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Online Supplemental Material D

Analyses Using Only Last Two Minutes of Each Five-Minute Task

In this document, we repeated primary analyses using only the last two minutes of each 5-minute task (i.e., the last four out of ten 30-second intervals). The pattern of many significant findings was the same regardless of whether analyses included the last two minutes of interaction per task or the entire five minutes. However, some differences did emerge. Results which emerged in the two-minute analyses but not the five-minute analyses included: a) In the search tasks, the more neutral emotion a child expresses in one interval, the less happiness and the more neutral emotion their partner expresses in the next interval (de-escalation of positive emotion), and b) In the search tasks, the more anger a child expresses in one interval, the more happiness their partner expresses in the next interval (unexpected finding). Results which emerged in the five-minute but not the two-minute analyses included: a) In the search tasks, the more anxiety a child expresses in one interval, the more anxiety their partner expresses in the next interval (escalation of negative emotion), and b) In the planning tasks, the more sadness a child expresses in one interval, the more anxiety their partner expresses in the next interval (escalation of negative emotion).

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Table 1
Descriptive Statistics

	Search Tasks						Planning Tasks						Task Difference
	Min	Max	*M*	*SD*	Skew	Kurt	Min	Max	*M*	*SD*	Skew	Kurt	*F*
Happy	0.00	100.00	6.58	12.87	3.28	14.19	0.00	100.00	13.84	19.82	2.02	4.13	107.37***
Sad	0.00	35.03	0.19	1.53	11.55	171.87	0.00	81.88	0.13	1.93	32.45	1298.19	0.85
Angry	0.00	74.95	1.42	5.01	6.42	58.12	0.00	53.18	0.53	2.70	9.40	117.76	33.04***
Anxious	0.00	100.00	1.33	6.77	8.21	83.02	0.00	81.53	0.93	4.87	8.81	95.42	4.66*
Neutral	0.00	100.00	89.95	16.56	-2.65	8.50	0.00	100.00	83.61	21.79	-1.87	3.38	59.00***

Note: $N = 2424$ (202 children x 3 partners x 4 intervals); Min = minimum; Max = maximum; Kurt = kurtosis; * $p < .05$; *** $p < .001$

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Table 2

Multi-Level Models of Cross-Lagged Relations Across Dyad Members Within Same Emotion

	Search Tasks		Planning Tasks		Task Differences	
	Estimate	Posterior SD	Estimate	Posterior SD	Estimate	Posterior SD
Auto-Regressions Within Child						
$Happy_i \rightarrow Happy_{i+1}$	0.45***	0.02	0.51***	0.02		
$Sad_i \rightarrow Sad_{i+1}$	0.28***	0.02	0.19***	0.02		
$Angry_i \rightarrow Angry_{i+1}$	0.40***	0.02	0.18***	0.02		
$Anxious_i \rightarrow Anxious_{i+1}$	0.54***	0.02	0.36***	0.02		
$Neutral_i \rightarrow Neutral_{i+1}$	0.51***	0.02	0.54***	0.02		
Lagged Relations Across Children						
$Happy_i \rightarrow Happy_{i+1}$	**0.07*** **	0.02	**0.11*** **	0.02	-0.04	0.03
$Sad_i \rightarrow Sad_{i+1}$	0.03	0.03	-0.01	0.02	0.04	0.03
$Angry_i \rightarrow Angry_{i+1}$	**0.09*** **	0.02	0.04*	0.02	0.05	0.03
$Anxious_i \rightarrow Anxious_{i+1}$	0.03	0.02	0.02	0.02	0.01	0.03
$Neutral_i \rightarrow Neutral_{i+1}$	**0.12*** **	0.02	**0.13*** **	0.02	-0.01	0.03
Intercepts						
Happy	2.92***	0.31	4.97***	0.43		
Sad	0.14***	0.03	0.11**	0.04		
Angry	0.77***	0.11	0.42***	0.05		
Anxious	0.67***	0.13	0.56***	0.09		
Neutral	33.41***	2.30	27.97***	1.66		
Residual Variances						
Happy	124.71***	3.43	266.76***	8.68		
Sad	2.19***	0.06	3.57***	0.11		
Angry	21.55***	0.59	7.07***	0.22		
Anxious	32.95***	0.98	19.69***	0.66		
Neutral	194.37***	5.39	305.34***	9.42		

Note: This table represents five different models with one model per emotion. Estimates are unstandardized. Lagged relations across children are bolded if they are less than the Bonferroni-corrected α of .001. Task differences are bolded if they are less than the Bonferroni-corrected α of .002. *i = interval.* * $p < .05$; ** $p < .01$; *** $p < .001$.

