Supplemental Information for

Risk Factor, Consequence, or Common Cause? Linking Lower Self-Regulation and Internalizing Symptoms During Middle Childhood in a Random Intercept Cross-Lagged Panel Model

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Table S1

Changes of fit indices for testing weak factorial measurement invariance (MI) of questionnaire-based measures from t1 to t3

	CFI	RMSEA	SRMR	Δ CFI	Δ RMSEA	Δ SRMR
Internalizing symptoms						
baseline model	.955	.038	.041			
weak factorial MI	.946	.040	.049	.006	.001	.007
Inhibitory control						
baseline model	.949	.037	.065			
weak factorial MI	.941	.038	.067	.008	.001	.002
Planning behavior						
baseline model	.953	.054	.040			
weak factorial MI	.950	.055	.049	.003	.001	.009
Emotional reactivity						
baseline model	.945	.044	.045			
weak factorial MI	.945	.044	.046	<.001	<.001	.001

Note. A change of ≥ .010 in CFI, supplemented by a change of ≥ .015 in RMSEA or a change of ≥ .030 in SRMR, would indicate non-invariance when testing for weak factorial measurement invariance in sample sizes > 300 (Chen, 2007).

Table S2

Bivariate correlations between internalizing symptoms and SR facets at all measurement points

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	**t1 INT**	--																							
2	**t2 INT**	.631**	--																						
3	**t3 INT**	.533**	.561**	--																					
4	**t1 WM**	-.100**	-.119**	-.110**	--																				
5	**t2 WM**	-.132**	-.146**	-.124**	.454**	--																			
6	**t3 WM**	-.092**	-.122**	-.116**	.385**	.455**	--																		
7	**t1 CF**	-.003	-.047	-.027	.353**	.326**	.312**	--																	
8	**t2 CF**	-.035	-.016	-.062*	.310**	.320**	.266**	.568**	--																
9	**t3 CF**	-.034	-.020	-.028	.096**	.099**	.140**	.181**	.217**	--															
10	**t1 IN**	-.051	-.056	-.054	.270**	.256**	.269**	.327**	.339**	.168**	--														
11	**t2 IN**	-.056*	-.027	-.086**	.225**	.278**	.246**	.309**	.330**	.171**	.594**	--													
12	**t3 IN**	-.036	-.045	-.050	.197**	.222**	.205**	.260**	.286**	.168**	.502**	.515**	--												
13	**t1 IC**	-.134**	-.142**	-.192**	.101**	.118**	.054	.144**	.181**	.072*	.113**	.099**	.040	--											
14	**t2 IC**	-.095**	-.143**	-.160**	.048	.093**	.026	.137**	.139**	.098**	.120**	.119**	.073*	.657**	--										
15	**t3 IC**	-.048	-.080*	-.140**	.069*	.106**	.069*	.139**	.167**	.096**	.106**	.105**	.065*	.568**	.610**	--									
16	**t1 PB**	-.194**	-.164**	-.224**	.265**	.278**	.259**	.301**	.302**	.166**	.287**	.288**	.225**	.296**	.263**	.286**	--								
17	**t2 PB**	-.187**	-.150**	-.175**	.243**	.263**	.277**	.281**	.286**	.160**	.291**	.264**	.187**	.297**	.240**	.274**	.810**	--							
18	**t3 PB**	-.182**	-.158**	-.213**	.162**	.148**	.157**	.220**	.189**	.153**	.199**	.176**	.154**	.235**	.214**	.278**	.583**	.627**	--						

19	**t1 AD**	-.038	-.046	-.050	.074**	.094**	.065*	.095**	.079**	-.001	.028	.026	.016	.017	.016	.036	.012	-.010	-.040	--			
20	**t2 AD**	.005	.017	.006	.075**	.081**	.080**	.114**	.121**	.034	.088**	.072**	.033	.018	.029	.030	.045	.063*	.004	.259**	--		
21	**t3 AD**	-.014	-.005	-.037	.082**	.061*	.081**	.081**	.123**	.027	.041	.075**	.031	.026	-.001	.017	.076**	.048	.040	.199**	.271**	--	
22	**t1 ER**	.418**	.345**	.323**	-.097**	-.086**	-.043	-.057*	-.073**	-.050	-.096**	-.116**	-.057*	-.402**	-.299**	-.193**	-.165**	-.170**	-.199**	-.043	-.007	-.067*	--
23	**t2 ER**	.304**	.431**	.288**	-.059*	-.092**	-.060*	-.053	-.046	-.007	-.120**	-.124**	-.088**	-.346**	-.356**	-.272**	-.140**	-.131**	-.200**	-.049	.027	-.025	.697**	--
24	**t3 ER**	.274**	.282**	.430**	-.033	-.043	-.057	-.030	-.052	-.008	-.081**	-.081**	-.035	-.327**	-.308**	-.344**	-.124**	-.153**	-.212**	-.033	.010	.013	.617**	.641**	--

Note: Abbreviations are INT = internalizing symptoms, WM = working memory updating, CF= cognitive flexibility/set-shifting, IN = inhibition, IC = inhibitory control, PB = planning behavior, AD = affective decision-making, ER = emotional reactivity (non-inverted).

