Paths of Development
Language Acquisition in Spring 2020

Edited by

Michael Wilson

December 2020
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Acquiring Challenges and the Challenges of Acquisition

Michael Wilson

On March 11, 2020, the University of Massachusetts Amherst announced that following spring break, courses would be delivered remotely due to increasing concerns about the spread of the COVID-19 pandemic. In-person classes were expected to resume Monday, April 6.

It has now been almost 9 months since the move to remote instruction, and the majority of classes will continue to be taught remotely in Spring 2021, a full year after the move to remote instruction.

This shift from in-person classes to remote instruction was not something most (if any) were prepared for. Professors whose lesson plans required in-person instruction and projects suddenly found themselves retooling their assignments for online delivery and evaluation. Materials had to be reconfigured for online presentation. And students now had to deal not only with the difficulties of navigating complex course materials and their projects, but also with the stress and uncertainty that began its rising grip on the consciousness of the United States and the globe as the COVID-19 pandemic began to worsen.

As I write this, there is more hope than there had once been that things may look up soon and a fully safe return to in-person instruction may be possible. Several promising vaccine candidates have been developed and, we are told, are soon to be available to the public. Though things are not over yet, a small sigh of relief seems not unwarranted.

But when the students in the University of Massachusetts Amherst’s linguistics program wrote the papers included in this volume, no such relief seemed forthcoming. The stresses of quarantine and remote learning were acutely felt. All the more remarkable, then, that the undergraduate students whose papers are included in this volume were able to carry out and conduct exciting and innovative research on a variety of topics.

It is difficult to overstate just how impressive these students’ work is. Even in the best of times, these papers would constitute impressive class projects. But in the context of quarantine, they are truly a testament to these students’ dedication and enthusiasm. Not only did they redesign their experiments to be conducted remotely, they took advantage of the opportunities offered by this change. Many were able to conduct online and virtual surveys that would be impressive in a full study, much less a class project or thesis. In rising to the unique challenges of the Spring 2020 semester, these students have proven to be models of conscientious, thoughtful researchers.

As a teaching assistant for Tom Roeper’s Spring 2020 LING 411 language acquisition course, I no less than he had the privilege of working with students as they developed some of these projects during the challenging semester. Other papers included here are remarkable theses on language acquisition completed by the students of Tom’s Spring 2020 LING 397E course focused on experimentation in language acquisition. I have been lucky enough to encounter this latter set of papers for the first time due to their inclusion in this volume.

Daniel Callahan investigated the acquisition of the suffix −less, focusing on when children acquire absolute and contextual interpretations. Robyn Fitzgibbons examines the role of
contrastive stress on the interpretation of different kinds of possessive recursion in children from 6–10 years old. Maggie Gehm studied young children’s (ages 2–5) interpretation of various kinds of reflexive pronouns. Maria Girardin’s work examines the acquisition of pronouns in a child with high functioning autism. Hayley Lavinio studied scope and plurality in children’s and adults’ interpretations of *any*. Jaimie Mayor looked at L2 English speakers’ interpretation of ellipsis and inversion in English (e.g., *... so I did vs. ... so did I*), collecting a truly impressive amount of data from 46 subjects of various linguistic backgrounds. Tyler Poisson’s BA thesis examines the acquisition of possessive recursion and generic possessives in English (e.g., *John’s kid’s bike* can be interpreted as “the bike that belongs to John’s kid” or “John’s bike that is for kids”). Charlotte Santoro investigated children’s interpretation of compound nouns, such as *pancake house* and *house pancake*. Finally, Raster Young studied the acquisition of negative concord and double negation in L1 English-speaking children. As may be apparent from this list, the topics these students chose to work on were quite diverse, and they put their all into designing, running, and interpreting the results of their experiments. We have been truly inspired by their responses to the difficulties of this year.

This volume is dedicated to them.
I. INTRODUCTION

In trying to come up with a question for research in the last weeks of our class, I found myself referring back to the idea of negation. My first draft concerned negative polarity items, and how the negative operation occurred in complex sentences where NPIs may number three or more. This proved too complex for my mind to actualize, and for the child to respond to meaningfully. Keeping negative operations in mind, I began to think about the operation in terms of a visual concrete effect. An operation that negates the supposition of existence that is posited when a noun is used. From that line of thinking, my questions concerning the suffix “-less” were born. Children seem to overgeneralize when they apply a new concept, and then learn the contexts to which it is restricted in order to learn things like plural forms, and interpretations of quantifiers like every. Keeping these examples in my mind, I wondered whether “-less” acted this way as well for the child mind. The definition of “-less”, I initially posited to be a quite strict function of ¬NOUN (without NOUN). My hypothesis from this would be that children would be more likely to accept an example for “N-less” that was not total in it’s interpretation, that they might be more likely to accept a more “partial” understanding of “N-less”, where “-less” means, “less than the expected set”.

II. HYPOTHESIS

Originally, the hypothesis was that children would try and overgeneralize the situations for which “-less” is applicable, allowing for a more general interpretation that allowed both partial absence, as well as total absence. It was posited that this might occur along the continuum of ages 5-9, as reading begins and becomes common. CHILDES searches yielded no child results, and the suffix was relatively uncommon in children’s literature. The age range had to fall under around 10, where our concepts about morphemes and most words become adult level. Thus, the prediction would be that one would see a shift from multi-answer acceptances from the younger subjects, to purely total interpretations in the older children.

However, after testing the experiment on adult participants, and greater self reflection, it was found that adults tend to accept partial absences for “-less”, yet seek to contextualize why or how they might allow it. These intuitions are more complex, and so one would wonder if it is actually the reverse of our hypothesis that is the true acquisition path. I propose a third path after the data’s collection that merges the two, later on in the paper. Prior to that, I operated under the assumptions of the first hypothesis.

III. DESIGN

The experiment was intended to draw out children’s intuitions about the suffix “-less”, and thus I set up a somewhat complex comprehension task. Given COVID-19’s pandemic nature, the original experiment procedure would have to be modified to occur over telecommunication through Zoom call. I was able to field 7 participants ranging from 5-9 in age: 5;1, 6;1, 8;0, 8;1, 8;4, 8;5, 9;1. I set up 5 stories, each with 3 characters (cars in the final story), and drew accompanying pictures for the stories, divided in 3 boxes corresponding to an object or person in the story. Below each box were labelled each person, or the possessor of each object. The stories were made and the labelling was done in order to be able to have a response the children could
tie to the choices they’d pick for their interpretations of “-less”, in a way that could be relayed to me without having to guess about where the child might be pointing, or having to relay terribly on their grasp of left, right, and middle.

In the appendices below, you can look through and see each question and illustration paired with it, and the general protocol associated. The initial question remained the same, as did the question order. I would present the story of the boys at the dentist, and would first ask a question that would show me if they grasped the idea of partial absence, by using a word “missing” which presupposes the partial absence, and can extend to total absence. I would ask “Which boys are missing teeth?”, to see if they understood this form. That way one could note if they viewed “-less” distinctly by if it matches or differs in terms of the readings chosen. After, I would begin the questions of the form “Are there any toothless boys?”, and if I received a yes I would ask “Can you show me any?”. In many cases, the subjects responded to me with their answers before I asked the clarifying question, choosing to answer the yes-no question with the content that they knew I would ask them about shortly after. More examples of this in depth can be seen in the appendices below.

Often I would ask a follow-up question along the lines of “(Do you know) Why did you pick your answer(s)?”, to gain some insight on what pattern they were developing, or just what

<table>
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<tr>
<th>Adult Data</th>
<th>Missing?</th>
<th>Toothless</th>
<th>Fingerless</th>
<th>Sleeveless</th>
<th>Shoeless</th>
<th>Wheel-less</th>
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<td>Adult 1 (19)</td>
<td>P, T</td>
<td>T</td>
<td>(P), T</td>
<td>(P), T</td>
<td>(P), T</td>
<td>T</td>
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<tr>
<td>Adult 2 (22)</td>
<td>P, T</td>
<td>T</td>
<td>(P), T</td>
<td>(P), T</td>
<td>(P), T</td>
<td>T</td>
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<tr>
<td>Adult 3 (24)</td>
<td>P, T</td>
<td>T</td>
<td>T</td>
<td>P, T</td>
<td>P, T</td>
<td>T</td>
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<table>
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<tr>
<th>Child Data</th>
<th>Missing?</th>
<th>Toothless</th>
<th>Fingerless</th>
<th>Sleeveless</th>
<th>Shoeless</th>
<th>Wheel-less</th>
</tr>
</thead>
<tbody>
<tr>
<td>5;1</td>
<td>(P), T</td>
<td>P</td>
<td>P, T</td>
<td>P, T</td>
<td>P, T</td>
<td>P, I</td>
</tr>
<tr>
<td>6;1</td>
<td>P</td>
<td>N/A</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>8;0</td>
<td>P, T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
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<tr>
<td>8;1</td>
<td>P, T</td>
<td>P</td>
<td>P, T</td>
<td>P, T</td>
<td>P, T</td>
<td>P, T</td>
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<tr>
<td>8;4</td>
<td>P, T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
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</tr>
<tr>
<td>8;5</td>
<td>P, T</td>
<td>T</td>
<td>T</td>
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<td>T</td>
<td>T</td>
</tr>
<tr>
<td>9;1</td>
<td>P, T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
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their general idea of the concept was. These responses are catalogued below in the results section.

IV. RESULTS

Experiment Data

Subject 1 /5;1/
Missing= Connor, Bobby (interference, “anyone else?”)
1. Yes= “Bobby, I think”
2. Yes= middle and left, (Maria and April)
3. Yes, right and middle- (Emily and Jackson) “missing”
4. Right and left (Julian and Evan)
5. Left and middle (middle has all wheels)
Might be interference on mother’s part or could in fact reflect fuzziness as to the bounds of -less in their lexicon. The full wheeled car example, could just be the child saying the wrong word, or getting confused, it is hard to tell over Zoom call. First question favored the partial reading as a larger set, and ignored the “without” example.

Subject 2 /6;1/
Missing teeth: Middle = PARTIAL
1. No
2. Yes- April= TOTAL “middle only some cut off”
3. Yes- Jackson= TOTAL “doesn’t have any sleeves”
4. Julian =TOTAL
5. 3rd car to the right, said second, but mother says pointed at it. =TOTAL

Interference by parent in trying to facilitate answers, let me know the contradiction in where she pointed vs the word said. Don’t believe this is invalidating

Subject 3 /8;0/
Missing= Connor and Bobby
1. Yes-Connor
2. Yes-April
3. Yes- Jackson- “both are ripped off”
4. Yes- Julian- “you can see feet”
5. Furthest to right
TOTAL only

Subject 4 /8;1/
Missing= Connor and Bobby
1. Yes- Bobby (answered Bobby and Connor for missing teeth), biased to PARTIAL? “Bobby has little gaps”
2. Yes- Maria and April= P& T “April cut all off, Maria’s fell off”
3. Yes- Emily and Jackson= P& T “ripped one, ripped both”
4. Yes- Julian and Evan= P& T “Evan lost shoe”
5. Yes- left and right= P& T “one taken off, flat tires”
May have biased with the asking of the question, used “those” after saying yes to “any”, unsure if it’s his perception of word, although he did mark missing as Partial and Total, and then went for just the partial in the first, truly interesting “-less” case.

Subject 5 /8;4/
Missing = Bobby and Connor
1. Yes - Jason, Connor, TOTAL (corrected after answering question 3)
2. Yes - April, “no fingers”
3. Yes - Jackson, “no sleeves”
4. Yes - Julian, “no shoes”
5. Yes - right
TOTAL
Subject 6 /8;5/
Missing = Connor and Bobby
1. Yes - Connor (no teeth)
2. Yes - April
3. Yes - Jackson (no sleeves)
4. Yes - Julian
5. Yes - third one on the right (no wheels)
Clear Total interpretation, -less = no ___, without ____.

Subject 7 /9;1/
Missing = Connor and Bobby
1. Yes - Connor
2. Yes - April
3. Yes - Jackson, “no arms”
4. Yes - Julian
5. Yes - 3rd one (right)
TOTAL ACROSS BOARD

V. ANALYSIS

As shown above, the bulk of the participants were in the age range of 8-9 years of age. They exhibit a very total understanding of the morpheme, with the exception of Subject 4, who opts for both partitive and total readings across the board, even accepting purely partial for toothless, citing that “Bobby has little gaps”. This discrepancy is made even more interesting by their full understanding of “missing teeth” to apply to both total and partitive readings. The other 8 year olds all prefer total readings, often justifying their choices with the form “because ___ has no ___”, like in Subject 6 and 7’s responses. Subject 1, being 5 years of age, took a partial reading for “toothless”, though they understood “missing” to apply to both contexts. They chose partitive and total readings for all else, including an incorrect answer for the car example, perhaps signaling an inexperience with the morpheme (also heard “toothless” as “two plus”, rather charmingly). Subject 2, answered “no” to the “toothless question”, and exercised a strict total interpretation for each subsequent answer. Thus it becomes hard to say where we might see a shift to stricter interpretation, as on both sides of 6 we see acceptance of partitive readings.

Before the pilot trials for children, these tests were performed on adult subjects in order to gauge what the adult stage for comparison should be. Their responses were also shown to be more biased towards the total, especially as in the case of toothless wherein the total interpretation was the only one accepted by all 3 surveyed. However they seemed to allow a partitive interpretation as a secondary option, but not the primary. They created a hierarchical distinction, with Adult Subject 2 using the prefix “semi” to apply to these halfway examples seen in the second through fourth stories (i.e. Missing one sleeve = “semi-sleeveless”). Through this I came to understand that these examples were far from the same in the degrees and types of absence that they represented. The “sleeveless” and “shoeless” examples were the most similar,
as their expected set both numbered “2”. I would label these “dual set”, as there are two different states of absence to account for: 1 gone, 2 gone. The “fingerless” example about the gloves, was represented with a partial state of absence where 3 of the 5 fingers of the glove were removed, to mimic the previous two in proportionality, but is still a small set in terms of total fingers. The “wheel-less” example is a “small set” where the expected number is greater than 2, and it might be unsatisfying to label any number missing that isn’t the entirety, as “wheel-less”. The “toothless” example is similar to the car example but still the most unique in the sense that the expected set number for teeth is far larger. Individual teeth missing do not constitute toothlessness in the same way fingers missing from a glove might. There are more teeth, and therefore there is more to consider mathematically in applying a sweeping function like that of “-less” where all must be absent to qualify under it. Each adult took “without teeth” to be the meaning of toothless when asked to explain, and yet they made allowances for the other cases. This would lead me to believe that these cases I have provided are not equal in scope, and these differences are also somewhat reflected in the children’s data. Therefore it may well be possible that the acquisition path proceeds as follows: overgeneralization (partitive, total) > strictness (total) > context-sensitive (1.total, 2.partitive)

VI. CONCLUSIONS

The data collected here is quite a bit more varied than expected, as the task has shown that this question is even more complex than I previously thought. Given the responses of the younger minds in this study, one cannot claim that there is a path from overgeneralization to strictness, with certainty.

Given the sampling size of the data, there does appear to be some evidence suggesting that children grow more strict in only interpreting the total meaning of “-less” at around ages 8-9 (4 of the 5 children in the age range). However much more testing with larger sampling sizes must be done before this can be asserted believably.

Even the adult data raises questions. The adults I did survey were in the 19-24 age range, with the 24 year old being the staunchest user in total interpretation. I may have surveyed a group in which linguistic change regarding the meaning of the affix is happening. I should further survey older generations to see if this position is unified. This data may very well be the result of generational change, or speaker to speaker variation. There are now more questions raised from this experiment than answered, but they should be answerable.

VII. FUTURE CONSIDERATIONS

In order to continue working on this topic in the future, the experiment shall have to be split up, into at very least two experiments, perhaps even more. They would have to be split on the basis of the magnitude of the set of the noun that is being assessed, (ie. Larger set, small set, dual, as discussed in the analysis section.) This way we might still see the progression that I theorized, but with greater fidelity, and grouped in a more manageable way. Were COVID-19 and the constraints of an academic semester not imposed on us, I would have like to have more examples and more subjects are required to get a better picture of the differences between these ideas. I would also love to test children from the ages of 8-11 to see if more experience with higher division language allows for these more context based definitions, and clarify where they stand on the affix if there is something to be said about this being a generational shift.
VII. APPENDICES

PROTOCOL
SCRIPT:
• Hey there, INSERT NAME, I’m going to tell you some stories with three people in them, and show you some pictures. Once I’ve finished the story, I’m going to ask you a question about the pictures, where you’ll respond using the name underneath your answer or answers. Now remember, you are allowed to pick more than one answer if it makes sense to you to do so. Are you ready? Okay, let’s get started then.

• There are three boys who are going to get their teeth cleaned at the dentist today. The first boy, Jason, has all of his teeth and makes sure to brush them well every day! The second boy, Bobby, has lost some of his teeth, and is waiting for some new ones to come in! The third boy, Connor, has lost all of his teeth!
• My first question is, “Which boys are missing teeth?” (WARMUP)
• Thank you! Good work! Now I have another question for you, “Are there any toothless boys? … (Can you show me?) You should use the names under the pictures to answer.” Great! / Follow up Q/

• Three girls are playing in the winter snow. Jenny has brand new gloves that keep her fingers warm. Maria has older gloves with a few fingers missing. April cut all of the fingers off her gloves because she thought it would look cool.
• “Are there any fingerless gloves? … (Can you show me who has them?)
• Follow up, “Can you tell me why you chose those? I’m curious! … Thank you!

• Three children are walking to school in the rain. Lucy has a brand new jacket with both sleeves intact. Emily is missing one sleeve because her brother ripped it off, typical. Jackson ripped both of his sleeves off, so he could show off his muscles.
• “Are there any sleeveless jackets? … (Can you show me?” FQ)

• Now here we have three boys playing in the grass. Julian, likes to feel the grass on his toes, Evan lost one of his shoes playing, and Oliver is wearing his sneakers.
• “Are there any shoeless boys? … (Can you show me?” FQ) Fantastic!

• All right now just one last story, you’ve been very helpful for me today. There are three cars in the garage. The car on the left had a flat tire that is being changed. The car on the right had all of its wheels taken off to be replaced. The car in the middle has an engine problem and has all of its wheels.
• “Are there any wheelless cars? … (Can you show me?” FQ) Thank you so much!

You’ve really helped me a lot today! I really appreciate it.
Fig. 1

JASON  BOBBY  CONNOR

Fig. 2

APRIL  MARIA  JENNY
Fig. 3

LUCY  EMILY  JACKSON

Fig. 4

EVAN  OLIVER  JULIAN
I. Introduction

The general purpose of this experiment is to see how children interpret contrastive stress as it functions inside of recursive sentences. Contrastive stress is a device in which the main stress is placed on an element in a sentence to generate a set of the same grammatical category. A very basic example of this would be “It’s not a blue car, it’s a red car”. When the main stress is placed on blue, the set created would be to name any color that is not blue. Recursion is when grammatical phrases are embedded within each other to make a string of infinite related elements. In this experiment we are mainly looking at possessive noun recursion in which possessive nouns marked by ‘s are embedded and relate back to the same object. For example, a simple two level possessive recursive phrase would be Mary’s sister’s hat, in which the possession of the hat relates back to the sister and not Mary. This is considered a two level recursive string because there are two possessive nouns which precede the object, but the theory implies that an infinite amount of possessives can be embedded.

More specifically, the latest version of this experiment is focusing on generic and particular possessive nouns. This concept can be best explained with a simple example. Take the phrase men’s clothes- generic men’s clothes are clothing that men generally tend to wear and do not have ownership, whereas particular men’s clothes refer to a specific set of clothing that belong to a specific group of men. With this new addition, a more specific question to ask is if using contrastive stress on generic versus particular possessive nouns in a recursive string will pull out a specific reading or not. For example, if stress was placed on the men’s in men’s clothing, will the child understand it as generic or particular men’s clothes in the given scenario. These changes were added to further the research plan as a result of the pilot experiment, and hopefully the result of this change will result in finer conclusions.

II. Linguistic Theory

Because we are dealing specifically with possessive recursion, it is important to define indirect recursion which allows for the stacking of possessives to occur. Indirect recursion does not allow for a conjunctive reading, but proceeds phrase after phrase in a fixed order according
to Chomsky’s Strong Minimalist Thesis. The syntax shows that a determiner phrase is repeated inside of multiple possessive phrases allowing for an endless string of possessive noun phrases which then all trace back to the main determiner phrase (Roeppe, 2011).

Below is an example of a basic possessive recursive structure of the previously stated sentence *Mary’s sister’s hat*:

![Diagram of Mary's sister's hat](image)

Now the question to ask is how contrastive stress applies to this structure, and there are two possibilities. One is that contrastive stress is added onto this structure as an emphatic role, but the other is that contrastive stress is its own separate structure. This question is to be answered if the results show that children are using contrastive stress as a tool to understand recursion versus ignoring the stress patterns and focusing on the recursion element of the experiment. One way to tell if children are using contrastive stress as a tool is if they repeat the intonation of the experiment facilitator when answering the questions. This is a phenomena particular to children’s speech and not usually found in adult’s speech unless it is occuring in a sarcastic manner. To point this out, take the previously used sentence *Mary’s sister’s hat*. As demonstrated before, a sample format of a question used in the experiment would be “It’s not Mary’s *sister’s* hat..” (where *sister’s* is the word being stressed), and the expected response would be “It’s Mary’s *brother’s* hat.” In adult speech, they tend not to repeat back the stress on *brother’s* even if they know it is the word taking the contrastive stress meaning in the phrase. However, children often repeat the stress of the speaker on the word that was stressed, and it is probably for the reason that the stress is helping them understand the meaning of the phrase. This is not to predict that children will definitely and always do this, but rather that if they are doing it, it would be a good demonstrator for how contrastive stress is working in the recursive structure.
Another good demonstrator for the connection between contrastive stress and recursion is the new addition of the generic and particular noun differentiation. If contrastive stress enables children to pull out a difference between generic *men’s clothes* versus particular *men’s clothes*, it can indicate how the stress is acting systematically in a child’s grammar. If the stress is helping them in these ways, it should mean that the stress is embedded in the recursive structure and *not* acting separately from the recursion as its own system. If the stress proves not to have an impact in their understanding of the recursive sentences, it should mean that the stress is it’s own structure acting separately from the recursive structure, and is just something that can be added on top of it and not embedded.

III. Predictions

Originally, the general prediction for the pilot experiment was that children can generate and comprehend high level recursive structures *better* with the help of contrastive stress. The intonation on certain words should be able to guide them through the structure, and make a connection from the possessives to the object. Without stress, it might be harder for children to trace back which possessive belongs to the object if they do not have the full concept of recursion acquired. If they have recursion, then they will have contrastive stress, but if they do not have recursion, the contrastive stress can be used to help them.

After the results of the pilot experiment reported below, it is safe to assume that children of various ages can understand contrastive stress, and can understand recursion as well. The next questions to ask are if contrastive stress can pull out a difference between general and particular possessive nouns that are stacked recursively. If they are getting those differences, it can be assumed that contrastive stress is prevalent in their understanding of recursion and that the stress is working underlyingly in the embedded recursive structure. Based on this, my new prediction is that if the stress is placed on the head of the recursive string, it will give a generic reading. Likewise, if the stress is placed on any node after the head of the recursive string, it calls for a particular reading.
Here is an example of both taken from the final experiment script, questions 11 and 12:

**Is Sam’s chef’s hat in here?**

Here the contrastive stress is placed on the head of the recursive string, *Sam’s*. Based on my prediction, the stress will pull out a generic reading, and the answer would be “yes” because in this instance the image shows only generic chef’s hats.

**Is Sam’s pilot’s hat in here?**

Here, the contrastive stress is placed on the second node of the recursive string, *pilot’s*. Based on my prediction again, the stress will pull out a particular reading, and the answer would be “no, *Sam’s* pilot’s hat is” because the only hats in the image are still the generic chef’s hats.

This should also be true for the regular (non-contrastive) stress examples. Here is another example taken from the final script, question 18.

**Can you tell me what color Sam’s chef’s hat is?**

Here the stress is non contrastive, but having the stress on the second node should still call for a particular chef’s hat based on my prediction. All of the particular chef’s & pilot’s hats in this story are the yellow and pink hats because they are the hats that *all* chef’s wear, and not just a chef type hat like the one Sam wears, so the answer for this question should be yellow.

IV. **Participants**

The total number of participants across both experiments was 12. In the pilot experiment there was no recorded adult data, but the children tended to be on the older side of the age spectrum ranging from 6-10 years old. It is also important to note that child was not a native speaker of English, and his first language being Chinese. In the new experiment there were only 5 participants, two of which were adults aged 19 and 22, and three children aged 4 and 7. During this trial, all participants were native speakers of English which was not done on purpose, but because of the lack of subjects during this time. With a decent age range of children from the pilot and the final experiment combined, there should be a sufficient amount of data by the end to come up with an expected age for when the acquisition path begins for this phenomenon.
V. Methods

The methods used in this experiment consist of two trials- the pilot version and the final version. The pilot experiment was done in person with the children, and the entire experiment tested the children’s production rather than comprehension of the material. Using the Explain Everything app, the children were allowed to manipulate the images on the screen in response to the stories being told in the script, and the entire conversations were recorded as well which was helpful for data collection at the end. Since all of the pilot experiment trials were facilitated by me and included voice recording, the data collection was as reliable as it could possibly be.

Unfortunately due to complications with the coronavirus pandemic and nationwide lockdown, the format of the experiment had to change expecting that in person contact with the children would not be allowed. The format of the final experiment presentation is a prerecorded video of a slideshow which animates the script, leaving pauses for the children to answer after each question. This version was operated by the parent/guardian who played the video for their children (the adults played it for themselves) and wrote down the answers on the answer sheet attached in an instructive letter to them (see appendix). Not having the option to witness each trial in person with the children and not having voice recordings to collect the data might make the data less reliable, however I trust that the guardians who facilitated the video on my behalf did a fine job and if they had any concerns they would have contacted me.

Also, the new aspect of the experiment including the generic and particular nouns caused more questions, and more complicated questions at that. A total of 23 questions were asked throughout the course of the video, and were broken down by the following categories: recursion level (1-3), stress type (contrastive or regular), generic versus particular adjectives, and comprehension versus production type questions. Compared to the pilot experiment, there were far more 2 and 3 level recursion questions since the pilot indicated that children could understand basic recursion. As for stress, 12 of the questions were asked using contrastive stress, 10 of the questions used regular stress, and the one and question was unstressed. As for question type, the original plan was to have mostly all production questions similar to the pilot experiment, but since the experiment had to be formatted to a playable video, the majority of the questions were
comprehension or yes/no production questions. What I mean by yes/no production questions means that they could answer with production if they answered in a manner such as *No, it’s Sam’s hat*, but they could also just answer with *No*. As for the generic/particular possessive difference, there ended up being 12 questions where the outcome predicted a particular reading, and 6 questions predicted a generic reading.

VI. Results

The most important question to answer in regards to the pilot experimentation was whether or not children understand recursion with contrastive stress on any level, and if the stress helped them move through the recursive structures. Generally, the children had a near perfect success rate in each section of the experiment- from a simple contrastive stress task to multiple third level recursion tasks. There were no overt trends amongst age groups- as in they succeeded in most tasks regardless of age, and even regardless of English speaking status (child L.O is an L2 speaker of English). Here is a table that features how the children answered correctly for each type of question:

| Child’s Initials | Age | # Correct: Contrastive Stress (no recursion) | # Correct: Regular Possessive + C.S | # Correct: 2nd Level + C.S | # Correct: 3rd Level + C.S | # of Times Ellipsis Used | Repeated Intonation?
<table>
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<tbody>
<tr>
<td>1.) N.A</td>
<td>7</td>
<td>4/4</td>
<td>5/5</td>
<td>6/6</td>
<td>4/4</td>
<td>5</td>
<td>yes</td>
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<td>2.) V.A</td>
<td>6</td>
<td>4/4</td>
<td>7/7</td>
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<td>3</td>
<td>yes</td>
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<tr>
<td>3.) L.O</td>
<td>10</td>
<td>4/4</td>
<td>5/5</td>
<td>7/7</td>
<td>4/5</td>
<td>4</td>
<td>no</td>
</tr>
<tr>
<td>4.) N.V</td>
<td>8</td>
<td>4/4</td>
<td>6/7</td>
<td>6/8</td>
<td>2/2</td>
<td>0</td>
<td>no</td>
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<tr>
<td>5.) L.L</td>
<td>9</td>
<td>4/4</td>
<td>5/5</td>
<td>8/8</td>
<td>4/4</td>
<td>0</td>
<td>yes</td>
</tr>
<tr>
<td>6.) J.C</td>
<td>8</td>
<td>4/4</td>
<td>6/6</td>
<td>7/8</td>
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<td>2</td>
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<td>7.) L.E</td>
<td>9</td>
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<td>7</td>
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An aspect was not accounted for when designing the experiment was the use of ellipsis (omission of a word). When calculating the results, ellipsis was not marked as an error because although it was unexpected from the full target phrase, as long as they are omitting the right word then it should not count as incorrect. The few errors that were marked included omission of a wrong word, inclusion of a wrong word, and reversals. Most of the errors consisted of the first two, but there was one child (N.V) that showed the reversal case. For example, instead of saying *the cat’s mom’s hat*, she would say *the mom’s cat’s hat*. It is also interesting that this child was one of two children that showed zero ellipsis, a feature which ended up being common amongst the participants. This seems like the reversal feature was just a feature of this one child, but the ellipsis was definitely an overt trend in the data.

