ANAPHORA PROJECT UPDATE: 6/14

I. A Brief Review

THESIS HYPOTHESES:
1. Children improve in anaphora resolution ability as they age
2. Children exhibit consistent mechanisms to resolve anaphora
3. Parent speech reflects child language abilities

ACTIONABLES FROM 5/18 MEETING:
1. Use language capability (MCDI score) as a covariate (*see Part II*)
2. Use anaphora type (one, split, pronoun) as a covariate
3. Eliminate instances of child-driven anaphora use (*see Part VI*) or instances that require visual cues to resolve (*see Part V*)
4. Determine if parent gaze is a factor in where children attend to (could compare accuracy when parent is looking to when parent is not)
5. Preliminary analysis of storybook dataset for anaphoric instances

II. MCDI Scores

Below are the results from comparing anaphora resolution accuracy to MCDI scores (both `ProdTotal` and `ProdCountNoun`—was unsure about what the difference in these metrics are exactly, I'm assuming they refer to the total productive vocabulary score[1]?). No correlation was observed.
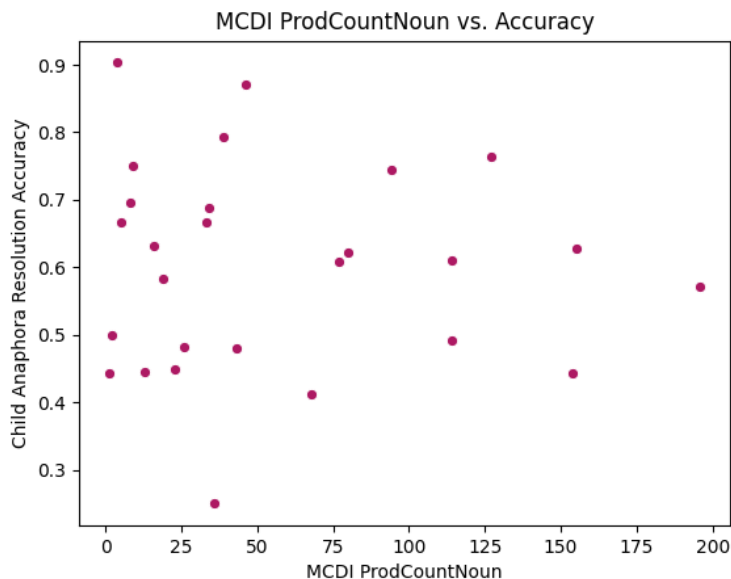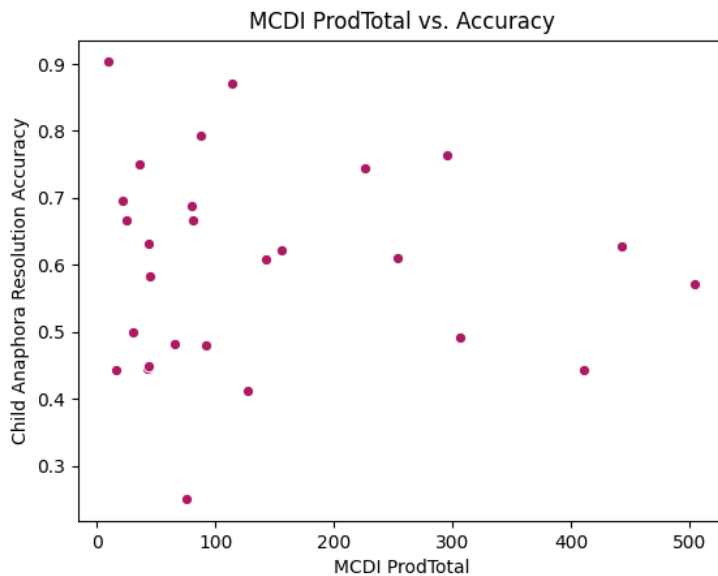
[1] I read (Heilmann et al., 2005) to get some background on the MCDI test.

Heilmann, J., Ellis Weismer, S., Evans, J., & Hollar, C. (2005). Utility of the MacArthur-Bates communicative development inventory in identifying language abilities of late-talking and typically developing toddlers. *American journal of speech-language pathology*, *14*(1), 40–51.