*$p < .05$, **$p < .01$, ***$p < .001$.

Table S3

Overview of standardized parameter estimates including p-values and confidence intervals of all pathways of the final RI-CLPM

	b	***p***	**CI lower 2.5%**	**CI upper 2.5%**
Paths directed to or from internalizing symptoms				
Random intercept (RI) associations				
RI INT ↔ RI ER	**.560**	**<.001**	**.468**	**.653**
RI INT ↔ RI IC	**-.289**	**<.001**	**-.404**	**-.173**
RI INT ↔ RI WM	**-.286**	**<.001**	**-.436**	**-.137**
RI INT ↔ RI CF	-.107	.384	-.347	.134
RI INT ↔ RI IN	-.059	.318	-.176	.057
RI INT ↔ RI PL	**-.489**	**<.001**	**-.681**	**-.298**
RI INT ↔ RI AD	-102	.277	-.287	.082
Autoregressive paths				
INT t1 → INT t2	**.235**	**.003**	**.081**	**.390**
INT t2 → INT t3	.062	.593	-.165	.289
Cross-lagged paths				
INT t1 → ER t2	.015	.815	-.110	.140
INT t1 → IC t2	.077	.183	-.036	.190
INT t1 → WM t2	-.043	.355	-.134	.077
INT t1 → CF t2	-.033	.468	-.123	.057
INT t1 → IN t2	-.040	.454	-.146	.065
INT t1 → PL t2	.030	.545	-.066	.125
INT t1 → AD t2	.010	.844	-.091	.111
ER t1 → INT t2	.088	.270	-.068	.243
IC t1 → INT t2	.062	.299	-.055	.179
WM t1 → INT t2	-.002	.963	-.097	.092
CF t1 → INT t2	-.074	.131	-.169	.022
IN t1 → INT t2	-.034	.513	-.134	.067
PL t1 → INT t2	.119	.117	-.030	.267
AD t1 → INT t2	.014	.735	-.066	.093
INT t2 → ER t3	-.043	.608	-.208	.122
INT t2 → IC t3	-.129	.052	-.001	.260
INT t2 → WM t3	-.042	.449	-.149	.066
INT t2 → CF t3	-.043	.410	-.145	.059
INT t2 → IN t3	-.017	.778	-.138	.103
INT t2 → PL t3	.115	.130	-.034	.263
INT t2 → AD t3	.022	.657	-.074	.118
ER t2 → INT t3	-.021	.805	-.068	.243
IC t2 → INT t3	-.019	.798	-.055	.179
WM t2 → INT t3	-.016	.786	-.097	.092
CF t2 → INT t3	-.056	.425	-.169	.022
IN t2 → INT t3	-.114	.083	-.134	.067
PL t2 → INT t3	.093	.306	-.030	.267
AD t2 → INT t3	.083	.147	-.066	.093
ER t2 → INT t3	-.021	.805	-.068	.243
Concurrent associations				
INT t1 ↔ ER t1	**.256**	**<.001**	**.124**	**.387**
INT t1 ↔ IC t1	.013	.826	-.107	.134
INT t1 ↔ WM t1	.020	.712	-.085	.125
INT t1 ↔ CF t1	-.001	.986	-.116	.114
INT t1 ↔ IN t1	-.038	.528	-.155	.079

