



# Relations Among Intersensory Processing, Social Competence, and Vocabulary Size in Infancy

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## BACKGROUND

Intersensory processing—coordinating temporally-synchronous stimulation across sensory modalities—is foundational for social and language development (Bahrack & Lickliter, 2012). For example, word-mapping and emotion perception are facilitated by synchronous audiovisual stimulation and attenuated by asynchronous or unimodal stimulation (Gogate & Bahrack, 1998; Vaillant-Molina & Bahrack, 2012). Research also indicates links between social and language development (Kuhl 2007; Vaughn van Hecke et al., 2007). However, interrelations among intersensory processing, social competence, and language have not been previously demonstrated. We thus explored relations among these three domains.

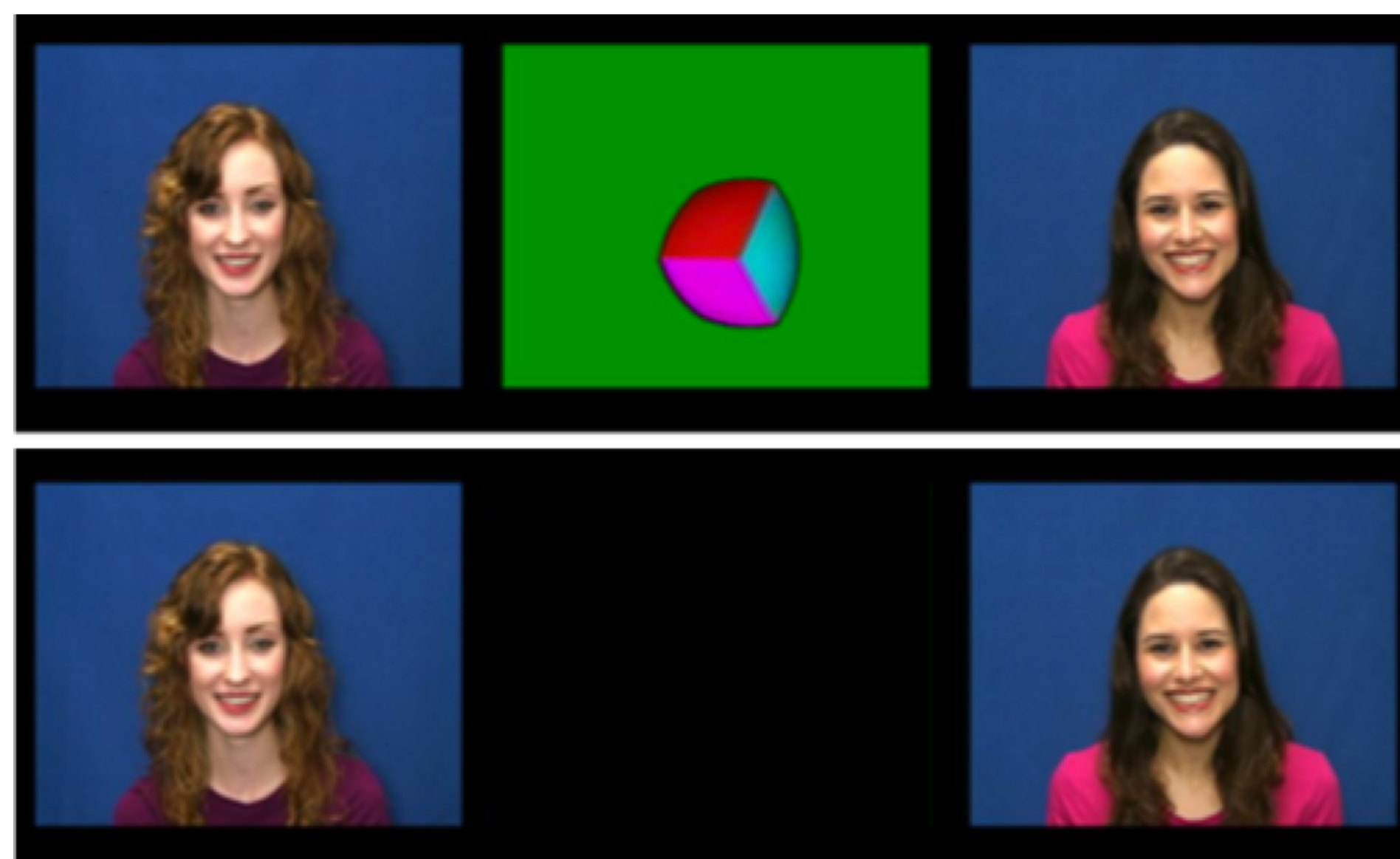
The Multisensory Attention Assessment Protocol (MAAP; Bahrack et al., in press), assesses individual differences in multisensory attention skills to audiovisual events in infants and children. The MAAP presents two dynamic visual events – one in synchrony with its natural soundtrack, and the other asynchronous. Children's looking time to these two events is used to calculate an individual difference measure of intersensory matching.

