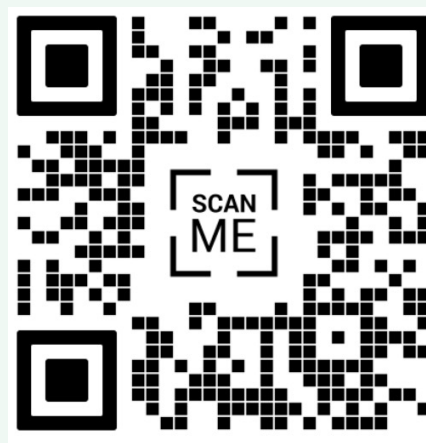


Multisensory Integration Correlates with Maternal Attention Facilitation, and Both Predict Vocabulary in Toddlers

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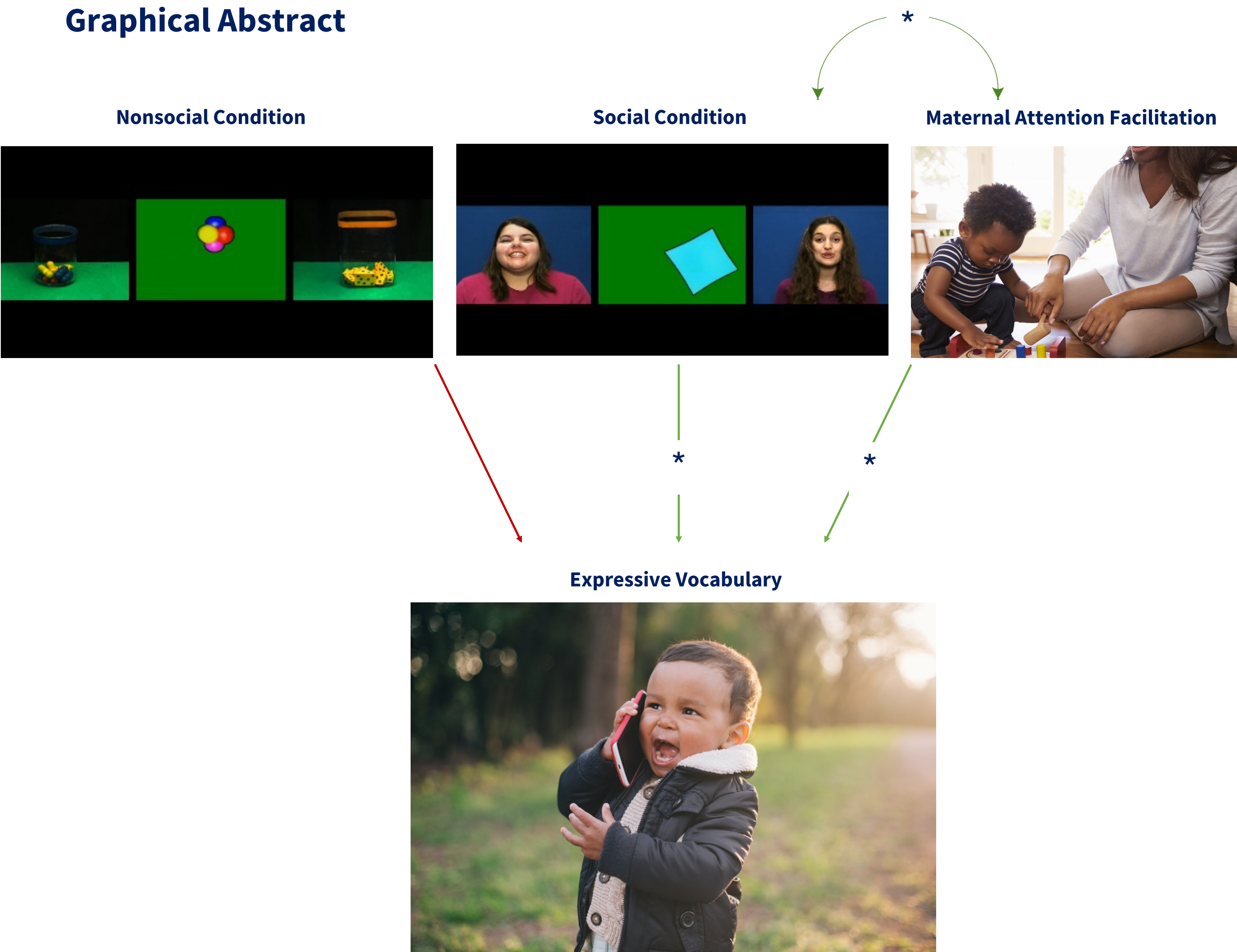
Highlights

