N 'weak animal'
N 'animal' + -y > N 'cozy animal'
N 'animal' + -y > N 'unimportant animal'
N 'animal' + -y > N 'immature animal'

Every diminutive form has a conceptual space that provides a range of meaning when implemented (Schneider, 2003). Diminutive meaning crucially depends on the context and situation in which a diminutive is used. For example, when adults use the term "horsey", their range of meaning could include derogatory and negative tones unlike children who use "horsey" for positive meaning. Adults often use diminutives for a downgrading force that belittles the hearer and their respective personas, possessions, and achievement (e.g., That's a teeny tiny car you have there). However, in some cultures, adults may use diminutives for modesty and politeness (e.g., My teeny tiny house is ready for you).

3.5. The syntax and semantics boundary

In our data set of 100 subjects, the younger subjects (6 years and under) were more likely to use the term "baby" to describe the image in Figure 4 (e.g., A baby zebra) indicating that the small size was a salient feature for them. It appears they know something is "off" about the image, and the solution, for the younger children, is that it must be a baby version of an animal. This terminology shifts a little for older subjects, who are more likely to use a term indicating that something about the animal is "not real." The term "fake," indicating that the subject knows this animal does not actually exist, was used across a wide age range from 6 to 12. Similarly, the term "mask" was used widely in that same age group. The terms "wearing", and "hat" were each only used twice, in the 9-year-old group and the 11-

year-old group, respectively. It seems that while all the subjects knew there was something a little bit "off" about this creature in Figure 3, the younger subjects focused on the size and the older subjects were more likely to focus on the features and knew that this creature was using a costume to disguise itself.