INT t1 ↔ PL t1	015	.855	-.146	.177
INT t1 ↔ AD t1	-.016	.735	-.107	.076
INT t2 ↔ ER t2	**.288**	**<.001**	**.183**	**.394**
INT t2 ↔ IC t2	-.023	.665	-.127	.081
INT t2 ↔ WM t2	-.060	.123	-.137	.016
INT t2 ↔ CF t2	.006	.898	-.082	.094
INT t2 ↔ IN t2	.009	.857	-.084	.101
INT t2 ↔ PL t2	.033	.589	-.088	.155
INT t2 ↔ AD t2	.042	.290	-.036	.119
INT t3 ↔ ER t3	**.283**	**<.001**	**.180**	**.386**
INT t3 ↔ IC t3	-.022	.666	-.121	.077
INT t3 ↔ WM t3	-.058	.122	-.133	.016
INT t3 ↔ CF t3	.005	.898	-.067	.077
INT t3 ↔ IN t3	.008	.857	-.079	.095
INT t3 ↔ PL t3	.026	.588	-.069	.121
INT t3 ↔ AD t3	.041	.293	-.035	.117
Paths directed to or from only SR facets				
RI associations				
RI ER ↔ RI IC	**-.475**	**<.001**	**-.563**	**-.388**
RI ER ↔ RI WM	**-.160**	**.039**	**-.311**	**-.008**
RI ER ↔ RI CF	-.177	.152	-.420	.065
RI ER ↔ RI IN	-.116	.064	-.238	.007
RI ER ↔ RI PL	**-.370**	**<.001**	**-.535**	**-.205**
RI ER ↔ RI AD	**-.201**	**.041**	**-.395**	**-.008**
RI IC ↔ RI WM	**.154**	**.039**	**.008**	**.301**
RI IC ↔ RI CF	**.271**	**.040**	**.013**	**.529**
RI IC ↔ RI IN	.086	.141	-.029	.201
RI IC ↔ RI PL	**.481**	**<.001**	**.325**	**.637**
RI IC ↔ RI AD	.144	.143	-.049	.336
RI WM ↔ RI CF	**.733**	**<.001**	**.471**	**.995**
RI WM ↔ RI IN	**.499**	**<.001**	**.371**	**.627**
RI WM ↔ RI PL	**.336**	**<.001**	**.150**	**.522**
RI WM ↔ RI AD	.122	.297	-.107	.351
RI CF ↔ RI IN	**.629**	**<.001**	**.418**	**.841**
RI CF ↔ RI PL	**.595**	**<.001**	**.285**	**.905**
RI CF ↔ RI AD	.017	.928	-.353	.387
RI IN ↔ RI PL	**.385**	**<.001**	**.235**	**.535**
RI IN ↔ RI AD	-.013	.885	-.196	.169
RI PL ↔ RI AD	.068	.584	-.175	.311
Autoregressive paths				
ER t1 → ER t2	**.254**	**.001**	**.101**	**.382**
ER t2 → ER t3	.131	.162	-.053	.314
IC t1 → IC t2	**.216**	**.003**	**.071**	**.361**
IC t2 → IC t3	.112	.112	-.026	.250
WM t1 → WM t2	**.146**	**.004**	**.047**	**.244**
WM t2 → WM t3	**.162**	**.002**	**.061**	**.263**
CF t1 → CF t2	**.418**	**<.001**	**.343**	**.493**
CF t2 → CF t3	**.107**	**.043**	**.003**	**.211**
IN t1 → IN t2	**.208**	**.001**	**.087**	**.329**
IN t2 → IN t3	.088	.156	-.034	.210
PL t1 → PL t2	**.608**	**<.001**	**.510**	**.706**
PL t2 → PL t3	**.268**	**.011**	**.061**	**.475**
AD t1 → AD t2	.081	.084	-.011	.173
AD t2 → AD t3	.073	.154	-.027	.174
Cross-lagged paths				
ER t1 → IC t2	-.030	.669	-.170	.109

