

Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Summary of Characteristics of Included Cross-Sectional Studies

Author	Year	Country	N (% Girls)	Mean age (y)	Measure of screen media	Measure of academic performance	Confounders
Adelantado-Renau et al ²⁵	2019	Spain	269 (48)	13.9 ± 0.3	Internet, MP, TV, VG	School grades: - Mathematics - Language - Overall of mathematics and language - GPA SRA Test of Educational Ability: - Numeric ability - Verbal ability	Sex and pubertal status
Busch et al ²⁶	2017	The Netherlands	905 (58.7)	13.9 ± 1.50	Internet, TV, VG	School grades: - GPA	Psychosocial problems
Caldas and Bankston ²⁷	1999	US	42041	10 th grade	TV	Louisiana Graduation Exit Examination: - GPA	Racial composition of school, family SES, and female structure.
Clarke and Kurtz-Costes ²⁸	1997	US	30 (50)	4.75 ± 0.5	TV	Metropolitan Readiness Test: - Reading	Age and IQ
Cooper et al ²⁹	1999	US	424 (53)	6-12 th grades	TV	Comprehensive Test of Basic Skills (CTBS/4): - Overall of mathematics and language Teacher-assigned grades: - GPA	Academic achievement (CTBS/4)

Dumuid et al ³⁰	2017	Australia	284 (53.9)	9-11	Screen media	National Assessment Program—Literacy and Numeracy: - Numeracy - Grammar - Reading - Spelling - Writing - Overall	BMI, parental education, sex, mother's weekly employment hours, and number of parents and siblings.
Drummond and Sauer ¹²	2014	22 OECD countries	192000	15	VG	Standardized academic achievement tests (i.e., PISA): - Mathematics - Reading - Science	School site and country
Esteban-Cornejo et al ³¹	2015	Spain	1146 (49.2)	12.5 ± 2.5	Internet, TV, VG	School grades: - Language - Mathematics - Overall of mathematics and language - GPA	Sex, age, city, maternal education, birth weight, gestational age, BMI, fitness and moderate-to-vigorous physical activity.
Faught et al ³²	2017	Canada	28608 (50.9)	11-15	Screen media	Self-reported academic achievement: - GPA	Age, sex, SES, physical activity, diet, sleep and BMI.
Ferguson ³³	2011	US	603 (48.8)	12.35 ± 1.34	TV, VG	Self-reported academic achievement by parents: - GPA	Sex, number of children and family income, depression and anxiety, psychological aggression and negative life events.
Fetler ³⁴	1984	US	10603	6 th grade	TV	Survey of Basic Skills: - Mathematics - Reading - Written expression - Overall of mathematics, reading and written expression	Parents' occupation and home environment.

García-Hermoso and Marina ³⁵	2017	Chile	395 (49.6)	B: 12.2 ± 0.6 G: 12.2 ± 0.7	Screen media	School grades: - Mathematics - Language - Overall of mathematics and language	Maternal education, SES and neonatal characteristics.
Hastings et al ³⁶	2009	US	70 (50)	7.8 ± 1.2	TV, VG	School grades: - GPA	NA
Hartanto et al ³⁷	2018	US	8971 (50.2)	14	VG	National standardized assessment: - Mathematics - Reading - Science	Sex, race, SES, home language, and family composition
		US	13979 (50.8)	16	VG	National standardized assessment: - Mathematics - Reading	
		US	8064 (52.2)	18	VG	National standardized assessment: - Mathematics - Reading - Science	
Inal et al ³⁸	2012	Turkey	804 (49.5)	16.13 ± 0.88	Internet	Academic achievement survey ad hoc: - GPA	NA
Jackson et al ³⁹	2008	US	515 (54.4)	12.8	Computer, internet, MP, VG	School grades: - GPA	NA
Jackson et al ⁴⁰	2011	US	482 (52.9)	12.19 ± 0.72	Internet, MP, VG	School grades: - GPA Self-reported school grades: - GPA Wide Range Achievement Test: - Mathematics - Reading	Sex, race, age and income.
Jaruratanasirikul et al ⁴¹	2009	Thailand	1492	15.9 ± 1.1	VG	Questionnaire designed ad hoc: - GPA	NA

