

Introduction

Attention and intersensory processing skills, cornerstones for social and language development, are traditionally studied independently. The Multisensory Attention Assessment Protocol (MAAP), our new nonverbal measure of basic attention and intersensory processing skills for infants (Bahrick et al., in prep; Todd et al., 2016), is designed to characterize individual differences in these skills within a single protocol. Using the MAAP, we examined how relations among attention maintenance, speed of shifting, and intersensory matching to audiovisual synchronous events change across infancy.

Methods

Infants were tested at 3 ($n = 86$), 6 ($n = 84$), and 12 ($n = 68$) months longitudinally (data collection ongoing). The MAAP consists of 12 trials of social events (women speaking) and 12 trials of nonsocial events (objects dropping against a surface). Trials consisted of a silent 3 s central event (animated shapes) followed by a soundtrack along with two lateral events (12 s) of either dynamic faces or objects (Figure 1). In each trial, one lateral event was synchronous with its natural soundtrack and one was asynchronous. On "competition trials", the central event remained on during the lateral events providing competing stimulation, and on "no-competition trials" it was turned off. We calculated *attention maintenance* (proportion of available looking time to the lateral events), *attention shifting* (speed to shift from the central to a lateral event), and *intersensory matching* (proportion of total looking to the sound-synchronous event) for competition and for no competition trials.

