

## Supplemental Material S1. General guidelines for child coding.

### I. Segmenting Utterances

It is important to know when a child communicative act ends and another begins. Often it is difficult to determine when an act is one continuous act or two or more acts that occur in rapid succession. The following can be used as a guide to determining how to segment child acts.

One communication act ends and other begins when:

- There is a *three second pause* in the child's vocalizations, gestures or talking.
- There is a *change in focus* of attention to new object.
- There is a *change in the intent* of the child's communication.

These rules should be applied whenever possible to accurately segment child communication acts. However, segmenting is frequently complicated by the presence of adult actions that occur simultaneously with portions of the child's act. When this happens, follow the guidelines below.

### Guidelines for Overlapping Communication Acts

- In general, try to think of the segmentation as much as possible in terms of natural turn taking in conversation.
- In the case of confusing overlapping speech: determine who begins speaking first and finish coding that utterance. The utterance is considered complete when the speaker either **a)** completes a thought or **b)** pauses for 3 seconds.
- As soon as the first speaker's utterance has been deemed complete, immediately start a new event in Observer and code the other speaker's utterance when it starts.

### II. Assigning a Communication Mode

The **mode** of a child's communication is described in four ways—as a **vocalization, sign, gesture**, or use of **augmentative and alternative communication (AAC)**. It is important to note that signs, gestures, or use of AAC can occur in conjunction with a verbalization or a vocalization. Vocalizations and AAC use are coded as state-based behaviors (timestamp start and end) and due to their typically short duration, signs and gestures are coded as point-based behaviors (timestamp just the start).

**Vocalizations:** Vocalizations include words, nonword vocalizations, and unintelligible speech. There must be obvious vocal cord vibration for the sound to be considered a vocalization.

Vocalizations can also include:

- Open vowels
- Raspberries
- Vowel approximations (string of two or more vowel sounds)
- Babbling – reduplicated or variegated
- Jargon – string of multiple consonant and vowel sounds produced with varied intonation

Vocalizations may also be coded as **Lexical** if the child is producing recognizable words; you can identify a clear communicative function, and or any of the following characteristics:

- Phonetically consistent form that is not related phonetically to the target word ("ba" for toy)
- Phonetically consistent form that is related to the target word in some way ("wawa" for water), may share at least one consonant with the target word

- Phonetically adult-like form which does not have to be produced perfectly, but can be readily identified as the target word ("wabbit" for rabbit)
- Intelligible words

Unintelligible speech includes vocalizations that have clear separation between words, marking of syllables and used to convey communicative intent, though the intent may be unclear.

Unintelligible speech would be coded as **Vocalization** + **Lexical** + **Unknown** communication function (see next section for details on communication functions).

**Sign Language:** Sign approximations are coded as signs if they are approximate to the actual sign and used to convey a consistent sign-meaning relationship.

**Gestures:** All gestures **MUST** be visible to be coded. The coder cannot assume that a gesture has occurred simply from contextual cues. The hand or other body part performing the gesture must be visible to the coder. Due to motor impairment, children with CP may not produce gestures clearly, however if the child is moving their body in a way that the mother interprets to have communicative intent, code it as a gesture. Body movements in which the mother does not interpret as having communicative intent do not need to be coded.

### **List of Common Gestures in Child Coding**

1. **Touching the Mother:** Examples include placing the mother's hand on a jar to request help opening it or pulling on the mother to gain her attention. Accidental touch, such as brushing up against the mother, is not coded.
2. **Showing an Object:** Child must extend object toward the mother.
3. **Giving:** Child must demonstrate attention to the mother, extend object and finally release object to the mother.
4. **Tapping:** Child must tap the object while looking at the mother. The child must seem to want the mother to notice the object. Tapping may be with the whole hand or with a single finger. This gesture must be interpreted as an indicative gesture: "notice this."
5. **Reaching:** A reach must be open-handed and abbreviated (i.e., the child does not directly grab object), involving an extended arm and a momentary, expectant pause by the child. The intention of the act may be imperative or declarative.
6. **Proximal Point:** Child refers to an object by touching it with a finger.
  - a. The index finger must be extended, must touch the referent, and must be separated from the adjacent fingers.
  - b. At least two of the adjacent fingers should be curled under or arched up.
7. **Object Movement:** Examples include throwing, dropping, moving an object away, moving an object toward mother, or moving object away from mother. This act must be purposeful and hold communicative meaning. Ask yourself "why is the child moving the object in the way that he/she is?" In the situation of moving an object toward the mother, the object must cross the midline between the child and the mother. The child must want the mother to understand some sort of communicative function and respond accordingly, whether that takes place through a verbal response or an action.
8. **Making a Depictive Gesture/Pantomime-Like Action:** Pantomime is the use of a part of the body or face to imitate an object or the use of that object.
  - a. Pretending to brush one's hair without a hairbrush