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Table 3

Multi-Level Models of Cross-Lagged Relations Across Dyad Members Across Different Emotions

	Model for Happy and Sad									
	Search Tasks		Lagged Relations Diff. for Search Tasks		Planning Tasks		Lagged Relations Diff. for Planning Tasks		Task Difference	
	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Auto-Regressions Within Child										
$Happy_i \rightarrow Happy_{i+1}$	0.47***	0.02			0.55***	0.02				
$Sad_i \rightarrow Sad_{i+1}$	0.29***	0.03			0.19***	0.02				
Lagged Relations Across Children			-0.33	0.20			-0.07	0.16		
$Happy_i \rightarrow Sad_{i+1}$	0.00	0.00			-0.00	0.00			00.00	0.00
$Sad_i \rightarrow Happy_{i+1}$	-0.33	0.20			-0.07	0.16			-0.25	0.25
Intercepts										
Happy	3.34***	0.25			5.95***	0.42				
Sad	0.14***	0.03			0.15***	0.05				
Residual Variances										
Happy	125.08***	4.09			270.51***	8.19				
Sad	2.19***	0.06			3.57***	0.11				
	Model for Happy and Angry									
	Search Tasks		Lagged Relations Diff. for Search Tasks		Planning Tasks		Lagged Relations Diff. for Planning Tasks		Task Difference	
	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Auto-Regressions Within Child										
$Happy_i \rightarrow Happy_{i+1}$	0.46***	0.02			0.55***	0.02				
$Angry_i \rightarrow Angry_{i+1}$	0.40***	0.02			0.19***	0.03				
Lagged Relations Across Children			0.14*	0.06			0.09	0.15		
$Happy_i \rightarrow Angry_{i+1}$	**0.02*** **	0.01			0.00	0.00			**0.02*** **	0.01
$Angry_i \rightarrow Happy_{i+1}$	**0.16*** **	0.05			0.09	0.15			0.06	0.16
Intercepts										
Happy	3.15***	0.25			5.90***	0.42				
Angry	0.72***	0.11			0.43***	0.07				
Residual Variances										
Happy	125.05***	4.10			270.55***	8.19				
Angry	21.66***	0.60			7.06***	0.21				

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Model for Happy and Anxious										
	Search Tasks		Lagged Relations Diff. for Search Tasks		Planning Tasks		Lagged Relations Diff. for Planning Tasks		Task Difference	
	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Auto-Regressions Within Child										
$Happy_i \rightarrow Happy_{i+1}$	0.47***	0.02			0.55***	0.02				
$Anxious_i \rightarrow Anxious_{i+1}$	0.54***	0.02			0.37***	0.02				
Lagged Relations Across Children			-0.05	0.04			0.06	0.06		
$Happy_i \rightarrow Anxious_{i+1}$	0.01	0.01			-0.00	0.01			0.02*	0.01
$Anxious_i \rightarrow Happy_{i+1}$	-0.03	0.04			0.07	0.06			-0.10	0.07
Intercepts										
Happy	3.36***	0.25			5.88***	0.42				
Anxious	0.58***	0.13			0.62***	0.11				
Residual Variances										
Happy	125.17***	4.06			270.73***	8.15				
Anxious	33.10***	0.96			19.41***	0.62				
Model for Happy and Neutral										
	Search Tasks		Lagged Relations Diff. for Search Tasks		Planning Tasks		Lagged Relations Diff. for Planning Tasks		Task Difference	
	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Auto-Regressions Within Child										
$Happy_i \rightarrow Happy_{i+1}$	0.46***	0.02			0.53***	0.02				
$Neutral_i \rightarrow Neutral_{i+1}$	0.54***	0.02			0.57***	0.02				
Lagged Relations Across Children			0.02	0.03			0.01	0.03		
$Happy_i \rightarrow Neutral_{i+1}$	-0.05*	0.02			**-0.07*** **	0.02			0.02	0.03
$Neutral_i \rightarrow Happy_{i+1}$	**-0.04*** **	0.01			**-0.07*** **	0.02			0.03	0.02
Intercepts										
Happy	6.65***	1.36			11.59***	1.64				
Neutral	41.49***	1.73			37.33***	1.70				
Residual Variances										
Happy	124.91***	3.95			272.21***	8.45				
Neutral	196.32***	5.41			310.52***	9.61				