- Multisensory integration (i.e., MSI; the ability to integrate information from multiple sensory modalities) plays a key role in development and language learning.
- Here, we found positive relationships between *social* MSI and expressive language at 24-months that were not found for nonsocial MSI.
- Additionally, maternal attention facilitation (measured during a 10-minute free-play) was significantly correlated to social MSI and expressive vocabulary.

Summary

The ability of two-year-olds to maintain focus on a speaking adult under other demands for attention predicts their vocabulary, and this ability seems positively influenced by mothers who are competent at facilitating the attention of their toddlers during play. Maternal attention facilitation also promotes good word learning. Interestingly, this integrative relationship does not emerge when toddlers are attending to AV nonsocial objects (compared to AV women speaking), so it may be extended experiences in face-to-face play that shape and guide multisensory integration skills and recruits them in the service of language learning.

Graphical Abstract



Graphical representation of MSI, expressive vocabulary, and maternal attention facilitation. There were significant and positive relationships between: 1) *social* MSI and expressive vocabulary, 2) maternal attention facilitation and expressive vocabulary, and 3) *social* MSI and maternal attention facilitation.

Introduction

Our purpose was to examine relationships between **multisensory integration**, aspects of **parenting**, and expressive vocabulary.

In infancy, attention is often directed and maintained by events high in ‘intersensory redundancy’ – coordinated, co-specified, synchronous properties across modalities.

Recent work in our lab found that 24-month-olds who attended more to an AV-matched event in the presence of a distractor had higher expressive vocabularies (Bruce, Panneton, & Taylor, 2021). This relationship only held for social stimuli (e.g., face + voice) not nonsocial stimuli (e.g., object + sound).

Given the importance of toddler-caretaker interactions for language development, it is possible that mothers help multisensory integration (MSI).