As stated previously, it is important to keep noting that there are no “right” and “wrong” answers to the final experiment, only *expected* answers based on the hypotheses outlined in section III. In the [appendix](#) is the compiled answers and data collected from the final experiment. Some general trends to note are that the children performed better than the adults, but nobody got all 23 questions right based on the predicted answers. This is quite different from the pilot experiment where almost everyone answered correctly. As stated earlier, the results were broken down into total number correct, recursion level, stress type, and adjective type (generic v.s particular). Here are some graphs which break down the results of each participant according to these categories. The first two bar graphs posted side by side are the adult data, and the following three graphs are the child data. For easier reading, the graphs are color coded as followed: Light pink are total correct, green are 1st level recursion questions, yellow are 2nd level recursion questions, blue are 3rd level recursion questions, light purple are contrastive stress questions, orange are regular stress questions, dark purple are questions with a predicted generic reading, and dark pink are questions with a predicted particular reading.
For the total correct category, the children all performed better than the adults. Judging by recursion level, the majority of the questions were 2nd level recursion and seems to be where most participants had trouble. All of the children performed near perfect in 1st level questions, as expected from the pilot results where the children performed the same. Similarly, the children performed near perfect for the 3rd level questions despite there only being four of them at the end. However, the children tended to underperform in the 2nd level recursion questions compared to the adults, and overall the numbers show that is where most of the trouble was. Looking specifically at which questions they got wrong, every single participant got questions 17, 18 and 19 wrong.

These questions were not only 2nd level recursion questions, they were questions using regular stress versus contrastive stress. This ties into another category of questions which was the contrastive versus regular stress difference. Generally, the participants performed much better and near perfect in questions that used contrastive stress versus questions that used regular stress. This is a very strong indicator for the big question at hand that contrastive stress is in fact helping children (and even adults) understand recursion. Among the children’s wrong answers, each of them only answered one or two questions wrong that featured both contrastive stress and some level of recursion. All of the other questions they got wrong either used regular stress or no stress. This revelation along with the pilot experiment data is probably the biggest proof that contrastive stress is being used as a tool for children acquiring recursion, and this was seen across children ages 4 to 10 years old.

As for the generic and particular feature, it was mixed results across participants whether they answered with a generic possessive or a particular possessive. The two adults tended to answer questions that predicted a particular possessive answer correctly, but really struggled with questions that predicted a generic possessive reading. This could mean that adults tend to take a particular reading over a generic reading in cases where it is ambiguous, and regardless of any stress pattern there may be. As for the children, two of them scored better in questions that predicted a generic reading, and one of them did better in questions that predicted a particular reading like the adults. As there is no unanimous pattern across the children, there is no sure conclusion here. But considering that two out of the three children gave the generic answer over
the particular, it is possible that children prefer a generic reading in cases where it is ambiguous, opposite from the way the adults answered. The only way to make a clearer conclusion to this is to test more children in the future using the final experiment, as the pilot data did not test the feature of generic and particular possessives.

VII. Discussion

Now is the time to finally answer each of the hypothesis questions from both experiments combined by comparing the trends in the results as discussed in the discussion above. The first question to answer is do children understand recursion and contrastive stress separately? I think it is safe to answer yes. If they did not understand recursion or contrastive stress, we could not have moved on from the pilot experimentation. The second question is if they understand contrastive stress and recursion when combined, and again I would answer with yes. Based on the pilot experiment again, the children’s understanding of these concepts come from the success rate. Not only did they all get near perfect (or perfect) scores data wise, these questions were also almost all production questions. Production questions are much more effective than comprehension questions and yes/no questions because it is less likely that the children are just repeating or guessing the answers to the questions. If we were to ask if children were understanding recursion with contrastive stress based on the final experiment alone, it would be much more tricky considering the lack of subjects, the use of mainly comprehension questions, and a lower overall success rate. It is also hard to tell since I was not personally there to witness or facilitate the experiment, so data is all I have to rely on for conclusions.

To continue the original research questions, another one that can only be answered using the final experiment data is does contrastive stress help children understand generic and particular possessive adjectives, and does having stress on a certain node in a recursive string call for a certain reading. Again, I am hesitant to make a sure conclusion because of the lack of participants and lower success rate of the final experiment, however there were still some prominent patterns in the data as stated above that can answer the questions. It seems that the adults tend to prefer a particular possessive reading while the children tend to prefer a generic possessive reading. This is not something I took into consideration when making my hypotheses so it is very interesting that this arose. My hypothesis was that everyone (regardless of age)
would take a generic reading if the stress was on the head of the recursion string, and a particular reading if it was on the nodes after the head. Instead of this, it seems that the participants had a predetermined bias towards a generic or particular reading regardless of the stress pattern. However, considering the lower success rate of the final experiment across participants and the fact that there were only 5 of them, there is still a chance that my experiment was too difficult for them to take or too difficult for the guardians to facilitate, or having a larger number of participants would show better trends in the data. For now, there is not enough proof that contrastive stress affects the understanding of generic and particular possessives, but there is some proof that maybe children prefer generic and adults prefer particular.

Finally, the last question that can be answered with both experiment data is if contrastive stress helps the understanding of recursive possessive adjectives, thus giving proof to how contrastive stress and recursion work syntactically. Based on all of the results, I think there is sufficient proof to say that contrastive stress does help children (and maybe even adults) understand recursion. Going off of the pilot experiment, the proof comes not only from the high success rate but from the use of repeated intonation. Since the experiment was mostly production based, this called for children to speak aloud their answers after I asked them the questions. As stated previously, I noticed more times than not that children copied my intonation when I put stress on certain words. This was a clue for me that not only they were hearing and noticing the stress, they understood how I was using it to emphasize certain words in the phrase and did it themselves correctly.

Sadly, there was no way to get this information from the final experiment since the questions were mostly comprehension based, and there were no voice recordings of the children’s responses to see if it happened at all. However, as discussed earlier, the proof I have for this question from the final experiment is the high success rate of questions that used contrastive stress versus regular stress. For the children, out of all of their wrong answers, only one or two of them were contrastive stress questions, and the rest were regular stress questions. This means that without contrastive stress, it was harder for them to guess whether or not a possessive was generic or particular, and could even mean that children have a hard time understanding recursion overall without the contrast. If the contrastive stress was helping them in
both the pilot and the final experiment to some degree, this should be a sign as to how the two systems operate syntactically. My original hypothesis was that if contrastive stress is helping children understand recursion, this means that the structures are separate and the stress is just used as a tool. The final results showing that children have a hard time answering questions if it is not a question featuring both contrastive stress and recursion means to me that children do in fact use contrastive stress as a tool for understanding possessive adjective recursion. If they need both in order to get a correct answer, this must mean that the contrastive stress is embedded when inside of the recursive structure rather than being two separate structures.

VIII. Conclusions & Further Research

A lot of questions were answered, but many still remain. My hopes for the future is that this is not the end of the final experiment data and that more can be collected in the future to make more sufficient conclusions. Since there was such a low success rate for the final experiment as well, this might mean that some improvements need to be made to the experiment questions in order for it to be tested again. I would take a closer look at each of the questions the participants had trouble with, especially the ones like 17-19 that every participant got wrong, and see how they could be changed. I would also like the chance to facilitate the experiment myself and in person with some children in the future, that way I could have more insight as to what they were or were not understanding as I did in the pilot. Despite the challenges, I do not think the data collected was useless as I was still able to come up with some interesting conclusions. I would also like the chance to research contrastive stress with other types of recursion in the future as I think that would give better insight into the overall research question that is how children understand recursion and contrastive stress together. Also, I was surprised that even the four year olds I tested did a decent job with the experiment, so we still do not know exactly when children acquire this feature. If I were to continue this research, I would have to test children younger than four to see when this really starts to come into play for children on their language journey. Lastly, a feature that was discussed in the classroom was how non-native speakers of English had such difficulty with understanding contrastive stress with and without recursion. I
would also like to look more into why that is and if there are any languages outside of English that do understand contrastive stress or if it is a feature special to English.

IX. Appendix

Here is the script for the pilot experiment:

*Part 1: Contrastive Stress, No Recursion*

Hi, my name is Robyn, what’s your name? Today I brought some games that I made up but I want to see if they’re fun to play with other people, can you help me? Thanks!

In this first game I have a list of things I need for a party. I need something to drink, something to eat, something to play with, and something to wear. I picked out juice, pizza, balloons, and party hats. Here is a picture of my basket.

Oh no! When I went to buy my groceries, somebody mixed up their cart with mine! I accidentally brought home the wrong things! Can you help me remember what things I needed? I’m going to tell you what I *didn’t* need, and you have to tell me what I *did* need. Can you do that? Thanks!

Structure: I don’t want *milk*, I want ...

*Part 2.1: Contrastive Stress + Recursion*

Now I’m going to tell you a story about a girl named Sally, but I need your help telling it. This is Sally and this is her dog. She has a friend who also has a dog. Both of the dogs look the same!

Can you tell me whose dog this is? (points to Sally’s dog)

What about this one? (points to Sally’s friend’s dog).

Now Sally and her friend and their dogs go to the park. When they get there they see their family! Sally has a sister and her friend has a brother. Everyone looks the same, but they all know each other. But, also at the park is a new boy who just moved to the street. We have to help tell him who everyone is.

First he asks, “Who is Sally, is *this* Sally?”
Then he asks, “Okay, so is this Sally’s *mom*”
Then he asks, “And is this Sally’s *brother*?”
Then he asks, “What about this dog? Is that Sally’s *dog*?”

“Okay! I think I know who everybody is now! How about we get some ice cream!”

They go to get ice cream for everyone, even the dogs! There’s so many people in the ice cream shop. They each pick out their favorite flavors and wait for the waiter to bring it to their table. The waiter comes to the table and doesn’t know who to give the ice cream to. We have to help him. Can you help the waiter give the right ice cream to the right people?

“Is this Sally’s *friend’s* ice cream?”

“Is this Sally’s *friend’s brother’s* ice cream?”

23
“Is this Sally’s dog’s ice cream?
“Is this the new boy’s yellow ice cream?

Part 2.2- Anti-pragmatic Examples

Now this story gets a little bit weird. Sally’s dog can actually talk, and her dog is making plans to go see his friends at the mall to go shopping. Her dog’s friends are all different kinds of animals, but his best friends are a cat, a bunny, and a dog. Later on they get to the mall, here is everybody! They walk around the different stores and each buy some new things to wear. Here is what they picked out!

- Dog 1 → blue hat
- Cat → red hat
- Bunny → shirt
- Dog2 → pants

When they got home from the mall, they realized that they switched shopping bags by accident. Now we need to help give the right bags to the right animals, can you do that with me? Thanks!

- This isn’t the dog’s hat,
- This isn’t the dog’s pants
- This isn’t the bunny’s pants, it’s the __ (?)
- This isn’t the cat’s shirt?

Okay now everybody has the right bags again, here they are with the right ones. But, it turns out what they bought at the store were presents for their moms and dads. Here is everybody who they are going to give the presents to:

- Dog 1 → blue hat to mom
- Cat → red hat to mom
- Bunny → shirt to dad
- Dog2 → pants to dad

Oh no! The dog mixed up the bags again! Can we help him one more time? Good!

Here are all the mixed up bags, and we need to tell them what gifts everybody needs to get.

- Is this the dog’s mom’s hat?
- Is this the bunny’s mom’s shirt?
- Is this the dog’s dad’s shirt?
- Is this the cat’s mom’s hat?
Here is the script for the final experiment:

Slide 1
- Hi my name is Robyn, what's your name? Nice! And how old are you? Wow that sounds cool! Today I'm going to read you a story that has a couple of questions along the way where I'll need your help. Do you think you can help me finish the story? Thanks!
- The story I'm going to tell you about is about a bunch of different kinds of hats. Do you like to wear hats? Cool, me too! Now do you know any jobs where people have to wear hats? Right!

Slide 2
- So in this story, we're talking about pilots and chefs. Pilots and chefs are both people who have to wear hats to work every day! If they don't have their hat on, they can't go to work and they'll get in trouble!
- Here is a picture of a hat for chefs and a hat for pilots. The hats that real chefs and real pilots wear are always yellow, because it shows that they are hats for working and not for playing.

Slide 3
- So here is a picture of just the hats. I'm going to test you to see if you remember the hats we just saw.
  → “Are these two hats pilot's hats?”
  → “Isn't this one a real chef's hat?”

Slide 4
- In this story, there is a really rich man named Sam. He is so rich that he has a chef to make him food and a pilot to fly him all over the world. This is his chef and this is his pilot. See that they are wearing their yellow hats to go to work!

Slide 5
- Sam also has a bunch of hats. He loves to wear all kinds of crazy ones every single day. And, his favorite color is red so all of them are red. Look here, he even has a hat that chefs wear and a hat that pilots wear.

Slide 6
- One day Sam wanted to wear his hat for chefs, and he saw two of them on the table. Here is what they look like. I need to help Sam figure out which hat is his, can you help me?
  “Can you tell me what color Sam's chef's hat is?
  “Can you tell me what color Sam's hat is?”

Slide 7
- Oh no! Sam’s chef went to get his hat and realized it was missing! He went to Sam’s hat room to see if it was there. Look at this one:
  → Is this Sam’s chef’s hat?
  → Is this Sam’s hat?
- Nice! You found it! Now she can go to work for Sam.

Slide 8
- Later on, Sam’s wife comes downstairs and says she wants to go to the North Pole. It’s really really cold there, so Sam tells her to wear her hat that she left on the plane.

Slide 9
- When she gets on the plane, she sees two hats and doesn’t know which one to wear! She puts on a hat, and Sam’s pilot puts on a hat. Now I can’t tell if they’re wearing the right hats, I need your help.
  → That’s Sam’s wife’s hat, isn’t it? Who is wearing Sam’s wife’s hat?
  → But it’s not Sam’s pilot’s hat, right?

→ Is this Sam’s hat?

Slide 10
- Sam also has a brother who lives in the same house as him. His name is Steve. Sam and Steve live the same exact life. Everything they do and say is the same because they are twins. The only thing that is different is that Sam wears red and Steve wears blue.

Slide 11
- On that same day, Steve also wants to wear a hat for pilots, just like Sam. He goes to the hat room to look for the one he wants. Here are the hats that he sees.
  → “Are these Steve’s hats?”
  → “Is Sam’s chef’s hat in here?”
  → “Is Sam’s pilot’s hat in here?”

Slide 12
- Now Steve is in a different hat room. He wanted to be just like his brother, so he got a new chef and a new pilot to work for him. Because they are new, they don’t know what hats to wear to work.
- Sam wears red hats, Steve wears blue hats, and the chefs that are working wear yellow hats. You can also see that each hat in the hat room has its own color box.
  → First, can you tell me what color boxes the pilot’s and chef’s hats are in?
  → Now can you say what color boxes have just the pilot’s hats?
  → How about just the chef’s hats?
  → Now can you show me the box that has Steve’s pilot’s hat?
  → Can you show me the box that has Steve’s chef’s hat?

Slide 13
This is a new type of hat. This hat is pink and is worn by people who are not at work. It is for playing and NOT for working, because they don't want their working hats to get ruined at home!

Slide 14
- Here is Sam and Sam’s chef. Today Sam’s chef is not working, so he has to wear a hat that’s for playing in. Can you tell me what color Sam’s chef’s hat is?
- Now Sam wants to wear a chef’s hat again today, but he doesn’t remember what box his hat is in. Can you tell me what color Sam’s Chef’s hat is?

Slide 15
- Here is a brand new chef that works for Sam's chef. Sam's chef is so tired when he gets home, that he needs his own chef to cook for him.
- The chef that works for Sam’s chef wears green because green makes her so happy that she never wants to take it off!

Slide 16
- Sam’s chef and the chef that works for him are both going to work today, but they each wear different hats. Sam’s chef needs a hat that’s for working in, and the chef that works for him only wears one hat. But, they don’t remember what boxes they put their hats in, so we have to help them.
- First, can you tell me what color Sam’s chef’s chef’s hat is?
- What about Sam’s chef’s chef’s hat? What color is that?

Slide 17
- Today is another new day, and Sam’s chef and Sam’s pilot are both at Sam’s house to go to work. They were feeling a little bit silly today, so they want to switch hats. Sam’s chef wants to wear a pilot’s hat, and Sam’s pilot wants to wear a chef’s hat.
- When Sam sees them, he is so confused!
- Is this Sam’s chef’s pilot’s hat? (It’s Sam’s pilot’s chef’s hat)
- Is this hat Sam’s pilot’s chef’s hat? Whose chef’s hat is it? (It’s Sam’s chef’s chef’s hat)

Here is an image of the data for the final experiment results. The link can also be followed by clicking here.
Here is a link to the letter and answer key sent to the participants and guardians of child participants for the final experiment: Letter to Participants

X. Citations

Roepre, Tom; The Acquisition of Recursion: How Formalism Articulates the Child’s Path; 2011
The purpose of this experiment was to investigate the emergence and use of argument vs adjunct reflexives in English-learning children (e.g., He saw a picture of himself (argument) vs He went to the store by himself (adjunct). My hypothesis was that there would be a slight difference between the acquisition paths of adjunct and argument reflexives in that children would begin acquiring the argument form first. I believed the argument form would emerge foremost because there is more cognitive (personal) interest associated with its meaning than with the meaning of the adjunct form. The argument form is closely associated with location, This experiment involved four children, one 2 year old, and three 5 year olds. Participants were recruited via Facebook, and assessment took place over video chat (either Zoom or FaceTime). Interviews lasted less than 15 minutes each. Children were presented with a series of scenarios posed to elicit a reflexive form (adjunct or argument), OR a response about a reflexive form. During the experiment, the children were expected to listen to these short scenarios and respond to the question(s) they were asked at the end.

I tested my hypothesis by asking questions that would elicit responses in three categories: adjunct, argument, and ambiguous. Adjunct and argument questions were meant to elicit those forms as an answer. By presenting additional scenarios where the given reflexive could be ambiguous, it was meant to elicit reactions based upon the child’s current understanding of the underlying structure. That is; do kids tend to perceive reflexives first in the argument form or in the adjunct during early stages of development? For example, in the following scenario: “Johnny and his brother had trouble sleeping, so they both got into one bed. Did Johnny go to bed all by himself? (Why?)”.

An answer that connects “all by himself” to the adjunct form might say “No, he was in bed with his brother” and associate the reflexive with Johnny’s location.

An answer that connects “all by himself” to the argument might say, “Yes, he got into the bed by himself”, indicating a meaning associated with Jonny’s ability to go to bed.

It is in my interest to find out which structure emerges first, and which meaning comes up more often depending on children’s ages.

The introductory script was as follows, “First, you will listen to me tell you a short story. At the end, I will ask you a question about someone in the story, and you will give me the answer that makes most sense to you. After some of the questions, I might ask you why you gave me that answer. You will just have to explain to me why your answer makes the most sense. Are you ready to begin?” Children were then presented with the following questions in the given (random) sequence so as not to create a predictable pattern between answers.

Q1: (adjunct) Every morning, Tim’s mom helps him get dressed and ready for school. This morning, Tim decided to get dressed without any help from his mom. How did Tim get dressed this morning?

Q2: (argument) Yesterday, Tommy found his parent’s photo album and started looking at pictures they took of him when he was a baby. Who was Tommy looking at pictures of?
Q3: (ambiguous) Carol and her dog went for a walk this afternoon. Usually Carol’s mother comes along to help during the walk, but today she was too busy and did not. Did Carol go on a walk all by herself?

Q4: (argument) A group of musicians wanted to make a song about their memories together, but didn’t want anyone else to be part of the song. Who did the band want to write about?

Q5: (adjunct) Your parents normally wake you up for school every day. However, last night your parents decided that starting tomorrow, they will no longer be waking you up anymore. How will you have to wake up for school from now on?

Q6: (ambiguous) Earlier today, I went to the car shop and my friend came with me. We looked for the perfect car and I paid for it using all the money saved in my piggy bank for the past five years. Did I buy the car all by myself? Why?

Q7: (adjunct) Usually, Gina and Kevin watch their father cook dinner at the stove every night. Tonight, their father let the children decide what to make and did not help them cook at all. How did the children cook dinner tonight?

Q8: (argument) Rachel likes to leave her dirty clothes in a pile on the floor, but her sister Sally likes to put her dirty clothes away in the hamper. One morning, Rachel looked at their room and said, “Some people don’t know how to clean up their mess” Who was Rachel talking about?

Q9: (ambiguous) Joey wanted to go to the park on Saturday, and asked his friend to join. His friend said yes, but he would need to take his own car and meet him there. Did Joey go to the park all by himself? Why?

Adjunct Results

<table>
<thead>
<tr>
<th>Name ; Age</th>
<th>Q1</th>
<th>Q5</th>
<th>Q7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jace ; 2.5</td>
<td>xxx</td>
<td>tomorrow</td>
<td>make</td>
</tr>
<tr>
<td>Maliah ; 5</td>
<td>He put on his shirt and pants</td>
<td>Maybe happy</td>
<td>They did it all by theirselves</td>
</tr>
<tr>
<td>Vivian ; 5</td>
<td>He put on his clothes like a big boy</td>
<td>You just gotta wake up without them</td>
<td>Working together</td>
</tr>
<tr>
<td>Morgan ; 5</td>
<td>I don’t know</td>
<td>To wake up yourself</td>
<td>Don’t know</td>
</tr>
</tbody>
</table>

30
### Argument Results

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Q2</th>
<th>Q4</th>
<th>Q8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jace</td>
<td>2.5</td>
<td>Of me</td>
<td>me</td>
<td>xxx</td>
</tr>
<tr>
<td>Maliah</td>
<td>5</td>
<td>Him when he was a baby</td>
<td>I think ...All of them</td>
<td>Um, one of the girls Rachel</td>
</tr>
<tr>
<td>Vivian</td>
<td>5</td>
<td>His self</td>
<td>All of the other music players</td>
<td>Cleaning up your stuff after you used it</td>
</tr>
<tr>
<td>Morgan</td>
<td>5</td>
<td>Himself and his family</td>
<td>Me, don’t know</td>
<td>sally</td>
</tr>
</tbody>
</table>

### Ambiguous Results

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Q3</th>
<th>Q6</th>
<th>Q9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jace</td>
<td>2.5</td>
<td>Yeah, because mom wasn’t there</td>
<td>Yeah ...</td>
<td>Yes, don’t know</td>
</tr>
<tr>
<td>Maliah</td>
<td>5</td>
<td>No, he (the dog) needs someone with him</td>
<td>No because you need somebody with you !</td>
<td>No, he had his friend with him</td>
</tr>
<tr>
<td>Vivian</td>
<td>5</td>
<td>Yes, because if she was working she has to do the other thing because she wants to</td>
<td>No, because the brother was with her</td>
<td>No, because both of them are going to the park at the same time</td>
</tr>
<tr>
<td>Morgan</td>
<td>5</td>
<td>No, don’t know</td>
<td>No, don’t know</td>
<td>No, because he wanted to have fun with someone else</td>
</tr>
</tbody>
</table>

When it came to analysing adjunct vs argument responses, the implications of the results were not clear at first glance. The responses appear to show that the 2 year old had trouble responding to the questions that call for reflexive answers, while the 5 year olds seem to have a slightly better grasp. However, there was still a lower instance of overall reflexive use than anticipated. The most consistent response occurred under Q2 (argument), as two out of four children grasped the concept of Tommy looking at “himself” in the photo album. Overall, the most instances of pronouns uttered (including non-reflexives) occurred in the argument category, demonstrating a basic understanding of the underlying reflexivity. The way in which the questions were worded may have been confusing, which should be noted and adjusted for future studies. The ambiguous results more clearly reflect the hypothesis. The 2 year old consistently responded with argument reasoning when asked ambiguous questions (e.g., “Did she go on a walk all by herself?” “Yes, because mom wasn’t there”), while the 5 year olds generally responded with adjunct reasoning (e.g., “No, the dog was there too”). This supports my hypothesis that argument reasoning may be acquired first in language development. Children seem to begin by generalizing most reflexive meanings as the argument form, and eventually switch to interpret these questions in a different, broader manner with the adjunct). For this particular study, finding participants proved challenging under the circumstances. Still, further studies should ideally include a larger sample size with children from all across the age range of
2-5 years old to obtain a clearer picture of the distribution, and find where the switch between the two ambiguous meanings might occur.
EXAMINING THE ACQUISITION OF PRONOUNS IN A MONOLINGUAL ENGLISH-SPEAKING CHILD WITH AUTISM SPECTRUM DISORDER USING A NOVEL ONLINE ASSESSMENT AND TREATMENT: A CASE STUDY

An Honors Thesis Presented

By

MARIA G GIRARDIN

Approved as to style and content by:

** Thomas Roep 05/22/20 20:48 **
Chair

** Jill R Hoover 05/25/20 11:38 **
Committee Member
The purpose of this study was to investigate the pronoun use of a monolingual English-speaking child with autism spectrum disorder (ASD) using a novel assessment and to examine the efficacy of a novel treatment on pronoun usage. The participant was first given the online assessment and, after the results were analyzed, the child demonstrated areas of weakness in producing plural pronouns and in producing the correct case and person of pronouns. There was also a high incidence of pronoun reversal and pronoun avoidance observed throughout the first assessment. After five 10-25-minute online training sessions were administered, the child was retested by the assessment. The results of the second assessment demonstrated that the child improved in all areas of weakness and less incidences of pronoun avoidance and pronoun reversal were observed. It was concluded that more research is needed to examine the potential difficulty of pronominal case in children with ASD. Future research should include testing the assessment and treatment on a larger sample size with a control group, so that the results can be generalized on a larger population.
Introduction

The Pronoun Paradigm

Pronouns are complex words. There are five features involved when we use pronouns: person, gender, number, case, and part of speech. Additionally, some pronouns have lexical features that are dependent on context. Each of these features can be represented in a pronoun paradigm which demonstrates which grammatical features each affix carries. For example, one could say the affix “r” on the second person pronoun “your,” the first person plural, “our,” the third person singular pronoun “her,” and the third person plural pronoun “their” denotes possessive/genitive case. For the most part, English pronouns are inflected in an irregular manner. For example, there is no phonetic pattern that cues for the first person feature. “I,” “me,” “my,” “we,” “us” and “our” are all phonetically different from each other. English is a fusional language, meaning that one affix can encode multiple features. For example, one could argue that the initiating /h/ at the beginning of “he,” “him,” and “his” reflects both the gender, the person, and the number of the pronouns. In the case of the third person feminine pronoun, the accusative and possessive case both have the same phonetic representation and orthographic representation, “her.” Thus, when English-speaking children are acquiring pronouns, they are faced with the task of understanding what an affix encodes when inflecting a stem without many regular phonetic pattern cues (Fitzgerald, Rispoli, & Hadley, 2017).

Acquisition of the person feature of pronouns

Linguists often refer to words that are dependent on point of view as deixis. These words include pronouns (me, you, her, my), demonstratives (this, that), temporal words (then,
now), and locative words such as (here, there). These are often accompanied by gestures such as pointing and eye gaze. For a child to understand deixis, they must be able to understand that the meaning of these words is not fixed, but instead is dependent on the speaker and the position and location of his or her body. They need to be able to role-shift or put themselves in the shoes of the person who is speaking to understand what the words mean (Hobson, García-Pérez, & Lee, 2010). For pronouns, deixis impacts the person feature. For example, if someone asks, “Could you tell her to put a banana on my plate?” It is necessary to first put oneself in the perspective of the person who is speaking and identify the referents of the pronouns. After correctly identifying which people correspond to which pronouns, it is necessary to shift one’s eye gaze and attention to the person identified as “her,” a third person pronoun, and address the person as “you,” a second person pronoun.

Many linguists have attempted to address how the brain chooses appropriate pronouns and understands pronominal indexical shifts. Tanz (1980) argues that children start out learning words through the view of “word realism.” She states that children see words as names for objects based on their physical properties. For example, the word “bottle” might only refer to one specific bottle in front of them that can be characterized by visual and tactile information. As a child grows older, this view diminishes and they begin referencing objects that are not in the room. Soon, they understand that words are more symbolic than their physical representation and only then can they understand deixis (Tanz, 1980).

One other theory describes the existence of the Point of View (POV) operator which explains how we understand and produce the person feature of pronouns. The POV operator acts much like the negation operator because it affects words that it c-commands in a similar way.
The POV operator lies within the complementizer phrase (CP) of the sentence and dictates which person will be used when producing a pronoun based on the point of view of the speaker. The CP c-commands the IP and thus the rest of the sentence. (See Figure 1. below for a visual representation of the POV operator in a syntactic tree.) The operator functions by allowing the indexing of each pronoun in terms of the speaker, referred to as [+speaker]. Thus, the listener understands that it is not their own point of view. While the speaker is comprehending the sentence and initiating a response, the point of view is recomputed for the new speaker (deVillers, Nordmeyer, & Roeper, 2018).

Figure 1.

People often shift pronouns in conversation. For example, when a person says “Ask him to give me a slice of watermelon,” the listener needs to first identify the speaker and the third person and reorient themselves to address the third person. Once there is a change in eye gaze the POV operator from the first sentence changes.
To learn each of these steps and fully acquire the POV operator, it is important that a child have joint attention. In the perlocutionary period, between 0 and 10 months, children usually only exhibit solo or dyadic behaviors. Dyadic means that a child would interact with only one other being (probably a parent) or thing (probably a toy). However, often in this period of development, a parent or other experienced speaker will bring themselves into a situation where a child is playing with a toy and start to play with them. After a while, the child will be able to focus on two or more things/people which is called joint attention (Frank et al., 2016). Joint attention is very important for learning pronouns because only through following eye gaze from person to person and person to object, can children start to understand role shifting and observe the use of the POV operator in other people.