Jeong and Kim ⁴²	2011	Korea	600 (62.3)	12-18	VG	School grades: - GPA	NA
Keith et al ⁴³	1986	US	28051	NA	TV	HSB Reading, Mathematics I, and Mathematics II standardized tests: - Overall measure	Ethnicity, family background, gender, intellectual ability, parental involvement and homework.
Kiatrungrit and Hongsanguansri ⁴⁴	2014	Thailand	768 (57.7)	15.4±1.5	Computer, MP, TV, VG, Screen media	School grades: - GPA	NA
Kim et al ⁴⁵	2017	Korea	59105 (48.3)	12-18	Internet (for study and for general purpose)	Self-reported school grades: - GPA	Age, sex, obesity, region of residence, income level, education level of father, education level of mother, stress level, sleep time, days of physical activity, smoking, alcohol consumption, drug use, and total study time.
Kovacs et al ⁴⁶	2008	Spain	7048 (50.9)	13-15	TV	Academic failure	NA
Kovess-Masfety et al ⁴⁷	2016	Germany, The Netherlands, Lithuania, Romania, Bulgaria, and Turkey	3195 (36.6)	6-11	VG	Teacher self-reported academic performance - GPA	Sex, age, the number of children in household, region (Eastern vs Western Europe), mother's age, SES, marital status, and mother's psychological distress.
Kristjánsson et al ⁴⁸	2009	Iceland	5810 (51.7)	14-15	TV	School grades: - Mathematics - Icelandic - English or Swedish - Danish or Norwegian - Overall of mathematics, English or Swedish and Danish or Norwegian	Gender, parental education, family structure and depressive symptoms.

Kureishi and Yoshida ⁴⁹	2013	Japan	422	5-6 th grades	TV	Mother self-reported academic performance - GPA	Sex, grade, sibling composition, types of school, mother's employment status, father's workplace, educational attainment of parents, father's age, parental asset, income and population of each prefecture where the family lives.
Leng et al ⁵⁰	2009	Malaysia	236 (51.5)	13-14	VG	Primary School Assessment Test or Ujian Penilaian Sekolah Rendah: - GPA	NA
Malhi et al ⁵¹	2016	India	362 (49.4)	14-18	Computer, TV	Woodcock-Johnson III Tests of Achievement: - Mathematics - Reading - Spelling - Writing fluency	NA
Martínez-Gómez et al ⁵²	2012	Spain	1825 (52.9)	13-18	TV	School grades: - Mathematics - Language - Overall of mathematics and language	BMI, family structure, school attitude, who had to repeat a year in school, and skipping classes.
Morita et al ⁸	2016	Japan	315 (48.3)	12-13	Screen media	School grades: - GPA	Household income, mother's education, utilization of a cram school/private teacher, obesity status and physical fitness.
Muñoz-Miralles et al ⁵³	2014	Spain	5538	12-16	Computer, VG	Academic failure	NA
Özmert et al ¹⁰	2002	Turkey	689 (50.2)	2 nd -3 rd grades	TV	Child Behavior Checklist: - School achievement	Gender and SES.

Özmert et al ⁵⁴	2011	Turkey	860 (51.2)	7-8 th grades	TV	Child Behavior Checklist: - School achievement	Gender, SES, age, having TV in bedroom, maternal education, paternal education, aggressive behaviour, delinquent behaviour, sex problem and social problem scores.
Peirce ⁵⁵	1983	US	102	5-8 th grades	TV	Test based on guidelines provided by the National Assessment of Educational Progress: - Writing	Books, parent interest and education.
Peiró-Velert et al ⁵⁶	2014	Spain	3095	12-18	Computer use, MP, VG, Screen media	Failed subjects index	Gender and SES.
Potter ⁵⁷	1987	US	543 (50.3)	8-12 th grades	TV	McGraw-Hill Comprehensive Test of Basic Skills, Version U: - Math - Language - Reading - Science - Social studies - Overall of mathematics, language and reading	Intelligence Quotient
Poulain et al ⁵⁸	2018	Germany	850 (48.8)	13.01	Internet, MP, TV, VG, Screen media	School grades: - Mathematics - Language - Physical Education	Age, gender, SES, year of data assessment, and BMI.
Regondola and Barbado ¹³	2017	Filipins	127 (53.5)	2 nd -6 th grades	TV, VG, Screen media	School grades: - GPA	NA