ER t1 → WM t2	-.007	.909	-.121	.108
ER t1 → CF t2	.039	.431	-.058	.136
ER t1 → IN t2	-.071	.245	-.190	.049
ER t1 → PL t2	.040	.513	-.080	.161
ER t1 → AD t2	.081	.084	-.025	.204
IC t1 → ER t2	-.070	.267	-.195	.054
IC t1 → WM t2	.087	.087	-.013	.186
IC t1 → CF t2	**.139**	**.005**	**.042**	**.235**
IC t1 → IN t2	.053	.347	-.058	.164
IC t1 → PL t2	-.017	.735	-.117	.082
IC t1 → AD t2	-.017	.758	-.123	.090
WM t1 → ER t2	.032	.516	-.064	.127
WM t1 → IC t2	-.047	.337	-.142	.049
WM t1 → CF t2	**.063**	**.042**	**.002**	**.124**
WM t1 → IN t2	-.018	.631	-.093	.056
WM t1 → PL t2	.041	.297	-.036	.119
WM t1 → AD t2	-.002	-960	-.081	.077
CF t1 → ER t2	-.026	.611	-.127	.075
CF t1 → IC t2	.060	.263	-.045	.164
CF t1 → WM t2	**.127**	**.001**	**.051**	**.204**
CF t1 → IN t2	**.132**	**.001**	**.053**	**.211**
CF t1 → PL t2	.030	.411	-.042	.103
CF t1 → AD t2	**.113**	**.002**	**.040**	**.187**
IN t1 → ER t2	-.028	.615	-.135	.080
IN t1 → IC t2	.038	.502	-.072	.147
IN t1 → WM t2	.005	.912	-.077	.086
IN t1 → CF t2	**.125**	**.002**	**.045**	**.204**
IN t1 → PL t2	.055	.206	-.030	.140
IN t1 → AD t2	**.125**	**.006**	**.035**	**.214**
PL t1 → ER t2	.043	.571	-.106	.193
PL t1 → IC t2	-.021	.789	-.172	.131
PL t1 → WM t2	**.173**	**.004**	**.054**	**.291**
PL t1 → CF t2	.086	.071	-.007	.179
PL t1 → IN t2	.095	.119	-.025	.216
PL t1 → AD t2	.065	.258	-.048	.178
AD t1 → ER t2	.017	.670	-.061	-094
AD t1 → IC t2	-.024	.579	-.108	.060
AD t1 → WM t2	.059	.094	-.010	.129
AD t1 → CF t2	.042	.125	-.012	.096
AD t1 → IN t2	.027	.423	-.039	.094
AD t1 → PL t2	.018	.584	-.047	.083
ER t2 → IC t3	-.102	.133	-.235	.031
ER t2 → WM t3	.002	.967	-.112	.117
ER t2 → CF t3	.083	.122	-.022	.189
ER t2 → IN t3	-.029	.668	-.162	.104
ER t2 → PL t3	-.061	.396	-.203	.080
ER t2 → AD t3	.044	.425	-.027	.174
IC t2 → ER t3	-.041	.600	-.195	.113
IC t2 → WM t3	-.047	.371	-.149	.055
IC t2 → CF t3	.033	.546	-.075	.142
IC t2 → IN t3	.002	.974	-.113	.117
IC t2 → PL t3	-.062	.349	-.192	.068
IC t2 → AD t3	-.030	.534	-.125	.065
WM t2 → ER t3	-.008	.892	-.129	.112
WM t2 → IC t3	.064	.218	-.038	.166
WM t2 → CF t3	-.060	.140	-.139	.020

WM t2 → IN t3	.015	.743	-.074	.103
WM t2 → PL t3	.007	.898	-.099	.113
WM t2 → AD t3	-.007	.860	-.086	.072
CF t2 → ER t3	.017	.807	-.120	.154
CF t2 → IC t3	.098	.122	-.026	.223
CF t2 → WM t3	.082	.059	-.139	.020
CF t2 → IN t3	**.153**	**.004**	**.048**	**.257**
CF t2 → PL t3	.040	.486	-.073	.154
CF t2 → AD t3	**.122**	**.001**	**.049**	**.194**
IN t2 → ER t3	-.066	.351	-.204	.072
IN t2 → IC t3	.040	.473	-.070	.150
IN t2 → WM t3	.082	.059	-.074	.103
IN t2 → CF t3	.035	.401	-.046	.116
IN t2 → PL t3	-.047	.380	-.152	.058
IN t2 → AD t3	**.092**	**.014**	**.018**	**.166**
PL t2 → ER t3	.065	.521	-.134	.264
PL t2 → IC t3	.051	.536	-.111	.212
PL t2 → WM t3	**.216**	**<.001**	**.095**	**.338**
PL t2 → CF t3	-.010	.868	-.125	.106
PL t2 → IN t3	-.005	.939	-.141	.131
PL t2 → AD t3	.085	.145	-.029	.199
AD t2 → ER t3	.100	.081	-.012	.213
AD t2 → IC t3	-.018	.729	-.120	.084
AD t2 → WM t3	.023	.562	-.054	.100
AD t2 → CF t3	.025	.479	-.044	.093
AD t2 → IN t3	.035	.430	-.053	.124
AD t2 → PL t3	.002	.971	-.094	.098
Concurrent associations				
ER t1 ↔ IC t1	**-.315**	**<.001**	**-.428**	**-.201**
ER t1 ↔ WM t1	**.256**	**<.001**	**-.161**	**.074**
ER t1 ↔ CF t1	-.015	.818	-.143	.113
ER t1 ↔ IN t1	-.074	.229	-.195	.047
ER t1 ↔ PL t1	.015	.861	-.156	.187
ER t1 ↔ AD t1	.013	.808	-.089	.114
IC t1 ↔ WM t1	.080	.164	-.033	.194
IC t1 ↔ CF t1	.087	.164	-.035	.209
IC t1 ↔ IN t1	**.115**	**.049**	**.001**	**.230**
IC t1 ↔ PL t1	.063	.409	-.087	.214
IC t1 ↔ AD t1	-.018	.691	-.105	.070
WM t1 ↔ CF t1	**.251**	**<.001**	**.164**	**.337**
WM t1 ↔ IN t1	**.138**	**.003**	**.047**	**.229**
WM t1 ↔ PL t1	**.235**	**<.001**	**.111**	**.360**
WM t1 ↔ AD t1	.052	.196	-.027	.132
CF t1 ↔ IN t1	.218	<.001	.123	.314
CF t1 ↔ PL t1	**.188**	**.002**	**.066**	**.310**
CF t1 ↔ AD t1	**.128**	**.001**	**.051**	**.205**
IN t1 ↔ PL t1	**.181**	**.008**	**.047**	**.315**
IN t1 ↔ AD t1	.057	.140	-.019	.133
PL t1 ↔ AD t1	.047	.374	-.057	.152
ER t2 ↔ IC t2	**-.201**	**<.001**	**-.299**	**-.104**
ER t2 ↔ WM t2	-.042	.307	-.122	.039
ER t2 ↔ CF t2	.022	.624	-.067	.112
ER t2 ↔ IN t2	-.025	.589	-.117	.067
ER t2 ↔ PL t2	.010	.866	-.111	.132
ER t2 ↔ AD t2	**.120**	**.038**	**.046**	**.193**
IC t2 ↔ WM t2	.040	.252	-.029	.109