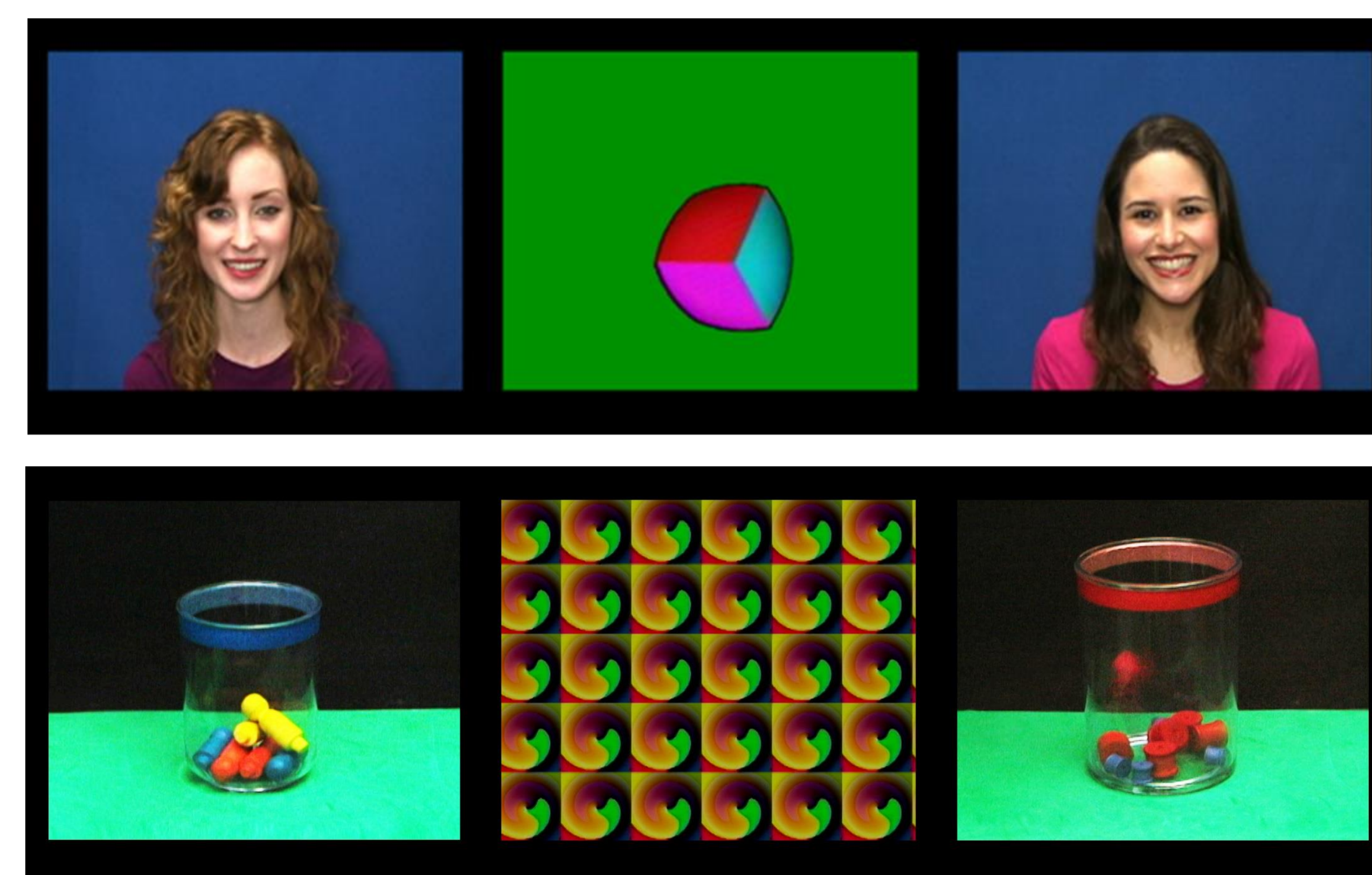


Figure 1. Static images of the social and nonsocial events.

Results & Conclusions

Measures of maintenance, shifting, and intersensory matching became increasingly inter-correlated (Table 1) and less variable (Figure 2) across age, particularly during competition trials. At 3 months, no significant relations were evident for either competition or no competition trials. At 6 months, during competing stimulation, infants with faster attention shifting (disengagement from the central event) maintained longer attention to the lateral events (*Pearson* $r = -.33$, $p = .01$). At 12 months, during competing stimulation, infants with faster attention shifting (disengagement) not only maintained longer attention to the lateral events ($r = -.42$, $p < .001$), but also showed greater intersensory matching ($r = -.33$, $p = .01$). In contrast, there were no significant correlations on no-competition trials at any age (except for a marginal correlation between maintenance and speed at 12 months). Further, it is apparent from Figure 2 that the variability and residual error for each of the measures decreased across age. Findings demonstrate that these building blocks for social and language development become increasingly coupled across infancy and interrelations are most evident in the context of competing stimulation.

Table 1. Correlation coefficients for attention maintenance (proportion of available looking time to the lateral events, PALT), intersensory matching (proportion of total looking time to the sound-synchronous lateral event, PTLT), and speed (reaction time to fixate a lateral event, RT) on competition and no competition trials as a function of age (3, 6, and 12 months).

	Age in months		
	3	6	12
Competition Trials			
Maintenance and Intersensory	.18	-.01	.22
Maintenance and Speed	-.07	-.33*	-.42**
Intersensory and Speed	.06	-.17	-.33*
No Competition Trials			
Maintenance and Intersensory	-.03	-.07	.05
Maintenance and Speed	-.14	-.05	-.27†
Intersensory and Speed	-.18	-.03	.17

Note. Correlation coefficients were tested against a modified alpha value of $p = .017$ ($.05 / 3 = .017$), to adjust for multiple statistical tests. † $p < .05$, * $p < .017$, ** $p < .001$.

References

Bahrick, L. E., Todd, J. T., & Soska, K. C. (2016). The Multisensory Attention Assessment Protocol (MAAP): A new nonverbal individual difference measure predicting language and cognition in young children. Manuscript under revision.

Todd, J. T., Soska, K. C., & Bahrick, L. E. (2016, May). Attention to multimodal events from 3 to 12 months: Developmental differences are magnified by competing stimulation. Poster session presented at the International Congress on Infant Studies, New Orleans, LA.

