Supplemental Material S1.

Word by Word Project
Operational Definitions for All Measures

Note: These definitions were developed for use across a range of measurement contexts. Measures such as "video probes" do not apply to the current manuscript (which focuses only on play contexts), but they remain in place, both for future publication purposes and also to accurately reflect the information available to the coders.

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Goals

- Operationally define range of measures used to assess progress in “Word by Word” studies
- Establish reliability for newly created measures used to track graphic symbol utterance progress

Utterance Boundaries & Transcription Conventions

All data

- Transcribe aided utterances using CAPITAL LETTERS.
    - Insert a space between symbols. *Symbols that contain more than one word should be transcribed as a single word*.
        - Examples
            - RED DOG
            - I EAT ICECREAM
    - Use square brackets to transcribe symbols selected by the examiner.
        - Example
            - Child: DOG
            - Examiner: EAT

              ➔ Transcribe as DOG [EAT]
    - Use curly brackets to transcribe unconnected symbols selected by the child during a co-constructed utterance.
        - Example
            - Child: DOG
            - Examiner: EAT
            - Child: BIG
            - Examiner: CAKE

              ➔ Transcribe as DOG [EAT] {BIG} [CAKE]
- Inflectional morphemes: Put a space then a hyphen before each inflectional morpheme. Regardless of the context for –S (plural, possessive, 3rd person singular, contracted copula/auxiliary), follow this same convention.
    - Examples
        - I AM EAT -ING
        - DOG -S PLATE
        - DOG –S EAT -ING
- Transcribe the child’s final production on Observer
    - ***Video Probe Data***
        - Code the child’s final production for each target*. The final production may or may not be played back (by the child or researcher selecting the message bar). *Exception: If child produces more than one utterance for a target, code the utterance that is most reflective of the child’s linguistic ability, rather than behavior or attending skills.

    - ***Play Intervention/Play Measurement/Storybook/Activity Scene Data***
    - *Measures are designed to capture linguistic abilities of the children; not operational skills such as selecting or clearing the message bar.*
    - Utterance boundaries are determined by several contextual factors

- Child selects symbol(s) in either an independent or co-constructed utterance and it is clear that the utterance is completed.
    - *Note*: For co-constructed utterances, the utterance may be partly completed by the examiner.
- Child selects symbol(s) & message bar → No one erases the message → Child *adds to* message with no turns in between
    - This all counts as one utterance = count entire message once
    - Exception: It's obvious that the child intended to produce two separate messages and simply forgot to erase prior production
- If the previous message was not erased before the new utterance began:
    - Code as a *separate utterance* if it is clearly a mistake (e.g., examiner indicates that they forgot to erase the previous message, there is a clear change in context or clearly a new turn, with new utterance being produced or elicited).
        - Example
            - Child: RED DOG
            - [Message bar]
            - Child: adds BLUE DOG
            - Message that is played is RED DOG BLUE DOG
            - Examiner indicates that they should've erased the previous message.
                → Code RED DOG and BLUE DOG as two separate utterances.
        - Code as one utterance if the child indicates they need to add more symbols (either verbally or by gestures) or adds symbols in response to the examiner's prompt.
            - Example
                - Child: RED DOG
                - [Message bar]
                - Examiner: What is the red dog doing?
                - Child: adds EAT
                - Message that is played is RED DOG EAT
                → Code as one utterance of three symbols

Utterance boundaries of co-constructed utterances

- Sometimes the examiner deletes the symbol immediately after the child selects it to elicit a correct utterance. Transcribe the final utterance excluding the symbols selected by the child and deleted by the examiner.
- Example:
    - Examiner is trying to elicit RED DOG. She provides spoken directive and pointing.
    - Examiner: Says "red" and points to the RED symbol.
    - Child: RED
    - Examiner: Says "dog" and points to the DOG symbol.
    - Child: HORSE
    - Examiner: Deletes HORSE, says "dog," and points to the DOG symbol.
    - Child: HIPPO

    - Examiner: Deletes HIPPO, says "dog," and points to the DOG symbol.
    - Child: DOG
    - Utterance played back: RED DOG
    - Transcript: RED DOG
- If the clinician verbally responds to the child's utterance and deletes it, we transcribe both the first utterance and the second utterance.
- Example:
    - Clinician is trying to elicit RED DOG.
    - Child: RED HIPPO
    - Clinician: "Is this a red hippo?" (Spoken open-ended prompt)
    - Child: No.
    - Clinician: Deletes the utterance.
    - Child: RED DOG
    - Transcript: RED HIPPO is one utterance & RED DOG is a separate utterance
    - If the clinician deletes only HIPPO and child selects DOG to complete RED DOG, Transcribe the final RED DOG