- b. Moving arms in a "rocking baby" movement without a doll
  - c. Finger plays such as "Here is the church"
9. **Wave:** Child waves the hand or arm. This can be directed toward an object or a person for the purpose of a greeting or a goodbye. Remember that the function of a wave is always social interaction
  10. **Shrug of Shoulders:** A shrug includes lifting of the shoulders to the ears or upturning of palms to indicate "what" or "I don't know."
  11. **Uprturned Palm:** The palm should be upturned as if to say, "give that to me." There should be an expectant pause in which the child waits for the adult to react. The upturned palm must not be part of an act designed to retrieve an object independently.
  12. **Both Palms Uprturned:** Both hands are held palms up and to the side as if to ask, "Where is \_\_\_\_\_?"
  13. **Come Here:** Uprturned palm with one or more fingers or the whole hand wiggling to convey the message to come over.
  14. **Shh Sign:** The sign must be distinctive with the finger held in close approximation to the mouth.
  15. **Head nod or shake:** A head nod or shake must be intended to convey the message yes or no.
  16. **Crossed Arms:** Arms crossed over chest to show dissatisfaction; not just a resting position.
  17. **Clapping:** Child brings hands together quickly in midline, palms should touch briefly.
  18. **Patting on a Chair:** As in "sit by me."
  19. **Hands Over Mouth:** One or both hands over mouth as if to express surprise.
  20. **Distal Point:** The index finger must be extended toward the object/person of interest. The other fingers should be at least slightly curled under making the point obvious. The child's finger must not touch the object/person and must be six or more inches from the object or person being indicate

**AAC:** May include pictures symbols, communication boards/books, digitized voice output, speech-generating device, or iPad with communication app.

### III. Assigning a Communication Function

Communication acts need to be assigned a communicative function, a function is determined primarily according to the apparent effect on the adult. If a communication act does not have a clear intent, code it as unknown:

**Initiation:** A self-initiated communication act is any act where the child is drawing the mother's attention to something and not directly responding to a mother's directive or question and not trying to obtain the object.

- Example – "Mom, look at the Legos!" (point)

**Requesting:** An act that has the effect of drawing mother's attention to some object and her assistance in obtaining that object or some action upon it.

**Responding:** All behavior that is a direct response to a request, question, or event (e.g., "Look at me," "Do you think that was funny?") when a response is obligatory.

**Protesting:** An act in response to an adult's action or verbalization and has the effect of ending an activity or removing an object.

**Repair:** An act of repair occurs when a communication breakdown has taken place between the child's communication act and the mother's reception of that act.

**Comment:** An act of commenting is a direct response if it follows an adult's turn and serves to continue an action when it's not obligatory.

**Imitation:** An imitation is any time a child imitates the words, sounds, signs, or gestures of the mother or a recorded voice such as a toy that makes noise. To be coded as an imitation, the act must meet the following requirements

- It must occur within 3 seconds following the mother's or toy's act.
- The imitation must match or approximate verbalization to verbalization, vocalization to vocalization, gesture to gesture, and sign to sign.
- If the imitation is a verbal one, it must NOT occur in conjunction with head nodding (to indicate agreement or disagreement) or with any other form which might indicate that the child is answering a question posed by an adult.
- Note: see reading code for exception to imitation rules.

**Unknown:** Intent could not be determined because the vocalization included unintelligible speech or vocalizations that were not interpreted by the mother.