Ribner et al ⁵⁹	2017	Canada	807 (50.2)	5.74 ± 0.34	TV	Woodcock-Johnson III Tests of Achievement: - applied problems subtest - letter-word subtest	Age and sex
Ridley-Johnson et al ⁶⁰	1983	US	322	5-8 th grades	TV	School grades: - Mathematics - Reading	NA
Sánchez-Martínez and Otero Puime ⁶¹	2010	Spain	1328 (53.7)	15	Internet	Academic failure	NA
Scott ⁶²	1958	US	456	6-7 th grades	TV	School grades: - Arithmetic - Reading - Language - Spelling	Age and intelligence quotient.
Sharif and Sargent ⁶³	2006	US	4508 (51)	5-8 th grades	TV, VG	Self-reported school performance: - GPA	Parenting style, child personality, demographics, and school.
Sharma et al ⁶⁴	2017	Peru	1234 (61.4)	11-19	TV	Self-reported school performance: - GPA	Sex, age group, physical activity, school and grade.
Shashi Kumar et al ⁶⁵	2013	India	586 (39.07)	9-12 th grades	TV	Questionnaire designed ad hoc: - GPA	NA
Shejwal and Purayidathil ⁶⁶	2006	India	654 (43.7)	16.05 ± 0.85	TV	School grades: - GPA Test of Cognitive Processes (Oad and Misra, 1999): - Mathematics	NA
Shin ⁶⁷	2004	US	1203 (49.7)	6-13	TV	Woodcock-Johnson III Tests of Achievement: - Applied problem - Calculation - Letter-word subtest - Passage comprehension	Homework and studying, reading for leisure, impulsive behaviours and academic achievement (other subtests different from the studied dimension).

Skoric et al ¹¹	2009	Singapore	333 (46.0)	10 ± 1.08	VG	School grades: - English - Mathematics - Science	Race, gender, video game addiction and engagement tendencies.
Syväoja et al ⁹	2013	Finland	277 (55.6)	12.2 ± 0.6	Screen media	School grades: - GPA	The mother and father's education, family income, marital status, and children's learning difficulties.
Syväoja et al ⁶⁸	2018	Finland	970 (52.3)	12.5 ± 1.3	Screen media	School grades: - GPA	Learning difficulties, and mother's education.
Trinh et al ⁶⁹	2015	Canada	2660 (52.5)	15.8 ± 1.30	TV	Self-reported school performance: - GPA	Grade, years of highest parental education, BMI, type of living and physical activity.
Van Schie and Wiegman ⁷⁰	1997	The Netherlands	346 (50.6)	7-8 th grades	VG	School grades: - Arithmetic - Language - GPA	NA
Vassiloudis et al ⁷¹	2014	Greece	528 (51.5)	10-12	TV	School grades: - GPA	SES, adherence to the Mediterranean diet, BMI, sleep duration, physical activity, self-esteem, mother and father's education, mother's ethnicity and family income.
Walberg and Weinstein ⁷²	1982	US	2001 (51.5)	17	TV	Social studies test: - GPA	Attitude, stimulation, extracurricular activities, class, homework, gender and race.
Walberg and Tsai ⁷³	1984	US	2912 (50)	18	TV	Booklet 15 test: - Reading	NA
Wang et al ⁷⁴	2018	China	23543 (49.7)	15.6	Screen media	Self-reported school performance: - GPA	Sociodemographic and health-related behavioural factors.

