Supplementary Tables

Early Childhood Media Use and Family Context: Longitudinal Associations with Problematic Media Use at Age 12

Path estimates and confidence intervals are identified by their estimation method in each table note.

Primary analysis: fully adjusted ML-FIML path model, N = 2,150. Additional checks use different samples, estimators, and confidence interval methods as stated in each table.

Table S1. Fully adjusted and reduced longitudinal path specifications

Path or association	Fully adjusted (N = 2,150)	Reduced (N = 2,150)
Age-6 media use → age-9 media use	.171 [.118, .225]	.171 [.118, .225]
Age-9 media use → age-12 PMU	.108 [.053, .164]	.114 [.060, .169]
Age-6 media use → age-12 PMU	.034 [−.020, .089]	.035 [−.019, .089]
Age-6 parent–child interaction → age-12 PMU	−.078 [−.132, −.024]	−.084 [−.138, −.031]
Lower age-6 parenting stress → age-12 PMU	−.182 [−.235, −.129]	−.185 [−.237, −.133]
Maternal education → age-12 PMU	−.063 [−.130, .004]	0 (fixed)
Paternal education → age-12 PMU	.009 [−.059, .077]	0 (fixed)
Household income → age-12 PMU	.017 [−.041, .076]	0 (fixed)
Indirect association via age-9 media use	.0186 [.0077, .0320]	.0196 [.0088, .0328]
Total age-6 media use association	.0529 [−.0015, .1078]	.0549 [.0004, .1088]

Note. Values are standardized β [95% CI]. Direct-path confidence intervals are Wald (delta-method) intervals from the corresponding ML-FIML models; indirect- and total-association intervals are nonparametric percentile bootstrap intervals based on fully standardized (std.all) effects. Each model used 5,000 attempted bootstrap resamples (4,994 valid in the fully adjusted model; 5,000 valid in the reduced model). The reduced model constrained the three socioeconomic direct paths to age-12 PMU to zero. Because the lower limits of both total-association confidence intervals were close to zero, their different threshold classifications should not be interpreted as evidence that the model-specific associations differ statistically.

Table S2. Sensitivity checks for age-9 problematic media use and teacher-rated age-6 self-control

Panel A. Additional adjustment for problematic media use at age 9

Path or association	Without age-9 PMU: β	With age-9 PMU: β [95% bootstrap CI]
Age-6 media → age-9 media	.1798	.1789 [.1223, .2349]
Age-9 media → age-12 PMU	.1004	.0557 [.0010, .1124]
Age-6 media → age-12 PMU	.0422	−.0122 [−.0666, .0434]
Indirect association	.0180	.0100 [.0002, .0218]
Age-9 PMU → age-12 PMU	—	.3639 [.3087, .4171]

Note. Both models used fully adjusted ML-FIML specifications in the same 1,389 children with observed age-9 PMU. The first numeric column reports point estimates only; the second reports 95% nonparametric percentile bootstrap CIs from the PMU9-augmented model (5,000 attempted resamples; 4,988 valid). The corresponding baseline model was fitted on the same subset but was not subjected to the reported 5,000-resample bootstrap. The age-12 PMU R^2 was .094 without PMU9 and .205 with PMU9. PMU9 and age-9 media frequency were assessed concurrently, so adjustment does not identify a causal pathway.

Panel B. Additional adjustment for teacher-rated self-control at age 6

Path or association	Without self-control	With self-control
Age-6 media → age-9 media	.161 [.100, .223]	.163 [.101, .224]
Age-9 media → age-12 PMU	.119 [.056, .181]	.121 [.058, .184]
Age-6 media → age-12 PMU	.048 [−.014, .110]	.046 [−.016, .108]
Parent–child interaction → age-12 PMU	−.087 [−.150, −.025]	−.085 [−.147, −.023]
Lower parenting stress → age-12 PMU	−.200 [−.260, −.139]	−.196 [−.256, −.136]
Self-control → age-9 media use	—	.042 [−.021, .104]
Self-control → age-12 PMU	—	−.074 [−.135, −.012]
Indirect association	.019 [.006, .032]	.020 [.007, .032]

Note. Same 1,203 children with teacher-rated self-control information; ML-FIML, standardized β [95% Wald CI]. Self-control was included as an age-6 covariate predicting both outcomes; its seven-item score had Cronbach's α = .845. Results are exploratory and specific to the teacher-rating subset.

