Infant Multisensory Attention to Social Events Predicts IQ in Toddlers

Kaitlyn Testa, James Torrence Todd, Elizabeth V. Edgar, Bret Eschman, & Lorraine E. Bahrick

Infant Development Lab

Florida International University

Introduction

Multisensory attention skills, including attention duration, speed of shifting, and accuracy of intersensory matching, are considered foundations for language, social, and cognitive development (Bahrick & Lickliter, 2012). Prior studies have demonstrated that multisensory attention skills predict language and social functioning (e.g., Bahrick, Todd, & Soska, 2018); however, few studies have focused on predicting cognitive outcomes. We propose that infant multisensory attention skills should predict cognitive outcomes in childhood. Enhanced multisensory attention skills reflect better attention control (i.e., selectively attending to relevant information and filtering out irrelevant information) and, in turn, should foster greater engagement and better learning from social-communicative interactions (events that provide high levels of rapidly changing multisensory information). The Multisensory Attention Assessment Protocol (MAAP; Bahrick et al., 2018) assesses individual differences in multisensory attention skills and thus, can be used to index relations with cognitive outcomes. We predicted that longer attention maintenance, faster attentional shifting, and greater intersensory processing accuracy in infancy as assessed by the MAAP would predict greater Full-Scale IQ (FSIQ) on the WPPSI-IV (Wechsler, 2012) in toddlers.

Methods

Children (N = 66) participating in an ongoing longitudinal study received the MAAP at 12- and 36-months. For the MAAP, each trial begins with a silent 3s central visual event (animated shapes) immediately followed by two lateral events (12s) of women speaking (social) or objects striking a surface (nonsocial; see Figure 1). The visual movements of one lateral event are synchronous with its natural soundtrack while the other is asynchronous. For social and nonsocial events, we calculated measures of *attention duration* (proportion of available time looking to lateral events), *shift speed* (reaction time to look from the central to the lateral events), and *intersensory accuracy* (proportion of total looking time to the synchronous events, i.e., intersensory matching). At 36-months, children received the WPPSI-IV and the FSIQ was calculated.
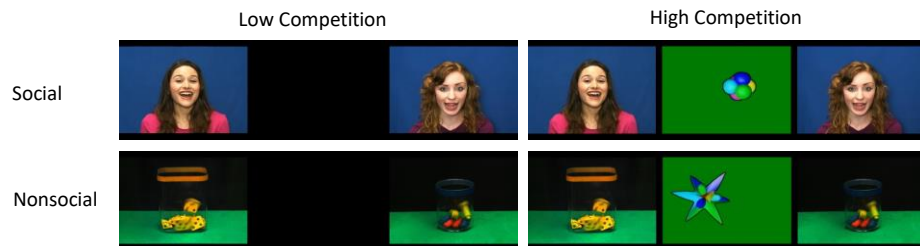

Figure 1. Static images of the dynamic audiovisual events from the MAAP.

Results

Correlations revealed that 12-month intersensory accuracy for social (but not nonsocial) events predicted 36-month FSIQ, p = .02 (Table 1; see Figure 2a). However, 12-month attention duration and shift speed did not predict FSIQ. Also, at 36 months, intersensory accuracy, p = .04, and attention duration, p = .01 (but not shift speed), for social (but not nonsocial) events predicted FSIQ (accuracy: Figure 2b, duration: Figure 2c). Importantly, 12-month intersensory accuracy was a significant predictor of FSIQ, unstandardized regression coefficient = .60, SE = .25, p = .02, (R_2 change = 11%) even after controlling for 36-month intersensory accuracy (R_2 total = .22; $F(2, 42)$ = 5.78, p = .01).

| | MAAP Measures | | | | | |
| | Social | | | Nonsocial | | |
Age	Duration	Accuracy	Speed	Duration	Accuracy	Speed
12 months	.09	.32*	-.07	.07	-.01	-.13
36 months	.36**	.28*	-.22	.13	-.15	-.11

Note: * p < .05, ** p < .01

Table 1. Correlations between WPPSI Full Scale IQ and the three MAAP measures (attention duration, accuracy of intersensory matching, speed of shifting) as a function of event (social, nonsocial) and age (12, 36 months).
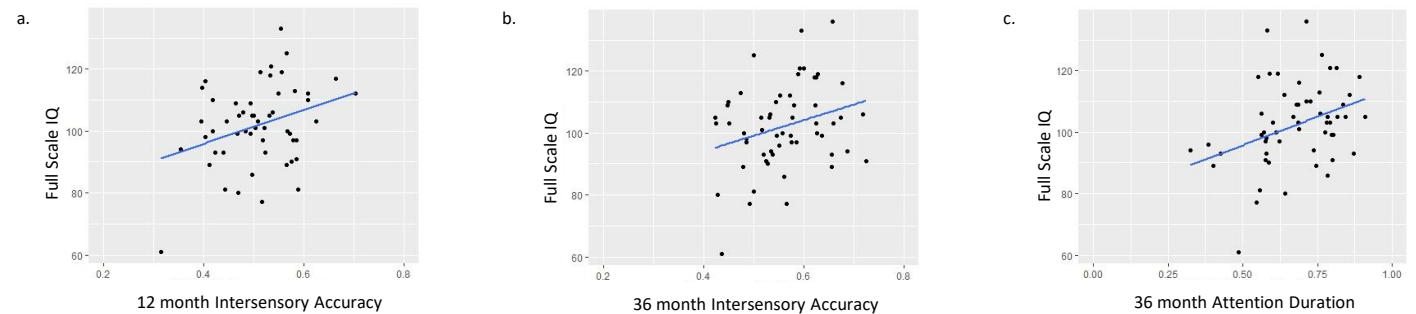

Figure 2. Scatterplots depicting relations between Full-Scale IQ on the WPPSI at 36 months and (a) intersensory accuracy at 12 months, (b) intersensory accuracy at 36 months, and (c) attention duration at 36 months.

Conclusions

The present findings provide novel evidence linking multisensory social attention skills with cognitive outcomes. Not only did we find concurrent relations between 36-month multisensory attention skills (duration, accuracy) and FSIQ, but multisensory attention skills (accuracy) in infancy (at 12-months) also predicted FSIQ at 36-months. These findings suggest that early assessments of multisensory attention skills may aid in identifying children at-risk for cognitive delays who could benefit from early interventions. Future research will explore the causal pathways between infant multisensory attention skills and child IQ (both verbal and nonverbal).

References

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