Utterance boundary of self-corrected utterances

- If a child deletes a symbol before the clinician says anything, do not transcribe it as an utterance.
    - Example:
    - Child: RED DOG, deletes dog, HIPPO
    - Transcript: RED HIPPO
- If a child deletes a symbol following the clinician's prompt, transcribe it as two utterances.
    - Example:
    - Child: RED DOG
    - Clinician: "Do you want a red dog?"
    - Child: Deletes RED DOG and selects RED HIPPO
    - Transcript: RED DOG & RED HIPPO
- If the child deletes only DOG and then selects HIPPO to complete RED HIPPO, give the child credit for both RED DOG and RED HIPPO here, as this was all child selections.

Measures of Interest

The following measures are behaviors and modifiers to be coded in Observer (See Observer SOP & Video Walkthrough)

- Imitative/ Non-imitative
- Independent vs. co-constructed aided utterances
- Communicative intent present/ absent
- No. of symbols
- No. of relevant symbols
- Word order score (0, .5, 1)
- SV structure (i.e., is there a subject-verb present?)
    - Grammatical intent
    - Lexical verb
    - Add subject-verb combination to comments
    - USV (Unique Subject-Verb)
    - Lexical/non-lexical verb
- Grammatical Intent
- Inflectional morphemes present/not present
- Part of speech
    - Noun
    - Pronoun
    - Verb
    - Preposition
    - Adjective
    - Determiner
    - Conjunction

The following measures will be calculated automatically based on the measures above

- Percentage of relevant symbols (PRSym)
    - Number of Symbols and Number of Relevant Symbols are used
- MLU in symbols (MLUSym)
    - Number of Symbols per utterance are used
- Weighted MLU in symbols (W-MLUSym)
    - No. relevant symbols * Word order score = W-MLUSym
    - *NOTE: This is how we are initially calculating W-MLUSym. We will explore various methods to see what best captures positive shifts in grammar. For example, we will try adding in a measure that captures the number of different parts of speech.*

Operational Definitions

Imitativeness

Definitions	Purpose	How to code
Non-imitative utterance: Child's aided production contains at least one novel concept compared with the examiner's prior aided/spoken utterance. I*mitative utterance*: Child's aided production contains no novel symbols compared with examiner's immediately prior aided/spoken utterance. The intention is to capture immediate, not delayed imitations.	To differentiate imitative utterances from non-imitative utterances. Utterances that are imitative demonstrate a lower level of linguistic sophistication and internalization.	Code each utterance to indicate if it is *non-imitative* or *imitative*

Details

Video Probe Data

This code is not relevant for Video Probes

Play Intervention/Play Measurement/Storybook/Activity Scene Data

Code each utterance as either *independent* or *co-constructed*.

- Possible codes include (a) *non-imitative,* (b) *imitative – spoken + aided model,* (c) *imitative – spoken model,* or (d) *imitative-aided model.*
    - Non-imitative
        - The aided utterance contains **at least one novel symbol** compared with examiner's immediately prior spoken or aided utterance.
        - If examiner provides a brief spoken prompt telling the child to produce an utterance (e.g., "Now you tell me)", compare the child's utterance with the examiner's model.
        - Example
            - Examiner: Oh, I'm eating cake. What are you eating?
            - Child: EAT CAKE [Non-imitative]

            Rationale: To respond to the question "What are you eating?," the child's linguistic task is to respond appropriately to the question, which requires EAT CAKE. Thus, this is not considered an imitation.
        - Example
            - Examiner: Oh, I'm eating cake. I EAT CAKE. Now you tell me.
            - Child: EAT COOKIE [Non-imitative]

              Rationale: The child added the novel symbol COOKIE.
    - Imitative – Spoken + aided model
        - All symbols are in the examiner's immediately prior *spoken and aided* utterance.
        - If examiner then provides a brief spoken prompt telling the child to produce the utterance, use this same code.

- Example:
  - Examiner: I'm eating cake. I EAT CAKE. Now you tell me.
  - Child: EAT CAKE [Imitative – Spoken + aided model]
    Rationale: The child's utterance contains ALL symbols from the examiner's immediately prior spoken + aided utterance. The spoken prompt "You tell me" does not count as the Examiner's immediately prior utterance.

