Iconic gestures are hand movements that depict motion and shape (e.g., wiggling the index and middle fingers to depict *walking*). People naturally produce iconic gestures while speaking (McNeill, 1992), and children understand the meaning of such gestures by age 3;0 (Stanfield, Williamson, & Özçalışkan, 2013). Iconic gestures that depict people's actions (e.g., *walking*) may influence how children process action events (e.g., a person *walking*) and associate verbs with these events (e.g., to *walk*). My dissertation describes a collection of empirical studies on how seeing iconic gestures facilitates action event memory and verb learning in preschool-aged children (M_{age}=3;6, range=2;11-4;2), in tasks that have proven to be difficult for this age group (Imai, Haryu, & Okada, 2005).

First, I developed and normed a stimuli database that contains 702 videos of action events and iconic gestures (Aussems, Kwok, & Kita, 2017a). Videos of action events showed actors moving across the length of a scene in unusual manners (e.g., quick upward kicking of the legs) and videos of iconic gestures showed an experimenter producing iconic gestures that depicted how the actors moved (e.g., alternating the hands in a quick up and downward motion as if the hands represent the leg kicks). My first empirical chapter describes four norming experiments with adult participants, which assessed how well the iconic gestures matched and mismatched the actors' renditions of the unusual movements (N=293), how similar different actors performed the same unusual movements (N=40), how distinct each unusual movement was relative to all other movements (N=222), and how difficult it was for English native speakers to describe the movements (N=24). This stimuli database is useful for experimental psychologists working on language and gesture; thus, I made the database and norming data openly available (Aussems, Kwok, & Kita, 2017b). I used a selection of videos with the best overall norms in my experiments with children.

Second, I examined whether 3-year-old children remember action events differently when they see iconic gestures while encoding action events (Aussems & Kita, in press). I

showed children videos of actors moving in unusual ways (*N*=72), while producing either iconic gestures that depicted how the actors moved, interactive gestures that did not depict any aspect of event but indicated excitement and surprise, or no gesture. After a short interval, children were asked to point at the videos they had seen before in a two-alternative forced choice test. Iconic gestures significantly boosted children's memory of the action events compared to interactive gestures and no gesture. Specifically, children showed better memory of those aspects of the events that were depicted in iconic gesture. This study revealed a novel function of iconic gestures; they focus children's attention on part of an event where important information can be seen.

Third, I investigated whether seeing action events before learning the verbs associated with those events promotes children's verb learning and whether seeing iconic gestures that depict those actions influences this process (Aussems, Mumford & Kita, 2018). Pre-exposure to actions facilitated verb learning (*N*=96), but only when iconic gestures guided the children's attention to the actions. A second experiment (*N*=48) replicated this effect and demonstrated that children benefited more from seeing iconic gestures than seeing extra action events. This study showed that children can use unlabeled experiences with action events for subsequent verb learning and that iconic gestures play a key role in this process.

Fourth, I tested whether children develop more general knowledge about verbs that belong to the same sub-category (e.g., locomotion verbs), when they learn verbs with iconic gestures that depict individual verb meanings (Aussems & Kita, 2019). Children who had previously been taught novel verbs with iconic gestures demonstrated such general knowledge in an immediate (*N*=48) and delayed (*N*=48) novel verb learning task in which different novel verbs were taught without iconic gestures. They significantly outperformed children who had previously been taught novel verbs with interactive gestures. This study showed that seeing iconic gestures helps children generate new abstract linguistic knowledge

about a sub-category of verbs, which they can use in subsequent verb learning. This effect persists long-term.

This dissertation expands our theoretical understanding of how iconic gesture promotes language acquisition, by revealing three novel functions of gesture: 1) directing children's attention to those aspects of events where important information can be seen, 2) integrating information from multiple (unlabeled) exemplars for subsequent verb learning, and 3) promoting abstract linguistic knowledge of the sub-category locomotion verbs. It thus shows that iconic gesture is an excellent tool for promoting children's word learning. This is important, because the vocabulary size of preschool-aged children is a major predictor of school success (Rowe, Raudenbusch & Goldin-Meadow, 2012).

References

Aussems, Suzanne, & Kita, Sotaro. 2019. Seeing iconic gesture promotes first- and second-order verb generalization in preschoolers. Ms. University of Warwick, Coventry.

Aussems, Suzanne, & Kita, Sotaro. in press. Seeing iconic gestures with action events facilitates children's memory of these events. *Child Development.* doi: 10.1111/cdev.12988

Aussems, Suzanne, Kwok, Natasha, & Kita, Sotaro. 2017a. GestuRe and ACtion Exemplar (GRACE) Video Database: Stimuli for Research on Manners of Human Locomotion and Iconic Gestures. *Behavior Research Methods* 50(3). 1270-1284. doi: 10.3758/s13428-017-0942-2

Aussems, Suzanne, Kwok, Natasha, & Kita, Sotaro. 2017b. Digital resource to support: GestuRe and Action Exemplar (GRACE) video database [online]. University of Warwick, Department of Psychology. Available at http://wrap.warwick.ac.uk/78493/

Aussems, Suzanne, Mumford, Katherine, & Kita, Sotaro. 2018. Seeing iconic gestures helps 3-year-olds use unlabeled action exemplars for verb learning. Ms. University of Warwick, Coventry.

Imai, Mutsumi, Haryu, Etsuko & Okada, Hiroyuki. (2005). Mapping novel nouns and verbs onto dynamic action events: Are verb meanings easier to learn than noun meanings for Japanese children? *Child Development* 76(2). 340-355. doi: 10.1111/j.1467-8624.2005.00849_a.x

McNeill, David. 1992. *Hand and mind: What gestures reveal about thought.* Chicago: University of Chicago Press.

Rowe, Meredith, Raudenbusch, Stephen & Goldin-Meadow, Susan. (2012). The pace of vocabulary growth helps predict later vocabulary skill. *Child Development* 83(2). 508-525. doi: 10.1111/j.1467-8624.2011.01710.x

Stanfield, Carmen, Williamson, Rebecca & Özçalışkan, Şeyda. 2013. How early do children understand gesture–speech combinations with iconic gestures? *Journal of Child Language* 41(2). 462-471. doi: 10.1017/S0305000913000019