## METHOD

Thirty-three infants were tested longitudinally at 6 ( $M = 5.98$ ,  $SD = .21$ ) and 18 months ( $M = 18.02$ ,  $SD = .38$ ). At 6 months, infants received the MAAP. Each trial begins with a 3 s central visual event (morphing geometric forms) followed for 12 s by two lateral events (two women speaking), one of which is synchronous with her natural soundtrack (see Figure 1). Intersensory matching is calculated as the proportion of total looking time to the sound-synchronous event. For half of the trials, the central visual event remains on throughout the lateral events (high competition), and for the other half, it is turned off at the onset of the lateral events (low competition). For this study, we focused just on low competition trials, as high competition trials appeared too difficult for 6 month-olds.

At 18 months, we obtained parent-reports of social competence using the Infant-Toddler Social Emotional Assessment (Carter & Briggs-Gowan, 2006) and expressive vocabulary size using the MacArthur-Bates Communicative Development Inventory (Fenson et al., 2007).

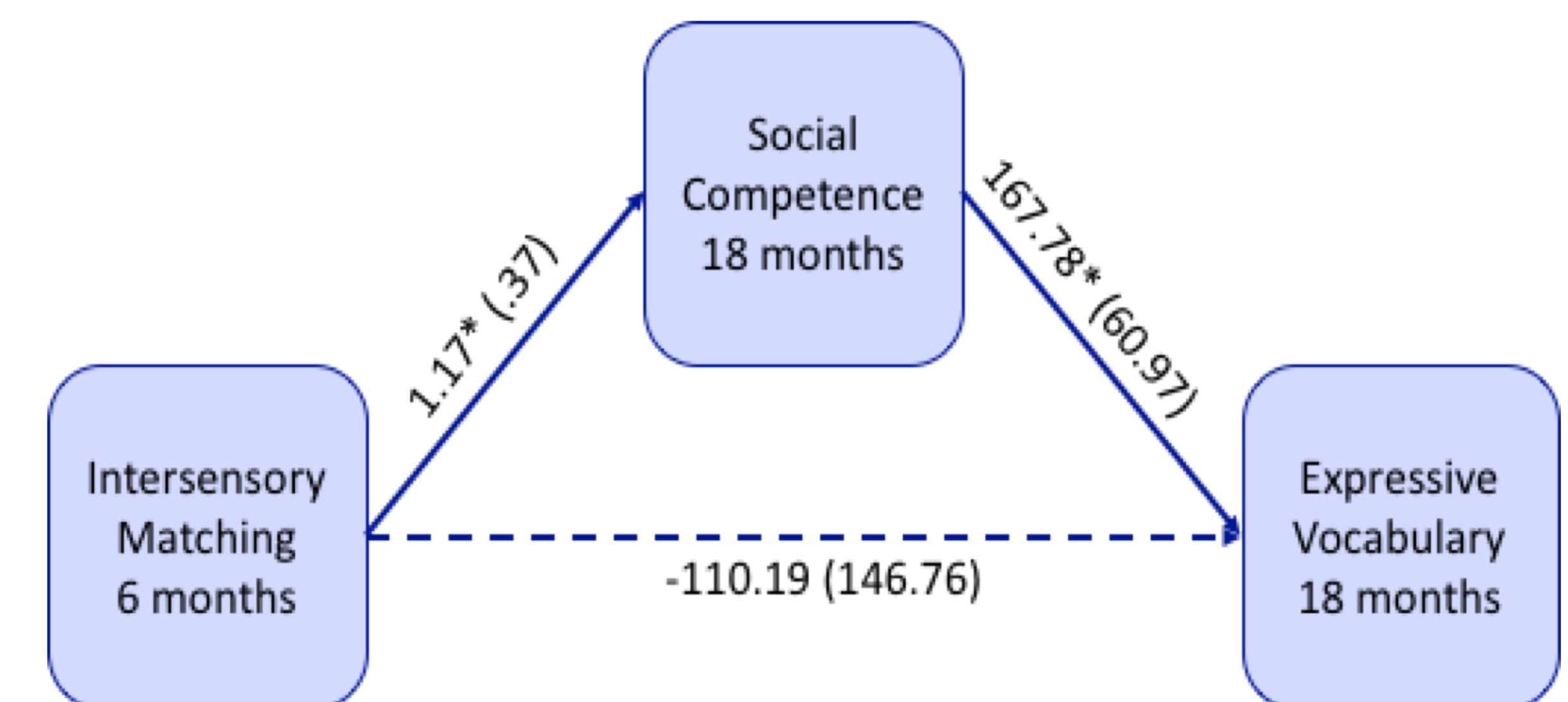
Figure 1. The Multisensory Attention Assessment Protocol (MAAP): Static images of high competition (top) and low competition (bottom) trials.



## RESULTS

Social competence was correlated with both intersensory matching ( $r = .41$ ;  $p = 0.004$ ) and vocabulary ( $r = .47$ ;  $p = .006$ ). Intersensory processing and expressive vocabulary were not correlated ( $r = .14$ ,  $p = .41$ ). Regression analyses indicated intersensory matching was a significant predictor of social competence,  $b = 1.17$ ,  $SE = 0.377$ ,  $p = .004$ ,  $R^2 = 24\%$ . In turn, social