- Imitative – Spoken model
  - All symbols are in the examiner's immediately prior *spoken* utterance.
  - If examiner then provides a brief spoken prompt telling the child to produce the utterance, use this same code.
  - Example:
    - Examiner: Oh, I'm eating cake. Now you tell me.
    - Child: EAT CAKE [Imitative – spoken model]
      Rationale: Same as above
- Imitative – Aided model
  - All symbols are in the examiner's immediately prior AIDED utterance.
  - If examiner then provides a brief spoken prompt telling the child to produce the utterance, use this same code.
  - Example:
    - Examiner: I EAT CAKE. Now you tell me.
    - Child: EAT CAKE [Imitative – Aided model]
      Rationale: Same as above

- If the examiner offers *binary choices* or *multiple options* via spoken or aided modalities, consider the child's production non-imitative.
  - Example:
    - Examiner: Do you want red horse or blue horse? RED HORSE BLUE HORSE
    - Child: BLUE HORSE [non-imitative]
    - Child: RED HORSE [non-imitative]
    - Examiner: We have a yellow, train, blue train, green train, and dirty train.
    - Child: DIRTY TRAIN [non-imitative]

Independent vs. Co-Constructed Aided Utterances

Definition	Purpose	How to code
Independent utterance: Child's aided production is produced without substantial prompting from the Examiner. *Co-constructed utterance*: Child received prompting assistance while in the process of constructing an utterance.	To differentiate utterances the child produces without any assistance from utterances that are supported by the examiner while the child is in the act of producing the utterance.	Code each utterance to indicate if it is *independent* or *co-constructed*

Details

Video Probe Data

This code is not relevant for Video Probes

Play Intervention/Play Measurement/Storybook/Activity Scene Data

Code each utterance as either *independent* or *co-constructed*.

- Independent
  - While constructing the utterance, the child receives none of the supports listed below from the examiner.
  - It's ok for the examiner to provide purely *operational* supports (i.e., App/iPad functioning; e.g., to select the message bar, erase a selection, etc.). If the examiner provides any *linguistic* suggestions (i.e., selecting symbols to construct the message; e.g., "That's not quite right, etc.") then it's co-constructed.
- Co-constructed
  - Child receives at least one of the following types of assistance from the examiner *while in the act of constructing an utterance*:
    - Spoken open-ended prompt
      - Examiner's prompt is general; does not tell the child which specific symbol to select
      - Example:
        - Child: I EAT
        - Examiner: What are you eating?
        - Child: adds CAKE. Plays back I EAT CAKE.
    - Spoken directive prompt
      - Examiner tells the participant to produce at least one particular symbol
      - Example:
        - Child: I EAT
        - Examiner: You're eating **cake**.
        - Child: adds CAKE. Plays back I EAT CAKE.
    - Pointing directly to the symbol(s)
      - Examiner points *directly* to at least one symbol as the participant constructs an aided utterance

- Pointing generally to the device or to an area of the display does not count; utterances receiving this kind of assistance are considered independent

- Selects the symbol(s)
  - Examiner selects at least one symbol during the child's aided utterance.
    - Code the child's initial selection only. Examiners selections are in square brackets [ ]. Child's second selection is in { } brackets.
    - Example:
      - Utterance: [DOG] EAT [CAKE]
        ➔ Only EAT will receive codes.
      - Utterance: [DOG] EAT [BIG] {CAKE}
        ➔ Only EAT will receive codes.

Please refer to utterance boundaries and transcriptions section on page 3.

Communicative Intent: Present/Not Present

Definition	Purpose	How to code
When communicative intent is present, the child is selecting graphic symbols with an intention to communicate something to someone else	To differentiate aided utterances in which symbols are chosen intentionally versus selection of random symbols with no clear communicative purpose	Code each utterance to indicate if communicative intent is *present* or *not present.*

Details

- Code communicative intent as either *present* or *not present*
- Code communicative intent "Present"
    - When the child is producing a meaningful utterance of any length with intent to communicate
    - Code as "present" if any part of the message has clear communicative intent
- Code communicative intent "Not Present"
    - When the child is just "messing" or randomly selecting symbols across an entire utterance
    - If the child randomly selects numerous symbols and is obviously messing around, do not take the time to try to transcribe all of the selected symbols
    - *Utterances for which communicate intent is "Not Present" receive no additional codes*

Number of Symbols

Definition	Purpose	How to calculate
Total number of symbols that the child selects in final message.	This is used to calculate MLU in symbols (MLUSym) and Weighted MLU in symbols (W-MLUSym).	Count the number of symbols, including symbols representing both free and bound morphemes.