Acquisition of the case feature of pronouns

Pronouns are one of the few English words that have phonetic marking for the linguistic element of Case. Case shows the semantic or syntactic function of a word in a sentence. For example, in the statements, “The girl kicked the ball to the boy,” and “The boy has the ball,” the form of the noun phrase “The boy” does not change when it is in the subject versus the object position. However, when replaced with a pronoun the word form changes, “The girl kicked the ball to him. He has the ball,” “He” and “him” are words that have the same person, gender, number, part of speech, but only differ in case. This adds another layer of complexity for the acquisition of pronouns. (Fitzgerald, Rispoli, & Hadley, 2017).

Children usually start out using the accusative/dative or the object case which is known as the default case in English every time they produce a pronoun. For example, a child might say
“Me want it.” instead of “I want it.” One possible reason for this preference is that the word “you” phonetically represented as /ju/, can refer to the second person in both the subject case and the object case and the third person masculine pronouns “he” and “him” are similar phonetically. They can also go through a process of over-regularization which means they think that “me” or phonetic form, /mi/, represents person and has not yet understood the case feature.

Over time, the child stops producing these case errors between the first person and second person and learns the case feature in the pronoun paradigm. Additionally, Fitzgerald, Rispoli, and Hadley (2017) showed that pronoun case is acquired in a paradigm instead of separately for each pronominal person.

**Lexical differences in plural pronouns**

Some pronouns are more complicated than others because of lexical ambiguities that rely on context. You plural is one such example of this. In the southern dialect in the United States and in African American English, “you all” or “y’all” refers to more than one person.

However, in Standard American English, the word “you” can be singular or plural. Forms of “you” can also be distributive depending on the context. For example, a teacher can say to a class, “Can you please get your history books and turn to page 10?” In this case, “you” refers to the whole class and “your” is distributive meaning each child should get their personal book not all the books in the class and not just one singular book. Another example of this is the first person plural: “we.” The first person plural can either be inclusive and exclusive. For example, if one guy is talking to a girl and says “I know we love bagels.” Depending on the context, the person may be referencing the girl’s and his love for bagels (inclusive) or his and another third
person’s love for bagels (exclusive). It can also mean his, the girl’s, and a third person’s love for bagels. Due to the ambiguity involved and lack of a clear-cut meaning, the first person plural pronoun might be acquired later than others. In general, children start acquiring the pronoun paradigm by age 1;6. In typically developing children, there are often still errors in pronoun production such as pronoun case errors and pronoun person reversals which are common before 3;6 (Naigles et al., 2016).

Procedures Used to Test the Acquisition of Pronouns

In her work, *Studies in the acquisition of deictic terms*, Christine Tanz tested typically developing children ranging from ages 2;6 and 5;3 on their acquisition of deictic terms such as temporal words, location words, and pronouns and their ability to understand and produce indexical shifts. She asked many questions to the participants such as “Ask X what his favorite color is?” and “Ask X what I found yesterday?” and recorded what they said to whoever was “X.” Through this form of questioning, she was able to evoke a response from a child using and shifting pronouns. For example, to “Ask X what *his* favorite color is?” the child should turn to X and respond, “What is *your* favorite color?” The children had to understand the referent; understand that the word “his” refers to “X” and also understand that when the child talks to X, the third person possessive pronoun “his” must shift to the second person pronoun possessive pronoun “you” (Tanz, 1980).

deVillers, Nordmeyer, and Roeper (2018) further refined the protocol of Tanz adding another level of pronoun shift. In the protocol, the child is prompted to tell or ask a puppet utterances with more than one pronoun. For example, one question asked is “Tell him that *his*
eyes are my favorite color.” When a child is asked this, they must understand the referent of “his” and “my” and change them both based on their point of view. The child should, assuming that the person asking is male, respond “Your eyes are his favorite color” to the puppet.

**Autism Spectrum Disorder and Pronoun Use**

Autism spectrum disorder (ASD) refers to a group of developmental disabilities that cause problems with social interaction, communication, and behavior that affects 1 in 59 children in the United States (Baio et al., 2018). The cause of ASD is unknown. Children with ASD often struggle with using pronouns in conversation. Pronoun avoidance, which means using a person’s name instead of a pronoun even when it is not appropriate, is common in children with ASD. For example, a child might say his or her own name instead of the first person singular pronoun; “I.” Another common way this struggle manifests is pronoun reversal which occurs when a child speaks as if from another person’s perspective (Arunachalam & Luyster, 2018).

Both typically developing children and children with ASD are more likely to use pronoun reversal in imitative contexts which can show that the linguistic aspects of pronouns are not fully productive in their grammar. For example, to express wanting to eat grapes, a child might say “Yes, you do want grapes” after a parent asks him or her “Do you want grapes?” Some classify pronoun reversal as a symptom of Echolalia or verbal repetition which is very common in children with ASD in other contexts besides pronoun use. Others understand incorrect pronoun usage as lack of understanding of the self and others as separate entities (Fay, 1979).

Pronoun avoidance tends to be more common than pronoun reversal in the acquisition stage. It has been theorized that pronoun reversal is caused by a disconnect between a child’s
language learning and social awareness skills. So, a child might understand linguistic elements such as case, number, and gender, but does not have the theory of mind skills or social skills to understand the person as a feature of pronouns (Naigles et al., 2016). More evidence for the connection between social skills and pronoun use includes Carmody and Lewis (2012) which, after testing the joint attention and pronoun skills of child with and without ASD, showed that poor social interaction and less initiations of joint attention with the researcher correlated with poor usage of pronouns. Loveland and Landry (1986) also showed that, in a population of children with ASD, the number of times the child initiated joint attention spontaneously correlated with the number of pronouns produced correctly.

**Procedures Used for Assessment and Treatment of Children with Pronoun Difficulty**

There is a lack of evidence-based assessments and treatments used by Speech Language Pathologists that specifically target pronoun deficits. Because joint attention skills are highly correlated with correct pronoun usage in children with ASD and is often seen as the underlying cause of pronoun reversals, some Speech Language Pathologists often target improving joint attention instead of specific pronouns. The goal is that directly targeting pragmatic skills and social awareness would generalize to improvements in overall pronoun usage. One such technique is the Mirror Self-Awareness Development (MSAD) which utilizes a mirror to help individuals with ASD learn to separate the idea of themselves and others, therefore developing Theory of Mind skills. Duff and Flattery (2014) utilized a combination of MSAD, practicing joint attention skills, and practicing pronouns in order to increase the self-awareness and correct
pronoun usage of individuals with ASD. In the end, their two-week-long therapy significantly increased the pronoun skills of two of the six adolescent participants.

When it comes to specifically targeting pronouns, some Speech Language Pathologists use sign language to prompt a child with ASD to use the appropriate pronoun. For example, they will put their hand on their chest to cue first person pronouns and point to cue the second person pronouns. Some reasons for using sign language cues is that children with ASD tend to pay more attention to visual information rather than auditory. Additionally, Deaf children with ASD who use sign language show a significantly lower rate of pronoun errors than hearing children with ASD (Shield, Martin, & Tager-Flusberg, 2016).

Informal assessments and treatment that target first person and second person pronouns also include utilizing objects and asking “Who?” and “Whose?” questions. For example, Loveland and Landry (1986) passed an object back and forth from the researcher to the child and asked the child questions such as “Whose got the..?” and “Whose is it?” to assess the child’s pronoun skills. However, this assessment only targets first person and second person pronouns. Currently, there are not any assessments or treatments that have been systematically researched that test for and teach third person pronouns, plural pronouns, and pronominal shifts.

**Purpose**

The purpose of the current study is to investigate the pronoun usage of one child with ASD through a novel assessment and then help the child improve upon identified areas of weakness through five training sessions. The assessment is meant to help identify if the child struggles with a particular pronominal feature, particular pronoun, or a combination of both. The
assessment and training is novel because it is comprehensive; it tests and teaches many pronouns including singular first, second, and third person pronouns in the nominative, accusative, and genitive (possessive) case and plural pronouns in the accusative and possessive case. Two meanings of the first person plural are tested. The first meaning is the sum of the listener and the speaker or “you” and “I” and the second meaning represents everyone present which can also be represented by saying the first person and the word “all.” For example, one could say “we all,” “us all,” and “all of our” to reference everyone, but saying “we,” “us,” and, “our” can also portray that meaning given the proper context. The assessment and training include a cartoon boy and girl to represent both genders of the third person pronouns and targets pronominal shifts by including questions similar to the ones asked in the Tanz (1980) study. One example is “Tell him to give me a banana.” In which, a child must go from conversing to one person to a different person and convert the first person to the third person by saying “Give her a banana.” Testing for and teaching pronominal shifts is useful for understanding more about a child’s use of the person feature in pronouns. If the child uses pronoun reversal only when hearing the pronouns the researcher used in the pronominal shift section and not in the other section where pronouns are not produced by the researcher, it could show that the child only reverses pronouns in imitative contexts. It will also help show if the child has acquired the POV operator and if so, in what contexts they have acquired it. This study addressed three research questions.
Research Questions

1. Which specific pronouns and features has the child acquired prior to the training sessions? Which are emerging? Which are absent?

2. What does the child’s knowledge of certain features and pronouns demonstrate about potential causes and effects on other systems of language?

3. Are the training sessions effective and if so, what features and specific pronouns did they help with the most?

Methods

Participant

The participant is a female monolingual American-English speaker. She was 11 years and 7 months old at the time of the assessments and training sessions. The child was diagnosed with high functioning autism at four years old and has a cognitive age of 7 or 8 years. She has been observed to use incorrect pronouns, pronoun reversal, and proper nouns instead of pronouns. The child has been attending speech therapy at school once a week and outpatient therapy with a Speech Language Pathologist since attending preschool. Improved pronoun usage has been an IEP goal for the child for several years. Speech language pathologists that have worked with her have been using ASL prompting with her to elicit pronoun use. For example, they might have her touch her hand to her chest when she should say a first person pronoun and use a pointing gesture when she should say a second person pronoun.
Protocol Design

There are seven sessions in total. The first session is an assessment during which no help is provided and an evaluation sheet is marked to determine the child’s current knowledge of pronoun usage. After the results are analyzed, there are four training sessions during which explanations, gestures and cues are provided which use different characters and objects than the assessment and varies between sessions to maintain engagement. After the training sessions, there is one more assessment session to determine if progress has been made.

The assessment was previously designed to be in person (using toys instead of pictures of objects) to allow the child to point and make eye contact with other people while using pronouns. Thus, the child would interact with people and/or puppets instead of a cartoon boy and girl on a screen when third person pronouns were targeted. This protocol was altered to be online due to new stay-at-home guidelines during the coronavirus pandemic and therefore does not provide the child with these cues from the researcher and prevents the researcher from assessing the eye contact, pointing, and spatial awareness of the child.

For the online model, the app Explain Everything is used because it allows the researcher to upload pictures and clipart and be able to manipulate the images on a page. On the page, there is a picture of the researcher, the child, and a cartoon picture of a boy and girl. There are also pictures of four plates (all different colors), four apples, four pears, four watermelon slices, and four bananas. (See Image 2 for more on the initial setup.) The sessions are held via the video conferencing application, Zoom, and are recorded through Zoom to be analyzed later.

The protocol of the assessment consists of two parts. During the first part, the researcher hovers the cursor around and moves fruits and then asks a variety of “Who?” and “Whose?”
questions. These questions target singular accusative, possessive, and nominative pronouns and plural accusative and possessive pronouns. All persons: first, second, and third, and genders: masculine and feminine are tested. Questions such as “Whose plate is yellow?” and “Who has the pears?” are meant to evoke different pronouns based on context. (See full protocol script in the appendix section for more details) After the child takes a short break, the assessment resumes. All of the fruit is now congregated around the boy and the researcher points out that the boy needs to share. The researcher then moves certain fruits from the boy to other people or himself and then asks questions like “Who did he give the banana to?” to target all of the object pronouns.

The final part of the assessment is centered on pronominal indexical shifts. The researcher asks the child to relate his/her questions to the little boy on the basis that he cannot hear him/her. The researcher produces several commands such as “Tell him to give me the banana,” and “Tell him to put his pear on my plate” in hopes of eliciting a person shift when the child turns to the little boy and asks him the question. After each response, the researcher moves the fruit from the boy to the appropriate plate that was referenced in the researcher’s commands.

This is a dynamic assessment which means that scaffolding is used when the child provides either no response or an inappropriate response. There are three forms of prompting used. If the child does not respond to the question or uses a name instead of a pronoun, the researcher tries telling the child that “The boy and girl don’t know the names, so we can’t say names. What else can you say instead of a name?” If this form of prompting fails, the researcher tries using contrastive stress. For example, if the child says “That’s the girl’s plate,” the researcher can say “It’s not his plate, it’s…” If this does not elicit a response, the researcher can
try ASL prompting by putting their hand to their chest to elicit a first person pronoun and pointing to elicit a second person pronoun. If the child also does not respond with a pronoun the researcher moves on to the next question and marks it as no answer. Additionally after the child responds, verbal positive reinforcement is used. The assessment might be difficult and frustrating to the child, so it is important to say “Great job,” “Awesome!” or “You’re doing great” to keep them motivated.

Figure 2.
The training sessions are very similar to the assessment sessions because they follow a similar script and format. These five 10-25 minute sessions are the researcher’s opportunity to model correct pronoun use, correct the child when he/she makes a mistake, and explain certain pronouns are appropriate in different contexts. The training session utilizes a complexity approach which means that more difficult pronouns are targeted in addition to the pronouns that are seen as emerging. In general, the researcher tries to give the child exposure to every pronoun in every session in hopes that the child can start acquiring the pronoun paradigm. The script is almost identical to the script of the assessment session. However, in the training sessions, the researcher uses different cartoon males and females, different objects, different settings, and different orientation of the participants. The researcher can also ask the child about his/her interests before creating the next set up. For example, if the child likes a certain TV show, one can use characters from that TV show as the objects or “toys.” When the child has more input and sees images and characters, he/she likes it makes the session more enjoyable. Figure 3 shows one example of a set-up on Explain Everything. (See the Appendix Images A, B, C, and D for more examples of set-ups.) It is also important to rearrange the script in each session to prevent the child from memorizing the order of responses.
Protocol for Pronoun Assessment Script

Protocol Key

X- Experimenter’s Name

Y- Child’s name

(...)- Actions

Intro: Hi! What is your name? My name is X. We are going to play a game where we make a fruit salad. Look at me, X, I’m playing the game. Do you see my picture? (Hover mouse around X’s picture). You, Y, You are here too! (Hover mouse around Y’s picture) and this boy and this
girl will also play! Do you want to play the game with us? (Wait for verbal consent) If you want to stop or take a break just tell me, ok? (Wait for verbal consent).

**Test singular possessive pronouns:** Now before we make our fruit salads, let's look at our plates. This plate belongs to me, X. This plate belongs to you, Y. This plate belongs to her, the girl. This plate belongs to him, the boy. (Hover mouse in circular motion around plates when referencing them for emphasis) Whose plate is this? (Hover mouse over X’s plate) Whose plate is this? (Hold mouse of Y’s plate) Whose plate is this? (Hover mouse over the girl’s plate). Whose plate is this? (Hover mouse over the boy’s plate) (Use scaffolding if necessary)

**Test singular subject pronouns:** Now we all have different colored plates, right? Let’s look at all the plates. Who has the yellow plate? Who has the white plate? Who has the blue plate? Who has the green plate?

**Test plural pronouns:** Now, it is time to hand out the fruit! Look at all the fruit! Can you tell me what kind of fruit we have? (Make sure they know the name of all the fruit and if they don’t make them familiar with the names.) I’m going to give myself an apple and you a pear! (Move apple and pear to appropriate plates.) Who has fruit? (Should say “We do” if they say “Me and you” use contrastive stress

“They don’t have fruit, right? Who has fruit?”) (Put the fruit back to the middle). Now I’m going to give the boy a watermelon and a girl the banana! (Put the banana and watermelon on the appropriate plates.) Who has fruit? (Again use contrastive stress if necessary “We don’t have
fruit. Who has the fruit?

Now I’m going to give myself a banana because I’m a little hungry and she has an apple. (Move banana and apple to appropriate places) Who has fruit? (Child should say plural you or you all.) (Put fruit back to center). Now time to eat the fruit! What fruit do you want to eat? (Let the child decide and put that fruit on plate and put other fruit on X’s, the boy’s and the girl’s plates). Who has fruit? (Child should say “we do”) Let’s eat (Put all fruit from plate to faces).

**Short Break:** Now let’s take a break. You can do jumping jacks or lie down for a second or sing! Stop sharing screen. (Move all fruit next to boy, but not in his plate)

**Test object pronouns:** (Reshare screen) Wow that was delicious! We ate it all! But look! The boy brought some more fruit! Hooray more fruit salad! I want some watermelon. Hey, little boy, Can I have some watermelon? ((Move watermelon to X’s plate). Who did he give the watermelon to? (Move apple to Y’s plate). Oh that’s nice. He is sharing? Who did he give the apple to? Now he is giving the banana! How nice of him! (Move banana to her plate) Who did he give the banana to? (Move the pear to his plate). Who did he give the pear to?

**Test perspective switching:** He still has more fruit to give away! Hmmm… I think I want a banana, but he’s far away and can’t hear me! Can you tell him?! Please tell him to give me a banana. (Move banana to wherever Y says). She’s hungry for a juicy watermelon slice? Please, tell him to give her a watermelon. (Move watermelon to wherever Y says.) You don’t have a
pear on your plate, right? Tell him to give you a pear, please! (Move pear to wherever Y says.)
Tell him to give him an apple! I think he wants one! (Move apple to wherever Y says.)

**Test perspective switching plural:** Mmm that watermelon looks good! You don’t have a watermelon yet and I want some more! Tell him to give us watermelon, please. (Move watermelon to wherever Y says.) Tell him to give them apples! (Move apples to wherever Y says.) You, X, and the boy still don’t have bananas! You don’t and he doesn’t. Tell him to give you (all/guys) bananas! (Move bananas to wherever Y says.)

**2nd level perspective switching:** He has two pears left, but I want a pear. Tell him to put his pear on my plate. The girl doesn’t have a pear either! Tell him to put his pear on her plate! Oh wait, I have too many watermelons and he doesn’t have any. He should get one. Tell him to put my watermelon on his plate! Hmm he has two apples, but I don’t want any. Tell him to put his apple on your plate.

**Protocol for Pronoun Training Script**

**Intro:** Hello! We are going to play a game! There are four people in the game: Me, X, You, Y, her, this girl and him, this boy right here. In this game we are going to play with colorful balls in this box. Do you want to play the game? If you want to stop or take a break let me know. Ok? Does that make sense?
**Modelling Pronouns**: Ok, Y, I’m going to give everyone a ball. This ball belongs to me, X. It is my ball. This ball belongs to you. Y, it is your ball. This ball belongs to him; his ball and this ball belongs to her, her ball.

**Subject and possessive pronouns**: So first, let's look at the color of each ball. So, you don’t have an orange ball right? Hm, you don’t. Who has the orange ball? So whose ball is it? She doesn’t have the red ball, right? Who has the red ball? That’s right. He does. So, whose ball is it? I don’t have the purple ball. Who has the purple ball? That’s right you do! So whose ball is it? He doesn’t have a green ball right? Who has the green ball? That’s right she does. Whose ball is it?

**Subject and possessive plural pronouns**: Now, we are going put all the balls in the middle in the box. I’m gonna give the balls to some people. Lets see who! First, I’m going to give me, X and you, Y a ball. Who has the balls? That’s right we do! I have a ball and you have a ball. So whose balls are these? Now I’m going to give a ball to him and her. Who has a ball? That is right they do. When there are two people you are not talking to you should use the word “they.” So whose balls are these? Now, I’m going to give a ball to me and to him. I’m going to give a ball to everyone. You get a ball and you and you and you! Who has the balls? Whose balls are these? Who has the balls? That’s right, say “You do! Or “You guys do!” Or “you all do!” Whose balls are these? That’s right, say ‘ours” They are our balls.

**Short Break**
**Object pronouns:** Now look what happened! She has more balls! And she is going to share!

Who did she give the orange balls to? Us! Who did she give the red ball to? Me! Who did she give the green ball to? You! Who did she give the purple balls to? Them! Who did she give that green ball to? Him! Who did she give the red ball to? Her! Who did she give the red and orange ball to? (You plural!) Who did she give balls to? Everyone! Us!

**Perspective switching (Please add the objects used in the training session with each “…”):**

Now we all have a ball let’s pass the balls! Can you tell him…? Can you tell me…? Can you tell her…? Can you tell me to pass my…? Can you tell him to pass his…? Can you tell her to pass her…?
Results

The results section is divided into two parts. The first section includes the analysis of the child’s responses to the “Who?” and “Whose?” questions and the second section discusses the results of the pronominal shifts section of the assessment and trainings. Charts and tables may include notes below that clarify the results.


Percent Correct with Prompting (Cues Specified)

<table>
<thead>
<tr>
<th>Target Pronoun</th>
<th>Pre-test response</th>
<th>Post-test response</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>me</td>
<td>Yes</td>
<td>Yes ^</td>
</tr>
<tr>
<td>my</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>you</td>
<td>No</td>
<td>Yes *</td>
</tr>
<tr>
<td>You (object)</td>
<td>Yes ^</td>
<td>Yes *</td>
</tr>
<tr>
<td>your</td>
<td>No</td>
<td>Yes *</td>
</tr>
<tr>
<td>he</td>
<td>Yes (without does)</td>
<td>No</td>
</tr>
<tr>
<td>Him</td>
<td>No</td>
<td>Yes (REP)</td>
</tr>
<tr>
<td>his</td>
<td>Yes</td>
<td>Yes ^</td>
</tr>
<tr>
<td>she</td>
<td>Yes (without does)</td>
<td>No</td>
</tr>
<tr>
<td>her</td>
<td>No</td>
<td>Yes ^</td>
</tr>
<tr>
<td>Pronoun Type</td>
<td>Response</td>
<td>Correct</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td>Her (object)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>We (speaker+listener)</td>
<td>No</td>
<td>Yes +</td>
</tr>
<tr>
<td>Us (speaker+listener)</td>
<td>No</td>
<td>Yes ^</td>
</tr>
<tr>
<td>We (all)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Us (all)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>You (plural) (subject)</td>
<td>No</td>
<td>Yes *</td>
</tr>
<tr>
<td>They</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Them</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Percent Correct</td>
<td>26.32% (5/19)</td>
<td>73.68% (14/19)</td>
</tr>
</tbody>
</table>

**Key**

- **“Yes”** - child produced the pronoun after asked an associated “Who” or “Whose” or “Who did (someone) give (something) to?” question

- **“No”** - the child did not produce the pronoun after asked an associated “Who” or “Whose” or “Who did (someone) give (something) to?” question

The symbols below next to a “Yes” response show at what point of prompting did the child produce the correct pronoun. If there is no symbol associated that means that the child produced the pronoun without prompting.

- **#** - “no names” prompting- telling the child to not use a name because the little boy doesn’t know our names.
- Contrastive Stress Prompting- (For example, saying “He doesn’t have it, right? Who has it?” when prompting for “She.”)

- *-ASL prompting (Touching hand to chest to prompt first person and pointing when targeting second person)

- +- “Together” prompting (Used for prompting plurals when child says all the people individually)

- (REP)- Repeated the question to evoke response

Percent Correct Based on Category in the Pre-test and Post-test

<table>
<thead>
<tr>
<th>Category</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent correct without prompting</td>
<td>21.05%</td>
<td>42.11%</td>
</tr>
<tr>
<td>Percent correct with contrastive stress prompting</td>
<td>26.32%</td>
<td>52.63%</td>
</tr>
<tr>
<td>Percent correct with ASL and contrastive stress prompting</td>
<td>26.32%</td>
<td>73.68%</td>
</tr>
<tr>
<td>Percent Correct Person</td>
<td>57.89%</td>
<td>94.74%</td>
</tr>
<tr>
<td>Percent Correct Case</td>
<td>57.89%</td>
<td>84.21%</td>
</tr>
<tr>
<td>Percent Correct Gender</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Percent Correct Number</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
• Note on Person: Any proper nouns that the child spoke were counted as third person. Therefore if the child said “the boy” instead of “He,” it is counted as a correct response, but if the child says their name instead of “Me,” it is counted as incorrect because that would be third person, instead of first person.

• Note on Case: If the child said a proper name instead of a pronoun it was counted as correct as long as it was in the proper case

• Note on Gender: Gender was only assessed for third person singular pronouns

• Note on Number: If the child said all the referents of the targeted plural pronoun as proper nouns, it was counted as a correct response because it still shows that the child understands that the question requires referencing multiple individuals. If the child mentions one name or one pronoun when the number should have been plural, it would be counted as incorrect.
Percent Correct Based on Category in Part 1 (“Who?” and “Whose?” Questions) in the Pre-test and Post-test
Percentages of Incidences of Pronoun Avoidance and Pronoun Reversal Before and After Prompting during the “Who?” and “Whose?” section of the Pre-test and Post-test over the Total Number of Possible Instances

- Note on Pronoun Avoidance before prompting: Avoiding using a third person pronoun by saying “the boy” and/or “the girl” was counted as pronoun avoidance. However, saying proper nouns when referring to third person individuals is perfectly adult-like and if these were not counted as pronoun avoidance, there would be less disparity between the pre-test and post-test percent correct scores.
## Part 2: Pronominal Perspective Shifts

### Percentage of Correct Pronominal Perspective Shifts

<table>
<thead>
<tr>
<th>Pronoun shift</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Him → You (object)</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>You → Me (object)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Me → Her (object)</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Her → Her (object)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>His → Your (possessive)</td>
<td>0%</td>
<td>33%</td>
</tr>
<tr>
<td>Your → My (possessive)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>My → Her (possessive)</td>
<td>33%</td>
<td>100%</td>
</tr>
<tr>
<td>Her → Her (possessive)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Cumulative Percent correct</td>
<td>54.17%</td>
<td>79.17%</td>
</tr>
</tbody>
</table>

- Note: During the pre-test, the participant repeated everything the researcher said. If a third person pronoun was targeted and they said the name instead of a pronoun, it was marked correct because that is technically adult-like and shows that the child understands the referent of the pronoun
Percentages of Incidences of Pronoun Avoidance and Pronoun Reversal Before and After Prompting during Pre-test and Post-test over the Total Number of Possible Instances during the Perspective-switching question portion of the Assessment

- Note: Decrease in Percentages show an increase in Pronoun skills. Her → Her transitions were not included because there is no way to tell if the child actually understood the pronoun or was using pronoun reversal and just repeating the pronoun. The child repeated the question almost every time which was counted as a pronoun reversal. If the participant used names instead of reversal that shows understanding of the referent of the pronoun, so can be viewed as progress from pronoun reversal stage.
Discussion

Pre-Test Analysis: What did the assessment show about the participant’s pronoun use?

The results of the first assessment that was given prior to the training sessions showed that the child could produce the pronouns, “me,” “he,” “she,” and “his” without any prompting and the pronoun “you” in the object or accusative case with contrastive stress prompting. It is also important to note that the child had no problem using the correct number and gender and received an 100% correct in each category in the first assessment and the second assessment.

It is unclear if the participant’s use of “he” and “she” demonstrated an understanding of the pronouns. The child’s production of third person pronouns was inconsistent. In the first assessment, the child overused the pronouns “he” and “she” in inappropriate contexts. In the second assessment, after the training, the child did not use “he” and “she” at all even with prompting. One possible reason for the inconsistency is the parent’s comment in the first assessment. Before the first assessment, the parent was present and emphasized that the child should refer to the cartoon boy and girl as “he” and “she.” Therefore, the child might have seen the words, “he” and “she,” as names and not pronouns. This is evident by how the child says “He” instead of “He does” and “She” instead of “She does” when asked “Who has the (color) plate?” One example of the lack of “does” is presented below.

Researcher: Who has the white plate?

Child: She
However, a more likely reason is that the child was struggling with the pronoun’s verbal agreement and Case. In English, it is necessary to say the subject and the auxiliary or verb when responding to a question. However, with the accusative case, no added information is necessary. To rewrite the example above, if the researcher asked “Who did she give the white plate to?” the correct answer would be “her” without “does.” The absence of verbal agreement implies that the subject or nominative case could be the default case for the child. This is also evidenced by the child saying “he” and “she” when asked who the boy gave a fruit to, instead of saying the object pronouns, “him” and “her.” An example of the incorrect case response is given below.

Researcher: Oh, that’s nice. He is sharing? Who did he give the apple to? Now, he is giving the banana! How nice of him! Who did he give the banana to?
Child: He

Additionally, there is more evidence that suggests that the child has difficulty with using the correct case when producing pronouns. For instance, the participant said “me” when asked “Whose plate is this?” instead of saying “My plate” or “Mine.” Overall, the child used the correct case 57.89% of the time.

The child’s difficulty with pronominal case also evokes a broader question about the cause of pronoun difficulty in children with ASD. Currently, most literature on the subject states that issues with pronouns is solely a pragmatic problem. They state that pronoun issues stem from problems with perspective-switching, theory of mind, and existing in the mind-frame of word realism. Most of the literature shows this by talking about pronoun reversal which is the
switching of the person of pronouns as a symptom of Echolalia or verbal repetition. While the participant did show difficulty with person by using the correct pronoun person only 57.89% of the time, the person of the pronouns was not the only area of difficulty.