competence was a significant predictor of expressive vocabulary,  $b = 167.78$ ,  $SE = 60.91$ ,  $p = .01$ ,  $R^2 = 20\%$ . When controlling for social competence, intersensory matching was not a significant predictor of expressive vocabulary,  $b = -110.19$ ,  $SE = 146.76$ ,  $p = .46$ . Importantly, the indirect effect of intersensory matching on expressive vocabulary was significant,  $b = 197.24$ ,  $95\% CI = 43.44-473.83$  (See Figure 2).

Figure 2. Path model showing relations between intersensory matching, social competence, and expressive vocabulary. Unstandardized regression coefficients are presented with standard error in parentheses. Note: \*  $p < .01$ .



## CONCLUSIONS

Findings are among the first to demonstrate causal relations among intersensory processing, social competence, and vocabulary in early development. Infants who are more skilled at intersensory processing (who showed greater attention to face-voice synchrony) at 6 months, later, at 18 months, showed greater social competence, and in turn, larger expressive vocabularies. These findings suggest that infant intersensory processing may play a role in an important developmental cascade impacting later social and language skills. Increased attention to social events may lead to more opportunities for social interaction. More social interaction may lead to increased opportunities for developing social competence (e.g., affect attunement, empathy), as well as language learning. Findings also suggest that early identification of intersensory processing impairments may aid in identifying children at risk for language and social impairments.

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