Details

Indicate the total number of symbols in each utterance

Adjacent duplications

- Count adjacent duplications only once
- Child: RED COW COW = 2 symbols; do not consider the 2nd COW in any analysis
- Child: RED COW RED = 3 symbols; no two identical adjacent symbols; consider all symbols in all analyses

Number of Relevant Symbols

Definition	Purpose	How to calculate
Total number of symbols that are relevant to the target/context.	This is designed as a *semantic* measure. The results are used to calculate the percentage of relevant symbols (PRSym)	Count the total number of both free and bound morphemes that are relevant to the target/context

Details

Indicate the total number of relevant symbols in each utterance

Video Probe Data

General rules

- If a symbol is part of the VP target or the list of relevant symbols, it's relevant.
- Both targeted and additional symbols that are counted as relevant for the video probes are included in these Video Probe Accurate Additions spreadsheets.
    - These lists were carefully constructed and agreed upon by multiple study team members.

Bound morphemes

- Bound morphemes are counted as relevant if they are part of the original target or if they contribute logical semantic information.
    - *Exception*: Bound morphemes used as a single utterance are not counted as relevant, even if they appear to be targeted
- Symbols representing free-standing morphemes
    - These are considered "relevant" if the word logically fits in the context of the video, regardless of the target. Examples:
        - HAPPY is relevant in all videos except for those in which the only animal to appear is explicitly sad.
            - Otherwise, the animals can all reasonably be judged to be happy.
        - BLUE is relevant in all videos in which WASH is part of the target, as the washcloth being used is blue.
- Bound morphemes (-S and -ING)
    - Must come immediately after an appropriate free morpheme to be considered relevant
        - *Exception*: If bound morphemes are part of the original target, count the exact number that appear in the target as relevant no matter where they appear in the child's utterance.
        - Examples
            - Target: MONKEY -S RED CAR
            - Child: MONKEY RED -S CAR
                - Relevance: -S counts as relevant
                - Rationale: -S is part of the target.
                - Word order score: 0.5

- Child: MONKEY RED -S CAR -S
  - Relevance: Only one -S counts as relevant.
  - Rationale: There is only one -S in the target. Coders cannot count both -S as relevant because the first -S is not located immediately after an appropriate free morpheme, and there is only one car in the video.

- If the bound morpheme contributes logical semantic information, count it as relevant.
  - Example 1
    - Target: DIRTY MONKEY IS IN THE GREEN CAR
    - Child: MONKEY -S CAR
      - Relevance: -S ***does*** count as relevant.
      - Rationale: It's logical to think that the car could belong to Monkey
    - Child: MONKEY CAR -S
      - Relevance: -S does ***not*** count as relevant.
      - Rationale: There are not two cars in the video.
  - Example 2
    - Target: PIG IS HUGGING THE RED CAR
    - Child: PIG -S BEHIND CAR
      - Relevance: -S ***does*** count as relevant.
      - Rationale: The -S here can logically be construed as a contraction for 'is.'
  - Example 3
    - Target: DIRTY COW IS HUG –ING THE DIRTY BED
    - Child: COW -S DIRTY -S BED -S DIRTY
      - Relevance: All are relevant except for the middle -S
      - Rationale: Interpreted as: COW IS DIRTY -S (contractible copula, + 1 irrelevant -s); BED IS DIRTY (contractible copula)
      - Word order score: 0.5

Determiners (A and THE)

- Must be before an appropriate free morpheme to be considered relevant
  - *Exception*: If articles are part of the original target, count the exact number that appear in the target as relevant no matter where they appear in the child's utterance.
- Examples
  - Target: MONKEY IS IN THE RED CAR
  - Child: MONKEY RED THE CAR, *or* MONKEY RED CAR THE
    - Relevance: THE counts as relevant.
    - Rationale: THE is part of the target.
    - Word order score: 0.5
  - Child: MONKEY RED THE CAR THE
    - Relevance: Only one THE counts as relevant.
    - Rationale: There is only 1 THE in the target, and the second THE is not located before an appropriate free morpheme.

- *"To be"* verbs (IS, AM, ARE)
  - Must come after the relevant free morpheme

- Exception
  - If the 'to be' verbs are part of the original target, count the exact number that appear in the target as relevant no matter where they appear in the child's utterance.
  - Examples:
    - Target: MONKEY IS IN THE RED CAR
    - Child: MONKEY RED IS CAR
      - Relevance: IS counts as relevant
      - Rationale: IS is part of the target.
      - Word order score: 0.5
    - Child: MONKEY RED IS CAR IS
      - Relevance: Only one IS counts as relevant.
      - Rationale: There is only one IS in the target, and the second IS is not located after the relevant free morpheme.