Method Continued

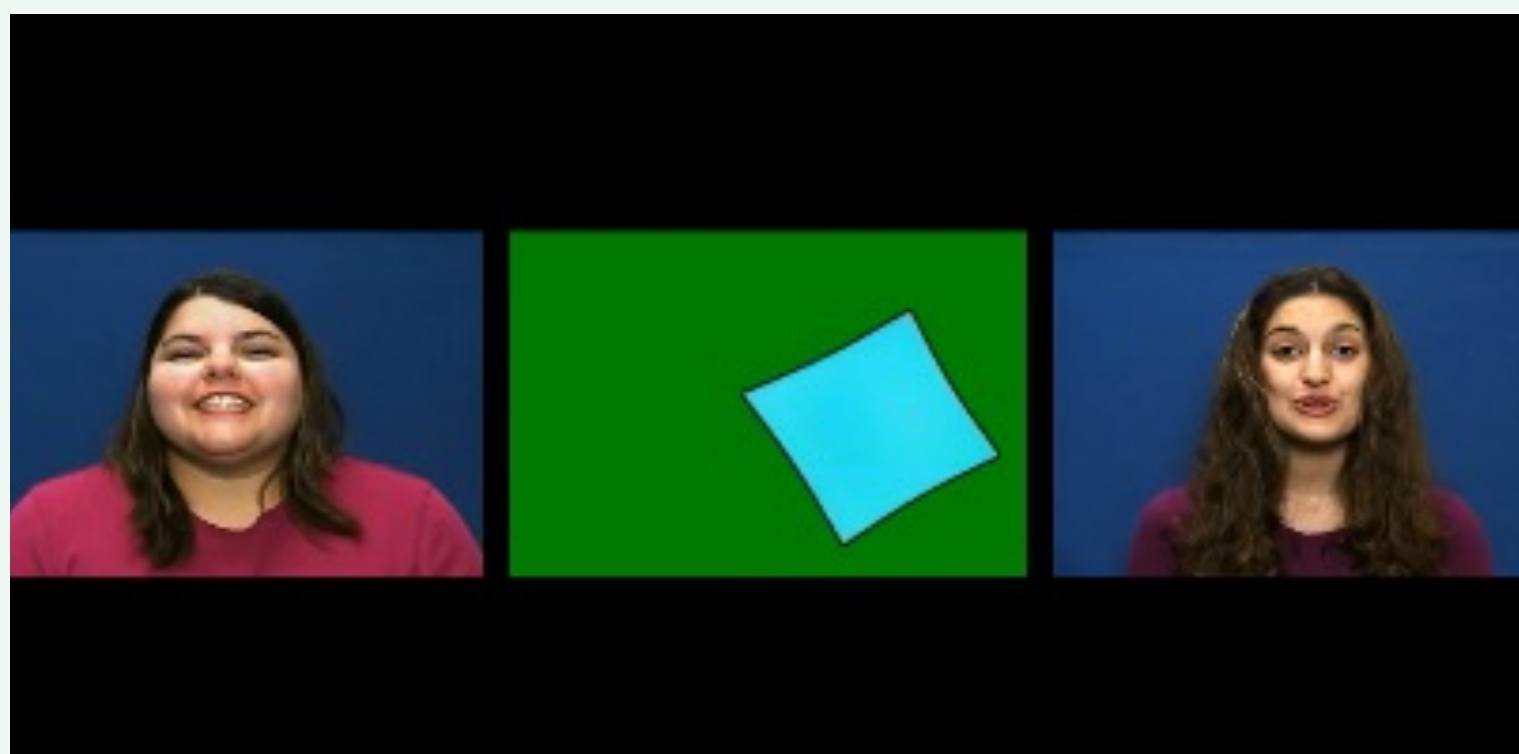
Multisensory Integration

- MSI Calculation**
- Each trial included one AV match (synchronous to the soundtrack) and one non-match.
 - Half of the trials were social, and the other half were nonsocial (see examples on the right).
 - On half of the trials, a distractor was present between the lateral events.

- Total duration of looking to the match was calculated for distractor trials:

