Exploring Joint Attention in American Sign Language: The Influence of Sign Familiarity

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Joint attention (JA), broadly defined as the active shared coordinated attention of a child and a caregiver on an object or an event (Gabouer & Bortfeld, 2021) has been shown to facilitate word learning and subsequent vocabulary development in young children (Abney et al., 2020; Morales et al., 2000; Yu et al., 2019). In spoken language interactions, children can direct visual attention to an object while perceiving auditory linguistic input, enabling them to perceive parallel input during JA. In contrast, during interactions in sign language, children perceive both environmental and linguistic information visually, leading to a more sequential input. As a result, JA in signed interactions requires higher sensitivity to gaze. It has been shown that signers are more sensitive to gaze cues in the input of their interactions by increased gaze-switches and mutual gaze in signers (Lieberman et al., 2014). However, how JA episodes are initiated and maintained in sign language interactions is largely unknown. It is likely that the unimodal nature of the signed input also has consequences on how JA is initiated and maintained in signed language interactions.

Although JA has been described in both spoken and signed interactions, within and across modalities there have been a wide range of approaches to defining and coding JA. The overall aim of the current study is to quantify JA between parents and children during signed interactions. A recent coding scheme developed by Gabouer and Bortfeld (2021) includes objective characterization of the social aspect of JA so that intentionality and mutual awareness of the social partners' attentional state are considered. We explored whether this coding scheme could capture the attention dynamics in interactions in American Sign Language (ASL). If so, we were interested in what possible insights it can give about the temporal organization of JA in signing dyads. With the coding scheme we successfully identified properties of JA (e.g. frequency and duration) in our ASL dataset that we then used to investigate the temporal layout of JA episodes. We predicted that interactions around novel signs would differ from those around familiar signs with regard to the timeline of JA initiation within the dyad's interaction.

Method. We analyzed an existing corpus of 12-15-minute-long parent-child interactions in ASL, the ASL-PLAY dataset (https://osf.io/3w8ka/). Children between the age of 9 months and 69 months were playing with a caregiver in one of two naturalistic play situations. In "familiar" play sessions (n =23, x̄= 35m.o.), children were given a set of familiar objects (e.g. a fruit set). In the "novel" play sessions (n = 31, x̄ =41m.o.), children were given both familiar as well as four novel objects (e.g. kiwi, ostrich). Signs for these four objects (that have no lexical sign in ASL) were borrowed from other signed languages and taught to the caregivers in advance so that caregivers could use the novel sign if interacting with the object during the play session.

Coding. We focused on JA around "naming events", defined as instances in which a concrete object (familiar or novel) was labelled by either the parent or child. Following the coding scheme developed by Gabouer and Bortfeld (2021), we analyzed previously coded gaze,

touch, attentional behaviours and ASL signs surrounding all naming events, and identified JA episodes based on a number of criteria. As shown in Figure 1, a successful JA sequence between two interaction partners is described as a sequence consisting of 1) an initiator's bid for attention; 2) a target's response; and 3) an initiator's verification. All three parts of the sequence must be present and in a specific temporal relationship to each other to be considered a successful JA episode as further defined by the coding scheme. We identified the
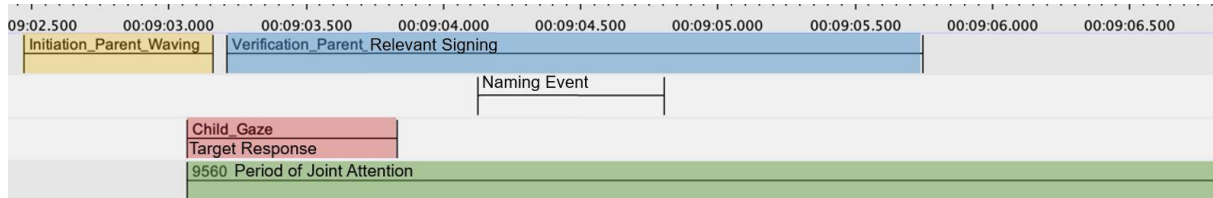

Figure 1 Application of the Gabouer & Bortfeld coding scheme onto ASL interaction data, showing a successful JA episode. Important elements (Initiation, Target Response, Verification, Naming Event and Shared Attention) are identified and can be seen in their temporal sequence. Here, the Naming Event is part of the parent's verification of the JA episode

success of each JA initiation (i.e. whether the initiation was followed by a target response and verification), the behaviours used to carry out each part of the JA sequence (e.g. signing, gaze, touch, other attentional behaviours), the timing of the naming event within the JA episode, as well as the duration and frequency of the JA episodes.

Results: We identified 587 naming events in the familiar sessions and 493 in the novel sessions. We compared the properties of JA episodes in both play sessions. While frequency and duration of JA episodes did not significantly differ for familiar vs novel naming events overall, we found significant differences in the way caregivers

Figure 2: Frequency of naming events being part of JA initiation by familiarity of the naming sign.

utilize and time JA events surrounding relevant sign events. More specifically, there were some differences in how JA was initiated: when naming familiar objects, the object label itself was frequently part of the JA initiation, but when naming novel objects, the object label was rarely part of the initiation (Figure 2). This suggests that caregivers may prioritize establishing JA *before* naming a novel object, presumably to ensure that the child is attending to them when they label the novel sign, and that caregivers time naming events within JA events carefully to maximize the chances for the child to successfully match the sign to the intended referent.
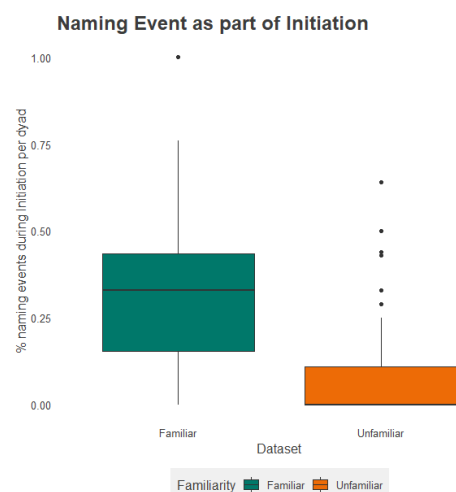
Our study provides support for the JA coding scheme proposed by Gabouer and Bortfeld as a useful tool for capturing JA in signed interactions. Our results show that caregivers interacting with deaf children in ASL are sensitive to the child's prior knowledge of object labels, and shape their interactions to support their child's language acquisition.

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