Play Intervention/Play Measurement/Storybook/Activity Scene Data

General rules

- If a selected symbol is in any way relevant to the topic of communication, count the symbol as relevant.
  - In general, give the child the benefit of the doubt
- Obvious errors are not relevant
  - Partial utterances that contain some symbols where the child is just "messing around"
    - Give the child credit for the relevant symbols, and no credit for the irrelevant ones
- If child selects multiple symbols successively from the same category (e.g., prepositions, adjectives), the context determines how many of the symbols are relevant.
  - Example
    - Child: IN ON UNDER BARN
      - It's likely that the child is searching for the correct word, and just one of these prepositions is relevant, so this most likely has 2 relevant symbols
    - Child: BIG BLUE RED DOG
      - If the dog is both big and blue, both are relevant. If the dog is not red and no red dog is relevant in the broader context, then red is not relevant.

Nouns

- *Characters* and *objects* are relevant if they are
  - Mentioned in a recent conversational turn
  - Within view of the child
  - Being requested by or commented upon by the child

Adjectives

- *Adjectives* are relevant if they are
  - Relevant to the current topic of conversation
  - A characteristic of a character or object the child is referring to

Prepositions

- *Prepositions* are relevant if they
  - Describe the location, even if they select the wrong preposition (e.g., IN instead of ON)

Articles

- *Articles* are relevant as long as
  - The utterance contains at least one adjective or noun
  - Examples
    - Child: BLUE THE
      - Relevance: THE is relevant.
      - Rationale: It could be a word order issue (Which one do you want? THE BLUE)
    - Child: IN THE
      - Relevance: THE is ***not*** relevant.
      - Rationale: There is nothing here for the article to be describing

"*To be*" verbs

- *IS, AM*, and *ARE* are
  - Relevant if they are attached to a subject
  - Examples
    - Child: COW IS
      - Relevance: IS is relevant, regardless of the relevance of COW
      - Rationale: IS agrees with the subject.
    - Child: COW ARE
      - Relevance: ARE is relevant, regardless of the relevance of COW
      - Rationale: This utterance lacks SV agreement but the child is moving in the right direction
  - Not relevant if they
    - Seem to appear randomly, with no logical connection to the rest of the utterance
    - Are selected in isolation; e.g., an utterance that is just the symbol *IS*

Bound morphemes

- -ING is relevant if
  - Any lexical verb (that is, any verb other than IS, AM, or ARE) is present in the utterance, even if in the wrong word order.
  - Examples:
    - Child: COW –ING WASH
      - Relevance: -ING is relevant.
      - Rationale: There is a lexical verb WASH even though the word order is wrong.
    - Child: COW –ING or COW IS -ING
      - Relevance: -ING is not relevant.
      - Rationale: There is no lexical verb.
- -S is relevant if
  - The utterance contains a noun, pronoun, or a lexical verb even if in the wrong order
  - Remember that –S can function as a
    - plural (BLUE COW –S)
    - plural (BLUE –S COW)
    - contracted copula (COW -'S WASH –ING THE CAR)
    - 3rd person singular marker (COW WASH –(E)S THE CAR)
    - possessive (COW –'S PLATE)

Adjacent repetitions

- If the child repeats any symbols adjacently, count the symbol only once.

Non-adjacent repetitions

- All non-adjacent repetitions of a relevant symbol count as relevant.
    - Target: RED MONKEY IN CAR.
    - Child: CAR MONKEY CAR IN CAR
        - Relevance: All five symbols are relevant (PRSym = 100%).

Relevance vs. word order

- Do not attend to word order. If a symbol is relevant, count it.

Word Order Score*

Definition	Purpose	How to calculate
Rating of how accurate the word order is. *Accurate vs. complete:* "Correct" word order does not necessarily mean "complete." An utterance can have a score of 1 even if elements are missing.	This is designed to be a *syntactic* measure.	Each utterance receives a score of 0, .5, or 1. • 0 = No discernable word order is apparent. • .5 = Some word order is apparent but is not entirely accurate or clear • 1.0 = Word order has no discernable errors

*Note: This is our initial approach to determining word order. We likely will explore additional avenues.

