# Dyadic coordination of infant behaviours and caregiver responses best predict later child vocabulary

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Children show large individual differences in their vocabulary development which influence their socio-cognitive outcomes. There is robust evidence that infants' gestures and vocalisations on the one hand, and caregivers' contingent responses on the other hand, individually predict later child vocabulary. Recent studies suggest that dyadic combinations of infant behaviours and caregiver responses are more robust predictors of children's vocabularies than individual behaviours. Previous studies have not yet systematically compared the effects of different dyadic combinations, including different infant behaviours and types of caregiver responses, on children's vocabulary outcomes. We examined 114 caregiver-child dyads at 9–11 months during six minutes of free play and children's concurrent (N-CDIs) and longitudinal (N-CDIs and PPVT-III-NL) vocabulary outcomes at 2–4 years. Using robust linear models, we compared the predictive value of three subsets of predictors: 1) frequencies of infants' behaviours (vocalisations, points, and shows+gives), 2) frequencies of infants' behaviours met with caregivers' verbal responses, and 3) frequencies of infants' behaviours met with caregivers' multimodal responses for children's vocabulary outcomes. Caregivers' responses were both semantically and temporally contingent on infants' behaviours. Caregivers' multimodal responses included all contingent verbal responses that were at least partially overlapping with nonverbal behaviours, including gestures and facial expressions. We found that infants' points related to children's later receptive vocabularies (b = 2.48, p < .001), while infants' shows+gives related to children's later productive vocabularies – but only when taking the instances that elicited caregivers' multimodal responses into account (b = 5.98, p < .05). We also found that only shows+gives met with caregivers' verbal or multimodal responses related to infants' gesture repertoires measured with the N-CDI (b = 1.53, p < .001; b = 1.20, p < .01, respectively). The results highlight the importance of examining dyadic and multimodal aspects of caregiver-infant interactions when examining relations to children's vocabulary development.