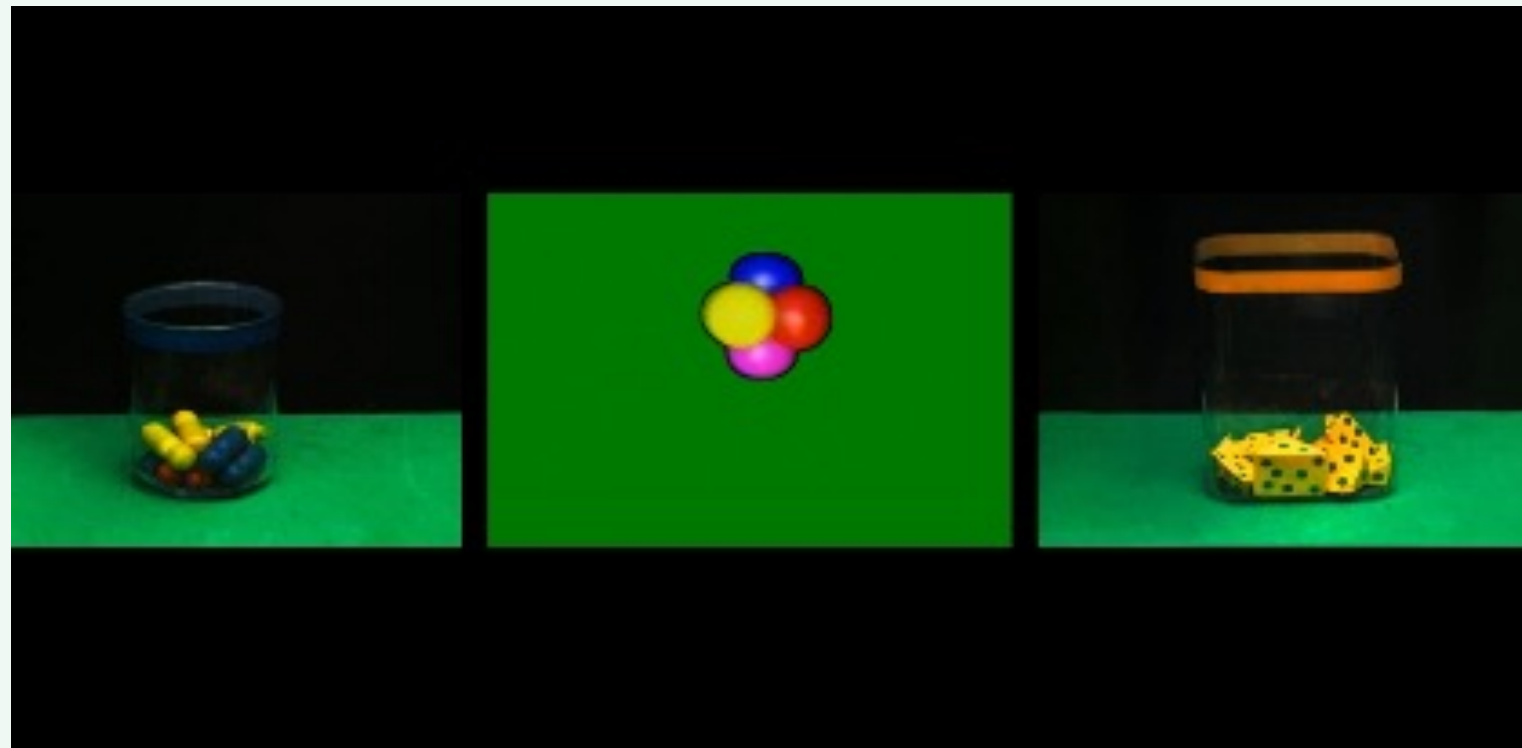
Match
Match + Distractor

Match Distractor Non-match



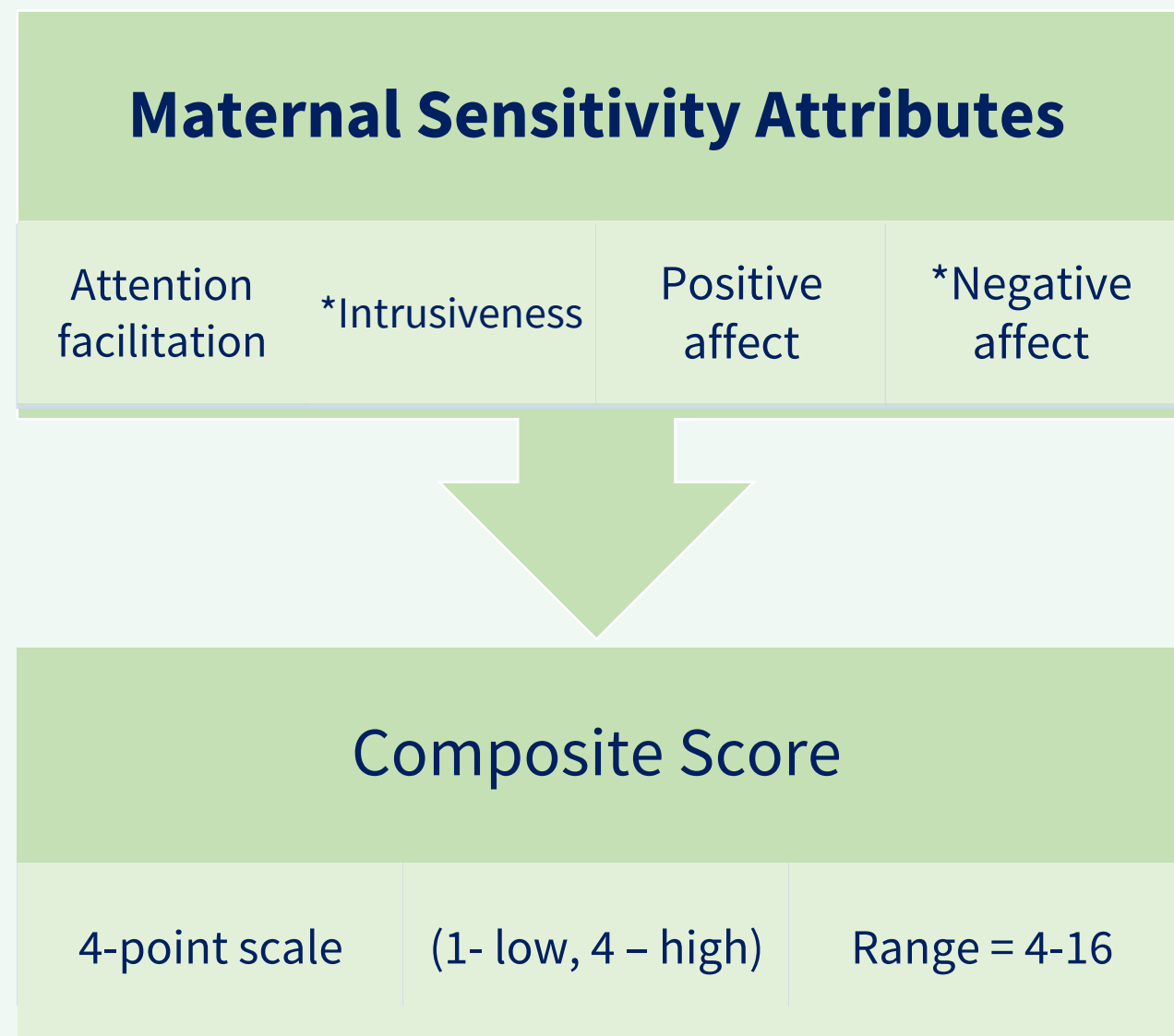
Social Condition

Match Distractor Non-match



Nonsocial Condition

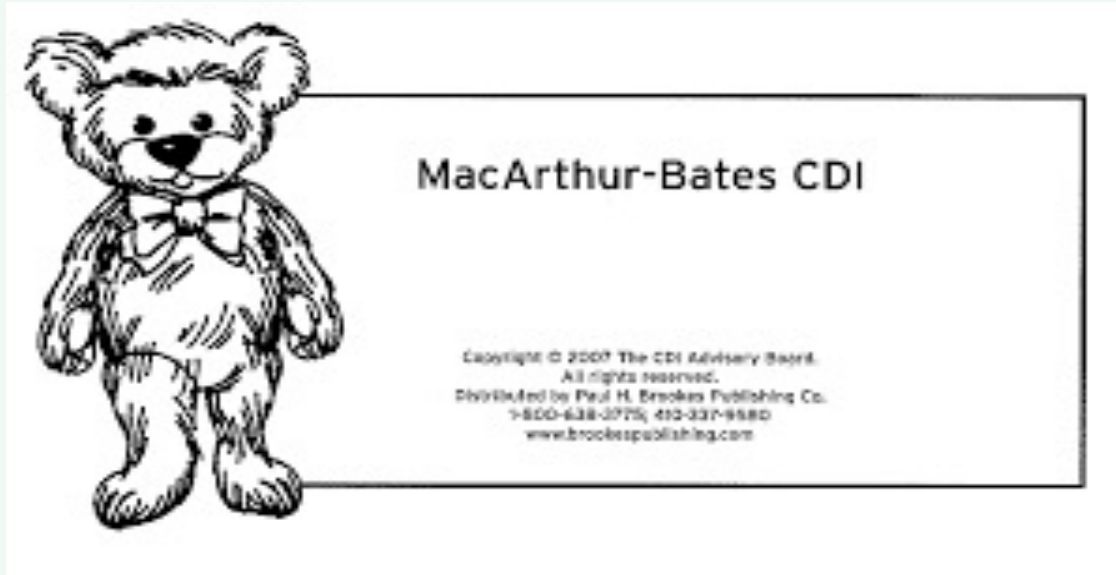
Maternal Attention Facilitation



Maternal Attention Facilitation

- During each session, each mother-toddler dyad completed a 10-minute, unstructured free-play.
- These sessions were recorded and offline coded for their total maternal sensitivity score.
- For the purpose of the current research question, we selected attention facilitation as the primary attribute of interest.

Expressive Vocabulary



- Vocabulary was measured using parent report of the MacArthur-Bates CDI Words and Sentences (MCDI).