Details

Single symbol utterances

- Single symbol utterances = 1.0
    - *Exception*: Bound morphemes used as single symbol utterance = 0

General rules:

- If <u>any</u> part of the word order is *inaccurate*, it cannot be scored as a 1.
- If <u>any</u> part of an utterance with flawed word order is *accurate*, such as putting the subject first but the rest is a mess, score this as a 0.5.

Labeling and Listing Within Same Part(s) of Speech

- If the child provides a list of nouns or adjectives by themselves, score this as a 1.
    - SAD HAPPY
    - COW RED BOX BLUE
    - GREEN DOG YELLOW MONKEY (Also see *Adjectives and Subject-Verb-Complement* section)
    - PUSH SHAKE
    - SHAKE PUSH
    - IN ON
    - I YOU

Contextual information

- Take all contextual information into account. If it's clear from the context that there are word order errors, do not give full credit.

***Video Probe Data** Examples*

- Target: BIG PIG IS PUSH -ING THE GREEN BATHTUB
- Child: GREEN PIG BIG HAPPY BATHTUB
    - Word order score: .5

        - Rationale: Pig & bathtub are in the right order; also the bathtub can be considered big
    - Child: GREEN PIG HAPPY BATHTUB
        - Word order score: 0
        - Rationale: No elements are in the right order.
    - Target: I AM ABOVE COW 'S BATHTUB
    - Child: BATHTUB ABOVE
        - Word order score: 0
        - Rationale: No elements are in the right order.

    - Target: ELEPHANT IS IN PIG'S AIRPLANE
    - CHILD: AIRPLANE IN ELEPHANT
        - Word order score: 0
        - Rationale: Elephant and Airplane are in the wrong order.

Relevance vs. word order

- Examine word order without regard to relevance

Video Probe Data *Examples*

    - Target: YOU ARE UNDER THE BLUE BOX
    - Child: IS MONKEY BOX BLUE
        - Word order score: .5
        - Rationale: Subject appears before object, so it's not a 0. However, it's also possible that the child meant to produce "Is Monkey's box blue?" However, we are not giving the children credit for possibly trying to create questions during video probes (see below).

Subject-Verb-Object (SVO) vs. Object-Verb-Subject (OVS)

- If the child produces an SVO utterance as an OVS, this is a 0, unless other elements of the utterance have a correct word order.

Video Probe Data *Examples*

    - Target (SVO): THE RED COW IS WASH –ING THE BLUE CAR
    - Child: CAR WASH COW
        - Word order score: 0
        - Rationale: OVS production
    - Child: CAR WASH RED COW
        - Word order score: .5
        - Rationale: Partial credit for Adj + Noun (RED COW)

Multiple adjectives

- No particular word order is required for adjacent adjectives
    - SAD BLUE COW (1)
    - BLUE SAD COW (1)

Adjectives and Subject-Verb-Complement (SVC)

- If an adjective + noun go together, give credit if it's presented as an S(V)C* utterance:

Video Probe Data *Examples*

  - Target: RED COW IS ON THE BLUE BOX
  - Child: RED COW
    - Word order score: 1
    - Rationale: Adjective + noun
  - Child: COW IS RED
    - Word order score: 1
    - Rationale: SVC
  - Child: COW RED
    - Word order score: 1
    - Rationale: S(V)C
  - Child: COW BOX LITTLE
    - Word order score: 1
    - Rationale: S(V)C
  - Child: COW RED BOX BLUE
    - Word order score: 1
    - Rationale: 2 S(V)C utterances; e.g. Cow is red, and the box is blue.
  - Child: COW RED BLUE BOX
    - Word order score: .5
    - Rationale: You cannot easily make this into one grammatical utterance
  - *Exception*: If there is more to the utterance than S(V)C, this likely is a word order error; example:
    - Target: RED COW IS ON THE BLUE BOX
    - Child: COW RED ON BOX
      - Word order score: .5
      - Rationale: These are two separate propositions (Cow is red; Cow is on the box); you can't easily make this a grammatically complete utterance that a preschooler would say. ON BOX is correct.
  - Target: COW -'S RED BOX
  - Child: BOX RED COW
    - Word order score: 0
    - Rationale: Same as above; these are two separate propositions (The box is red and/or there's a red cow).
- Brush up on subject complements online as needed.

Same order as target

- If two symbols are in the same order as the target – even if other symbols appear in between – give the child (some) credit.