Welch et al ⁷⁵	1986	US	1960 (50)	9	TV	Achievement test: - GPA	Ability, motivation, quality and quantity of instruction, homework, class and home environment, gender and race.
Yan et al ⁷⁶	2017	China	2625 (46.9)	15.1 ± 1.70	TV, VG	Self-reported school grades: - GPA	Age and sex.
NA: not available; TV: television viewing; VG: video game playing; Screen media indicates a composite measure of 2 or more screen activities; GPA: grade point average; BMI: body mass index; SES: socioeconomic status.							

eTable 2. Data from Included Studies Examining the Linear Associations or Mean Differences Between Duration of Screen-based Activities and Academic Performance in Children and Adolescents

Author	Unadjusted analysis	Adjusted analysis
Adelantado-Renau et al ²⁵ 2019	Spearman correlations coefficients: Internet ✓ Math: -0.156* ✓ Language: -0.168* ✓ Grade point average: -0.187* ✓ Verbal ability: -0.084 ✓ Numeric ability: -0.096 Mobile phone ✓ Math: -0.097 ✓ Language: -0.066 ✓ Grade point average: -0.116 ✓ Verbal ability: -0.055 ✓ Numeric ability: -0.119 Television ✓ Math: -0.002 ✓ Language: -0.108 ✓ Grade point average: -0.052 ✓ Verbal ability: 0.073 ✓ Numeric ability: -0.050 Videogames ✓ Math: -0.021 ✓ Language: -0.158* ✓ Grade point average: -0.087 ✓ Verbal ability: 0.055 ✓ Numeric ability: 0.090	Partial correlations adjusted by sex and pubertal status: Internet ✓ Math: -0.193* ✓ Language: -0.165* ✓ Grade point average: -0.221* ✓ Verbal ability: -0.068 ✓ Numeric ability: -0.100 Mobile phone ✓ Math: -0.092 ✓ Language: -0.110 ✓ Grade point average: -0.143* ✓ Verbal ability: -0.034 ✓ Numeric ability: -0.089 Television ✓ Math: -0.003 ✓ Language: -0.028 ✓ Grade point average: -0.057 ✓ Verbal ability: -0.057 ✓ Numeric ability: 0.116 Videogames ✓ Math: -0.051 ✓ Language: -0.050 ✓ Grade point average: -0.076 ✓ Verbal ability: -0.014 ✓ Numeric ability: -0.005
Busch et al ²⁶ 2017	NA	Mixed-effects regression models. Internet use <i>Girls</i> ✓ Grade point average: -0.130* <i>Boys</i> ✓ Grade point average: NA
Caldas and Bankston ²⁷ 1999	Zero-Order correlations coefficients: TV viewing	Multivariate linear regression adjusted by

	<p><i>White students</i> ✓ Academic achievement: -0.105* <i>African-American students</i> ✓ Academic achievement: 0.023*</p>	<p>Model 1: control variables (sex, English proficiency, time spent at work, and time spent in organized activities) and individual television watching habits. TV viewing <i>White students</i> ✓ Academic achievement: -0.107* <i>African-American students</i> ✓ Academic achievement: 0.011 Model 2: control variables + family SES TV viewing <i>White students</i> ✓ Academic achievement: -0.077* <i>African-American students</i> ✓ Academic achievement: 0.013</p>
Clarke and Kurtz-Costes ²⁸ 1997	NA	<p>Partial correlations adjusted by age: TV viewing ✓ Reading: -0.329*</p>
Cooper et al ²⁹ 1999	<p>Bivariate correlations coefficients: TV viewing ✓ Academic achievement: -0.13* ✓ Teacher-assigned grade point average: -0.11*</p>	<p>Semipartial correlations coefficients (covariates NA): TV viewing ✓ Academic achievement: 0.07 ✓ Teacher-assigned grade point average: 0.08</p>
Dumuid et al ³⁰ 2017	NA	<p>Cluster analysis adjusted by sex, parental highest education, mother's employment hours, number of siblings and number of parents, BMI, and school attended: Screen media[†] <i>a) Unhealthiest diet, highest screen time and moderate PA</i> ✓ Grammar: 472 (82)^a ✓ Reading: 491 (77)^a ✓ Writing: 471 (64) ✓ Spelling: 479 (64)^a ✓ Numeracy: 470 (60)^a ✓ Overall: 477 (57)^a <i>b) Healthiest diet, lowest screen time, moderate PA</i></p>