Results

Correlation Coefficient

For *social* trials, significant correlations were found between MSI, maternal attention facilitation, and vocabulary

- MSI and vocabulary ($r = .59, p = .001$)
- MSI and maternal attention facilitation ($r = .35, p = .05$)
- Maternal attention facilitation and vocab ($r = .45, p = .01$)

Linear Regression

In a linear regression, social MSI and maternal attention facilitation significantly predicted MCDI ($R^2 = .39$ $F(30, 2) = 8.93, p = .001$) and explained 35% of variance in MCDI scores

- Each predictor was significant in predicting MCDI

Method

Participants

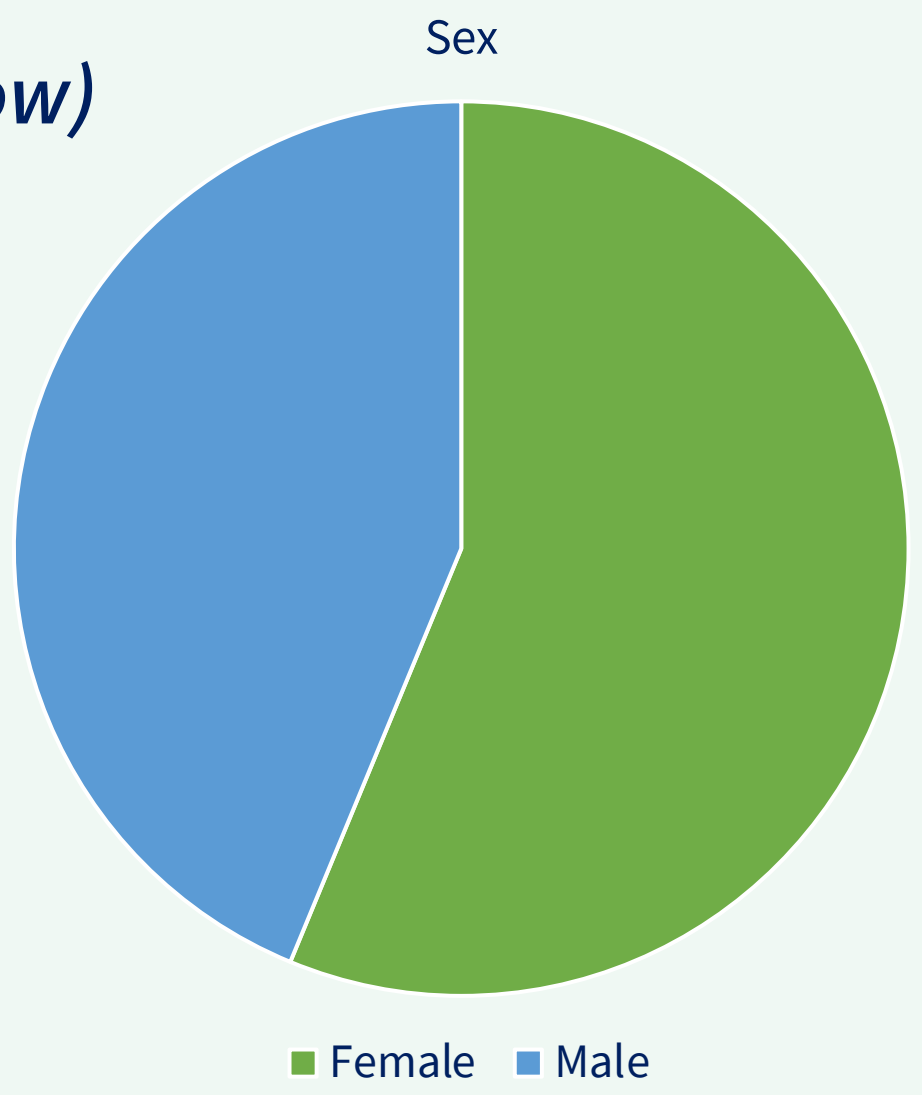
- 32 total mother-toddler dyads participated (18 = female)
- Toddlers were 24-months-old ($M = 23.5, SD = 1.30$)

Procedure

- Toddlers watched short clips of social and nonsocial stimuli, followed by a 10-minute free-play session

Variables Measured (Described in more detail below)

- MSI
- Maternal attention facilitation
- Expressive vocabulary



Discussion

Maintaining attention to the match under competition promotes language learning and face-to-face play with mothers (**particularly guided play**) shapes both **MSI** and **language**.