  Video Probe Data *Example:*
  - Target: YOU ARE PUSHING LION -'S BATHTUB
  - Child: LION BOX AIRPLANE BATHTUB
    - Word order score: .5
    - Rationale: LION + BATHTUB are in the correct order

Use of AND

- Score as 1, as "and" implies no particular word order
- Note: The child may be using "and" as part of a listing function
    - HUG AND AIRPLANE
    - AIRPLANE AND HUG
    - PIG AND SAD
    - SAD AND PIG

Clear syntax with no relevance

- In the rare case of an irrelevant utterance with accurate, clear syntax, give the child credit.
- ***Video Probe Data*** *Example:*
    - Target: RED COW IS WASH-ING THE BLUE CAR
    - Child: LION IN BOX
        - Word order score: 1
        - Rationale: Accurate and clear syntax

Question forms

- **Video Probes**: We are assuming the children are not attempting to create questions.
- *Rationale*: To give them credit for this is likely to inflate their scores; it's more likely that they have word order issues vs. trying to form a question.
    - Target: YOU ARE UNDER THE BLUE BOX
    - Child: ARE YOU UNDER BOX
        - Word order score: .5
        - Rationale: Inversion of YOU and ARE

Sometimes, this is just hard & we won't get 100% agreement all the time!

Video Probe Data *Example*

- Target: MONKEY –S DIRTY CAR
- Child: BEHIND MONKEY CAR (UCF4 Mo1 #2)
    - Word order score: Can argue this as a .5 or a 1.0

Subject-Verb Present/ Not Present

Definition	Purpose	How to code
Determine which utterances contain both a subject and verb. Childlike sentences contain both a subject and a verb.	The presence of a subject and verb determines if the utterance can be classed as a sentence or not.	• Code SV "present" vs. "not present" for each utterance

Details

- "SV not present"
  - No SV adjacent to each other, or
  - SV are not in the correct order
    - Child: EAT DOG [VS instead of SV] Note: DOG could also be an object here – that is, someone is eating the dog – in which case, this would be an (S)VO utterance, and SV is still not present.)
- "SV present"
  - Subject-verb MUST be adjacent and in the correct order
    - *Note*: The child does not have to demonstrate SV agreement.
    - Child: DOG DRIVE TRACTOR
      - SV present
    - Child: TRACTOR DOG DRIVE
      - SV present (SV is present and adjacent and in the correct order, even though the object is not in the correct order)
    - Child: DOG CAKE EAT
      - SV not present; DOG (S) and EAT (V) are separated by the object (O)
    - Child: MONKEY –S ON BED
      - This counts as a sentence. The –S could be a contracted copula.
    - Child: PIG 'S IN THE BATHTUB
      - This counts as a sentence. The –S could be a contracted copula.

Modifiers

- *Grammatical intent clear/ Grammatical intent unclear*
  - Details are in the next section; whether an utterance is "clear" or "unclear," complete the modifier re: lexical verbs.
  - *Lexical verb/ Non-lexical verb*
    - Lexical verbs include all verbs (in the current study) other than IS, AM, and ARE
    - Remember: IS, AM, and ARE can function as an auxiliary verb or a main verb.
      - I AM DIRTY = AM is a main V
        - This utterance does not contain a lexical verb
      - I AM WASH CAR = AM is an Aux V, and WASH is the main V
        - This utterance does contain a lexical verb (WASH)
  - *Unique Subject-Verb (USV) coding*
    - Each utter is coded as either "USV" or "Repeated SV combination"
    - If USV, transcribe the USV in the comment section.

- To code USVs, *only analyze the subject and verb*. Ignore the rest of the utterance.
- USVs contain unique subject + *lexical* verb combinations
- If the utterance is coded as "non-lexical verb," do not code USV. Examples:
    - MONKEY WASH CAR
        - WASH = Lexical Verb
        - Code the USV: MONKEY WASH
    - MONKEY IS WASHING CAR
        - WASH = Lexical Verb:
        - Code the USV: MONKEY WASH
    - MONKEY IS SAD
        - IS = Main V, which is a non-Lexical Verb
        - Do not Code USV
    - DOG WASH CAR: USV = DOG WASH
    - DOG WASH AIRPLANE: Repeated SV combination of DOG WASH
        - By definition, this is not a USV; it's a repeated SV combination. The core subject-verb combination is the same.
    - Child: PIG 'S WASH IN BATHTUB
        - This counts as a sentence. The –S could be a contracted auxiliary.
        - SV = PIG WASH
    - Child: I –S WASH –S BATHTUB
        - This counts as a sentence. The child could be trying to attach a 'to be' verb to the pronoun "I" (i.e., I IS WASH BATHTUB)
        - SV = I WASH