In fact, the participant’s struggle with pronominal case shows that her difficulties and maybe the difficulties of other children with ASD are much more complicated than that. Pronouns are one of the only types of words that mark case. Therefore, this difficulty with case in the limited scope of pronoun use might show a much larger problem with syntax and the child’s grammar in general.

The first assessment also showed that the child did not produce the pronouns “I,” “my,” “you” (subject), “your,” “him,” “her” (object), and “her” (possessive), nor any plural pronouns even after being prompted through several methods. The participant produced 26.32% of all pronouns that were asked for through “Who?” or Whose?” questions. The most common error was pronoun avoidance or saying a proper noun such as a name instead of a pronoun. An example of one of these instances is presented below.

Researcher: I want some watermelon. Hey, little boy, Can I have some watermelon? Who did he give the watermelon to?

Child: (Researcher’s name).

Researcher: Yeah! So, he didn’t give it to you, right? He gave it to…?

Child: You!
Pronoun avoidance occurred in 63.16% of the responses before prompting. After prompting, the child used a proper noun in 36.84% of instances. This disparity of before prompting versus after prompting shows that the child may be aware of pronouns, but not comfortable using them yet. While it is perfectly fine to use people’s names when they are the third person or outside the conversation, it is not appropriate to use a name and/or proper noun in the first and second person. However, people can say names in addition to the first and second pronouns. For example, someone can say “Sally, you are amazing,” to someone named Sally. Therefore, due to these examples, the child might think that using names instead of pronouns is always appropriate. There is also probably not a lot of negative reinforcement given to her when she makes this mistake. For example, if she is talking to a girl named Sally and says, “Can Sally pass the ice cream?” the girl will understand what the child means and will do what she says. Thus, the child will benefit from communicating with pronoun avoidance even if it is not adult-like.

In the pronominal shift or perspective-shifting section of the assessment, the child could make the “you” to “me” shift and the “your” to “my” shift when transitioning from talking to the researcher to talking with the little boy. The child also could produce the “her” to “her” shift in both the nominal object form and the adjectival possessive form. However, there is no way to tell if the child understood the pronoun or was just repeating the pronoun that was said to the child.

It is also important to note the distinction between the amount of pronoun reversal and pronoun avoidance in the different sections. During the “Who?” and “Whose” question, the child reversed pronouns very little; only once on the post-test before prompting and mainly struggled with avoiding pronouns. With the pronominal shifts, the child had opposite results. She struggled
with pronoun reversal most of the time, reversing pronouns 100% of the time before prompting, and did not use many proper nouns. It is unclear if the repetition was the result of processing the sentence before turning and talking with the boy due to the online format and the inability to see a shift in eye gaze.

This disparity may suggest that the main cause of pronoun reversal is Echolalia, verbal repetition. In general, the child only reversed pronouns when she had just heard those pronouns, meaning that she repeated the pronouns of the researcher. It was also observed that the child would often repeat the full command that the researcher uttered every single time during the first assessment. Additionally, sometimes the child added question intonation to the entire command meaning that her tone would increase towards the end. Adding question intonation demonstrates that she understood that she should ask the boy a question. However, it also shows that she did not yet understand that, in order to ask a question, one has to manipulate the command given to them and recompute it according to their own point of view. Thus, it was clear that the child had not acquired the point of view operator. It also raised concerns about whether the child was able to form other necessary components of questions, since they repeated the entire phrase uttered by the researcher every time and the researcher alway had to help them by saying “Little boy give…” or “Little boy put…” prompting. Having the ability to fill in a sentence is very different from computing a sentence without help. Therefore, this may be more evidence for a lack of syntactic skills.

The participant struggled with some transitions more than others. For example, the participant was able to make the “my” to “her” transition once out of three times and never
produced the “him” to “you” shift, the “me” to her” shift, and the “his” to “your” shift. One example of the child reversing pronouns instead of making an appropriate shift is shown below.

Researcher: Tell him to give me a banana.

Child: Tell him to give me a banana.

Researcher: Yeah, so say, “Little boy give…”

Child: “me a banana”

There are many possible reasons for this difficulty. It could be that she does not understand the referent of “me” as someone else other than herself. It could be that she understands the referent, but repeats the researcher because she does not understand that a shift in pronouns is necessary for the little boy to understand the referent.

Additionally, based on the 0% instances of production for both “him” to “you” and “his” to “your,” the child struggles with switching a third person pronoun to a second person pronoun. It is also important to note that the child also was not able to produce the second person pronoun without prompting when asked the “Who?” and “Whose?” questions in Part 1. Thus, the second person pronoun was targeted in the training sessions. There are many possible reasons for the lack of comprehension and production of the second person pronoun. It is possible that the child has always been referred to as “you” by other speakers and so thinks that is linked with her own identity. However, she never says “you” or “your” to refer to herself in Part 1 (“Who?” and “Whose?” questions) or Part 2 (perspective switching). This means that she understands the referent when others are talking to her and using the second person pronoun with her.
Another reason could be that she does not have the pragmatic skills to understand that she can engage with one person and not just herself. In other words, there is no distinction between third person and second person because using the second person requires one to acknowledge the engagement between themselves and another separate individual versus other individuals. This may point to a lack of theory of mind skills or the knowledge that every individual is separate and similar. Another potential reason is that the child does not understand the concept of a conversation yet. She uses a lot of proper nouns in the first section which demonstrates an understanding that other people are separate beings. Therefore, she might just be struggling with knowing that she is involved in a conversation with one person and not everyone in the room which is what distinguishes the first second and third person. The context of a conversation can be difficult. At times, people have conversations with more than one person or everyone in the room. So, it is possible that she just does not have the social cues to understand the concept of “conversation” and what conversational cues and context define the conversational members. This is more aligned with other symptoms of ASD such as poor eye contact, avoiding interaction, and generally playing with oneself instead of others.

Post-Test Analysis: Did the Training sessions help?

After the first assessment was given and the data was collected, the researcher met with the child for five online 10-25-minute training sessions. Then, the child was given the assessment again to see if progress was made in the child’s pronoun use. Overall, the child produced more pronouns and pronominal shifts correctly than in the assessment prior to the training sessions. In the first assessment, the child produced the correct pronouns 73.68% of the time with prompting
when necessary, compared to 26.32% when responding to “Who?” and “Whose?” questions. It is important to take the use of ASL prompting into consideration. ASL prompting included using a hand on chest gesture to prompt a first person pronoun and using a pointing gesture to prompt a second person pronoun. It is possible that the child just memorized the word that corresponded to the sign during the training session and did not actually understand why to use the pronoun. Therefore, there was also an analysis of the results without ASL prompting which showed that the instances of correct pronoun use doubled from the first assessment (26.52% correct in the first assessment vs. 52.63% correct after the training sessions). In the end, each use of prompting showed an increase in the percent of correct pronouns.

The biggest success was the child’s use of plural pronouns. It was not expected that the child would have learned to produce plural pronouns which have one or more grammatical features in comparison with the singular pronouns. However, this hypothesis was proven wrong. The child went from using 0% of the plural pronouns correctly to 85.71% of the plural pronouns correctly. The training sessions were an example of a complexity approach, meaning that it taught difficult targets first in hopes that this would help the child understand a grammatical system rather than focusing on one or two emerging pronouns. In the end, this seemed like an effective approach considering the results. The correct usage of case and person when choosing pronouns also increased.

In the second part of the final assessment, which focused on perspective switching, the cumulative percent correct increased from 54.7% to 79.17%. The instances of pronoun reversal out of total instances after prompting diminished from 62.50% to 42.86% which shows a better understanding point of view. In other words, the child’s awareness of the process of
understanding the referent of the speaker, and shifting the pronouns based on the new speaker and listener increased.

Limitations

One limitation of the current study is the online format of the assessment and training sessions. With an online Zoom session, it is not possible to observe the shift of eye contact from one person and the next person. Eye gaze is an important part of pronominal shifts. With the online format, shifts in eye contact between the researcher and the “boy” could not be observed or taught effectively during training. Additionally, people do not generally talk to cartoon boys or girls on their computer screen. If the protocol was done in person with an actual person, puppet, or toy replacing the cartoon boy, it might be easier to observe if the child’s verbal repetitions after being asked questions were the child’s way of forming a question or the child repeating the question to herself privately before she begins to talk to the boy.

Another major limitation is that the study only included one participant and no control group. Such an extremely small population size makes it impossible to generalize the results of the study to a larger population. The study also did not include a test of the generalization of the pronouns learned in the training to different contexts. This could be done by taking an informal language sample of the child playing before and after the training session. There is also no way to conclude if the positive changes in the child’s grammar as a result of the training was a permanent one. There was also no discussion with the parent beforehand about not helping the child. It is natural for a parent to want to help their child do and say the right thing. However, it
defeats the purpose of the assessment when a parent is making comments and correcting the child.

It is also unclear if the changes made in the child’s grammar were permanent. This could be changed by giving the assessment again a couple weeks after the second assessment to see if the child has maintained the improvements since the training. There was also no way to see if the pronoun skills the child acquired were generalized which could be tested by doing a language sample in which the child is recorded playing before and after the assessment and training sessions.

Conclusions

Based on these results, we can conclude that there needs to be more analysis about the cause of pronoun reversal, pronoun avoidance, and generally impaired pronoun use in children with ASD. The fact that the child struggled with pronominal case in the beginning almost as much as pronominal person shows that there may be a syntactic issue that is preventing children with ASD from learning pronouns and that also has the potential of being part of a much larger language problem that may affect language comprehension. For example, it is possible that the child has issues with other systems that involve agreement with verbs and nouns and syntax. The child’s inability to form a question and command during the pronominal shift section was also evidence for a problem with syntax. While there is not enough evidence to suggest that this is a problem in all children with ASD because there is only one participant, further research should explore this possibility.
The assessment and training session have also proved successful in helping identify areas of difficulty and in helping the child learn pronouns. The training sessions helped the child learn plural pronouns. In the first assessment, the child did not produce any plural pronouns, but, after the training, the child produced six out of the seven tested plural pronouns correct with prompting in the post-assessment. More specifically, the training helped the child learn the person and case feature of pronouns. After the training, the child’s percent correct of person marking increased by 37% and the child’s percent correct marking of Case rose by 26.32%. The training also helped decrease the number of instances of pronoun reversal and pronoun avoidance.

Therefore, this assessment and training may be useful for Speech Language Pathologists who want to work with children who have trouble with pronouns, especially if they are already using online therapy methods. However, it is recommended that this assessment and training is given to a larger sample group with a control group for more comprehensive results on the efficacy of both.

Although the results show an overall increase of pronoun skills, the child still did not get 100% correct in all pronoun categories and 0% in instances of pronoun reversal and pronoun avoidance which shows there is a need for improvement. Further research should also include conducting the assessment and training sessions in person to see if there are better results. It is also recommended that researchers conduct an informal speech sample before and after the assessment and training program to test for generalization and re-do the assessment weeks after to determine if the change in the child’s grammar is permanent.

There are many other directions to take to attempt to improve the assessment and
training. For example, it is possible that breaking the training up into sections that focus on individual pronouns or certain categories of pronouns at a time will better help children. It might also be a good idea to add more than five training sessions. It also might be important to add a discussion with the parent(s) in the protocol to make sure they do not make comments and try to help the child during the assessments for more accurate results. Thus, while the current study cannot provide any conclusions for the general population of children with ASD, it provides the field with more research opportunities and an assessment and treatment that if proven effective through further research may have the potential of helping children who struggle with pronoun usage.

**Bibliography**


Appendix

More Examples of Training Session Set-ups on *Explain Everything*

(Grey boxes represent where pictures of the participant and researcher were.)

Image A.
Image B.

Image C.
The Acquisition of Any: Understanding Scope and Plurality
Hayley Lavinio

The goal of this experiment was to determine two aspects of how children acquire the word any. In order to understand the word any, an individual must be able to grasp several complex and subtle concepts. To illustrate: if someone asks for “any glass,” they could want an unspecified member of the set of all glasses extant in the universe. Probably, though, they really mean to ask for one of the set of all glasses in the house, or perhaps in the cabinet, or maybe on the table. Which set is really meant is heavily context- and implication-dependent and can even change over the course of a conversation. Any can also include plural or singular implications, also depending on context and implication. These are just a few of the complexities associated with adult use of any, and somehow children must figure out what the word means in each different context in which it is used.

In my experimental design, I chose to focus on two aspects of the word: scope and plurality. I designed some scenarios in which I could introduce a set, and then narrow the question under discussion to a subset, reducing the scope of expected answers from the whole set to the smaller subset. I asked a question like “can you point to any of the x,” and took note of whether the subject pointed to an object in the narrower or wider scope, and also how many objects they pointed to. For comparison, and to help determine if the subjects were understanding scoping, I also asked a few questions with all instead of any. I also had some questions where I chose the narrower question under discussion (QUD), and some where I led the subject to choose the narrower QUD. I was able to perform the experiment with 5 children between the ages of 6 and 10 and with 3 adults between 18 and 23. The full procedure, along with the pictures used, can be found in Appendix A.

Due to circumstances, I found it necessary to modify my experiment to be done via videoconferencing (Zoom), which somewhat limited the scope of the experiment. Because I could not see where the subjects were pointing, I had to raise the minimum age of subjects so that I could ask and they would be able to articulate to me where they were pointing. I was also not able to have as many subjects as I would have liked because setting up the technology made the individual sessions run longer. Aside from that, I also made an error myself, in that the procedure calls for the last picture to show cupcakes, but I forgot that when I was drawing them up, and I drew vegetables instead. I only realized after it was too late that I had done this, but it ended up resulting in some very interesting consequences that I believe actually improved the experiment.

The raw data from the experiment can be found in Appendix B. In each graph below, “set” refers to the whole group of objects (hats, plates, etc.) and “subset” refers to the narrowed scope QUD (feathers on a hat, vegetables on a plate, etc.). Note that the y-axis scale is not consistent between graphs because some display a subset of the data for closer analysis.
Overall, I got mixed results for children and adults as to whether the subjects chose the set or the subset. Although both groups tended to choose any item from the subset rather than the set, a greater relative proportion of children chose the set reading than adults did. Some of this may be due to the small sample size, but it is also possible that my experiment was not consistent enough in which context any was presented, which is made clearer by breaking down the data further.

In the questions for vases and hats, the subject chose the QUD, and in the books and tables questions, I chose the QUD. When I chose the QUD, the adults only took any to be scoped to the subset. None of them answered from the entire set, but some of the children’s answers did indicate the set reading. On the other hand, when the other person chose the QUD, although both groups tended to choose the subset reading over the set reading, I got a mix of responses from both groups. It seems significant to me that in the first case there were no adult set readings at all, and I would like to see whether this difference would hold with a larger sample size.
An interesting exception to the pattern is the veggies question, which led adults to tend to assume any referred to the whole set of vegetables more often, while children tended to the subset reading. Some of the skew toward the subset with the children may be because I asked them to pick their favorite vegetable, so they may have had bias toward choosing from the same subset a second time. However, the adult response seems very significant because in this case alone do they prefer returning to the whole set after a smaller set has been introduced. I think that this is because all of the other cases have the subjects choose between different colored or patterned items of the same type, where there is no noun-label for the distinction. With the vegetables, though, the responses were invariably using the specific noun-labels (carrots, peas, broccoli), so when I asked for “any of the vegetables,” I actually widened the scope of the QUD back to the less specific case.

The responses for the two questions involving all are different in preferred scope from any, showing that both children (and adults) understand that different scoping is possible for different scoped terms. Thus, even if children have not mastered all the adult scoping rules, they at least can grasp the idea that different words can imply different scopes.
Plurality:

Over the whole set of responses, children have a tendency to give plural answers for any and adults have a tendency to give singular answers. However, just as in the scope analysis, after completing the experiment as designed, I believe that the questions are not consistent enough in the implications inherent in the scenarios for the overall graph to give the whole picture.

The children gave mixed responses as to whether they preferred the singular or plural reading for all of the questions, although they tended to give a plural reading. The adults, intriguingly, tended to give singular answers for the items where I asked for any integral component of the item (table legs and book corners) and plural answers for the items where I asked for any associated component of the item (flowers in a vase and feathers on a hat). I found this significant because it is such a marked difference, and one that I did not expect. It suggests that perhaps there is another subtle distinction between use cases for any that I did not account for in the experiment. There are also a few irrelevant or unclear responses, where I knew the scope the subjects were referring to, but it wasn’t possible to get the plurality. In those cases, the subjects had indicated that they understood the QUD I introduced when I asked the “any” question but did not actually respond by pointing to what I asked for. All of these answers came from the question about book corners, and the subjects just indicated the whole book.
As previously stated, the vegetables question was a special case, and although the pattern of preferred readings is different than the other associated component questions, I believe that is an artefact of the noun-label problem.

Given all of the responses to the experiment questions, the scoping and plurality aspects of any are much more complex that I had anticipated when designing the experiment. I found that the children’s responses tended to favor a plural, subset-oriented reading in each case, but the adult reading varied considerably depending on the use case. This would lead me to the conclusion that children between 6 and 10 do not yet fully grasp the adult usage of any, but because of the problems with my experimental design, further research is needed to confirm this hypothesis. In the future, I would like to expand and refine this experiment to account for the three use cases I found and to further study the differences in which reading is preferred, by adults and children. I would also like to have a larger sample size, encompassing a larger range of ages. It would also be interesting to compare terms like any and all that have specific scoping and plurality implications to see if the acquisition of those words differs in any way from that of any.
Appendix A: Procedure and Visual Aids

Procedure:

Introduction:
I’m working on a project for school and I need your help with it. I have a couple of pictures to show you and I’m going to ask a few questions about them. There are no right or wrong answers, so don’t worry if the question seems silly or doesn’t make sense, if that happens you can just guess. Ok?

Experiment:

This first picture is of some books I have. I like all of them, but the big one is my favorite. It’s about a man and a woman who grow a giant turnip in their garden. Can you point to any of the corners? Which did you point to? Ok, good job.

This next picture is of some vases filled with flowers. Which vase do you like best? What do you like about it? Can you point to any of the flowers? Which did you point to? Can you point to all of the flowers? Which did you point to? Nice, thank you!

Here’s another picture I drew. This one has a bunch of different tables. Which table has a pattern on it? Yes, I drew big pink polka dots on it! Can you point to any of the legs? Which did you point to? Great!

Here’s another picture, of hats with big feathers in them! Which of the hats do you like best? I like that one, too. Can you point to any of the feathers? Which did you point to? Can you point to all of the feathers? Which did you point to? Awesome job!

Ok, one more picture. This one is of plates with cupcakes on them. Which cupcake looks the yummiest to you? Yes, it looks really yummy! Can you point to any of the cupcakes? Which did you point to?

Thank you so much for your help!

For the last question, I drew vegetables instead, so I actually substituted the word “vegetables” for “cupcakes.”

Visual Aids:

Image 1:
### Appendix B: Raw Data

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*unanswered: indicated the right book, but just pointed to the book

**I accidentally asked an all question for one subject in the table scenario. This data point is not included in the graphs and analysis.
Experimental Write-Up

The purpose of this experiment is to determine whether or not L2 speakers understand ellipsis and inversion in English [so I did, so did I; so I have, so have I]. In one construction, “John wanted someone to do the dishes and so I did,” ellipsis omits the rest of the second clause *do the dishes* and gives a *therefore* reading of *so*. In the other construction, “John wanted someone to do the dishes and so did I,” ellipsis omits the rest of the second clause *want someone to do the dishes* and *I* and *did* are inverted, giving an *also* reading of *so*. The L2 speaker’s interpretation of the sentences depend on what they understand the omitted phrases to mean. I predicted that the *also* meaning of *so* would be easier to understand because it reconstructs the whole first clause, rather than needing to extract the verb phrase.

While the experiment was originally intended to be conducted verbally and in-person, the current restraints of the COVID-19 pandemic necessitated a move online to a Google Form. All of the responses were collected through the Google Form, although I conducted a verbal interview with my 80-year-old grandmother over the phone and transcribed her answers into the form, and my grandfather filled his form out with my verbal assistance as well. In the end, 46 responses were collected, 30 of which were native English speakers, and 15 of which were native speakers of a variety of other languages, namely Mandarin Chinese (7), Spanish (4), Arabic (1), French (1), Amharic (1), Bambara (1), and Swedish (1). The following questions were given in each survey in a randomized order:
➢ John wanted someone to clean the kitchen, and so Mary did. Did Mary clean the kitchen?

➢ Mary wanted someone to get the mail, and so John did. Did John get the mail?

➢ Mary asked for someone to get bread from the store, and so John did. Did John get bread from the store?

➢ John wanted to go to the store, and so did Mary. Did Mary go to the store?

➢ Mary hoped that someone would cook dinner, and so did John. Did John cook dinner?

➢ John needed help to reach the shelf and so did Mary. Could Mary reach the shelf without help?

➢ Mary has gone to the zoo, and so John has. Did John go to the zoo? If yes, did he go to the zoo because Mary did?

➢ Mary has watched the movie and so John has. Has John watched the movie? If yes, did he watch it because Mary did?

➢ John has read the book and so Mary has. Has Mary read the book? If yes, did she read it because John did?

➢ John has finished his homework, and so has Mary. Has Mary finished her homework? If yes, did she finish her homework because John did?

➢ John has visited the city, and so has Mary. Has Mary visited the city? If yes, did she visit the city because John did?

➢ Mary has walked through the park, and so has John. Has John walked through the park? If yes, did he walk through the park because Mary did?

Participants had the options of answering yes, no, or not necessarily, though the second half of the questions necessitated more complex options, for example:
- Yes, he did go to the zoo because Mary did.
- Yes, he did go to the zoo but not because Mary did.
- Yes, he did go to the zoo but not necessarily because Mary did.
- No, he did not go to the zoo.
- He did not necessarily go to the zoo.

The following percentage graphs represent L1 and L2 speakers’ responses, with the ‘to have’ questions only representing the answers to the second half of a ‘yes’ answer. A few responses were omitted because the participant skipped the question on the survey or because they answered ‘no’ or ‘not necessarily’ to the first half of a ‘to have’ question. Full data can be found here. The numbers represented on each bar represent the total number of answers each option received between all participants and the three questions, while the y-axis represents the percentage each option was answered.
Overall, the L2 speakers answered similarly to L1 speakers. In both groups, errors in both versions of the ‘to do’ questions were similar. However, in the ‘to have’ questions, in both groups responses varied much more in the non-inverted sentences than the inverted sentences. I believe that this may be because the experiment was conducted via a written form and was missing tone and inflections that may imply a different meaning for the inverted ‘to have.’

In addition, I was able to do the experiment with both of my grandparents who are L2 speakers. There was little control for language proficiency in the other responses, but for my grandparents, they both immigrated to the US in the 1960s. While both of their language proficiencies in English have fluctuated over the years, as they often do, my grandfather has used English much more and more recently than my grandmother. Generally, they identify him as the more proficient English speakers. Interestingly, my grandmother’s responses to the ‘to do’ questions were a ‘yes’ to all six questions, meaning she interpreted the inverted so to still mean...
the non-inverted *therefore*. My grandfather, on the other hand, answered much more similarly to an L1 speaker, answering ‘yes’ to all three non-inverted sentences, and ‘not necessarily’ or ‘no’ to the inverted sentences. He even answered ‘not necessarily’ to the first two of the inverted sentences (“Mary did not necessarily go to the store.”; “John did not necessarily cook dinner.”) and ‘no’ to the third question (“Mary could not reach the shelf without help.”), catching the ambiguity in the first two sentences that was much more common in the L1 speakers’ responses than the L2s’. My grandmothers’ responses suggest that the non-inverted sentences may be easier to understand as the speakers need to only reconstruct a verb phrase rather than a full clause, but my other respondents may have been proficient enough in English for this to not appear.

Going forward, I believe it would be interesting to continue to research this, especially in-person when health crises permit. It will also be important to control for English language proficiency, as I had no was to account for this in my original survey, but there are important differences between the proficiency of my friend whose native language is Spanish but grew up in the American (English) education system and that of a friend who has never even lived in an English-speaking country. A way to control for this would be to survey English-language students in some sort of ESL program at various predetermined levels or to conduct some sort of proficiency testing beforehand. An experiment that aims to produce language may also yield interesting results.
The Kid’s Kid’s Bike

Generic possessives in the acquisition of recursive possessives in English

May 2020

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BA Thesis in Linguistics & Philosophy

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* With thanks to Barbara Partee for helpful comments on a draft
1 Introduction

Your friend’s kid’s bike may not be a kid’s bike. Perhaps your friend’s kid is a professional cyclist, in which case her bike is probably not a kid’s bike but a racing or touring bike. Or, maybe your friend doesn’t have a kid but has a bike made for kids from her childhood. In this case, your friend’s bike is not some kid’s bike! In either case, your friend’s kid’s bike is not a kid’s bike!

The present study investigates the acquisition of recursive possessives in English in terms of constructions like friend’s kid’s bike. These structures involve embedded possessives but are not necessarily recursive; since the lower possessive is ambiguous between two readings, insofar as there is a unique syntactic structure associated with both readings, there is a way to represent the whole phrase non-recursively. In this study we consider novel naturalistic and experimental data in light of this possibility. We obtain robust evidence that English speaking children between the ages of 4 and 10 have, and can represent in single phrases, both possessive readings. Our findings favor an acquisition path for recursive possession that is nuanced by generic possession. In the concluding section of this work we review new and exciting implications borne out of our investigation.
2 Theoretical Background

2.1 Possession

Possession is expressible in every language and it is one of the very first relations children express. The concept of possession enables us to relate a possessor and a possessed entity, such that the former stands in relation to (e.g., owns, or has as a part) the latter. There are multiple ways in which speakers can express this asymmetric relationship. One basic distinction follows.

1. John has a bike  
   predicative possession

2. John’s bike  
   adnominal possession

In predicative possession, the possessor and the possessum are arguments of a predicate. In adnominal possession, the possessor and possessum are a part of the same determiner phrase. The possessive structures under investigation herein are adnominal. Adnominal possession manifests differently across languages.

3. A wheel of the car  
   prepositional

4. Car’s wheel  
   non-prepositional

5. De auto van Jan (Dutch)  
   prepositional (Merx 2016)

---

The third main form is external possession, in which possessor and possessum are arguments of a predicate whose lexical meaning does not have the notion of possession (e.g., She tapped him on the back).
Adnominal possessive constructions can be divided into two subtypes, prepositional and non-prepositional, represented in (3) and (5), and in (4) and (6) respectively. Some languages (e.g., English, Dutch, and Greek) allow both prepositional and non-prepositional possessives. This is not the case for all languages. Hebrew, for instance, has only prepositional forms of adnominal possession. Adnominal possessive constructions differ across languages in more ways as well. For example, some languages, such as English, have adnominal possessive constructions in which the possessor precedes the possessum (like in (3) and (4)). Other languages, like Greek, have both possessum-possessor and possessor-possessum constructions.

Furthermore, possession can be expressed with pronouns in both non-prepositional and prepositional possessive constructions.
In pronominal, non-prepositional possessive constructions like (9), the possessive pronoun is a lexical possessive and head noun modifier.

The narrow focus of this study is on non-prepositional possession involving genitive case, where a genitive marker (GEN) is used. Genitive case marks a noun as modifying another noun. Genitive markers are used in possessive constructions to mark possessors as standing in relation to possessed entities (or vice-versa). Genitive markers and their behaviors differ across languages.

(11) *Papas Fahrrad* (German)
    Dad-GEN bike
    *Dad's bike*

(12) *Biçikleta e Jackit* (Albanian)
    Bike GEN Jack
    *Jane's bike*

(13) *Jane-no jitensha* (Japanese)
    Jane-GEN bike
    *Jane's bike*

---

ii Prepositional possessives can involve genitive markers too (e.g., *The friend of Bill's*).
In German, possessives can be marked by a suffixed -s morpheme, as in (11). In Albanian, genitive case is marked with a clitic, e when the possessed object is feminine, as in (12), and i when it is masculine. Possessives in Japanese are marked by no, as in (13). And in Turkish (14), both the possessor and possessum are suffixed with a genitive marker, of which there are numerous, whose usage depends on the endings of the words to which they are added.

In English, -s marks genitive case on possessors. That is, -s “attaches to the final word at the rightmost edge of a full DP ([the man]’s hat, [every man]’s hat, [the Queen of England]’s hat, [the person I was just talking to]’s hat, etc.)” (Barker 2010).

In addition to sorting out all of the complexities of possession above and below, children acquiring English face the challenge of having to differentiate speech acts involving the -s morpheme. In spoken and written English, -s can be the contracted form of auxiliary verbs is (e.g, it’s good) and has (e.g., she’s been there), and of us in first-person plural imperatives (e.g., let’s go). Additionally, -s is used to mark plurals in English. Orthographically, the genitive case marker is ’s (for possessive singular nouns, and s’ for possessive plural nouns).

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iii In English this is sometimes called ‘possessive case’, and -s is sometimes called a ‘possessive marker’. Possessive case can be regarded as a subset of genitive case. There exist semantic (function-argument application) differences between the two cases. We use ‘genitive case’ and ‘genitive marker’ in this paper. ‘Genitive’ will refer to a noun in genitive case.
Genitives are used to express different types of possession. For instance, a prominent distinction can be drawn between alienable and inalienable possession. Certain relational concepts (such as family relations) are lexicalized in nouns (such as *brother*), while others (such as ownership) are not (books are not inherently owned; they can be unowned, and owned by numerous kinds of entities, e.g., libraries, teachers, etc.). Inalienable nouns are inherently relational and they take genitives as arguments in possessive constructions (e.g., *Will’s brother*). Oftentimes inalienably possessed nouns are attributes, like *color* in *the fruit’s color*. Likewise, part-whole relations, such as *the table’s top*, are generally inalienable. Alienable nouns in possessive constructions can be separated from their possessor because they are not inherent features thereof; there is neither a necessary nor a lexicalized relation in alienable possession.