IC t2 ↔ CF t2	.061	.173	-.027	.149
IC t2 ↔ IN t2	.062	.131	-.019	.143
IC t2 ↔ PL t2	.024	.677	-.088	.135
IC t2 ↔ AD t2	-.012	.761	-.087	.063
WM t2 ↔ CF t2	.058	.063	-.003	.120
WM t2 ↔ IN t2	.044	.176	-.020	.108
WM t2 ↔ PL t2	**.080**	**.049**	**.000**	**.160**
WM t2 ↔ AD t2	.025	.395	-.033	.083
CF t2 ↔ IN t2	**.088**	**.012**	**.017**	**.159**
CF t2 ↔ PL t2	-.001	.960	-.077	.073
CF t2 ↔ AD t2	.037	.122	-.012	.103
IN t2 ↔ PL t2	-.011	.819	-.102	.080
IN t2 ↔ AD t2	.061	.059	-.001	.125
PL t2 ↔ AD t2	.050	.233	-.032	.131
ER t3 ↔ IC t3	**-.195**	**<.001**	**-.290**	**-.100**
ER t3 ↔ WM t3	-.041	.308	-.120	.038
ER t3 ↔ CF t3	.018	.624	-.067	.112
ER t3 ↔ IN t3	-.024	.588	-.112	.063
ER t3 ↔ PL t3	.008	.866	-.088	.104
ER t3 ↔ AD t3	**.118**	**.037**	**.046**	**.190**
IC t3 ↔ WM t3	.038	.251	-.027	.104
IC t3 ↔ CF t3	.049	.170	-.021	.119
IC t3 ↔ IN t3	.058	.132	-.017	.133
IC t3 ↔ PL t3	.018	.677	-.068	.104
IC t3 ↔ AD t3	-.011	.761	-.083	.061
WM t3 ↔ CF t3	.047	.061	-.002	.097
WM t3 ↔ IN t3	.042	.181	-.019	.103
WM t3 ↔ PL t3	**.063**	**.047**	**-.001**	**.125**
WM t3 ↔ AD t3	.024	.393	-.032	.081
CF t3 ↔ IN t3	**.070**	**.012**	**.016**	**.124**
CF t3 ↔ PL t3	-.001	.960	-.051	.048
CF t3 ↔ AD t3	.037	.122	-.010	.084
IN t3 ↔ PL 3	-.008	.819	-.078	.062
IN t3 ↔ AD t3	.058	.054	-.001	.118
PL t3 ↔ AD t3	.039	.236	-.026	.104

Notes. Significant parameters printed in bold. Abbreviations are INT = internalizing symptoms, ER = emotional reactivity, IC = inhibitory control, WM = working memory updating, CF = cognitive flexibility/set-shifting, IN = inhibition, PL = planning behavior, AD = affective decision-making.

References

Chen, F. F. (2007). Sensitivity of Goodness of Fit Indexes to Lack of Measurement Invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, *14*(3), 464–504. doi:10.1080/10705510701301834