- *Subject-Verb Agreement*
    - Only use this code for utterances that contain at least one 'to be' verb (IS, AM, ARE)
    - Code modifier "Subject-verb agreement (is, am, are) present" if the subject and 'to be' verb agree. Examples:
        - DOG IS
        - DOG IS EAT
        - DOG IS EAT -ING
        - HIPPO IS BIG
        - I AM HAPPY
        - YOU ARE LITTLE
        - YOU ARE HIDE
        - YOU ARE HIDE -ING
    - Code modifier "Subject-verb agreement (is, am, are) absent" if the subject and 'to be' verb do *not* agree. Examples:
        - DOG ARE
        - DOG ARE EAT
        - DOG ARE EAT -ING
        - HIPPO AM BIG

- I ARE HAPPY
- I IS BIG
- YOU AM HIDE
- YOU AM HIDE –ING
- YOU IS LITTLE

Grammatical Intent

Definition	Purpose	How to code
Enough grammatical information is present to confidently determine what the child is trying say (i.e., grammatical intent is clear), even if some grammatical elements are missing	This is used to determine whether a sentence is still at Phase 1/Phase 2 vs. moving into the realm of Phase 3/Phase 4; that is, moving into childlike and adultlike sentences	Code grammatical intent as "clear" or "unclear"

Details

- Only use this code for utterances coded as "SV present" (i.e., sentences)
    - Codes: Clear vs. Unclear
- The basic question
    - Is there enough grammatical information there that we know what the child is trying say, and just is missing some grammatical elements? Or are we unsure of what the thrust of the utterance is?
    - The utterance can be a stripped down, childlike sentence and still be clear. Examples:
        - DOG DRIVE CAR
        - DOG DRIVE
    - If there is doubt about what the intended sentence, it's unclear.
- Do not refer back to the target
    - Look at the sentence as its own proposition
        - The idea is to rate the grammatical intent, not the semantics
        - Even if it's not readily apparent what the child is referring to from the video, play context, etc., if the grammatical intent is clear, rate it as "clear."

Tense/Agreement

- Tense markers, such as present progressive –ing vs. past tense –ed, are not required for the sentence to be 'clear'

Word order

- Subject and verb must be in the correct order to be rated as "clear"
- It's possible for sentences to have a word order of .5 and still have clear grammatical intent. This may be rare, but it's possible.
    - ***Video Probe Example***
        - Target: BIG MONKEY IS WASH -ING THE AIRPLANE
        - Child: MONKEY WASH AIRPLANE BIG
            - SV = MONKEY WASH
            - Word order score = .5
            - Grammatical intent = Clear
        - Child: BIG MONKEY AIRPLANE WASH
            - SV = No SV, so do not rate this one
                - SV are not adjacent
            - Word order score = .5

Parts of Speech

Definition	Purpose	How to code
Indicate the presence of the following parts of speech: • Noun • Pronoun • Verb • Preposition • Adjective • Determiner • Conjunction	This measure is used to determine word class diversity of the child's utterances	Select each of the part of speech that is present in the utterance

Details

For each utterance

- Present
  - At least one part of speech is used in the utterance
    - The only time this won't happen is if the utterance consists only of bound morphemes
  - Modifiers: Select each part of speech that is present
    - Only select a part of speech once per utterance, even if it occurs multiple times. Example:
      - DOG DRIVE CAR
        - Noun
        - Verb
      - THE HIPPO -S IN BATHTUB
        - Determiner
        - Noun
        - Verb (Note: the –S is considered to be a contracted copula)
        - Preposition
- Absent
  - No parts of speech are used; i.e., the utterance consists only of bound morpheme(s).

Inflectional Morphemes: Present/ Not Present

Definition	Purpose	How to code
The available inflectional morphemes include -S and -ING. This measure indicates if either of these are appropriately used in a given utterance.	This is a very broad measure designed to simply capture the child's use of bound grammatical morphemes – any bound grammatical morphemes – over time.	Code each utterance to indicate if any grammatical morphemes are *present and appropriately used* or *not present.*

Details

- An inflectional morpheme is Present if used correctly in the utterance
  - COW HIDE-ING = present
  - DOG -S AIRPLANE = present
  - DOG –S = present
  - HIPPO-S WASH -ING CAR = present
- Inflectional morpheme is Not Present if used incorrectly
  - -S HIPPO BOX = not present
  - DOG -ING CAR = not present
- This is only used once per utterance, regardless of the number of inflectional morphemes.