Table S3. Alternative media-use composite specifications

Age-specific media-use specification	a: age 6 → 9	b: age 9 → 12	Indirect β [95% CI]	p	R^2 age 9	R^2 age 12
All age-6 devices and all age-9 purposes	.164	.104	.017 [.006, .028]	.002	.049	.082
Age-6 television only	.080	.107	.009 [.001, .016]	.026	.029	.081
Age-6 non-TV devices	.155	.104	.016 [.006, .027]	.003	.046	.082
Age-9 learning/information	.015	−.001	.000 [−.001, .001]	.975	.033	.071
Age-9 gaming/entertainment	.203	.152	.031 [.017, .045]	<.001	.077	.093
Age-9 social networking	.116	.066	.008 [.000, .015]	.051	.074	.075

Note. Exploratory fully adjusted ML-FIML specifications, all using the same subset with nine media-use items observed (n = 1,219; age-12 PMU observed in 1,103). Wald confidence intervals and unadjusted p values are shown. Alternative composites represent different constructs; statistical significance across models should not be interpreted as a formal test of coefficient differences. The social-networking indirect effect was not statistically significant at .05 (p = .051); its lower CI rounds to .000.

Table S4. Missing-data and age-9 partial-response scoring sensitivity checks

Panel A. FIML versus complete-case estimation

Path or association	FIML (N = 2,150)	Complete case (n = 1,082)
Age-6 media → age-9 media	.171 [.118, .225]	.167 [.109, .225]
Age-9 media → age-12 PMU	.108 [.053, .164]	.095 [.036, .153]
Age-6 media → age-12 PMU	.034 [−.020, .089]	.023 [−.035, .082]
Parent–child interaction → age-12 PMU	−.078 [−.132, −.024]	−.058 [−.118, .002]
Lower parenting stress → age-12 PMU	−.182 [−.235, −.129]	−.175 [−.234, −.116]
Indirect association	.019 [.007, .030]	.016 [.005, .027]
Total association	.053 [−.001, .107]	.039 [−.019, .097]

Note. Standardized β [95% Wald CI] from the fully adjusted specification; the same model covariates were used in both estimations. For parent–child interaction, p = .005 under FIML and p = .056 under complete-case estimation. The analysis does not verify the missing-at-random assumption.

Panel B. Exclusion of observations with minimal information

Sample definition	n	Age 6 → 9 β	Age 9 → 12 β	Interaction → PMU β	Indirect β
Full cohort	2,150	.171	.108	−.078	.019
Excluded sex-only participants	1,686	.171	.108	−.078	.019
At least one focal measure observed	1,674	.171	.108	−.078	.019

Note. ML-FIML. Wald CIs are produced by script 08 of Supplementary Code S1. Point estimates are shown to three decimals. Removing these cases yielded effectively unchanged estimates; this alone does not establish absence of selection bias.

Panel C. Age-9 media-use score restricted to complete item responses

Scoring rule	Age-9 media observed	Age 6 → 9 β	Age 9 → 12 β	Indirect β [95% Wald CI]
Available-item mean	1,362	.171	.108	.019 [.007, .030]
Five items all observed	1,327	.164	.113	.019 [.007, .030]

Note. The age-9 score originally averaged available responses among five media-use items; 35 participants supplied one to four valid items. In the second specification, the age-9 score was set to missing for those 35 participants, while the full set of 2,150 records was retained in FIML estimation. The indirect association was unchanged at displayed precision.