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Model for Sad and Angry										
	Search Tasks		Lagged Relations Diff. for Search Tasks		Planning Tasks		Lagged Relations Diff. for Planning Tasks		Task Difference	
	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Auto-Regressions Within Child										
$Sad_i \rightarrow Sad_{i+1}$	0.29***	0.03			0.19***	0.02				
$Angry_i \rightarrow Angry_{i+1}$	0.41***	0.02			0.19***	0.03				
Lagged Relations Across Children			0.00	0.07			-0.01	0.03		
$Sad_i \rightarrow Angry_{i+1}$	-0.01	0.07			0.00	0.03			-0.01	0.07
$Angry_i \rightarrow Sad_{i+1}$	-0.01	0.01			-0.01	0.02			0.00	0.02
Intercepts										
Sad	0.16***	0.03			0.11***	0.04				
Angry	0.86***	0.09			0.45***	0.06				
Residual Variances										
Sad	2.19***	0.07			3.58***	0.10				
Angry	21.73***	0.60			7.06***	0.21				
Model for Sad and Anxious										
	Search Tasks		Lagged Relations Diff. for Search Tasks		Planning Tasks		Lagged Relations Diff. for Planning Tasks		Task Difference	
	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Auto-Regressions Within Child										
$Sad_i \rightarrow Sad_{i+1}$	0.29***	0.03			0.19***	0.02				
$Anxious_i \rightarrow Anxious_{i+1}$	0.54***	0.02			0.37***	0.02				
Lagged Relations Across Children			-0.05	0.10			-0.02	0.05		
$Sad_i \rightarrow Anxious_{i+1}$	0.06	0.10			0.02	0.05			0.03	0.11
$Anxious_i \rightarrow Sad_{i+1}$	0.01	0.01			-0.00	0.01			0.01	0.01
Intercepts										
Sad	0.14***	0.03			0.11***	0.04				
Anxious	0.67***	0.11			0.58***	0.09				
Residual Variances										
Sad	2.19***	0.07			3.58***	0.10				
Anxious	33.13***	0.97			19.44***	0.62				

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Model for Sad and Neutral										
	Search Tasks		Lagged Relations Diff. for Search Tasks		Planning Tasks		Lagged Relations Diff. for Planning Tasks		Task Difference	
	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Auto-Regressions Within Child										
$Sad_i \rightarrow Sad_{i+1}$	0.29***	0.03			0.19***	0.02				
$Neutral_i \rightarrow Neutral_{i+1}$	0.55***	0.02			0.59***	0.02				
Lagged Relations Across Children			-0.38	0.22			-0.10	0.20		
$Sad_i \rightarrow Neutral_{i+1}$	0.38	0.22			0.10	0.20			0.29	0.28
$Neutral_i \rightarrow Sad_{i+1}$	-0.00	0.00			0.00	0.00			-0.00	0.00
Intercepts										
Sad	0.25	0.16			-0.10	0.15				
Neutral	39.90***	1.64			34.39***	1.50				
Residual Variances										
Sad	2.19***	0.07			3.57***	0.10				
Neutral	196.03***	5.43			309.90***	9.53				
Model for Angry and Anxious										
	Search Tasks		Lagged Relations Diff. for Search Tasks		Planning Tasks		Lagged Relations Diff. for Planning Tasks		Task Difference	
	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Auto-Regressions Within Child										
$Angry_i \rightarrow Angry_{i+1}$	0.41***	0.02			0.19***	0.03				
$Anxious_i \rightarrow Anxious_{i+1}$	0.54***	0.02			0.37***	0.02				
Lagged Relations Across Children			-0.00	0.03			-0.03	0.04		
$Angry_i \rightarrow Anxious_{i+1}$	0.01	0.03			0.02	0.04			-0.01	0.05
$Anxious_i \rightarrow Angry_{i+1}$	0.00	0.02			-0.01	0.01			0.01	0.02
Intercepts										
Angry	0.89***	0.10			0.45***	0.06				
Anxious	0.67***	0.12			0.57***	0.09				
Residual Variances										
Angry	21.65***	0.67			7.10***	0.19				
Anxious	33.14***	0.96			19.45***	0.62				