III. Accuracy Score Errors

One major issue with the resolution accuracy scores that I just realized when going through the data to plot the MCDI scores is that they are not accurate! The way the scores were calculated was by counting up the number of total anaphoric instances per subject, then counting the number of anaphoric instances the child resolved correctly (i.e. looked at the target object while the parent referred to the object). However, this causes a significant issue for split anaphora cases the way the spreadsheet is currently set up by counting each object referred to by one split anaphor as a separate instance of anaphora use. For instance, the spreadsheet for subject 1213 at time 820.27 seconds records 5 separate anaphoric instances, all at the same time stamp (snippet from spreadsheet shown below).

1213	12	820.27	821.07	17	1	2	2
1213	12	820.27	821.07	8	1	2	2
1213	12	820.27	821.07	22	1	2	2
1213	12	820.27	821.07	24	1	2	2
1213	12	820.27	821.07	2	1	2	2

As long as the child looks at just one of the objects referred to by a split anaphor, the instance should be marked as correct. In our current results, each object referred to by a split anaphor is counted separately. For instance, child 1213 may be looking at Toy 17, but not at Toy 2, 8, 22, 24. Then, 4 out of 5 of the above anaphora would be marked incorrect, giving child 1213 a score of 20% for the anaphor used at time 820.27, when in reality it should just be marked as one anaphor that they resolved correctly.

This error is skewing the accuracy scores, making them especially lower for children whose parents used many split anaphora or split anaphora that refer to many different objects. This is also affecting other metrics as well, namely the number of total anaphoric instances and number of split anaphoric instances for all participants—children whose parents use split anaphora that refer to several different objects would have higher numbers of total anaphoric instances and split anaphoric instances than the data actually reports.

TODO: **each subject's data must be edited to reflect accurate split anaphora data. All metrics must be recalculated (accuracy scores, total number of anaphora, total number of split anaphora, percentage of one anaphora, percentage of split anaphora, percentage of pronouns) and all graphs must be replotted.**

IV. Child-Driven Anaphora

We define an instance of **child-driven anaphora** as a case for when a parent uses an anaphor to refer to an object that the child is already attending to. For instance, consider the transcript excerpt below:

```
what did you find

rake

car

oh it has got buttons
```

The parent sees that the child is attending to an object, and *then* the parent refers to the object using an anaphor. Thus, these cases do not reflect whether a child truly understands the anaphor in question.

TODO: eliminate child-driven anaphora usage from accuracy score calculations.
- **OPTION 1: Go through and manually code for child-driven cases with a new variable (would have to watch children eye tracking videos for that)**
- **OPTION 2: Go through all data streams and manually annotate which cases should be eliminated by determining visually—if the child's gaze is focused on an object that a parent hasn't referred to before, but then the parent refers to that object, then this is a child-driven case.**

V. Extraverbal Cues

An anaphoric instance with **extraverbal cues** occurs whenever a parent presents a visual cue while using anaphora to indicate where the child should be attending to (e.g. pointing, handing an object to the child, etc.). Any instances where extraverbal cues are present or required to *resolve the anaphor* should be coded for (separate variables for a cue that is merely present vs. a cue that is required to understand the anaphor in question).

TODO: **eliminate anaphora that use extraverbal cues that are <u>required</u> from the accuracy score calculations. Note prevalence of extraverbal cues that are <u>not required</u> to resolve the anaphor, and whether they have an effect on resolution accuracy.**

- **The cue variable we coded for initially does half the work—it codes for required extraverbal cues. It does not code for cues that are present but not required.**
- **Coding for unrequired extraverbal cues would involve watching all videos again to manually code for this new category.**

VI. A Summary

FOLLOW-UP ON ACTIONABLES FROM PART I:
1. Use language capability (MCDI score) as a covariate – no correlation found but in the process of doing this, I realized there's an error in the resolution accuracy scores (see Part II), which I'm in the process of fixing.
2. Use anaphora type (one, split, pronoun) as a covariate – will test once the accuracy scores are recalculated.
3. Eliminate instances of child-driven anaphora use (*see Part VI*) or instances that require visual cues to resolve (*see Part V*) – in the process of doing.
4. Determine if parent gaze is a factor in where children attend to (could compare accuracy when parent is looking to when parent is not) – will test once the accuracy scores are recalculated/data is reprocessed.
5. Preliminary analysis of storybook dataset for anaphoric instances – should we still proceed with this?