### 2.1.1  Regular and Generic Possessives

To further complicate matters, -s marks at least two kinds of possessive relations between nouns in the English language (Munn 1995; Gatt 2004; Strauss 2004; Willemse 2007). Consider (15): for native English speakers, the determiner phrase *A kid’s bike* can refer to the bike of some particular kid or to the kind of bike kids generally ride. We can capture this difference with bracketing:
(17) [A [kid’s bike]]  
    generic possessive (GP)

(18) [A kid’s [bike]]  
    regular Possessive (RP)

(17) signifies a bike of the type that is for kids, whereas (18) signifies the bike of a kid.

When a possessor is “type-denoting”, like in (17), we’ll call the possessive ‘generic’ (we’ll
sometimes refer to generic possessives as ‘GPs’ or ‘NP-possessives’). When a head noun belongs
to a possessor, like in (18), we’ll call the possessive ‘regular’ (and we’ll sometimes refer to regular
possessives as ‘RPs’ or ‘DP-possessives’).

We encounter both kinds of possessives in everyday language, and they are most often
not ambiguous between regular and generic readings. For example, *a mother’s instinct* refers to a
type of instinct that is motherly, and *Paul’s magazine* refers to a magazine that belongs to Paul.
Wherever ambiguity is theoretically possible, GPs and RPs are disambiguated by speakers
through prosody — where the GP gets a unique stress pattern (something like compound
stress) — and determiners — where, for example, *those doctors’ protective gear* is an unambiguous
RP while *much doctor’s protective gear* is an unambiguous GP. Neither of these considerations will
receive in-depth treatment in this paper, but they are worth noting at the outset.

According to Munn (1995), the generic possessor shows agreement such that it is plural
with a plural modified head noun (or with a mass head noun) and singular with a singular
modified head noun. Strauss (2004) doesn’t address this issue but uses plural forms in nearly all
of his examples of generic possessives. It’s not clear one way or another how to treat generic
possessors in every case; someone might say of an axe (to the extent that axes are
stereotypically used by men) *that's a man's tool or that's a men's tool.* When it comes to transcriptions of naturalistic data, we should note that transcribers just have to guess for all of the nouns that have regular -s plural forms whether the generic possessor is plural or singular (e.g., whether two write *kids'* or *kid's*). In this document generic possessors are singular where possible.

Many languages have generic possessives (Chappell and McGregor 1989; Koptjevskaja-Tamm 2002, 2004; Munn 1995; Strauss 2004). Languages that do not have GPs, like German, can express the same (or, subtly different) meanings with (plural) compounds. Some generic possessives in English, like *bull's eye* and *men's room*, by virtue of being idiomatic, are in fact compounds. Munn (1995) grants that certain generic possessives are probably idiomatic fixed compounds but argues against a compounding analysis for GPs in general (we'll consider and endorse his arguments below).

Generic possessives (and compounds) involve genericity, which is a challenging linguistic/philosophical quality to formalize. Generics refer to categories as “abstract wholes” rather than to individuals (Gelman 2005; Carlson and Pelletier 1995), and generic statements refer to kinds (Carlson 1977; Gelman 2005). For example, in the expression *Dogs bark*, ‘dogs’ is a generic NP and it therefore invokes dogs as a general kind, as opposed to a set of individual dogs. The complete phrase could be restated *Dogs are a kind of animal that barks* (Gelman 2005).

Notably, generic statements are compatible with counterexamples unlike statements universally quantified with *all* and *every*. So, in the presence of a single dog that does not bark.
the generic statement *Dogs bark* is true, while the statement *All dogs bark* is false. Generics do not invoke *most* readings either. For instance, *Mosquitoes carry the West Nile virus* is a true generic statement, despite the fact that at least 99 percent of mosquitoes do not carry the West Nile virus (Leslie 2008). We find the same features are true of generic possessives. For example, at a space history museum, *an astronaut's helmet* persists in its reference to the kind of helmet generally worn by astronauts, even if it is far outdated and no longer used by astronauts at all, or if it was only worn by some astronauts. Orthogonal to the puzzle of their truth conditions is the puzzle of how generics are acquired. In section 3 we will consider how and when children acquire the concept of genericity.

Munn (1995), Gatt (2004), Strauss (2004), Willemse (2007), and others motivate a syntactic analysis of generic possessives, against the idea (of Barker 1991 and others) that they should be treated as lexical compounds. For instance, Gatt points to the following example from Maltese, which has generic possession with genitive case.

(19) *il- hanut ibiżen sbieħ ta- t- tfal* (Maltese)  
*DEF-shop sells shoes beautiful POSS- DEF- children*  
*The shop sells beautiful children's shoes*

While nominal compounds resist internal modification, the GP in (19) does not. Along the same lines, Munn (1995) offers evidence that the ambiguity with (15) is structural; it disappears under a single substitution.
(15)a  This kid's bike and that one  two kid-type bikes

b  This kid's bike and that one's  two bikes, each belonging to a different kid

Because one (in (15)a and b) is substituted for an NP, (15)a demonstrates that possessors can be constituents of nouns (such that kid's bike forms an NP). In (15)a one cannot be substituted for kid and must instead be substituted for kid's bike. Whereas, the opposite is true in (15)b.

Additionally, possessor-NP coordination in (20) is grammatical and it would not be if GPs were lexical items (Gatt 2004; Bresnan and Mchombo 1995).

(20)  The boy's and girl's uniforms  two kinds of uniforms (two GPs)

So, the difference between the generic and regular possessive can be expressed syntactically. Following Munn (1995), generic possessors are modificational (GPs are sometimes called ‘modificational possessives’); they form constituents with head nouns and are limited to NPs. Regular possessors are determining; they are full DPs. In their simplest form, under an Abney (1978) DP analysis, here are the trees:
(17)a corresponds to the generic possessive, and (18)a to the regular possessive. These structures account for the above observations, namely that the possessor in a generic possessive is limited to an NP, and that the possessor in a regular possessive “is a full DP, as evidenced by the possibility of overt determiners, proper names and pronominal forms, relative clauses and adjectival modifiers” (Munn 1995). For instance, *J’s father’s friend’s cousin from Boston’s... book* and *her shoes* do not have generic readings.

Now, suppose the bikes in (17) and (18) can have only one owner. In that case, a new character could possess (17) but not (18).

(17)b  *John’s kid’s bike*

(17)b may refer to John’s bike that is for kids. It cannot, on the other hand, refer to a bike that John co-owns with a kid. However, readers will notice a third option: (17)b can refer to the bike of John’s kid. Noting this is to identify a particularly interesting and language-dependent property of non-prepositional possessives, namely their ability to be used recursively.

2.2  **Recursion**

Merge is the fundamental structure-building operation in syntax (in the Minimalist Program; Chomsky 1995). Merge takes two syntactic objects, α and β, and forms from them a new set and assigns to it a dominance-reflecting label (α in (21)):

\[
\text{Merge: (α, β) } \rightarrow \{α, \{α, β\}\}
\]
Recursion occurs in natural language whenever a string of three or more words combine in syntax via two binary Merge operations. For example, [(N)John [(V)runs (Adv)fast]] forms a (S)entence when the output (the syntactic object with the dominance-reflecting label; VP in the phrase-structure rule (PSR): Vp -> V Adv) of one Merge operation itself merges with another syntactic object to form another output (S in S -> N VP). In this way, it’s argued that recursion is a fundamental property of language because “all languages with three-word combinations are examples of recursion over two binary acts of Merge” (Roeper 2011).

Beyond this, we can distinguish between “direct” and “indirect” recursion. Direct recursion occurs whenever a category reproduces itself. This happens with conjunction; for example, the sentence Dave and Joe and Ned and… laughed has only practical limits with respect to its possible length, because it is produced by an operation that can be applied to its own output infinitely many times via the rule defined in (22).

(22) NP -> NP ((and) NP)

Indirect recursion happens whenever some category generates itself through an intermediate category. Phrase-structurally, indirect recursion is represented in (23), which is a PSR set for possessives.

(23) DP -> (Determiner) NP
    Determiner -> [ARTicle POSSessive]
    POSS -> DP ‘s
From the set of rules in (23), we get recursion when a second DP is generated within a possessive phrase that is itself a determining element in a DP (as in (17)b, in which John’s kid is a DP generated within the possessive phrase John’s Kid’s, which functions as a determiner in the whole DP John’s Kid’s Bike).

Unlike direct recursion, which allows order freedom, the order of elements in indirectly recursive syntax is determinant of meaning. Consider the following illustration with possessives.

(24)a  The student’s and teachers book
   b  The teacher’s and student’s book

(25)a  The student’s teacher’s book
   b  The teacher’s student’s book

While (24)a and b refer to the same book, (25)a and b may refer to different books. Changing the order of possessives in recursive possessive structures affects reference.

2.2.1 Recursive Possessives

Recursive possessives are a language-specific form of indirect recursion. For example, German and Dutch do not have possessive recursion with the genitive marker -s. Alternatively, Japanese and English permit the iterative self-embedding of possessive DPs with the no and –s possessive marker respectively. In languages where recursion with non-prepositional
possessives is available, speakers can produce strings of (indefinitely many) multiply embedded possessives via (23).

Recursive possessives have been the subject of appreciable attention in language acquisition literature (Limbach and Adone 2010; Fujimori 2010; Roeper 2011, 2013; Pérez-Leroux et al. 2012; Amaral and Leandro 2013, 2015; Hollebrandse and Roeper 2014; and more), but no studies to our knowledge have examined a further possibility: the apparent availability of recursion with generic possessives. That is, up to this point studies of the child’s capacity for recursion with possessives have involved only regular possessives, leaving unexplored constructions like (26).

(26)a  A kid’s firefighter’s helmet

b  Women’s men’s jeans

The helmets firefighters wear are too heavy for kids to use for play. That’s why a plastic version of the classic, red fire helmet exists. Typically, the kid-friendly version will have a yellow badge stickered on the front and kids pretending to be fire-men and -women will wear them. If this describes the referent of (26)a, which it plausibly does, then (26)a looks to be a recursive generic possessive. That is, as opposed to possessive recursion with DPs, (26)a illustrates possessive recursion with NPs. Of course, (26)a could have a particular referent as well, in case the kid has a toy firefighter who has a helmet. But it’s instructive and worth noting on its own that recursion with generic possessives is available to English speakers.
Similarly, (26)b is a recursive generic if we take it to mean the women’s version of jeans that are for men. Jeans for men tend to have longer front zippers, deeper pockets, and wider and longer pant legs than jeans for women. But, at some point in the recent past, it became fashionable for women to wear jeans which were designed for men. To compensate for this, clothing manufacturers designed jeans with the characteristic features of men’s jeans, the long zipper, the deep pockets, and the wide pant leg, but marketed them to women and made them appropriately form-fitting by shorting the pant leg and selling them in women’s sizes. These are women’s men’s jeans.

There are major conceptual and semantic differences between recursion with generic possessives and recursion with regular possessives. While both recursive structures are order-dependent, whereas recursion with regular possessives involves a chain of particular referents wherein the innermost (the lowest) possessive carries the main relation between some object or quality and its possessor, recursion with generic possessives involves a chain of nominal modification wherein the outermost (the highest) possessive carries the main type-denoting relation between some kind and an (already generic kind of) object or quality. Computing the recursive generic, then, involves hearing the full possessive phrase and working backwards from the head noun to figure out the referent. Adding layers to recursive generic possessives involves narrowing in on subsets of kinds that are themselves subsets of kinds. This process of conceptualization is complex in and of itself.
However, recursive generics are beyond the scope of the present study, which concerns the role of generic possessives in the acquisition of recursion with regular (DP-)possessives in English. In the next section, we will survey the acquisition path for possessives beginning with the noun phrase and ending with recursion.

3 The Acquisition Path

One of the early elements of a child’s grammar is the noun (and by extension, the noun phrase), which they externalize, many times with their first word, when they label entities. For example, two common first words are *dada* and *mama*. To succeed in pointing out a person, or any external object, with a word requires a great deal of mental sophistication that should not be taken for granted. Noam Chomsky famously theorizes that our mental structure includes an innate capacity for language, which he calls the Language Faculty. According to his theory, our capacity for natural language is genetically hardwired, evidenced by the fact that the various modes of syntactic and semantic composition which affect grammaticality and meaning do not have to be explicitly taught to children. No matter what language(s) they grow-up around, children become competent speakers of, and brilliant conversationalists in, their native language(s) relatively quickly, despite a Poverty of Stimulus (Chomsky). Narrowly, the Language Faculty makes effortless the incredibly complex task of acquiring a language. According to Chomsky’s Universal Grammar (UG) theory, our innate capacity for language consists in a meta-grammar (UG), which effectively constrains the set of possible natural
languages that can be attained. The child is therefore tasked with selecting, from the set of possible grammars, the grammar that generates the strings of the language they are acquiring.

In what follows, I’ll review the acquisition challenge posed by recursive possessives, primarily in English.

3.1 Acquiring Possessives

One of the first concepts children convey with language is possession. Generally, possession is expressed for the first time through utterances of single words. For instance, a child might point at a hat and say dada (Roeper 2007). In so doing they are expressing a relation between a person and an object, namely, an association between a hat and a person.

Now, it’s worth pausing here to consider an important question. Is the child’s concept of possession (and are their conceptual tendencies more generally) at this point referential or generic? In other words, is the child’s viewpoint “concrete” and particular, or abstract” and general?

Child grammar can be loosely characterized as having a simple syntax and a complex semantics. If children can express a relation as complex as possession with single words, what

---

Broadly, our capacity for language defines our humanity; no other species shares in it, and it enables us to manipulate symbols in coordinated efforts to communicate and conceptualize. Furthermore, this ability affords us (theoretically) infinite creative power, with which we can produce and comprehend novel strings in the languages we know, and by that means accomplish much more.
else might they be expressing in using their early vocabulary? For example, when a child says *like milk*, or *milk good* after enjoying some, are they saying they like the particular milk they drank? How, then, would they go about requesting more, and why would they, if the particular milk they drank was gone; they could not expect to enjoy the “next” milk without some form of a general concept of milk. If the child in this scenario has in mind milk generically, then it makes sense for them to ask for it again in the future. There is reason to believe that generic thinking is fundamental to early cognition.

Young children comprehend and produce generics before quantified sentences. That is to say, children deal with the puzzling truth conditions of generics more efficiently and readily than the precise and logically simple truth conditions of explicitly quantified sentences. Moreover, no language to our knowledge has an explicit operator to signify generics or generic interpretations, and yet generics are expressible in every language (Carlson and Pelletier 1995). One possible explanation for this is that our mechanism of generalization is a default (Leslie 2008).

To this effect, in her book “The Essential Child”, Susan Gelman argues that essentialism, the idea that sets of characteristics are central to the nature of certain categories (such as ‘girls’, ‘birds’, ‘intelligence’, etc.), is a foundational cognitive bias that young children have. She argues that children have a prelinguistic notion of genericity and that once acquired, generic language, in tending to emphasize kinds and inherent properties, provides input into generic concepts.
She writes of generics that they “express qualities that are relatively essential, enduring, and timeless (Carlson and Pelletier, 1995). Properties stated generically are not essential in the sense of being true of all instances of the kind, yet they are relatively more essential than nongenericized properties.” Citing numerous empirical studies, Gelman makes the case that infants conceptualize the world around them on the assumption that it contains kinds (or property clusters). For instance, she points out that children as young as nine months generalize properties from objects to similar ones (Baldwin, Markman, and Melartin 1993). And after minimal generic language production up to a point, between the ages of two and three children produce generics eruptively.

This consideration, that generics represent/inform a default mode of thought in young children, lingers in the background of our examination of possession throughout this document. It will add to the plausibility of certain hypotheses in section 4 and subtract from others.

The second step in the acquisition of possession with genitives involves two-word utterances. At this point, with respect to possessives, children are still figuring out what grammar determines the acceptable strings of their language. As outlined above, non-prepositional possession with genitives is not a feature of every language, and across those of which it is a feature, genitives behave differently. English speaking children, as a part of the
process of narrowing in on the constraints of English grammar, leave off the genitive marker at this step (Marinis 2016).

(27)  

(a) Mommy milk  
Travis, 17 months (Marinis 2016, from Tomasello 1998)  

(b) Lauren house

(28)  

(a) Mommy's. Mommy key  
Gia, 20 months (Marinis 2016, from Bloom, 1970)  

(b) Daddy's  
Laura, 17 months (Braunwald 1971)

Occasionally, children at this stage will express possession by producing the genitive and omitting the possessum, as in (28). Tomasello (1998) catalogs in detail his daughter's utterances at this stage. At this point, children express possession by merging two syntactic elements — either a bare possessor and possessum, or a possessor and a genitive marker — but not three.

(29)  

CHI: Hair  
1;9 years  
Valian/04b.cha:2776

MOT: That's my hair

CHI: Mommy's

Eventually, sometime after one and a half years, children typically begin to use pronominal possession (often with pronouns in accusative case, e.g., me book. Pr3onominals in genitive case are used consistently by age 3 (Radford & Galasso 1998)). At the same time children start combing possessors and determiners.

(30)  

The boy's duck  
CHI, 2 years  
Belfast/David/david02.cha:4718
Crucially, the addition of determiners and the graduation to an expression of possession that combines genitives and possessed entities is not necessarily representative of possession syntax beyond nominal modifiers. To see why, we need to turn to recursion.

### 3.2 Acquiring Recursive Possessives

It has been documented that recursive possessives are difficult for children in both experimental and naturalistic settings (Roeper 2011). In fact, children of age 3 and 4 oftentimes actively avoid them by dropping one or more possessive(s) (i.e., interpreting boy's friend's bike as just friend's bike). Five-year-olds persist in avoiding recursion with possessives. Children around this age tend to default to conjoined readings (on which boy's friend's bike is reinterpreted as boy's and friend's bike) (Roeper 2007; Limbach and Adone 2010).

Production data from 3-, 4-, and 5-year-old English speakers from a recent study by Pérez-Leroux, et. al accords with these observations. While children as young as three and through the age of five could produce non-embedded possessive targets without difficulty, the same children produced an embedded possessive target phrase only once in total. In one study by Fujimori (2010), Japanese speaking children achieved adult-like interpretations of two embedded possessives at the age of 4, and at this stage they could also embed up to four possessives. And in a study of Wapichana-Portuguese bilingual children, Amaral and Leandro (2013) found that children did not have adult interpretations of recursive possessive structures.
until age 7. This evidence in sum suggests that, despite simple possessives being acquired early, recursive possessives are acquired late.

In addition to these findings, that L2 English speakers are also prone to difficulties in their attempts at processing recursive possessives suggests that there is a “trigger” that enables speakers to move from non-recursive to recursive possessive constructions (Roeper 2007). It has been assumed for some time that the acquisition of recursive possessives is a two-step process which could be outlined as follows.

(31) Step 1: Children have single possessives

Step 2: Children have recursive possessives

For one thing, an example of single-embedding with possessives is not sufficient evidence for the child that the language has recursive possessives because, some languages, such as German, have single-embedding but still cannot embed genitives recursively and rely instead on prepositional possessives to embed multiple possessive elements. Still, children are exposed to embedded genitives in common parlance and nevertheless avoid them for some time (from Roeper 2011):

(32) MOT: What’s Daddy’s Daddy’s name?

CHI: uh.

MOT: What’s Daddy’s Daddy’s name?
A syntactic explanation for this gap between the acquisition of singular possessives and the acquisition of recursive ones is offered by Hollebrandse and Roeper (2014). According to their theory, recursive possessives are available only when the child substitutes DPs for NPs and projects POSSPs.

(31) a

\[
\begin{align*}
\text{NP} & \quad \text{DP} \\
\text{NP(MOD)} & \quad \text{POSSP} \\
\text{N} & \quad \text{NP} \\
\text{Will's} & \quad \text{b} \\
\text{bike} & \quad \text{bike} \\
\end{align*}
\]

On this account, genitives start out as head noun modifiers in NPs. In this respect, (31)a mirrors the structure of early expressions of possession that leave off the genitive marker, like "mommy milk" in (27). Only when the child projects POSSPs and swaps the NP nodes for DPs can
they comprehend recursive possessives, because it’s the structure in (31)b that embeds DPs via indirect recursion (see (23) for PSRs).

In theory, once the child can comprehend recursion with two possessives (once they have 2-POSS structures), they should also have 3- and 4-POSS recursion⁷. The assumption here is that, once the system for indirect recursion is instantiated (i.e., once the child represents 2-POSS structures), the rest should come for free because every level of embedding beyond single embedding requires just the repeated application of the same rules, which the child would have already used to represent 2-POSS structures.

However, contrary to the supposed two-stage process in the acquisition of recursive possessives and the logic of the preceding paragraph, recent studies have illuminated a possible middle stage in need of further explanation and investigation. Terunuma and Nakato (2012), for instance, summarize the results of their examination of recursive possessives in Japanese with 29 children between the ages of 4 and 7 as follows.

Children’s responses to 1-POSS and 2-POSS sentences become adult-like in turn. Even when children’s responses to 2-POSS sentences become adult-like, their responses to 3-POSS and 4-POSS sentences are still different from adults’. Children come to give adult-like responses to 3-POSS and 4-POSS sentences almost at the same time.

⁷ n-POSS sentences/structures/constructions are those containing n POSS nodes or genitive markers such as -s.
Crucially, they found that children who could compute 3-POSS sentences had no greater difficulty computing 4-POSS sentences. This observation challenges the “incremental parsing hypothesis” according to which the more possessives that are embedded in a single phrase the more difficult that phrase’s interpretation is for the child. Furthermore, their results are incongruous with the DP substitution account because, as stated, it predicts that children who have 2-POSS representations should have 3- and 4-POSS ones as well.

Likewise, Merx (2016), finds evidence for a three-step path in an acquisition study of recursive possessives in Dutch. Recursive prepositional possessives are strongly preferred to recursive non-prepositional possessives in Dutch (and German). This is the case in these languages even though speakers thereof regularly express simple non-prepositional possesives, as seen in (6) and (11). Still, Merx found a considerable difference in the comprehensibility of 2-POSS and 3-POSS sentences, compared to the comprehensibility of 1-POSS and 2-POSS structures. Merx’s (2016) results from 32 Dutch speaking children between the ages of 4 and 6 align with Terunuma and Nakato’s (2012) results; they demonstrate that children who can process sentences with a single possessive can soon thereafter process sentences with two embedded possessives. At the same time, however, child participants across these studies found considerably more difficult 3- and 4-POSS embedding, even those who succeeded in interpreting 2-POSS structures.
Furthermore, in a production study of level-two genitives (2-POSS sentences), Gilblin, et al. (2019) obtain robust evidence that 4-year-old Mandarin speakers (n = 30, with a 79% success rate) and children speaking English 4 years of age and older (n = 25, with a 67% success rate) produce 2-POSS sentences\textsuperscript{vi}. These structures do occasionally appear in naturalistic data as well:

\(33\)\(a\) Anne's Mum's dolly  \(2;0\) anne/anne07b.cha:1499

b MOT: She could wear this jacket.
CHI: No.  \(2;3\) Valian/11b.cha:3241

CHI: It's Coby's baby's jacket.
MOT: But Coby's baby has clothes on already.
MOT: She could wear this dress.
CHI: No.
CHI: She could wear this baby's hat.

c CHI: You can't do that in my room.  \(4;3\)

Didn't you know that a boy's boy's room doesn't know any better.

MacWhinney/49b2.cha:591

Finally, recent acquisition experimentation (in particular an on-going adjective recursion study at UMass Amherst) has exposed a group of English speaking children (~4-year-

\textsuperscript{vi} Although, these authors argue against a possibility that is central to the present study, namely that 2-POSS structures might not be recursive.
olds) who understand two-level (big little box) but not three-level (little big little box) recursive adjectives, whereas other children readily comprehend three-level recursive cases.

So, evidence is mounting for a three-step acquisition path for recursive possessives. It seems to be more challenging for children to transition from 2-POSS to 3-POSS structures than it is for them to transition from 3-POSS to 4-POSS structures. That is, apparently kids who have single possessives cannot immediately jump to two-level possessives, and kids who have two-level possessives cannot immediately jump to three, but kids who have three seem to jump to four without issue. It’s also likely not the case that relations expressed in these possessive constructions are the source of the problem (Bloom et al. 1975). In all, it looks like the recognition of three-level possessive recursion is linguistically liberating for the child. So, we’re faced with the question of why recursion apparently comes along with 3-POSS sentences as opposed to 2-POSS ones. Here is a revised acquisition path:

(34) Step 1: Child has 1-POSS constructions

Step 2: Child has 2-POSS constructions

Step 3: Child can embed 2+ DPs

One proposal, articulated in Terunuma and Nakato’s 2012 paper, suggests the following revision to the DP substitution account. Recall that the possessive kid’s bike has both a generic and a regular reading. We can look to the syntax of the generic possessive, as proposed by Munn (1995) and revised in (35) below, to explain the three stages. Following Terunuma and
Nakato, “DP-possessives and NP-possessives are POSSPs with a DP projection and an NP projection respectively in their Spec”. The generic is expressed with an NP-possessive, as in (35)a, and the regular interpretation with a DP-possessive, as in (35)b.

(35)a is the generic possessive and (35)b is the regular possessive. To incorporate the new terminology: both (35)a and b are 1-POSS constructions; 2(plus)-POSS constructions may contain NP-possessives (GPs), or DP-possessives (RPs), or a combination of NP- and DP-possessives. From (35)a and b we get this possibility:
We obtain (34)b, and thereby Stage 2, on the assumption that, instead of both DP substitutions happening at once in Stage 2, at least the DP substitution inside of the POSSP is delayed. So, in review, in Stage 1 the child treats genitives like lexical possessives and takes them to be noun modifiers. In Stage 2, POSSPs are projected as NP-possessives. And finally, the recursive system is instantiated at Stage 3 once a DP is swapped for the NP inside of the possessive phrase. And, since the semantics is generic for NP-possessives and referential for DP-possessives (wherein the possessor is not itself generic), there should be observable semantic effects. Naturalistic data also motives this theory.

(36)a  *Cowboy like it cowboy's boots. Dat a cowboy boot.*  Adam, 2;7 years

*Brown/Adam/adam09.cha:1860*

b  *I'm gonna have a little kid's spoon.*  Child, 2;8

*Clark/shem20.cha:4563*
c  Want to get big girl’s ones [goggles].  Child, 2;9  
Manchester/gail/gail28b.cha:669

d  Here my doctor’s things.  Child, 3;0  
Suppes/nina45.cha:4142

e  And I said tomorrow would be kid’s day.  Child, 3;6  
Kuczaj/abe106.cha:592

f  We forgot our scientist’s hats.  Child, 3;6  
Kuczaj/abe114.cha:129

g  This is a big boy’s horsie. My horsie.  Child, 4;1  
Garvey/dontim.cha:230

h  CHI: No, that’s a dog’s house.  Child, 5;0  
INV: It’s a dog’s house?  
CHI: Yeah.  
INV: But there’s no dog.  
Fletcher/5/smma.cha:1491

i  That’s the biggest fireman’s hat I ever [saw].  Ari, 5;1  
Garvey/ariken.cha:643

The children in (36)a-i are producing unambiguous generic possessives. Consider, for instance, the first three in turn. In a, the child uses both a generic possessive and a novel
compound. In b, little kid's spoon is too long for a compound analysis. In c, we have perfect evidence for the syntactic analysis of the GP, because girl's ones involves NP anaphora for goggles, which could not happen if girl's goggles was a lexical compound. Examples c and g play off the familiar tendency of children to modify nouns with big girl's/boy's; young children think of many things as being intended for, and/or used by “big girls” and “big boys”, and they will often refer to such things using a generic possessive to convey this idea. This example set is instructive because these children fall right within the age range of those thought to be in Stage 2 of recursive possessive acquisition.

So, maybe there is a minor step on the path to acquiring recursive possessives where children impose generic readings on single embedded possessives to avoid recursion. In practice, according to this possibility, children in stage 2 would turn [Will's [kid's [bike]]] into [Will's [kid's bike]], i.e., they would interpret the bike of will's kid as will's bike for kids. This is permissible on Munn's analysis, which represents a generic possessive inside of a regular one as follows:

(37)
With the building blocks of the structure in (37), speakers can produce the full range of grammatical combinations of generic and regular possessives. For example, the derivation above permits embedded generic possessives (*kid's firefighter's helmet*), embedded generic possessives within [embedded] regular possessives (*Will's [kid's] kid's firefighter's helmet*), and regular possessives with generic possessive possessors (*kid's bike's wheel*).

On the other hand, this account predicts that regular possessors cannot appear between generic possessor-possessum pairs; i.e., speakers cannot produce *kid's Will's bike* in reference to Will's bike for kids. The unavailability of this in the syntax we've proposed is a feature thereof, because these constructions, wherein regular possessives show up below generic ones, are ungrammatical. Since DP-possessors are full DPs, this makes sense because DPs resist internal modification. Still, it is perhaps an interesting and further question what guarantees that the DP is higher than the NP in these constructions. We might also ask whether children would ever accept or produce something like *kid's Will's bike*; we predict that these structures is not available in UG and therefore that children wouldn’t at any point accept them.