Table S5. Sensitivity analysis using longitudinal weights from the age-12 assessment (wave 13)

Path or association	Unweighted (n = 1,397)	Weighted (n = 1,397)
Age-6 media → age-9 media	.168 [.110, .225]	.156 [.094, .218]
Age-9 media → age-12 PMU	.110 [.051, .168]	.128 [.060, .196]
Age-6 media → age-12 PMU	.034 [−.020, .088]	.017 [−.044, .078]
Parent–child interaction → age-12 PMU	−.078 [−.134, −.022]	−.091 [−.148, −.034]
Lower parenting stress → age-12 PMU	−.184 [−.240, −.128]	−.199 [−.261, −.136]
Indirect association	.0184 [.0065, .0302]	.0199 [.0065, .0334]
Total association	.0528 [−.0012, .1067]	.0374 [−.0241, .0989]

Note. Standardized β [95% robust Wald CI] from MLR-FIML. Only participants with an available longitudinal weight from the age-12 assessment (wave 13; DHu20wgh002) were included; both models used the same 1,397 children. Weighting did not account for design strata or primary sampling unit (PSU) clustering. These are weight-only sensitivity analyses, not full survey-design-adjusted variance estimates.

For reference, the fully adjusted unweighted model in all 2,150 children yielded an indirect association of β = .0186, 95% robust Wald CI [.0068, .0303] (MLR-FIML).

Table S6. Observation overlap and exploratory attrition comparisons

Panel A. Observed focal measures across three waves

Age-6 media use	Age-9 media use	Age-12 PMU	n	% of cohort
Yes	Yes	Yes	1,132	52.65
Yes	Yes	No	120	5.58
Yes	No	Yes	130	6.05
Yes	No	No	142	6.60
No	Yes	Yes	91	4.23
No	Yes	No	19	0.88
No	No	Yes	40	1.86
No	No	No	476	22.14

Note. Original cohort N = 2,150. A total of 1,132 children (52.65%) had observed scores on all three focal measures, 1,082 were complete on all nine model variables, and 464 of the 476 with no focal measure observed had only sex recorded among the model variables.

Panel B. Baseline characteristics by availability of later-wave outcomes

Outcome availability	Age-6 characteristic	n obs/miss	Observed M	Missing M	SMD	p
Age-9 media observed	Age-6 media use	1252/272	.042	−.195	.239	<.001
Age-9 media observed	Parent–child interaction	1279/286	−.024	.108	−.129	.053
Age-9 media observed	Lower parenting stress	1279/286	.004	−.016	.019	.775
Age-9 media observed	Household income	1314/299	−.017	.073	−.082	.231
Age-9 media observed	Maternal education	1313/296	−.014	.061	−.075	.249
Age-9 media observed	Paternal education	1304/292	−.013	.058	−.070	.286
Age-9 media observed	Sex (female proportion)	1362/788	.496	.487	.017	.711
Age-12 PMU observed	Age-6 media use	1262/262	−.001	.005	−.006	.926
Age-12 PMU observed	Parent–child interaction	1299/266	−.007	.035	−.042	.537
Age-12 PMU observed	Lower parenting stress	1299/266	.006	−.031	.039	.560
Age-12 PMU observed	Household income	1336/277	−.008	.039	−.042	.558
Age-12 PMU observed	Maternal education	1333/276	.007	−.035	.042	.527
Age-12 PMU observed	Paternal education	1323/273	.007	−.033	.039	.567
Age-12 PMU observed	Sex (female proportion)	1393/757	.494	.490	.008	.866

Note. Each comparison uses available baseline observations. Means are standardized except sex (female proportion). SMD = standardized mean difference. Exploratory Welch t tests were used for continuous variables and Pearson chi-square tests for sex; p values are unadjusted. These tests do not establish whether MAR holds.