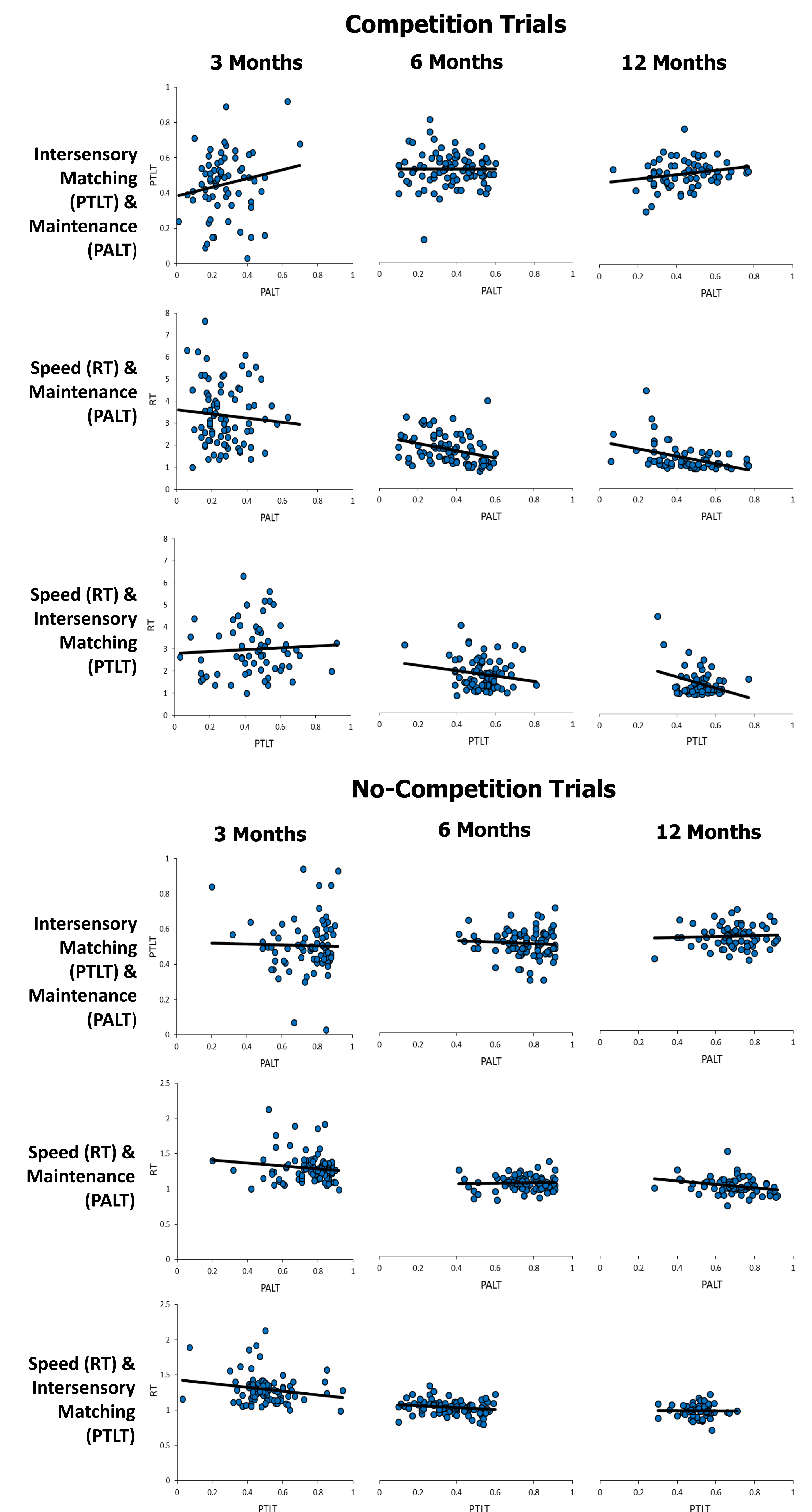


Figure 2. Scatterplots depict relations among measures, variability, and residual error for maintenance (proportion of available looking time to the lateral events, PALT), intersensory matching (proportion of total looking time to the sound-synchronous lateral event, PTLT), and speed (reaction time to fixate a lateral event, RT) on competition and no competition trials as a function of age (3, 6, and 12 months).