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Model for Angry and Neutral										
	Search Tasks		Lagged Relations Diff. for Search Tasks		Planning Tasks		Lagged Relations Diff. for Planning Tasks		Task Difference	
	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Auto-Regressions Within Child										
$Angry_i \rightarrow Angry_{i+1}$	0.40***	0.02			0.19***	0.03				
$Neutral_i \rightarrow Neutral_{i+1}$	0.55***	0.02			0.59***	0.02				
Lagged Relations Across Children			0.15*	0.07			0.09	0.18		
$Angry_i \rightarrow Neutral_{i+1}$	**-0.17*** **	0.07			-0.09	0.18			-0.06	0.18
$Neutral_i \rightarrow Angry_{i+1}$	**-0.02*** **	0.01			0.00	0.00			**-0.02*** **	0.01
Intercepts										
Angry	2.98***	0.55			0.46*	0.22				
Neutral	40.79***	1.65			34.47***	1.50				
Residual Variances										
Angry	21.57***	0.66			7.11***	0.19				
Neutral	195.82***	5.40			309.88***	9.53				
Model for Anxious and Neutral										
	Search Tasks		Lagged Relations Diff. for Search Tasks		Planning Tasks		Lagged Relations Diff. for Planning Tasks		Task Difference	
	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD
Auto-Regressions Within Child										
$Anxious_i \rightarrow Anxious_{i+1}$	0.54***	0.02			0.37***	0.02				
$Neutral_i \rightarrow Neutral_{i+1}$	0.55***	0.02			0.59***	0.02				
Lagged Relations Across Children			-0.02	0.04			0.01	0.08		
$Anxious_i \rightarrow Neutral_{i+1}$	0.01	0.04			-0.01	0.08			0.02	0.08
$Neutral_i \rightarrow Anxious_{i+1}$	-0.02*	0.01			0.00	0.00			-0.02*	0.01
Intercepts										
Anxious	2.04***	0.67			0.50	0.37				
Neutral	40.10***	1.63			34.46***	1.51				
Residual Variances										
Anxious	32.97***	1.05			19.77***	0.61				
Neutral	196.27***	5.44			310.12***	9.53				

Note: Estimates are unstandardized. Lagged relations across children are bolded if they are less than the Bonferroni-corrected α of .001. Lagged relations differences are bolded if they are less than the Bonferroni-corrected α of .0025. Task differences are bolded if they are less than the Bonferroni-corrected α of .002. SD = posterior standard deviation; Diff. = Difference; *i* = *interval.* * $p < .05$; ** $p < .01$; *** $p < .001$.

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Table 4

Interpretation of Cross-Lagged Relations in Multi-level Models of Emotion Transmission in Peer Dyads

	Search Tasks		
	Cross-Lagged Relations	Direction	Interpretation
Escalation of Positive Emotion	$Happy_i \rightarrow Happy_{i+1}$	+	The more happiness a child expresses in one interval, the more happiness their partner expresses in the next interval
Escalation of Negative Emotion	$Angry_i \rightarrow Angry_{i+1}$ $Angry_i \rightarrow Neutral_{i+1}$	+ -	The more anger a child expresses in one interval, the more anger and the less neutral emotion their partner expresses in the next interval
De-Escalation of Positive Emotion	$Neutral_i \rightarrow Happy_{i+1}$ $Neutral_i \rightarrow Neutral_{i+1}$	- +	The more neutral emotion a child expresses in one interval, the less happiness and the more neutral emotion their partner expresses in the next interval
De-Escalation of Negative Emotion	$Neutral_i \rightarrow Angry_{i+1}$ $Neutral_i \rightarrow Neutral_{i+1}$	- +	The more neutral emotion a child expresses in one interval, the less anger and the more neutral emotion their partner expresses in the next interval
Unexpected Findings	$Happy_i \rightarrow Angry_{i+1}$	+	The more happiness a child expresses in one interval, the more anger their partner expresses in the next interval
	$Angry_i \rightarrow Happy_{i+1}$	+	The more anger a child expresses in one interval, the more happiness their partner expresses in the next interval
	Planning Tasks		
	Cross-Lagged Relations	Direction	Interpretation
Escalation of Positive Emotion	$Happy_i \rightarrow Happy_{i+1}$ $Happy_i \rightarrow Neutral_{i+1}$	+ -	The more happiness a child expresses in one interval, the more happiness and the less neutral emotion their partner expresses in the next interval
De-Escalation of Positive Emotion	$Neutral_i \rightarrow Happy_{i+1}$ $Neutral_i \rightarrow Neutral_{i+1}$	- +	The more neutral emotion a child expresses in one interval, the less happiness and the more neutral emotion their partner expresses in the next interval

Note: This table only includes lagged relations across children below the Bonferroni-corrected α of .001.