4 Questions and Hypotheses

The foundational question of this study is whether English speaking children have the structure in (37). That is, we want to know first whether children have generic possessives and second whether they allow generic possessives within regular possessive constructions. We've so far reviewed evidence that suggests they have the embedded NP-possessive, but beyond
naturalistic data, the positive evidence examined thus far has been indirect. The experiment outlined and discussed below aims to provide direct evidence one way or another with respect to the availability of generic possessives inside of regular possessives in child English. A further question around which the experiment has been designed concerns how generic possessives figure in the acquisition of recursive possessives in English. This question has not been directly addressed by any experimental work in acquisition until now, and, with respect to the possibility of a three-step acquisition process for multiple embedding with regular possessives, this question is pertinent. Below, the two main questions (Qs) are listed and divided into testable sub-questions. For each (sub-)question, multiple hypotheses (Hs) are considered. We are assuming that children within the target age range have simple regular possessive constructions (we test for them in our experiment to make sure).

Q1: Do English speaking 4 to 10-year-olds have generic possessives inside of regular possessives?

Q1.1: Do English speaking 4 to 10-year-olds have generic possessives.

H1: Yes, 4 to 10-year-olds acquiring English have GPs. That is, children within this age range can represent NP-possessives. This hypothesis predicts that children will generally succeed at the simple GP control conditions.

H2: No, 4 to 10-year-olds acquiring English do not have GPs. As stated, we have reason to believe that this hypothesis is false. However, if it turns out that
children fail uniformly (by fail uniformly we mean end up at or below chance) at the simple GP control conditions, then we will have evidence that the NP-possessive is not available in their grammar at this age. A preliminary result confirming this hypothesis would also answer Q2 by showing that, because children do not have generic readings for possessives, generic possessives do not figure in the acquisition of possessive recursion.

Q1.2: Do English speaking 4 to 10-year-olds who have simple regular possessives also have non-recursive 2-POSS sentences (of the form in (37)), wherein a DP-possessive stands in relation to an NP-possessive?

H1: Yes, English speaking 4 to 10-year-olds do represent non-recursive 2-POSS structures involving the single-embedding of an NP-possessive inside of a DP-possessive. This hypothesis predicts that children will generally succeed at 2-POSS conditions involving regular and generic possessives.

H2: No, English speaking 4 to 10-year-olds do not represent 2-POSS structures involving the single-embedding of an NP-possessive inside of a DP-possessive. It’s possible that these representations are much more complex than possession with single-embedded simple NPs. Perhaps children cannot get both regular and generic readings for genitives within the same phrase. This hypothesis predicts
that children will fail uniformly at 2-POSS conditions involving regular and
generic possessives.

H3: Some children represent these structures and others do not. Assuming those
tested have simple DP-possessives, it’s not clear whether older or younger
children will be more successful at these conditions. One possibility is that older
children who already have recursive DP-possessive constructions prefer those to
constructions of this kind, and thereby perform worse on these conditions than
younger children who have not acquired recursion. The inverse is possible too:
that younger children perform worse on these conditions than older children
because they involve an additional layer of complexity that needs to be acquired.

Q2: How do generic possessives figure in the acquisition of recursive possessives?

Q2.1: Do English speaking 4 to 10-year-olds who have simple regular possessives also
have recursive 2- and 3-POSS sentences with embedded DP-possessives?

H1: Yes, English speaking 4 to 10-year-olds do represent recursive 2-POSS
structures. This hypothesis predicts that children will generally succeed at
recursive DP-possessive conditions.
H2: No, English speaking 4 to 10-year-olds do not represent recursive 2-POSS structures. This hypothesis predicts that children will fail uniformly at recursive DP-possessive conditions.

H3: Some children represent these structures and others do not. This is an expected result given the acquisition path reviewed earlier. Younger children will be less likely than older children to have acquired the mechanics of recursion with DP-possessives, and therefore younger children will generally struggle more with recursive possessive conditions than older children.

Q2.2: How do children who do not have recursive possessives represent 2-POSS structures?

H1: Children who do not have recursive possessives represent 2-POSS structures, whether they involve double embedded DP-possessives or the single embedding of an NP-possessive, as instances of single-embedding with NP-possessives. That is, children without recursion approach 2-POSS sentences assuming they involve NP- and DP-possessives and therefore no recursion. This hypothesis predicts that there will be a group of children who fail at recursion and succeed at non-recursive 2-POSS conditions involving regular and generic possessives.

H2: Children who do not have recursive possessives fail to represent 2-POSS structures. This hypothesis predicts uniform failure across 2-POSS conditions.
Our working hypothesis is first, that English speaking 4 to 10-year-olds have generic possessives within regular possessives and second, that there is a second acquisition stage prior to recursion in which children represent NP- and DP-possessives in 2-POSS structures. That is, we predict that the acquisition path for recursive possessives includes a middle step between having single- and having multiple-embedding at which point children represent 2-POSS structures without recursion by understanding them to involve DP- and NP-possessive substructures. If we find that children who do not have 3-POSS recursion represent NP- and DP-possessives in 2-POSS structures without a problem, we will have evidence for this middle stage.

5 Experiment

The present experiment builds, over the course of nine presentation slides, referents for recursive and generic possessives. These objects are then simultaneously pointed at (signalized) and referred to verbally, sometimes successfully and sometimes unsuccessfully, by the experimenter in order to test whether children have and can combine (non)embedded regular and generic possessives. Our experiment tests against the hypothesis that 4 to 10-year-old children have and can combine (non)embedded regular and generic possessives.

5.1 Participants

Five monolingual English speakers between the ages of 4 and 10 were tested. All five are included in the analysis herein. No additional data was gathered despite best efforts due to
multiple unforeseen complications caused by the transition from in-person to remote learning in the United States in March of 2020 — there was a state-wide school closure when our primary contacts for recruiting participants were a first grade teacher and an afterschool program director at Sunderland Elementary School in Amherst, MA.

5.2 Methods

This nine-slide experiment was designed with, and carried out on, Explain Everything EDU on an Apple iPad. The slides in sum form a continuous narrative about four characters and their bikes, and the script builds the narrative slide by slide to Slide 7, at which point the test questions start. Below, each slide is pictured above its corresponding script. Due to the global pandemic this year, only one participant, P1, was run in person with the iPad. The remaining four children were run remotely using webcam applications with screen share — no adjustments were made to the protocol, but remote experimentation led to minor inconsistencies in the data (which will be discussed). Whether in person or remote, the nine slide-script pairs were presented to the participants, in the order they appear next, by the experimenter. The results of each session are coded and discussed individually in section 5.3.

5.2.1 Figures and Scripts

Each of the following nine slide-script pairs is preceded by a description of its role within the wider experiment. In the scripts, bracketed material indicates non-verbal instruction, and the 6 questions labeled C by number (Cn) correspond to control questions,
while the 19 questions labeled Q by number (Qn) correspond to test questions. The test questions are examined closely in section 5.2.2.

Slide 1

Slide 1 serves foremost to establish a friendly rapport with the subject. The characters, Oscar and his kid, and Bill and his kid, are introduced in this slide and remain constant throughout the experiment. It’s important to note that they are not introduced with regular possessives but with the possessive pronoun his. The regular possessive is only used to refer to characters/objects in this experiment in control and test questions; that is, characters/objects are never referred to with regular possessives in the ongoing narrative. There are two control questions for simple regular possessives at the end.
[Start recording]

Hi, my name is [experimenter’s name]. What’s your name? It’s nice to meet you!

How old are you? Oh, so you’re in 10th grade? No!? What grade are you in then? Oh Really!?

That’s awesome! How do you like it?

Today we are going to look at some pictures together. And I’ll need your help to find stuff in the pictures okay? Great!

[While pointing from left to right at the figures] This is Oscar. Oscar has a kid; this is his kid.

This is Bill. Bill has a kid too; this is his kid.

Can you point to Oscar? Cool!

Can you point to Bill? Nice!

[If the subject mixes the characters up at any point say The way I remember their names is by remembering that O-scar is O-range and B-ill is B-lue!]

(C1) Can you point to Oscar’s Kid? Nice!

(C2) Can you point to Bill’s Kid? Sweet!

Slide 2

Slide 2 goes further in developing the narrative by placing the characters on bikes, which are the constant objects in this experiment. The image shows an adult riding a small bike and a kid riding a big bike, and vice-versa. The reason for this is that the bike are going to be established as generic kinds, and generics admit counter examples.
Oscar and Bill both really like to ride bikes, and their kids do too!

[If the subject failed the simple regular possessives, try again: Can you show me Bill? Great. Can you show me Bill’s kid? Nice. Can you show me Oscar? And can you show me Oscar’s Kid? Cool]

Do you notice anything about the bikes they are riding?

Slide 3

Slide 3 introduces the generic contrast set, which consists of a grownup’s bike and a kid’s bike, using generic language. However, these generic objects are not introduced or referenced with generic possessives at any point in the narrative; generic possessives are only used in the control and test questions. There are two control questions for simple generic possessives at the end.
You got it! There are two kinds of bikes they can have.

While pointing at the top bike and its parts as mentioned] This bike is for grownups. You can see it is tall and thin right? It has big wheels, fancy handlebars, and a tall seat. It has big pedals that make it go very fast! This kind of bike is easy for grownups to ride because it is made for them! It is hard for kids to ride because they are not big enough to ride it all the time.

While pointing at the bottom bike and its parts as mentioned] Can you guess who this bike is for? This bike is for kids! You can see it is small and strong right? It has small wheels, short handle bars, and a comfy seat. It has no bar along the top here [pointing at lack of horizontal bar connecting seatpost and handlebars], so it is easy to get onto. This kind of bike is easy for kids to ride because it is made for them! It is hard for grownups to ride because they are too big to ride it all the time.

(C3) Can you point to the kid’s bike? Nice.
And can you point to the grownup’s bike? Great!

(C4) Do you ride a bike?
Slide 4

Slide 4 establishes that Oscar owns both kinds of bikes (one that is for kids and one that is for grownups). It is important that the subject understands that Oscar (and eventually everyone) possesses both kinds of bikes. The color of each bike matches the color of its possessor. This is to make it clear which bikes belong to who.

When Oscar was young, he got two bikes, one that he could ride as a kid and one for when he grew up. Remember, this is a bike for grownups, and this is a bike for kids.

[If the subject failed at the simple generic possessives: Can you show me the kid's bike? Great. Can you show me the grownup's bike? Nice!]

Even though Oscar is a grownup now, he still has both kinds of bikes today. But guess what, Bill has two bikes as well!
Slide 5

Following Slide 4, Slide 5 establishes that Bill also owns both kinds of bikes. It also includes two comprehension questions, to make sure the participant understands that both characters own two bikes.

*Just like Oscar, when Bill was young, he got two bikes, one that he could ride as a kid and one for when he grew up.*

*Even though Bill is a grownup now, he still has both kinds of bikes today! Sometimes he even rides this bike [point to kid’s bike] because it reminds him of when he used to ride it as a kid!*

*How many bikes does Bill have?*

*And how many bikes does Oscar have? Great*
Slide 6

Slide 6, in the same way as the previous two slides, establishes that both Bill's and Oscar's kid have two bikes as well (without using regular or generic possessives in the narrative).

Bill wanted his kid to have two bikes just like he did! So, he got his kid a bike that is for kids, this one here, AND a bike that is for grownups, this one here, for when they grow up!

And you can see that Oscar got two bikes for his kid too! This one which is for kids and this one which is for when they grow up!
Slide 7

Slide 7 features all four characters and all eight bikes. Each character possesses two bikes, one that is for kids and one that is for grownups. This depicts the sharp contrasts that are central to this experiment. There is a salient contrast set of generic possessives (consisting of a kid's bike and a grownup's bike), and there is at least one salient contrast set of regular possessives (e.g., consisting of Oscar's kid and Bill's kid). Having developed them carefully, and given their equal prominence in the illustration, we can modify regular and generic possessives with the definite article the without favoring the regular possessive reading (RPs are paired with definite articles much more often than GPs are). Since every character has two bikes, it is necessary to identify any individual bike with its type. For instance, it's not enough to say Oscar's bike in reference to either of his bikes, because he has two. Rather, the situation we've developed forces specificity, such that a generic must be expressed: Oscar kid's/grownup's bike. Similarly, it's not enough to say the kid's kid's/grownup's bike in reference to any of the kids' bikes, because both Oscar and Bill have a kid. A regular possessive must be used to differentiate the two kids: Oscar's/Bill's kid. Thus, we have the appropriate ambiguity between kid's bikes. Our situation requires specification in reference to the generic and the non-generic objects. Two control and ten test questions, involving family and ownership relations expressed by regular possessives, and nominal modification expressed by generic possessives, go along with the scene.
So, look! Everyone has two bikes, one that is for kids and one that is for grownups.

(C5) Can you point to Oscar’s bikes? Nice!

(C6) Can you point to Bill’s bikes? Great!

(Q1) And can you point to Oscar’s Kid’s Bikes?

(Q2) What about Bill’s Kid’s Bikes, can you point to those? Awesome, like you can see it’s okay to point to more than one thing at a time.

Thanks for your help! Let’s figure more out!

(Q3) Oscar is looking for the bike he used to ride when he was a kid. [Pointing to Oscar’s kid’s bike] Is this Oscar’s kid’s bike? [From hereon, if the subject replies no, then ask: No, which bike is that?]

(Q4) Bill is also looking for the bike he used to ride when he was a kid. [Pointing to Bill’s grownup’s bike] Is this Bill’s kid’s bike?

(Q5) Bill’s kid wants to go for a bike ride! [Pointing to Bill’s kid’s kid’s bike] Is this Bill’s Kid’s kid’s bike?
(Q6) Oscar's kid wants to go for a bike ride too! [Pointing to Oscar's kid's bike] Is this Oscar's kid's kid's bike?

(Q7) Oscar wants to join the ride too! [Pointing to Oscar's kid's grownup's bike] Is this Oscar's grownup's bike?

(Q8) And Bill is coming too! [Pointing to Bill's grownup's bike] Is this Bill's grownups bike?

Wow, you're super helpful! I think me, Bill, and Oscar were a little confused!

(Q9) [Pointing to Oscar's kid's grownup's bike] So is this Oscar's kid's grownup's bike? Okay!

(Q10) [pointing to Bill's kid's bike] So is this Bill's kid's grownup's bike?

Slide 8

Slide 8 highlights a detail that the participant will have noticed, namely that the wheels of the bikes that the kids have are yellow. The aim of this observation is not to establish a generic wheel type (kid's wheel). Instead, the purpose here is to switch the participant's attention to the bike wheels and to break from the test questions. However, it is possible that the participant might strictly interpret kid's wheels generically following this slide and script. The presence of this possibility is important. Even though the script for Slide 8 is not designed to establish a generic like the script for Slide 3 is, if the participant understands kid's wheels generically following the narrative, then this behavior will be reflected in their responses to the questions in Slide 9.
You probably noticed that the kids had bikes with yellow wheels! This is because the kids need to be extra safe because they are new to biking. So, it's important that cars and other people can see their wheels. That's why the wheels of the bikes that kids have are yellow!

Slide 9

Slide 9, the final slide, is the same as Slide 7, except with a different set of 9 test questions, which involve family, ownership, and part-whole relations expressed by regular possessives and nominal modification expressed by generic possessives.
(Q12) Can you point to Oscar’s bikes’ wheels? Nice.

(Q12) And can you point to Bill’s bikes’ wheels? Great.

(Q13) And how about Oscar’s kid’s bikes’ wheels?

(Q14) And Bill’s kid’s bikes’ wheels. Very Good.

Now, We are still a little confused about some of these.

(Q15) [Pointing to Bill’s kid’s bike’s wheels] Are these Bill’s bike’s wheels? [From hereon, if the subject replies no, then ask: No, which wheels are those?]

(Q16) [Pointing to Bill’s grownup’s Bike’s wheels] Are these Bill’s kid’s bike’s Wheels?

(Q17) [Pointing to Oscar’s kid’s bike’s wheels] Are these Oscar’s kid’s bike’s wheels?

(Q18) [Pointing to Oscar’s kid’s grownup’s Bike’s Wheels] Are these Oscar’s kid’s grownup’s bike’s wheels?

(Q19) [Pointing to Bill’s kid’s grownup’s Bike’s Wheels] Are these Bill’s grownup’s bike’s wheels?

Okay thanks so much for all of your help! You were wonderful!
5.2.2 Test Questions

The experiment consists of 19 test questions, which can be divided into 6 picture-choice pointing tasks that test for DP-possessive recursion, and 13 yes/no truth-value judgment tasks, 8 with Slide 7 and 5 with Slide 9, that test for DP- and NP-possessive combinations. For each of the 13 yes/no questions, every negative answer is followed up with an additional question. The follow-up questions serve two functions: one, to elicit production of the target constructions, and two, to provide insight into the nature of (incorrect) interpretations on a subject by subject basis — this experiment is not a test for production, but productive data will help us judge how subjects are interpreting the possessives involved. Subjects vary in the amount of negative answers they give, meaning production data varies by subject. However, there are 6 “production targets” because there are 6 negative response targets among the truth-value judgment tasks.

There are also 6 control tests for simple NP- and DP-possessives that involve a basic, picture-choice pointing task: two in Slide 1 (DPs), two in Slide 3 (NPs), and two in slide 7 (DPs). Beyond this, a few filler and plot-related questions are asked throughout the experiment to ensure the participant stays engaged and understands the basic details of the running scenario.

The chart in this section catalogs the 19 test questions and is used in the Results section to score the participants. A majority of the test questions were yes/no truth-value judgment tasks that involved acts of pointing and questioning, and sometimes correcting. For every such question, a bike (or a pair of wheels) is pointed at (signalized) by the experimenter who then
asks the subject, *Is this (are these) [possessive]?* where [possessive] can be any regular or generic possessive that refers to a bike (or pair of wheels) in the picture, and sometimes the referents match and call for a *yes* response and sometimes they don’t match and therefore call for a *no* response. Whenever the response is *no*, the experimenter asks the subject to correct them and says *No, which bike is that?*

To illustrate, for question 7 the experimenter points to Oscar’s kid’s grownup’s bike and asks *is this Oscar’s kid’s bike.* If the participant says *no*, then the experimenter follows up *No, which bike is that?* So, the subject’s task is complex in that it requires them to map the linguistic structure of the verbalized regular/generic possessive onto an object that can be expressed with either a regular or a generic possessive (all of the objects can be labeled generically or referentially) and to judge whether the mapping succeeds or fails.

The syntactic structures of the signalized and verbalized referents are defined in the chart using bracketed DPs and NPs, where DP stands for the regular (DP-)possessive and NP for the generic (NP-)possessive.

The type of each of the 19 questions is determined by the syntactic structure of the possessive that is verbalized by the experimenter and not by the possible syntactic structure of the object that is signalized by the experimenter. The reason for this is that we are looking to see what children will allow possessive utterances to refer to; for any case, we want to know whether children will allow the possessive we utter to refer to the object we point to. Primarily,
we want to know whether possessives can refer to kinds as well as to particulars. In this respect, it's the utterances that matter.

Consider question 3, where the experimenter asks *Is this Oscar's kid's bike?* while pointing at Oscar's (generic) kid's bike. That utterance might involve either a generic or a regular possessive, so it's not initially obvious how we should label and score the question, for its technically not wrong if the child says *no*, it just means they are taking the uttered possessive to be regular and not generic. However, this question has been marked [DP [NP]] because we are testing to see what possessives are licit in the child's grammar, so, insofar as the generic possessive can apply to the object that is being pointed at, it will apply if the child has the relevant reading of the possessive (in this case the generic one). In other words, if the experimenter asks of an object if it's a *kid's bike*, whether the object is a bike that is for kids or a bike that belongs to a kid, the participant will say *yes* if they have a grammar which allows regular and generic possessives.

To summarize, in pointing to object *x* and asking *Is this y*, where *y* is a possessive phrase that involves DP- and NP-possession, we are finding out if the child has a reading for *y* according to which it refers to *x*. And, we are labeling the questions based on the structure of *y*, because, insofar as *y* can apply to *x* it will apply to *x* on the assumption that the child has the relevant possessive readings. So, when the child judges that *y* doesn't refer to *x* when in fact it can, or, when the child judges that *y* does refer to *x* when in fact it can't, we can discern what
referents they accept for \(y\) and thereby whether they (dis)allow regular and/or generic possessives.

Among the test questions, there are 5 \([\text{DP} \ [\text{DP}]\)] and 2 \([\text{DP} \ [\text{DP}[\text{DP}]]\) questions, both of which involve recursive regular possessives. There are 4 \([\text{DP} \ [\text{NP}]\)] questions, which take the non-recursive form in (37), wherein an NP is embedded in a DP. There are 4 \([\text{DP} \ [\text{DP} \ [\text{NP}]\)]\) questions, which involve recursion with DP possessives plus the embedding of a generic possessive (e.g., \textit{Oliver's kid's kid's bike}). And there are 3 \([\text{DP} \ [(\text{NP}) \ \text{DP}]\)] and 1 \([\text{DP} \ [\text{DP} \ [(\text{NP}) \ \text{DP}]\)]\) questions, wherein \((\text{NP}) \ \text{DP}\) signifies structures like \textit{kid's bike's wheels} where an NP-possessive \textit{(kid's bike)} functions as the possessor in a DP-possessive \textit{(kid's bike's wheels)}. Thus, the \([\text{DP} \ [\text{DP} \ [(\text{NP}) \ \text{DP}]\)]\) question is \textit{Are these Oscar's kid's grownup's bike's wheels?} To succeed at these questions, subjects will have to assign regular and generic readings to possessives within single phrases. Allowing the possessive to refer to both a generic kind and a particular possessed entity within the same phrase is strong evidence that both readings are available.

The chart includes all 19 test questions, 6 of which (1, 2, 11, 12, 13, and 14) are picture-choice tasks involving DP recursion, and 13 of which are yes/no truth value judgments involving DP- and NP-possessives. The questions are numbered in the first column, which is also where the object that is pointed at is indicated. The question that is asked is indicated in the second column (the structure of the question is determined by the structure of the possessive in this verbalized column). The task for the child is to figure out for each row, whether the structure in
column two refers to the object in column one. The target response is indicated in the third column (where $Y$ stands for yes and $N$ for no). And, the target production is indicated in the fourth column, but production is only elicited when there is a no response.

Test Questions

<table>
<thead>
<tr>
<th>Test Question Number</th>
<th>Question Asked</th>
<th>Target Response</th>
<th>Target Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Signalized</td>
<td>For 3-10: Is this... For 15-19: Are these...</td>
<td>Oscar's kid's bikes</td>
<td>For 3-10: No, which bike is that? For 15-19: No, which wheels are those?</td>
</tr>
<tr>
<td>Slide 7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Can you point to Oscar's kid's bikes [DP [DP]]</td>
<td>Oscar's kid's bikes</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Can you point to Bill's kid's bikes [DP [DP]]</td>
<td>Bill's kid's bikes</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Oscar's kid's bike [DP [NP]]</td>
<td>$Y$</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bill's grownup's bike [DP [NP]]</td>
<td>$N$</td>
<td>Bill's grownup's bike [DP [NP]]</td>
</tr>
<tr>
<td>5</td>
<td>Bill's kid's kid's bike [DP [DP [NP]]]</td>
<td>$Y$</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Oscar's kid's bike [DP [NP]]</td>
<td>$N$</td>
<td>Oscar's kid's bike [DP [NP]]</td>
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<td>7</td>
<td>Oscar's kid's grownup's bike [DP [NP]]</td>
<td>Oscar's grownup's bike [DP [NP]]</td>
<td>N</td>
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<tr>
<td>8</td>
<td>Bill's grownup's bike [DP [NP]]</td>
<td>Bill's grownup's bike [DP [NP]]</td>
<td>Y</td>
</tr>
<tr>
<td>9</td>
<td>Oscar's kid's grownup's bike [DP [DP [NP]]]</td>
<td>Oscar's kid's grownup's bike [DP [DP [NP]]]</td>
<td>Y</td>
</tr>
<tr>
<td>10</td>
<td>Bill's kid's bike [DP [NP]]</td>
<td>Bill's kid's grownup's bike [DP [DP [NP]]]</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Slide 9</td>
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<tr>
<td>11</td>
<td>Can you point to Oscar's bikes' wheels [DP [DP]]</td>
<td>Oscar's bikes' wheels</td>
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<td>12</td>
<td>Can you point to Bill's bikes' wheels [DP [DP]]</td>
<td>Bill's bikes' wheels</td>
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<tr>
<td>13</td>
<td>Can you point to Oscar's kid's bikes' wheels [DP [DP [DP]]]</td>
<td>Oscar's kid's bikes' wheels</td>
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<tr>
<td>14</td>
<td>Can you point to Bill's kid's bikes' wheels [DP [DP [DP]]]</td>
<td>Bill's kid's bikes' wheels</td>
<td></td>
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<tr>
<td>15</td>
<td>Bill's kid's bike's wheels [DP [DP]]</td>
<td>Bill's bike's wheels [DP [DP]]</td>
<td>Y</td>
</tr>
</tbody>
</table>
In summary, the aim of this experiment is to figure out two things, one, whether English speaking 4 to 10-year-olds have generic possessives and can handle them in complex possessive phrases and two, if they do, how generic possessives figure in the acquisition of recursive DP-possessives in English. We want to see if this group of children can manage recursive and nonrecursive sentences involving both kinds of possessives. We've designed the experiment around a yes/no truth-value judgement task because that is “the most appropriate method when the theoretical question under investigation is which possible sentence interpretations children will allow” (e.g., we want to find out whether kid's bike can have a generic referent in Oscar's kid's bike) (Ambridge and Rowland 2013). So, if children uniformly respond no when asked if Oscar's bike for kids is Oscar's kid's bike, then our data will support the
claim that children do not have embedded NP-possessives. Additionally, all six picture-choice conditions involve DP-possessive recursion (four double DP-possessives and two triple DP-possessives) and for each there are appropriate alternatives to the target. For instance, when asked to point to Oscar’s kid’s bikes, the child has the option of pointing to the recursive target, or of avoiding recursion in either of the two common ways (Roeper 2011): by dropping a possessive and pointing to Oscar’s bikes, or by going for the conjoined reading and pointing to Oscar’s and kid’s bikes. The data from these yes/no and picture-choice conditions will need to be reviewed on a subject by subject basis to see first whether children have both readings and second whether those who do not have DP-possessive recursion comprehend 2-POSS structures involving regular and generic readings.

5.3 Results and Discussion

In this subsection, the responses are tabulated and discussed first by participant, and then collectively.

The table below is the same as the one above, except that column four indicates the participant’s responses (where correct responses are highlighted), and column six indicates the participant’s production. A response is judged correct if it matches the target response, which is determined on the assumption that possessives can be both generic and regular. A subject “succeeds at” a question when their response is correct. The target response is yes whenever the uttered possessive can refer to the signalized one (as a combination of regular and generic possessives), and no whenever it cannot.
For some participants, there are responses marked n/a. n/a marks a skipped question. The vast majority of these marks were in picture-choice pointing tasks. To point remotely, the participant needed to annotate the shared screen, and this didn’t always work as planned despite having taught each participant how to annotate. So, when a participant couldn’t point, the question was skipped. There are a few yes/no truth-value judgment questions that are marked n/a, which were skipped either by mistake, or because of a technical difficulty or an interruption on the subject’s end.

We will judge whether a participant has generic and regular readings and can handle them within the same phrase-structure on an individual basis. Generally, if a participant scores above chance on the control and test questions, we will be able to say that they have both possessives and can manage their combination in single phrases. Because, if a subject does not have one of the possessive readings, then anytime a possessive successfully refers on the reading they deem illicit, they will deny the reference and in so doing be marked wrong, because for every question the target answer is yes whenever the utterance refers, on a generic and/or regular reading of the possessive(s) involved, to the signalized object. We suspect that the children will have both kinds of possessives and the structures that handle their combination.

Recall that the generic (and regular) possessive is not used to introduce or describe objects in the narrative; it is only used in the control and test questions. Additionally, note that in the experiment the definite article the is used in making reference to various generics,
whereas the indefinite article a is much more often paired with generic possessives whenever they appear in English. So, we can be confident that the subject has a generic reading for possessives if, despite these factors, they accept utterances involving generic possession as referring to kinds of bikes and not just persons’ bikes.

The production task is for the subject to correct the experimenter whenever the subject thinks the experimenter’s utterance fails to refer to the object that’s signalized. The production data will inform our judgments about the referents that individual children have for possessives, because it will require contrasting the uttered possessive with some phrase that they think correctly picks out the signalized object. If the subject has the generic interpretation of the possessive, it will be obvious in the production data because they will sometimes contrast kid’s bike with grownup’s bike, whereas if they don’t have the generic interpretation, they will only contrast kid’s bike with Oscar’s (kid’s)/Bill’s (kid’s) bike. For example, in question 4 the experimenter points at Bill’s grownup’s bike and asks Is this Bill’s kid’s bike. If the child has the generic reading of kid’s bike, they will say something like no, that’s his grownup’s bike, whereas if the child doesn’t have the generic reading, they will say no, that’s his bike.