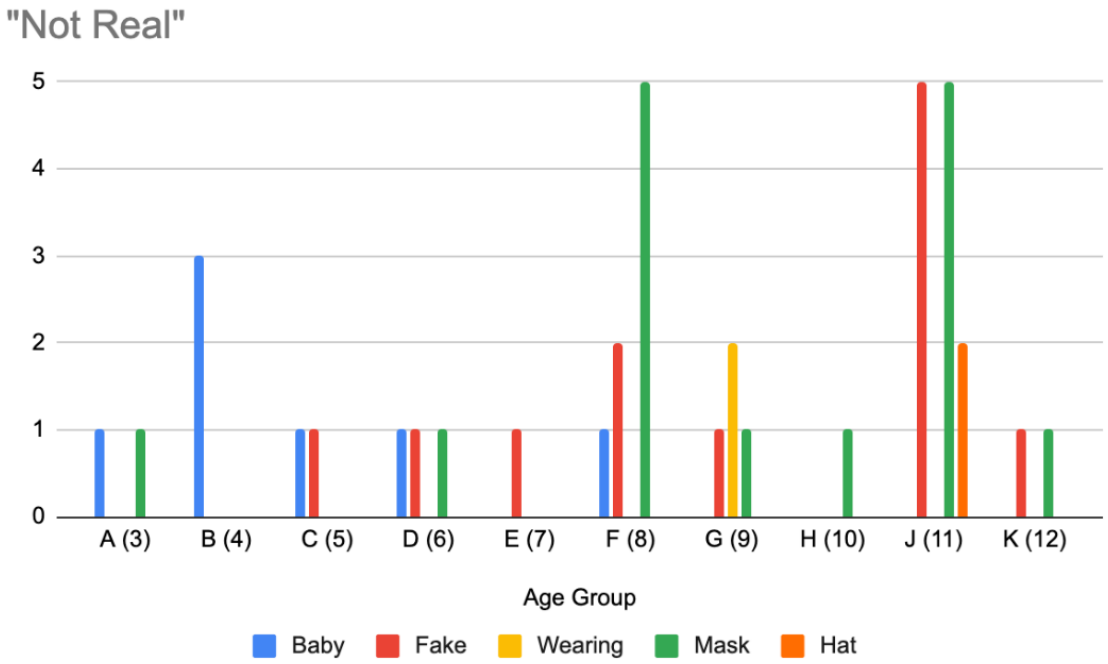

Figure 8. 'Not real' by different age groups

In terms of semantics, negation as a construct has been researched to show how it becomes more complex along the developmental span with young children using "no" as an imperative and negation; however, this one form "no" can have different functions for young children. Older children use the same form "no" for complex functions such as denial, rejection, and non-existence (Brown, 1973). An older child, male and age 11, responded to Question 3 with "Hmm...I don't know. I think just a cat". Another female student, also age 11, responded to Question 3 with "That's a cat with a horse wearing it...riding it...I don't know." Here we can see older children displaying non-anaphoric negation: to negate the information contained in the rest of the statement/question (Wode, 1977). When the 11-year-old female student said "I don't know" at the end, she was negating everything that came before in her response. The younger children ages 3 to 6 in our study displayed anaphoric negation with statements like "I don't know that one." Anaphoric negation occurs when one interpretation is dependent on a previous interpretation, and younger children reference the original question/statement when they respond with a negation and in tandem fashion. Here is a transcript of a 3.3 age white female child displaying an anaphoric negation expression full of negation-markers (not) and negative antecedents but referring to Figure 3 and our antecedent question (Deprez & Pierce, 1993):

A9: Horse
Author: Thanks! Anything else you want to tell me?
A9: It's not a real horse. It's just not a real horse. Not a real horse, not a real head, not real legs, not real body, just a pretend horse.

This young girl as a speaker is committed to the falsity of the proposition in Question 3.

4. Discussion and conclusion

Our study builds on previous research focusing on the understanding of derivational morphology in children and how the understanding and production of derivational morphemes changes across the developmental span. Our study highlights the creativity in children when they are creating and playing with new words, especially when offered compounding images that potentially can lead to derivational morphology. After completing the approximately 100 interviews for this study, we found ourselves more attuned to and reflective of how children use language and put words, phrases, and sentences together to make meaning.

The research also triggered moments in our own personal and professional lives that referred to the natural use of morphology in children at home and in schools. For example, thinking back to a joke shared in an early childhood classroom, we discussed how children have the proclivity to derive funny words that combine the names of two or more animals:

Child: What do you get if you cross an elephant and a rhino?
Adult: I have no idea.
Child: An 'ele-phino!'

We laughed at this joke because the derivation referenced a word that a three-year-old was unlikely to say in the daily classroom and functioned as a rare form of language use. Even if the child did not fully understand the meaning behind the actual joke, the other children in the classroom laughed because it was fun to play with words and create new ones, and to think about the meaning of those two words together in unison. Perhaps the child imagined a rhino with an elephant's trunk or an elephant with a rhino's ears. Whatever the child was picturing, they were doing so because the English language offered them the possibility of derivation to reference something previously unknown.

The way children use language tells us much more than which animals they know and love; language elicitation tasks tell us about how children categorize and label, and about how they interpret what they perceive to communicate their thoughts. When they do not have the "right" word or the "incorrect" language, they create something that makes sense to them, given their understanding of the rules of their language. Often, their "incorrect" use of grammar and morphemes tells us more about their understanding of language than their "correct" language. In our classroom of two- and three-year-olds, we see examples of both inflectional and derivational morphology daily. Once, we had a three-year-old child who routinely asked for more "chipses" at lunch, an overgeneralization of the -s

plural morpheme. The child knew that adding the -s morpheme made the noun plural. Even though the word "chips" is already plural, the child applied a general rule without ever taking a grammar lesson.

Sometime after completing the interviews for this study, we were outside in the park at our school. One of the children (three-and-a-half-years-old) came up to us and said, "I'm looking for my cutting-downer." We struggled for a moment to figure out what he meant, and he said, "It's for trees." We realized he was looking for a stick that he had been pretending was a saw; therefore, highlighting the dual representation of a stick as a saw in his cognitive development and the simultaneous use of compounding morphology: something to cut down trees…a cutting downer. The child used his knowledge of language to communicate meaning; even if cutting downer isn't a "real" word, he used language to his advantage. He used the action – cutting down – and shifted a verb to create a noun. Where and how this derivation came about we may never know for sure. Perhaps he had heard of a soccer play-er or coffee stir-er or a dragon slay-er: all words that use the -er morpheme to semantically shift an action or a thing into a role or a noun.

This past school year, our older children read Andrew Clement's children's book Frindle (1998), which is the story of a young boy who plays with words and challenges his classroom peers to derive new words for familiar objects. When the character comes across a gold-colored pen in the street, he decides to give a "pen" a new name: frindle. The book encourages children to invent new words for everyday known objects such as a "dog" and how their invented words hold validity in their sociolinguistic spaces. Playing with words opens a linguistic creativity that is inherent in children and allows them to become lexicographers of their own social worlds.

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