<table>
<thead>
<tr>
<th>Participant 1; 7-year-old</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Question Number</td>
</tr>
<tr>
<td>Object Signalized For 3-10: [pointing at a bike]</td>
</tr>
<tr>
<td>Slide 7</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>1 Can you point to...</td>
</tr>
<tr>
<td>2 Can you point to...</td>
</tr>
<tr>
<td>3 Oscar’s kid’s bike [DP [NP]]</td>
</tr>
<tr>
<td>4 Bill’s grownup’s bike [DP [NP]]</td>
</tr>
<tr>
<td>5 Bill’s kid’s kid’s bike [DP [NP]]</td>
</tr>
<tr>
<td>6 Oscar’s kid’s bike [DP [NP]]</td>
</tr>
<tr>
<td>7 Oscar’s kid’s grownup’s bike [DP [NP]]</td>
</tr>
<tr>
<td>8 Bill’s grownup’s bike [DP [NP]]</td>
</tr>
<tr>
<td>9 Oscar’s kid’s grownup’s bike [DP [NP]]</td>
</tr>
<tr>
<td>Slide 9</td>
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<tr>
<td>11</td>
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<td>13</td>
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<td>15</td>
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<td>16</td>
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<tr>
<td>17</td>
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<tr>
<td>18</td>
</tr>
</tbody>
</table>
Participant 1 (P1) of age 7 got all comprehension questions correct, so we can conclude that they followed the pragmatics. They scored perfectly on the control conditions, pointing correctly to 2/2 generic possessives and 4/4 regular possessives. They also scored perfectly on the 2-POSS DP-recursion conditions, pointing correctly to 5/5, and on the 3-POSS DP-recursion conditions, pointing correctly to 2/2. So, we can conclude that they can comprehend recursive possessives.

P1 answered correctly 3/4 for the [DP [NP]] conditions, and 4/4 for the [DP [DP [NP]]] conditions. Their single “error” was a result of the ambiguity between the regular and generic readings of question 3 (Q3). Based on their productive response, they interpreted the second possessor in Q3 to be regular, and therefore took kid’s to be referential and not type-denoting. Across these conditions they produced both [DP [NP]] and [DP [DP [NP]]] sentences, except turned the NP-possessive grownup’s bike into the compound grownup bike in 4 and 7. P1 produced a generic possessive in 6.

<table>
<thead>
<tr>
<th>grownup's bike's wheels [DP [DP [(NP) DP]]]</th>
<th>bike's wheels [DP [DP [(NP) DP]]]</th>
<th>N</th>
<th>N</th>
<th>Those are Bill's kid's grownup bike wheels</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 Bill's kid's grownup's bike's wheels [DP [DP [(NP) DP]]]</td>
<td>Bill's grownup's bike's wheels [DP [(NP) DP]]</td>
<td>N</td>
<td>N</td>
<td>Bill's kid's grownup's bike's wheels [DP [DP [(NP) DP]]]</td>
</tr>
</tbody>
</table>
P1 answered 2/3 correctly for the [DP [(NP) DP]] conditions and 1/1 correctly for the [DP [DP [(NP) DP]]] condition. Their single “error” was, similar to last time, the result of an ambiguity. They understood the utterance in question 17 to involve a three-level recursive DP-possession, as opposed to having the [DP [(NP) DP]] structure. In production, they reproduced the possessive in the question but added stress on kid’s in an effort to contrast the generic possessor kid’s and the regular possessor kid’s. In production, they resorted to compounding grownup’s bike and bike’s wheel, producing instead grownup bike and bike wheel, and in question 19, Those are Bill’s kid’s grownup bike wheels.

Overall, P1 scored 17/19 (90%), and from that score in combination with their productive responses, we can be confident that they have both regular and generic readings for possessives, and that they can manage phrases which include both.

Participant 2; 7-year-old

<table>
<thead>
<tr>
<th>Test Question Number</th>
<th>Question Asked</th>
<th>Target Response</th>
<th>Target Production</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Signalized</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For 3-10: [pointing at a bike]</td>
<td>For 15-19: Are these...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slide 7</td>
<td>Can you point to Oscar’s kid’s bikes [DP [DP]]</td>
<td>O’s kid’s bikes</td>
<td>n/a</td>
<td></td>
</tr>
</tbody>
</table>

161
<p>| 2 | Can you point to Bill's kid's bikes [DP [DP]] | B's kid's bikes | B's kid's bikes |   |
| 3 | Oscar's kid's bike [DP [NP]] | Y | N | His bike |
| 4 | Bill's grownup's bike [DP [NP]] | N | N | Bill's grownup's bike [DP [NP]] |
| 5 | Bill's kid's kid's bike [DP [DP [NP]]] | Y | Y |   |
| 6 | Oscar's kid's bike [DP [NP]] | N | N | Oscar's kid's bike [DP [NP]] |
| 7 | Oscar's kid's grownup's bike [DP [NP]] | N | N | Oscar's kid's grown-up's bike [DP [NP]] |
| 8 | Bill's grownup's bike [DP [NP]] | Y | n/a |   |
| 9 | Oscar's kid's grownup's bike [DP [NP]] | Y | Y |   |
| 10 | Bill's kid's bike [DP [NP]] | N | N | Bill's kid's bike [DP [NP]] |
| Slide 9 |   |   |   |   |
| 11 | Can you point to Oscar's bikes' wheels [DP [DP]] | O's bikes' wheels | O's bikes' wheels |   |
| 12 | Can you point to Bill's | B's | n/a |   |</p>
<table>
<thead>
<tr>
<th></th>
<th>bikes' wheels [DP [DP]]</th>
<th>bikes' wheels</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Can you point to Oscar's kid's bikes' wheels [DP [DP [DP]]]</td>
<td>O's kid's bikes' wheels</td>
<td>n/a</td>
</tr>
<tr>
<td>14</td>
<td>Can you point to Bill's kid's bikes' wheels [DP [DP [DP]]]</td>
<td>B's kid's bikes' wheels</td>
<td>B's kid's bikes' wheels</td>
</tr>
<tr>
<td>15</td>
<td>Bill's kid's bike's wheels [DP [(NP) DP]]</td>
<td>Bill's bike's wheels [DP [DP]]</td>
<td>Y</td>
</tr>
<tr>
<td>16</td>
<td>Bill's grownup's bike's wheels [DP [(NP) DP]]</td>
<td>Bill's kid's bike's wheels [DP [(NP) DP]]</td>
<td>N</td>
</tr>
<tr>
<td>17</td>
<td>Oscar's kid's bike's wheels [DP [(NP) DP]]</td>
<td>Oscar's kid's bike's wheels [DP [(NP) DP]]</td>
<td>Y</td>
</tr>
<tr>
<td>18</td>
<td>Oscar's kid's grownup's bike's wheels [DP [DP [(NP) DP]]]</td>
<td>Oscar's kid's grownup's bike's wheels [DP [DP [(NP) DP]]]</td>
<td>Y</td>
</tr>
<tr>
<td>19</td>
<td>Bill's kid's grownup's bike's wheels [DP [DP [(NP) DP]]]</td>
<td>Bill's grownup's bike's wheels [DP [(NP) DP]]</td>
<td>N</td>
</tr>
</tbody>
</table>
Participant 2 (P2) of age 7 got all comprehension questions correct, so we can conclude that they followed the pragmatics. They scored perfectly on the control conditions, pointing correctly to 2/2 generic possessives and 4/4 regular possessives. They also scored perfectly on the 2-POSS DP-recursion conditions, pointing correctly to 2/2, and on the 3-POSS DP-recursion conditions, pointing correctly to 1/1. So, we can conclude that they can comprehend recursive possessives.

P2 answered correctly 2/3 for the [DP [NP]] conditions, and 4/4 for the [DP [DP [NP]]] conditions. They also answered 2/3 correctly for the [DP [(NP) DP]] conditions but failed at the [DP [DP [(NP) DP]]] condition.

Despite answering 11/14 (79%) questions correctly and succeeding at the control conditions, a careful look at the production data suggests that P2 prefers the regular reading of kid’s bike to the generic reading. They never contrast kid’s bike with grownup’s bike in production; they always contrast kid’s with his where his refers to Oscar or Bill, suggesting an understanding of kid’s that is referential and not generic (see questions 3, 4, 10, 16 and 17). We cannot conclude that that P2 doesn’t have the generic interpretation, though. For one thing, they succeeded at the simple generic possessive controls (in Slide 3), and they accept structures like Oscar’s kid’s grownup’s bike (Q9), and Bill’s kid’s kid’s bike (Q5). Furthermore, it’s possible that in question 18 P2 produced a generic: They are the kid’s bike wheels, where bike wheels is a generic compound and kid’s bike wheels are the bike wheels that are for kid’s (the yellow ones). In this case, they would
have understood *grownup's bike's wheels* in the question as referring generically to the bike wheels for grownups (the non-yellow ones), as opposed to the generic grownup's bike.

Participant 3; 4-year-old

<table>
<thead>
<tr>
<th>Test Question Number</th>
<th>Object Signalized</th>
<th>Question Asked For 3-10: <em>Is this...</em> For 15-19: <em>Are these...</em></th>
<th>Target Response</th>
<th>Response</th>
<th>Target Production For 3-10: <em>No, which bike is that?</em> For 15-19: <em>No, which wheels are those?</em></th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Can you point to Oscar's kid's bikes [DP [DP]]</td>
<td>Oscar's kid's bike [DP [NP]]</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Can you point to Bill's kid's bikes [DP [DP]]</td>
<td>Bill's kid's bike [DP [NP]]</td>
<td>N</td>
<td>N</td>
<td>Bill's grownup's bike [DP [NP]] That one's when he grows up</td>
<td></td>
</tr>
<tr>
<td>3 Oscar's kid's bike [DP [NP]]</td>
<td></td>
<td>Oscar's kid's bike [DP [NP]]</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Bill's grownup's bike [DP [NP]]</td>
<td></td>
<td>Bill's kid's bike [DP [NP]]</td>
<td>N</td>
<td>N</td>
<td>Bill's grownup's bike [DP [NP]] That one's when he grows up</td>
<td></td>
</tr>
<tr>
<td>5 Bill's kid's kid's bike [DP [NP]]</td>
<td></td>
<td>Bill's kid's kid's bike [DP [DP [NP]]]</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Oscar's kid's bike [DP [NP]]</td>
<td></td>
<td>Oscar's kid's bike [DP [NP]]</td>
<td>N</td>
<td>N</td>
<td>Oscar's kid's bike [DP [NP]] [no response]</td>
<td></td>
</tr>
<tr>
<td>7 Oscar's kid's</td>
<td>Oscar's grownup's bike</td>
<td>N</td>
<td>Y</td>
<td>Oscar's kid's</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Bill's grownup's bike [DP [NP]]</td>
<td>Bill's grownup's bike [DP [NP]]</td>
<td>Y</td>
<td></td>
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</tr>
<tr>
<td>9 Oscar's kid's grownup's bike [DP [NP]]</td>
<td>Oscar's kid's grownup's bike [DP [NP]]</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Bill's kid's bike [DP [NP]]</td>
<td>Bill's kid's grownup's bike [DP [NP]]</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Slide 9</td>
<td></td>
<td></td>
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<tr>
<td>11</td>
<td>Can you point to Oscar's bikes' wheels [DP [DP]]</td>
<td>O's bikes' wheels</td>
<td>O's kid's bikes' wheels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Can you point to Bill's bikes' wheels [DP [DP]]</td>
<td>B's bikes' wheels</td>
<td>B's Kid's Bikes' wheels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Can you point to Oscar's kid's bikes' wheels [DP [DP]]</td>
<td>O's kid's bikes' wheels</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Can you point to Bill's kid's bikes' wheels [DP [DP]]</td>
<td>B's kid's bikes' wheels</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Bill's kid's bike's wheels</td>
<td>Bill's bike's wheels [DP [DP]]</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
P3 of age 4 answered all of the plot comprehension questions correctly, which suggests they followed along. They scored 2/2 on the simple generic possessive controls, and 2/4 on the simple regular possessive controls. This subject mixed up Oscar with his kid and Bill with his kid on two occasions, both times before a set of test questions though, so they were reminded each time who was who and then asked to point to the characters in order to make sure that they understood before the set of test questions was asked. This confusion first happened on Slide 7: in the two control questions they failed (C5 and C6), P3 pointed at Oscar's kid's bikes when asked *can you point to Oscar's bikes*, and at Bill's kid's bikes when asked *can you point to Bill's bikes*. The second time this (same error) happened was in questions 11 and 12. Again, both times
they were corrected and re-tested to make sure they had the characters sorted out before the test questions were asked.

P3 scored 3/4 on [DP [NP]] conditions, and 4/4 on [DP [DP [NP]]] conditions. They scored 2/3 on the [DP [(NP) DP]] conditions and 1/1 on the [DP [DP [(NP) DP]]] condition. In all, they got 11/15 (73%) correct, with 2 of 4 errors coming from the confusion between characters. In production they contrasted kid’s with grownup (questions 4 and 16), and also corrected the bike type in question 10. We can conclude from this that P3 has both readings for the possessive, and that they can handle phrases that include both. Despite technical difficulties with picture-choice pointing, we can say also that P3 has recursive DP-possessives based on their success at questions 6, 9, 10, and 15.

Participant 4; 6-year-old

<table>
<thead>
<tr>
<th>Test Question Number</th>
<th>Question Asked</th>
<th>Target Response</th>
<th>Respose</th>
<th>Target Production</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Signalized</td>
<td>For 3-10: [pointing at a bike] For 15-19: [pointing at a bike’s wheels]</td>
<td>For 3-10: Is this... For 15-19: Are these...</td>
<td>Target Respose</td>
<td>For 3-10: No, which bike is that? For 15-19: No, which wheels are those?</td>
<td>Production</td>
</tr>
<tr>
<td>Slide 7</td>
<td>Can you point to Oscar’s kid’s bikes [DP [DP]]</td>
<td>O’s kid’s bikes</td>
<td>O’s kid’s bikes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1</td>
<td>Can you point to Bill’s B’s</td>
<td>B’s</td>
<td>B’s</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Kid's bikes</td>
<td>Kid's bikes</td>
<td>Kid's bikes</td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>Oscar's kid's bike [DP [NP]]</td>
<td>Oscar's kid's bike [DP [NP]]</td>
<td>Y</td>
<td>N</td>
<td>Oscar's bike</td>
</tr>
<tr>
<td>4</td>
<td>Bill's kid's bike [DP [NP]]</td>
<td>Bill's kid's bike [DP [NP]]</td>
<td>N</td>
<td>N</td>
<td>Bill's grownup's bike [DP [NP]]</td>
</tr>
<tr>
<td>5</td>
<td>Bill's kid's kid's bike [DP [DP [NP]]]</td>
<td>Bill's kid's kid's bike [DP [DP [NP]]]</td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Oscar's kid's bike [DP [NP]]</td>
<td>Oscar's kid's kid's bike [DP [DP [NP]]]</td>
<td>N</td>
<td>N</td>
<td>Oscar's kid's bike [DP [NP]]</td>
</tr>
<tr>
<td>7</td>
<td>Oscar's kid's grownup's bike [DP [DP [NP]]]</td>
<td>Oscar's grownup's bike [DP [NP]]</td>
<td>N</td>
<td>N</td>
<td>Oscar's kid's grown-up's bike [DP [DP [NP]]]</td>
</tr>
<tr>
<td>8</td>
<td>Bill's grownup's bike [DP [NP]]</td>
<td>Bill's grownup's bike [DP [NP]]</td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Oscar's kid's grownup's bike [DP [DP [NP]]]</td>
<td>Oscar's kid's grownup's bike [DP [DP [NP]]]</td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Bill's kid's bike [DP [NP]]</td>
<td>Bill's kid's grownup's bike [DP [DP [NP]]]</td>
<td>N</td>
<td>N</td>
<td>Bill's kid's bike [DP [NP]]</td>
</tr>
<tr>
<td>Slide 9</td>
<td></td>
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<td></td>
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<tr>
<td>11</td>
<td>Can you point to Oscar's bikes' wheels [DP [DP]]</td>
<td>O's bikes' wheels</td>
<td>O's bikes' wheels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Can you point to Bill's bikes' wheels</td>
<td>B's bikes'</td>
<td>n/a</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[DP [DP]]</td>
<td>wheels</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>13</td>
<td><em>Can you point to Oscar’s kid’s bikes’ wheels [DP [DP [DP]]]</em></td>
<td>O’s kid’s bikes’ wheels</td>
<td>n/a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td><em>Can you point to Bill’s kid’s bikes’ wheels [DP [DP [DP]]]</em></td>
<td>B’s kid’s bikes’ wheels</td>
<td>B’s kid’s bikes’ wheels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Bill’s kid’s bike’s wheels [DP [(NP) DP]]</td>
<td><em>Bill’s bike’s wheels [DP [DP]]</em></td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Bill’s grownup’s bike’s wheels [DP [(NP) DP]]</td>
<td><em>Bill’s kid’s bike’s wheels [DP [(NP) DP]]</em></td>
<td>N</td>
<td>N</td>
<td><em>Bill’s grownup’s bike’s wheels [DP [(NP) DP]]</em></td>
<td>They are his big kid bike wheels</td>
</tr>
<tr>
<td>17 Oscar’s kid’s bike’s wheels [DP [(NP) DP]]</td>
<td><em>Oscar’s kid’s bike’s wheels [DP [(NP) DP]]</em></td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Oscar’s kid’s grownup’s bike’s wheels [DP [DP [(NP) DP]]]</td>
<td><em>Oscar’s kid’s grownup’s bike’s wheels [DP [DP [(NP) DP]]]</em></td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Bill’s kid’s grownup’s bike’s wheels [DP [DP [(NP) DP]]]</td>
<td><em>Bill’s grownup’s bike’s wheels [DP [(NP) DP]]</em></td>
<td>N</td>
<td>N</td>
<td><em>Bill’s kid’s grownup’s bike’s wheels [DP [DP [(NP) DP]]]</em></td>
<td>His kid’s big kid bike</td>
</tr>
</tbody>
</table>

P4 of age 6 answered all comprehension and control questions correctly. They scored 5/5 on DP recursion conditions. They scored 3/4 on [DP [NP]] conditions and 4/4 on [DP [DP [NP]]]
conditions. They also scored 3/3 on [DP [(NP) DP]] conditions and 1/1 on the [DP [DP [(NP) DP]]] condition. Their single “error” was a result of the ambiguity between the regular and generic readings of question 3. Based on their productive response, they interpreted the second possessor in Q3 to be regular, and therefore took kid’s to be referring to a person and not denoting a type. However, numerous productive responses (e.g., in questions 4, 6, and 10) draw a contrast within the generic set. P4 scored 16/17 (94%) in total.

Overall, it’s clear from P4’s picture-choice pointing answers that they have recursive DP-possessives, and it’s clear from their success at the yes/no truth value tasks and productive responses that they have both kinds of possessives and can handle phrases which include both.

Participant 5; 10-year-old

<table>
<thead>
<tr>
<th>Test Question Number</th>
<th>Question Asked For 3-10: Is this...</th>
<th>Target Response</th>
<th>Response</th>
<th>Target Production For 3-10: No, which bike is that? For 15-19: No, which wheels are those?</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Signalized</td>
<td>For 3-10: [pointing at a bike]</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>For 15-19: [pointing at a bike's wheels]</td>
<td></td>
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<td></td>
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<tr>
<td>Slide 7</td>
<td>Can you point to Oscar's kid's bikes [DP [DP]]</td>
<td>O's kid's bikes</td>
<td>O's kid's bikes</td>
<td>Can you point to Bill's kid's bikes [DP [DP]]</td>
<td>B's kid's bikes</td>
</tr>
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171
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<tr>
<td>3 Oscar's kid's bike [DP [NP]]</td>
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<td></td>
<td>Y</td>
<td>N</td>
<td>It's Oscar's</td>
<td></td>
<td></td>
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<tr>
<td>4 Bill's grownup's bike [DP [NP]]</td>
<td>Bill's kid's bike [DP [NP]]</td>
<td></td>
<td>N</td>
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<td>Bill's grownup's bike [DP [NP]]</td>
<td>The grownup bike</td>
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<td>5 Bill's kid's kid's bike [DP [DP [NP]]]</td>
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<td></td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>6 Oscar's kid's bike [DP [NP]]</td>
<td>Oscar's kid's kid's bike [DP [DP [NP]]]</td>
<td></td>
<td>N</td>
<td>N</td>
<td>Oscar's kid's bike [DP [NP]]</td>
<td>Oscar's kid's bike</td>
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<td>7 Oscar's kid's grownup's bike [DP [DP [NP]]]</td>
<td>Oscar's grownup's bike [DP [NP]]</td>
<td></td>
<td>N</td>
<td>N</td>
<td>Oscar's kid's grownup's bike [DP [NP]]</td>
<td>Oscar's kid's grownup bike</td>
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<tr>
<td>8 Bill's grownup's bike [DP [NP]]</td>
<td>Bill's grownup's bike [DP [NP]]</td>
<td></td>
<td>Y</td>
<td>Y</td>
<td></td>
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<tr>
<td>9 Oscar's kid's grownup's bike [DP [DP [NP]]]</td>
<td>Oscar's kid's grownup's bike [DP [DP [NP]]]</td>
<td></td>
<td>Y</td>
<td>n/a</td>
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<td>10 Bill's kid's bike [DP [NP]]</td>
<td>Bill's kid's grownup's bike [DP [DP [NP]]]</td>
<td></td>
<td>N</td>
<td>Y</td>
<td>Bill's kid's bike [DP [NP]]</td>
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<tr>
<td>11</td>
<td>Can you point to Oscar's bikes' wheels [DP [DP]]</td>
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<td>O's bikes' wheels</td>
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<td>O's bikes' wheels</td>
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<tr>
<td>12</td>
<td>Can you point to Bill's bikes' wheels [DP [DP]]</td>
<td></td>
<td>B's bikes' wheels</td>
<td></td>
<td>B's bikes' wheel</td>
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<tr>
<td></td>
<td>Can you point to Oscar's kid's bikes' wheels [DP [DP [DP]]]</td>
<td>O's kid's bikes' wheels</td>
<td>O's kid's bikes' wheels</td>
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<tr>
<td>13</td>
<td>Can you point to Bill's kid's bikes' wheels [DP [DP [DP]]]</td>
<td>B's kid's bikes' wheels</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>14</td>
<td>Bill's kid's bike's wheels [DP [(NP) DP]]</td>
<td>Bill's bike's wheels [DP [DP]]</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>15</td>
<td>Bill's grownup's bike's wheels [DP [(NP) DP]]</td>
<td>Bill's kid's bike's wheels [DP [[NP) DP]]</td>
<td>N</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Bill's grownup's bike's wheels [DP [(NP) DP]]</td>
<td>Oscar's kid's bike's wheels [DP [(NP) DP]]</td>
<td>Y</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Oscar's kid's bike's wheels [DP [(NP) DP]]</td>
<td>Oscar's kid's bike's wheels [DP [(NP) DP]]</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Oscar's kid's grownup's bike's wheels [DP [DP [(NP) DP]]]</td>
<td>Oscar's kid's grownup's bike's wheels [DP [DP [(NP) DP]]]</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Bill's kid's grownup's bike's wheels [DP [DP [(NP) DP]]]</td>
<td>Bill's grownup's bike's wheels [DP [DP [(NP) DP]]]</td>
<td>N</td>
<td>N</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Bill's kid's grownup's bike wheels</td>
<td>Bill's kid's grownup's bike's wheels [DP [DP [(NP) DP]]]</td>
<td></td>
<td>Bill's kid's grownup bike wheels</td>
<td></td>
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</tbody>
</table>
Participant 5 of age 10 got all comprehension questions correct, so we can conclude that they followed the pragmatics. They scored perfectly on the control conditions, pointing correctly to 2/2 generic possessives and 4/4 regular possessives. They also scored perfectly on the 2-POSS DP-recursion conditions, pointing correctly to 5/5, and on the 3-POSS DP-recursion conditions, pointing correctly to 1/1. So, we can conclude that they can comprehend recursive possessives.

P5 answered correctly 3/4 for the [DP [NP]] conditions, and 2/3 for the [DP [DP [NP]]] conditions. Their [DP [DP]] “error” was a result of the ambiguity between the regular and generic readings of question 3. Based on their productive response, like three others, they interpreted the second possessor in Q3 to be regular, and therefore took kid’s to be referential and not type-denoting. P5 correctly answered 2/2 [DP [(NP) DP]] and 1/1 [DP [DP [(NP) DP]]] conditions.

In total, P5 scored 14/16 (88% correct), and they produced both generic compounds and generic possessives. We can conclude from their data that P5 has both possessive interpretations and can combine them in complex phrases.

Now, we can quantify the combined results. In the fourth column of the chart below, the total number of times each question is asked, which is once or less per participant, so no more than 5, is divided by the total number of target responses recorded for that question.
All Participants

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Object Signalized</th>
<th>Question Asked</th>
<th>Target Response</th>
<th>Total number of times asked / Total number of target responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slide 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Can you point to Oscar's kid's bikes [DP [DP]]</td>
<td>O's kid's bikes</td>
<td>3/3</td>
</tr>
<tr>
<td>2</td>
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<td>Can you point to Bill's kid's bikes [DP [DP]]</td>
<td>B's kid's bikes</td>
<td>4/4</td>
</tr>
<tr>
<td>3 Oscar's kid's bike [DP [NP]]</td>
<td></td>
<td>Oscar’s kid’s bike [DP [NP]]</td>
<td>Y</td>
<td>1/5</td>
</tr>
<tr>
<td>4 Bill's grownup's bike [DP [NP]]</td>
<td></td>
<td>Bill’s kid’s bike [DP [NP]]</td>
<td>N</td>
<td>5/5</td>
</tr>
<tr>
<td>5 Bill's kid's kid's bike [DP [DP [NP]]]</td>
<td></td>
<td>Bill’s kid’s kid’s bike [DP [DP [NP]]]</td>
<td>Y</td>
<td>5/5</td>
</tr>
<tr>
<td>6 Oscar's kid's bike [DP [NP]]</td>
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<td>Oscar’s kid’s kid’s bike [DP [DP [NP]]]</td>
<td>N</td>
<td>5/5</td>
</tr>
<tr>
<td>7 Oscar's kid's grownup's bike [DP [DP [NP]]]</td>
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<td>Oscar’s grownup’s bike [DP [NP]]</td>
<td>N</td>
<td>4/5</td>
</tr>
<tr>
<td>8 Bill's grownup's bike [DP [NP]]</td>
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<td>Bill’s grownup’s bike [DP [NP]]</td>
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<td>4/4</td>
</tr>
<tr>
<td>9 Oscar's kid's grownup's bike [DP [DP [NP]]]</td>
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<td>Oscar’s kid’s grownup’s bike [DP [DP [NP]]]</td>
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<td>4/4</td>
</tr>
<tr>
<td>10 Bill's kid's bike [DP [NP]]</td>
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<td>Bill’s kid’s grownup’s bike [DP [DP [NP]]]</td>
<td>N</td>
<td>4/5</td>
</tr>
<tr>
<td>Slide 9</td>
<td>Question</td>
<td>Answer</td>
<td>Score</td>
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<tr>
<td>11</td>
<td><em>Can you point to Oscar’s bikes’ wheels</em> [DP [DP]]</td>
<td>O’s bikes’ wheels</td>
<td>4/5</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td><em>Can you point to Bill’s bikes’ wheels</em> [DP [DP]]</td>
<td>B’s bikes’ wheels</td>
<td>2/3</td>
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<tr>
<td>13</td>
<td><em>Can you point to Oscar’s kid’s bikes’ wheels</em> [DP [DP [DP]]]</td>
<td>O’s kid’s bikes’ wheels</td>
<td>2/2</td>
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<tr>
<td>14</td>
<td><em>Can you point to Bill’s kid’s bikes’ wheels</em> [DP [DP [DP]]]</td>
<td>B’s kid’s bikes’ wheels</td>
<td>3/3</td>
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<tr>
<td>15</td>
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<td>Bill’s bike’s wheels [DP [DP]]</td>
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<td>4/4</td>
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<tr>
<td>16</td>
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<td>Bill’s kid’s bike’s wheels [DP [(NP) DP]]</td>
<td>N</td>
<td>5/5</td>
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<tr>
<td>17</td>
<td>Oscar’s kid’s bike’s wheels [DP [(NP) DP]]</td>
<td>Oscar’s kid’s bike’s wheels [DP [(NP) DP]]</td>
<td>Y</td>
<td>5/5</td>
</tr>
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<td>18</td>
<td>Oscar’s kid’s grownup’s bike’s wheels [DP [DP [(NP) DP]]]</td>
<td>Oscar’s kid’s grownup’s bike’s wheels [DP [DP [(NP) DP]]]</td>
<td>Y</td>
<td>4/5</td>
</tr>
<tr>
<td>19</td>
<td>Bill’s kid’s grownup’s bike’s wheels [DP [DP [(NP) DP]]]</td>
<td>Bill’s grownup’s bike’s wheels [DP [DP [(NP) DP]]]</td>
<td>N</td>
<td>4/5</td>
</tr>
</tbody>
</table>

**Total:** 72/82

All five participants answered all of the plot related comprehension questions correctly, suggesting that (except for P3, as mentioned next) they followed the pragmatic buildup to Slides 7-9 without trouble. All five participants succeeded at all 4 simple DP-possessive controls (with the exception of 4-year-old P3 who got 2/4 — because they mixed up Oscar with his kid
and Bill with his kid — but succeeded after clarification), and at both simple NP-possessive controls. From this we can conclude that all five participants have simple regular and generics possessives.

In total, 87% of the responses to the test questions matched target responses. Every participant achieved the target response more than 70% of the time, with a mean of 85%:

~Percent Correct by Age

P3, 4;6: 73% target response

P4, 6;1: 94% target response

P2, 7: 79% target response

P1, 7: 90% target response

P5, 10: 88% target response

The overall rates of success are impressive. To perform better than chance on the test questions, a participant must consistently determine correctly whether complex linguistic structures involving embedded generic and regular possessives can refer to the various signalized objects. We would reasonably expect anyone without both possessive readings to be easily confused and fail often at this task.

Though it’s not represented in the chart above, across participants numerous productive responses involved pronominal possession and/or novel generic compounds. For example, consider P1. In producing phrases like *His grownup bike* (Q4), *Those are his grownup bike wheels* (Q16), and *Those are Bill’s kid’s grownup bike wheels* (Q19), they are avoiding embedding
possessives without changing that which the embedded possessives refer to; in swapping Bill’s for the possessive pronoun His, P1 preserves reference and drops an -s; likewise, by compounding grownup’s bike (producing grownup bike), P1 preserves reference and drops an -s.

The embedding of three, and sometimes even two, possessives is avoided in production and the unique referents are still be picked out. That the participants frequently produce novel compounds is unsurprising, given that “compounding is thought of as one of the simplest forms of concept formation as it involves use of elements that are already part of the language and requires little or no morphological changes, particularly in English” (Dhar 2019). There is a close semantic relationship between generic compounds and generic possessives cross-linguistically, and compounding is a skill that children have early on. How children acquire plural compounds is a related question, which we cannot address here.

Also unsurprising is the fact that the only participant to actually produce a three-level possessive was the ten-year-old, who said in question 16 Bill’s grownup’s bike’s wheels. But, to be clear, for us to judge that a participant has either the generic or regular possessive, it’s not necessary that they produce it, only that they consistently, yet discriminately, accept it as referring to the objects to which it may refer.

From the individual analyses, P2 is the only participant for whom it’s not definitive that both possessive readings are equally available. Based on the production data, P2 favored the referential reading. However, if they didn’t have the generic reading of the possessive at all, we would expect them to fail at more than 21% of the test questions and at the simple GP control
conditions (the prediction being that those who do not have the generic possessive would answer the simple GP control questions in Slide 3 by saying something like: *There is no kid/grownup, or What kid's/grownup's?). We looked closely at P2’s answers and showed that they have generic possessives.

Notably, of the 19 test questions, there was only one question that more than two participants got wrong, namely question 3. In question 3, the experimenter pointed to Oscar’s (generic) kid’s bike and asked *Is this Oscar’s kid’s bike?* Only 1/5 subjects answered *yes*, meaning 4/5 subjects got question 3 wrong and had a recursive [DP [DP]] reading. Interestingly, P3, the youngest participant at 4 years and 6 months, is the only one who had the non-recursive [DP [NP]] interpretation and answered *yes* in question 3.

Now, technically, it’s not “wrong” to answer *no* to question 3; on the available regular possessive reading of *kid’s bike*, the answer is *no*. However, the target responses were determined on the assumption that the participant has both readings for the possessive (we were testing against this hypothesis). The reason for this, again, is that if the participant has the generic reading of *kid’s bike* then they should accept *kid’s bike* as referring to Oscar’s bike that is for kids, for example. Question 3 is the first question involving an embedded NP-possessive. For every *no* answer, a follow-up question is asked. In this case, four participants were asked in follow-up *Which bike is that?* To answer this question, it’s not enough to say *Oscar’s bike*, because Oscar has two bikes. The experiment is designed so that an effective response to this question specifies the kind of bike with a generic expression. The reason that question 3 was the only
troubling question is likely due to the fact that the generic contrast set in Slide 7 (and 9) became obvious to the participants (excluding P3) only after their attention was directed towards it by the follow-up question. Once the participants determined that Oscar's bike for kids isn't *Oscar's kid's bike*, when asked which bike it is, they realized then that it is in fact *Oscar's kid's bike*, because it couldn't just be *his bike* as he also has a bike that is for grownups.

For this reasoning to hold, it looks like we have to also suggest that for the four children who got question 3 wrong, the default reading of *Oscar's kid's bike*, and presumably any 2-POSS sentence that is ambiguous between [DP [DP]] and [DP [NP]] readings, is the former, recursive referential one. In case this is true, it is evidence in favor of our hypothesis, because the single child for whom we cannot say the default reading is the recursive referential one (the only child to achieve the target response for question 3) happens to be the youngest of the group at 4-years-old, which is the age at which we predict children might be in the second, pre-recursive stage of acquisition during which they represent, by default, DP- and NP-possessives in 2-POSS structures. Following this logic, it’s probable that once the recursive system is instantiated, children revert to recursive DP-possessive structures by default, because those are much less rare in common parlance than recursive generic possessives are. This accords with the fact that the four children who got the recursive reading in question 3 are 6 years of age and up (children by 6 usually have recursive possessives) and had no problem on the recursive DP-possessive conditions.
This reasoning can also be used to account for P2's (7-year-old) reluctance to read kid's bike generally. Having already the recursive system for referential DP-possessives, it's possible that P2 is at a point in development during which they treat DPs as a strong possessive default.

As the only anomaly in our data, it turns out that question 3 is particularly insightful. The difference between the single 4-year-old and the group of four 6 to 10-year-olds, in terms of their success at this question, counts as evidence in favor of our hypothesis that there is a second acquisition stage prior to recursion in which children represent NP- and DP-possessives in 2-POSS structures.

After question 3, all of the participants accepted generic reference for possessives within DP-possessives. If we exclude question 3 from our calculation, in total, across 5 participants between the ages of 4 and 10, 92% of the responses to the test questions matched target responses and therefore allowed 2(plus)-POSS structures to carry concepts of both regular and generic possession.

5.3.1 Pilot Work

The path to this experiment was long. We cycled through various drafts of possible experimental designs and protocols in an attempt to create all of the sharp contrasts we needed between embedded RP and GP readings. The main challenge was making equally salient the GP and RP interpretations. The experiment evolved into what it is above late, only after we realized that, in order to motivate both the generic and the regular possessive interpretation to the same extent, we needed to have both a regular and a generic possessive contrast set. That
breakthrough is represented by the presence of the grownup's bike in our experiment, where we have a contrast set between generic bike kinds and a contrast set between regular possessive referents (Oscar's and Bill's kid). Prior to this, our experiments established only one generic possessive referent (e.g., a kid's bike) and at least one regular possessive referent (e.g., a kid who had a bike that wasn't for kids), both of which could be referred to with the same possessive (e.g., the kid's bike). Our experiment drafts at this point consisted of a contrast just between GP and RP readings. But, this didn't feel strong enough, so we eventually designed the experiment to contrast ambiguous GP and RP referents (kid's bike & kid's bike), RP and RP referents (Bill's kid & Oscar's kid), and, crucially, GP and GP referents (kid's bike & grownup's bike).

The presence of the generic contrast set is key in that it motivates a use of the generic possessive to refer to any of the bikes singularly, because every person has two bikes that are different only in kind. So, the situation requires both regular and generic reference to the same extent; to pick out any bike we first have to refer to a person and then to a kind. And, we still have the option to use recursive RPs in reference to pairs of bikes (Bill's kid's bikes necessarily involves recursive DP-possessives because he doesn't have two kid-type bikes). Additionally, we realized that the repetition of kid's in phrases like Oscar's kid's kid's bike had to involve DP- and NP-possessive substructure to refer in the situation we devised, so we used that understanding to our advantage. And, finally, we still had the kid's bike contrast between GP and RP readings.

We tested a version of this experiment which established (without using generic possessives) the novel generics monster's hair (the kind of hair that monsters have) and monster's
scissors (the kind of scissors that barbers use to cut monster’s hair), and (without using regular possessives) the regular possessive referents barber’s monster (the pet monster belonging to a barber), monster’s hair (the hair belonging to a monster), and monster’s scissors (the scissors belonging to a monster). The experimenter then asked the participant to pick out the referents of phrases like barber’s monster’s scissors, where recursive referential referents and non-recursive generic referents were both available and plausible, such that the structure was ambiguous between [DP [DP]] and [DP [NP]].

We tested six children between the ages of 6 and 9 and found that all of them had generic and regular possessive interpretations and could represent embedded possessives as NP-possessives. The youngest and only 6-year-old subject had the highest percentage of generic interpretations at 5/8 or ~63%. The remaining two 7-year-olds and three 9-year-olds preferred the regular interpretation to the generic.

In total then, between two experiments we tested 11 children’s interpretation of 2(plus)-POSS structures wherein embedded possessives have generic interpretations. All 11 children had simple generic possessives and could embed GPs inside of RPs.

6 Conclusion

The phenomenon of generic possession in the acquisition of recursive possession is in many ways a wonderful part of first-language development to study. As humans, our awesome capacity for infinite creative expression and collaboration consists in our ability to compute language recursively. Because recursion with possessives is a rather narrow and language-
specific case of recursion, the acquisition path poses a formidable challenge for the first-language learner. Our reasoning about how the universal cognitive aptitude for genericity affects this particular process has led to new and promising discoveries.

In this paper we've assumed a syntactic analysis for generic possessives according to which they are modificational NPs. We noted that this analysis predicts recursive generic (NP-)possessives (e.g., kid's firefighter's helmet). To our knowledge, this particular type of recursion has not been examined before in the literature. Recursive generic possession may be an exciting topic for future work, especially in acquisition where children's comprehension of the complex meanings can be tested directly. We also noted that the NP-possessive is lower in syntax than the DP-possessive, such that kid's friend's bike can't refer to a friend's kid-type bike. What guarantees this? Between these two outcomes, we've articulated philosophically fruitful avenues of investigation.

Children have to both sort out the generic and regular possessive and determine that both can be recursive. Given the cross-linguistic complexity of simple possession, and the time between when possessives are acquired and when possessive recursion is acquired, this is evidently not a trivial task. We're especially unsure about the acquisition of generic possessives. Perhaps direct evidence of DP-recursion is enough to trigger NP-recursion too. Or, maybe as a result of an early bias for genericity, NP-recursion comes first despite rare exposure.
On the assumption that syntactic elements are acquired from the top down\(^{\text{vii}}\) we would expect DP-possessives to appear first. Although, supposing children have an early bias for generics, we would expect NP-possessives to appear first. Insofar as there is a tension between syntax and semantics in this case\(^{\text{viii}}\), where syntax first supports DP-possession while semantics supports first generic possession, then it could be the case that children attempt in some way to map generic meanings onto DP-possessives. This could be tested. Alternatively, one kind of possessive might be an early default. It may be that children first interpret the possessive -s as introducing kinds and then sometime after gain the ownership interpretation or vice-versa. If they are equally happy with regular and generic possessives from the beginning, then the syntax, semantics assumptions are not tight. An experiment can be designed to address this question.

In section 3 of this paper we considered experimental and naturalistic data on the development of possession which suggested a second, middle stage in the acquisition of recursive possessives. In particular, we found numerous productive examples of unambiguous generic possessives, and some 2-POSS productions from young children. The thought is that, during the second stage, children who do not have a system for indirect recursion represent DP-possessives and NP-possessives in 2-POSS structures and thereby handle embedded

\(^{\text{vii}}\) The reasons for thinking this are many. For one, expressives that modify entire sentences are among the first things children produce.

\(^{\text{viii}}\) There may not be a tension between syntax and semantics internally. It’s possible that children can represent complex structures well before they can produce them, because production involves an extra system for phonology in combination with mental representation.
possessives while avoiding recursion. We then designed an experiment that had the power to disconfirm this hypothesis, namely that English speaking 4- to 10-year-olds have generic (NP-)possessives within regular (DP-)possessives. Were our evidence to show that children in this age range consistently deemed illicit either the regular or generic possessive within the various embedded possessive structures we tested, then we would have disconfirming evidence. However, the results we got accord with our hypothesis in that the five children we tested not only allowed simple possessives to refer generically, but they allowed embedded generic possessive interpretations within regular possessives. Four out of five participants adapted their interpretation of the verbalized sentence in almost every case to match, when possible, the signalized object. Only one child, P2 of age 7, showed any resistance to the generic reading (they still allowed it multiple times). We then noted that the results of pilot work on embedded generic possessives accords with our findings. Over the course of this study, of 11 English speaking children between the ages of 4 and 10, not a single one has failed to demonstrate generic readings for (un)embedded possessives. The theoretical background, naturalistic data, and experimental data, we’ve considered in this study harmonize and constitute a strong case in favor of the hypothesis that, for children acquiring English, the NP syntax of generic possessives is available within embedded possessives.

Unfortunately, due to a lack of subjects, we did not find any children for whom DP-recursion was unavailable. Because of this, we cannot say for sure of children who do not have the recursive system whether they can represent DP- and lower NP-possessives in the same
phrase-structure. However, the youngest (4-year-old) and only child to fail at any of the DP-recursion picture-choice pointing tasks (they got questions 11 and 12 wrong — although we suspect on a simple confusion) happens also to be the only child who got the generic reference for question 3. Future studies should aim to find out whether children without recursive possessives (those at and around 3-years-old) have 2-POSS structures with DP- plus NP-possessive substructures. We’ve laid the groundwork for this, and from the discussion in this document we can predict confidently that young children have generic interpretations that they can access within complex possessive constructions.
Bibliography


Compound Nouns Experiment/ Research
Charlotte Santoro

Experiment and Research Plan
For this project, I was interested in looking into asymmetric binary merges, specifically to answer the question: do children from the ages 2-4 understand which word dominates which in compound nouns? Although I was unable to test on the desired age range, I designed and tested an experiment on adults to see what kind of results they would give me. Then to supplement, I did a small amount of research on the subject. For the research, I searched for some commonly used compounds in the English language, and attempted to evaluate whether or not the child understands them/ uses them in the correct context. For the experiment, I tested the understanding of these binary merges on a variety of adults and teens of all different ages. This helped me understand whether or not my questions are getting the answers I want them to as well as if they are viable to then test on children.

Hypothesis
I believe that the closer a child gets to age 3, the more compound nouns they will be able to understand in the way it was meant, but they will not be able to fully grasp what a compound noun accomplishes until later on, maybe age 4.

Part 1: Experiment
Introduction Script
Hello! My name is Charlotte and today we will be looking at some pictures. I will hold up two pictures and ask you a question based on what you see. Please pick the picture that answers the question the best, either. No wrong answers here, just answer in the way you think makes the most sense. Any questions? *pause for questions* Alright, let's start!

Procedure
1. Show the child two pictures, one of a pancake house and one of a house pancake. Say while pointing at the corresponding drawing: “This is a pancake house and this is a house pancake. Which is the house?”
   For Experimenter: pancake house = house made of pancakes
   House pancake = pancakes made in a house
   Correct Answer = pancake house
   • This example tests the children’s knowledge of noun compounds that’s purpose is to explain how something is made/ what it is made out of. If they understand that a pancake house is a house made of pancakes, they will answer with “pancake house”.
2. Show the child two pictures, one of a straw hat and another of a hat straw. Say while pointing at the corresponding drawing: “This is a straw hat and this is a hat straw. Which is a straw?”
   For Experimenter: straw hat = hat made of straw
   Hat straw = a straw on a hat
   Correct Answer = hat straw
   • In this question, I am testing whether children understand the compound nouns in two completely different meanings - in hat straw, “straw” refers to a drinking straw, and in straw hat, it refers to straw as in hay. If they answer correctly, it shows they understand
the difference between the two different meanings of the word straw as well as the compound nouns.

3. Show the child one picture depicting a wood shoe. Ask: “What would you call this?” If a child says only shoes, prompt them with “What kind of shoe?” (this will have its own column for the results)
   For Experimenter: Wood shoe = show made of wood
   Correct Answer = wood shoe
   - In this question, it is using what the child has learned from the previous questions to test if they are able to put their own compounds together in the correct order. If they answer with “wood shoe”, then we know they understand what they are seeing is a shoe made out of wood.

4. Show the child one picture depicting a carrot tree. Ask: “What would you call this?” If a child says “tree”, prompt with “What kind of tree?”
   For Experimenter: carrot tree = tree that grows carrots
   Correct answer = carrot tree
   - Much like the third question, this helps us understand if the child understands how to put together compound nouns. Here, if they say “carrot tree”, we know they understand that the tree is growing carrots.

Pictures for Each example:

1.  
2.  
3.  
4.
Experimental Results
Green = answer I was looking for
red= a different answer than I was looking for

<table>
<thead>
<tr>
<th>Person, Age</th>
<th>Question 1</th>
<th>Question 2</th>
<th>Question 3 (Prompt? Y/N)</th>
<th>Question 4 (Prompt? Y/N)</th>
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</thead>
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<tr>
<td>Pam Santoro, 44</td>
<td>Pancake house</td>
<td>Hat straw</td>
<td>Shoes, clogs when prompted</td>
<td>Carrot tree</td>
</tr>
<tr>
<td>Joe Santoro, 44</td>
<td>Pancake house</td>
<td>Straw hat</td>
<td>clogs, pair of shoes when prompted</td>
<td>Carrot tree</td>
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<tr>
<td>Ayla Santoro, 15</td>
<td>Pancake house</td>
<td>Hat straw</td>
<td>Wooden shoes</td>
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<tr>
<td>Laura Santoro, 12</td>
<td>Pancake house</td>
<td>Straw hat-thinks it could go either way bc one is made out of straw and the other has a straw</td>
<td>Shoes - clogs when prompted</td>
<td>Carrot tree</td>
</tr>
</tbody>
</table>

Conclusion/Thoughts
For my first ever experiment, I’d say this was a success. There are a few things I would change but overall the experience of testing my questions to see what kind of answers they will generate was very intriguing. For question 1, I got the results I wanted in all cases, which shows that the question is valid.

For question 2, there was a bit more ambiguity to the answers I received. Laura first picked the incorrect answer, but then responded that she thought that the picture that is a “straw” could go either way, while Joe did not pick the answer I expected. When I asked him about it after the experiment, he said that my picture was unclear. As my picture of a “hat straw” was one I drew myself, I could see this being true. I also realized afterward that I may have omitted a particle when I asked the question to him, so instead of asking “which is a straw” I may have said “which is straw”. I didn’t realize at first, but this would completely change the answer of the question. I learned through this mistake though, and in future experiments will make sure I get my wording just right. This inconsistently also pointed out another potential problem with this question. Instead of testing a child’s ability to understand the meaning of compound nouns, it may have tested their knowledge of particles, which wasn’t what I was going for. So in future revisions of this experiment, I will most likely omit the example altogether and replace it with one that tests the correct thing.

The results I got for question three were the most interesting of all. Only one person I tested got close to the right answer, saying “wooden shoes” where I was looking for “wood shoes” after being prompted. All other participants said clogs, even after the prompt. This makes me wonder; though this example doesn’t seem to trigger the use of a compound noun in adults, would it in children? Because most children may not know what a “clog” is, they might instead
be more inclined to say “wood shoe” than the adults I tested were. I wouldn’t be able to prove this unless I was able to test the question on the target age group however, so this question will stay the way it is until such a time as I will be able to run this experiment again arises.

For question 4, much like 1, I got the answer I was looking for across the board, so no changes will be necessary here!

Overall, I learned that when designing an experiment, running it through on adults to test your questions is extremely helpful. Although I wasn’t able to experiment on kids, doing this provided me with important insight on my experiment that will help me revise and perfect it so if the time comes when I will be able to test it on the age range I’m looking at, it will be exactly what I want.

Part 2: Research

Searches

- “Football”, age 2, 240 results, lots of results using “football game” - a longer compound noun
- “Football game” ages 2-4, 13 results
- “Apple tree” all ages, 16 results
- “Picture book” all ages, 18 results

Findings/Conclusion

Overall, although I did not go as in depth with my searches here as I did with the search assignment we completed earlier in the semester, I still think I got some decent results. I searched three different main phrases, and came to the same conclusions for each.

When searching “football”, most of the results I came across used the word as different parts of speech, mostly either an adjective or a noun. To attempt to narrow it down to just uses with nouns, I changed the search a bit to the longer phrase “football game.” What I found with both iterations is that children from as young a 1.9 were able to use the compound nouns, which isn’t what I had predicted. This may be because “football” and “football game” are very commonly used phrases, so kids most likely can understand its meaning from an early age. This was probably not the best compound to use, so I moved on to “apple tree”, because it is a less used one. Here, again I found that children were using the word consistently, and I only found a few examples of them seemingly confused. One such example comes from a child the age of 1.8, which is already younger than I was primarily looking at. When asked “what are these on the tree?” the child said “apple tree.”, which shows they probably thought the phrase “apple tree” was dominated by “apple” rather than “tree”. But in almost all other examples I found, the children used the phrase correctly even without being prompted by their parents or simply repeating the phrase back.

At this point, I realized my searches weren’t actually proving/ disproving what I wanted them to. It was really difficult to know whether or not the child was actually understanding what they were saying, or if they were just using the compound nouns they had previously heard. This research wasn’t really able to pinpoint whether or not the children understood for example that “apple tree” is a tree that apples grow on. Thus, I concluded my searches with one more, this time of the phrase “picture book.” Here again, although there were less results, only one stood out as an example that really proved that the child understood the compound. This was a 2.6 year old child, and after the mother said “oh. I’m tired of this one. Shem. Why don’t you get the picture book over there. We’ll look at the picture book.”, they responded with “wead (read) the picture book.”
book.” Because the child used the verb “read” here, and books need to be read, one can safely assume the child knew his mother was talking about a book rather than a picture. But overall, I have concluded that research is not enough to test the hypothesis I want to test and that further experimentation must be done.

Appendix

Child: 2.1
LOI: what kind of ball? What’d you say?
Child: football.
Child:2.3
LOI: want to play football?
Child:3.0
Jud: Can you play ball? Do you want to play ball?
Child: I go football game. Go.
Jud: okay.
Child: 2.4
Mother: Can you tell them about the football game you saw sunday in the rain?
Child: rain. Saw football caught water,
Child: 2.9
Child: we go at the football game. I get something?
Child: 1.8
Mot: what are these?
Child: oink oink.
Mot: what are these on the tree?
Child: apple tree.
Mot: apples yes. Apple trees.
Child: one, two three, get off my apple tree. Get off!
Mot: I’m not your apple tree.
Mot: where’s the tree? The bit of the tree
Child: this tree. Apples.
Mot: its an apple tree, isn’t it?
Child: 2.6
Mt: oh. I’m tired of this one. Shem. Why don’t you get the picture book over there. We’ll look at the picture book.
Child: wead (read) the picture book.
Introduction

Children face an incredible hurdle when learning negation. They must disambiguate all the different forms of negation, understand their meaning and their scope, and be able to produce them all effectively.

Another thing children have to understand is how to treat multiple negative elements in a sentence. Many of the world’s languages are negative concord languages, meaning that while there are multiple negative elements in the sentence, they are only interpreted as being negated once. Given the amount of negative concord languages, and the capacity for negative concord in English dialects (African American English (AAE)), it is not a stretch to consider that when children are born with a universal grammar, that grammar has negative concord as an element. As that child grows up and is exposed to language, they realise what type of language they are speaking and adjust.

<table>
<thead>
<tr>
<th>Type of Negation:</th>
<th>Simple</th>
<th>With no-words</th>
<th>With no</th>
<th>Triple negation</th>
<th>With PP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example</td>
<td>Don’t</td>
<td>Didn’t eat</td>
<td>Didn’t</td>
<td>Nobody didn’t</td>
<td>Didn’t</td>
</tr>
<tr>
<td></td>
<td>not</td>
<td>nothing</td>
<td>eat no</td>
<td>eat nothing/no</td>
<td>see no</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cake</td>
<td>cake</td>
<td>dog with no</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>broken leg</td>
</tr>
<tr>
<td>Acquisition path</td>
<td>1st</td>
<td>2nd</td>
<td>2nd</td>
<td>3rd</td>
<td>1st</td>
</tr>
</tbody>
</table>

Simple Double Negation:

I hypothesize that simple double negation (*he didn’t not go to school*) will come in first in a child’s grammar. Simple double negation with *not* should be easier for a child because the
repetition of not (n’t) not can only be interpreted as double negation. There is no room for double negation in the interpretation of he didn’t not go to school.

Negation with no-words and with no

The next type of negation I will be looking at is potentially more confusing to child. While simple double negation is of two of the same elements (not not) this form of negation includes phrases such as no cake or nothing. With a phrase like He didn’t eat nothing there are two negative elements n’t (not) and the negative word nothing. Nothing is semantically negative, and since there are two negative elements in the sentence this opens the door for negative concord. The scope of negation for both no cake and nothing is over the single word or phrase.

The sentence he didn’t eat nothing can be interpreted two ways, one way with double negation meaning he ate something and one with negative concord meaning he didn’t eat anything. This all depends on whether the child has a negative concord grammar or not.

The sentence he didn’t eat no cake however, is different. The phrase no cake is not intrinsically semantically negative like the word nothing. No cake can be interpreted as a negative or non-negative element. This is a contrast to the earlier sentence, which is open to negative concord. Instead, the sentence can be interpreted as He didn’t any cake, if no cake is interpreted as non-negative, or as double negation if it is interpreted as negative.

I will need more data to determine which of these two forms of double negation comes in first, however if children treat he didn’t eat nothing as double negative, this is clear evidence that they have moved away from negative concord, or at the very least possess both double negation and negative concord in their grammar.

Triple Negation:
The next form of negation I will be looking at involves three negative elements. Such as, *Nobody didn’t get no prizes*. I hypothesize that without the proper pragmatics and context, even adult speakers of Mainstream American English (MAE) will be able to interpret these sentences with negative concord, showing that negative concord is a part of universal grammar. However, with the right pragmatics, I believe that children and adult MAE speakers will be able to interpret each element in the sentence as a separate negation.

For example, take the sentence *Nobody didn’t get no toys*. If the children are given the context that there is a party being thrown and that toys are being given away to people when they arrive, the children should interpret this sentence as a triple negation and understand that everyone got toys.

However if they are given the context that the people were going to be given toys but that the people who threw the party forgot to bring any of the toys with them the children should interpret the sentence with negative concord and understand that nobody got any toys.

Therefore I posit that the interpretation of triple negation relies most heavily on context and pragmatics.

Negation with PP:

As D’jaris showed in *Barrier Constraints on Negative Concord in African American English* (D’Jaris, 1998), a PP attached to a NP can block negative concord by blocking extraction in a way that a PP adjunct cannot. It is my hope that by including examples such as *He didn’t see no dog with no broken leg* I will be able to give some evidence showing how to force a negative reading even in a negative concord grammar. I hypothesize that if children are still in a stage in which they have a negative concord grammar, that they will still not be able to
extract from within a PP attached to an NP (*dog with no broken leg*) and that they will treat *no broken leg* as a separate negative element outside of negative concord.

Childes Data and Acquisition

The hypothesized acquisition path is a general trend from single negation to negative concord and then finally to true double negation. Data from the CHILDES database shows that negation with *n’t* comes in before negation with *not*.

Early instances of negation with *n’t* appear at 1;6, 1;7, and 1;8. By 1;10 children are using *n’t* regularly. Examples of early *n’t* are exclusively *can’t*, *don’t*, and *isn’t*. *Not* being used without a verb comes in at 1;7 (*not my tower*). Using *not* with a verb comes in at 1;10 and is used regularly by around 1;11 - 2;0.

At as early as 2;5, some children show examples of using two negative elements. (*cow can’t not do anything*). However this appears to be a miss pronunciation of *cannot*.

Examples of true double negation do not show up in child English in the CHILDES database however they do show up in a few examples of parent speech and of course are present in adult English.

Therefore my proposed acquisition path starts out with simple negation with *n’t* followed by simple negation with *not*. Then children enter a stage of negative concord. I propose that when they first encounter multiple negative elements they cannot compute them as separate negative elements and must either interpret some of the negated noun phrases as semantically non-negative or they must rely on negative concord.

I hypothesize that they will acquire true double negation with verb phrases before noun phrases. This study hopes to reveal whether there is a stage in which children have both double negation with verb phrases and negative concord with noun phrases.
Additionally, early pilot data suggests that simple double negation with the help of do support (didn’t not) comes in before double negation with modals (shouldn’t not)

Expected and Current Results

I expect that participants will treat double negation with verbs as true double negation. This assumption is backed up by my current understanding of the theory of negation and that two of the same elements (not + not) blocks negative concord. This is further backed up by my pilot data that shows that participants easily understand double negatives with verb phrases. Since n’t is another form of not, n’t not also blocks a negative concord reading. Negative concord only occurs between negative elements of different types.

I expect that participants tested will treat my negative NPs as negative concord. Not not blocks a negative concord reading, however one is still available with not no. I expect that many kids in my age range will treat the not no constructions as negative concord.

If my expectation holds, it will show that child english at that age has acquired double negation but is still in the process of moving from negative concord to double negation for noun phrases. If children do not properly compute double negation, this may suggest not that they are treating it as negative concord but that their grammars cannot account for two negative elements of the same type.

I expect that negation with PP’s will block the majority of negative concord reading, as shown in the D’jaris dissertation. Additionally, I expect triple negation to be interpreted as negative concord or not depending on the context. Children should move from a stage of treating no and no-word negation as negative concord to a stage of treating them as double negation. However negative concord will stay in their grammar for the more difficult to compute triple negation.
Conclusion

Each type of negation shows a different aspect of child’s grammar. The simple double negation is essential to show that children are able to compute double negatives; if children mess up on this step it shows that the child is incapable of interpreting multiple negations in a single sentence. The negation with *no-words* and *no* shows if the child has moved away from negative concord towards double negation. If a child still is in a phase of negative concord, the negation with *PP’s* should show that there are still limits to negative concord while if a child has moved away negative concord, triple negation should show that they still have the capacity for it in their grammar, given the right context.