		<ul style="list-style-type: none"> ✓ Grammar: 514 (80) ✓ Reading: 516 (76)^b ✓ Writing: 487 (52) ✓ Spelling: 509 (64) ✓ Numeracy: 498 (63) ✓ Overall: 505 (55) <i>c) Highest PA, lowest sedentary behavior</i> ✓ Grammar: 497 (75)^b ✓ Reading: 501 (76)^c ✓ Writing: 476 (54) ✓ Spelling: 502 (65)^b ✓ Numeracy: 496 (69) ✓ Overall: 494 (58)^b <i>d) Highest sedentary behavior, lowest PA</i> ✓ Grammar: 515 (89)^{a,b} ✓ Reading: 522 (78)^{a,b,c} ✓ Writing: 478 (51) ✓ Spelling: 515 (72)^{a,b} ✓ Numeracy: 488 (63)^a ✓ Overall: 504 (58)^{a,b}
Drummond and Sauer ¹² 2014	NA	NA
Esteban-Cornejo et al ³¹ 2015	NA	<p>Linear regression adjusted by sex, age, city, maternal education, birth weight, gestational age, BMI, fitness and moderate-to vigorous physical activity:</p> <p>Internet</p> <ul style="list-style-type: none"> ✓ Math: -0.067* ✓ Language: -0.066* ✓ Overall of both: -0.072* ✓ Grade point average: -0.091* <p>TV viewing</p> <ul style="list-style-type: none"> ✓ Math: 0.009 ✓ Language: 0.001 ✓ Overall of both: 0.005 ✓ Grade point average: 0.001 <p>Video games playing</p> <ul style="list-style-type: none"> ✓ Math: -0.033

		<ul style="list-style-type: none"> ✓ Language: -0.009 ✓ Overall of both: -0.022 ✓ Grade point average: -0.048
Ferguson ³³ 2011	Bivariate correlations coefficients: TV viewing <ul style="list-style-type: none"> ✓ Academic achievement: 0.06 Video game playing <ul style="list-style-type: none"> ✓ Academic achievement: -0.05 	Hierarchical multiple regression with gender, number of children and family income, depression, anxiety, psychological aggression and neighborhood-related variables entered in the model. TV viewing <ul style="list-style-type: none"> ✓ Academic achievement: 0.07 Video game playing <ul style="list-style-type: none"> ✓ Academic achievement: -0.07
Fetler ³⁴ 1984	Bivariate correlations coefficients: TV viewing <ul style="list-style-type: none"> ✓ Academic achievement: -0.15 	NA
García-Hermoso and Marina ³⁵ 2017	Analysis of variance: Screen media ; <2 vs. ≥2 hours per day <i>Girls</i> <ul style="list-style-type: none"> ✓ Overall of language and math: F = 3.304* <i>Boys</i> <ul style="list-style-type: none"> ✓ Overall of language and math: F = 3.825* 	Analysis of covariance adjusted by age, birth weight, SES, maternal education and weight status, and physical activity: Screen media ; <2 vs. ≥2 hours per day <i>Girls</i> <ul style="list-style-type: none"> ✓ Overall of language and math: F = 3.114* <i>Boys</i> <ul style="list-style-type: none"> ✓ Overall of language and math: F = 3.325*
Hastings et al ³⁶ 2009	Pearson correlations coefficients: Video games playing <ul style="list-style-type: none"> ✓ Academic achievement: -0.09 	NA
Hartanto et al ³⁷ 2018	NA	Square regression adjusted by gender, race, SES, home language, and family composition: ECLS dataset Video games playing <i>Weekday</i> <ul style="list-style-type: none"> ✓ Math: -0.15* ✓ Reading: -0.16* ✓ Science: -0.14* <i>Weekend day</i> <ul style="list-style-type: none"> ✓ Math: 0.05* ✓ Reading: 0.08* ✓ Science: 0.07*

		<p>ELS dataset</p> <p>Video games playing</p> <p><i>Weekday</i></p> <p>✓ Math: -0.10*</p> <p>✓ Reading: -0.11 *</p> <p><i>Weekend day</i></p> <p>✓ Math: 0.04 *</p> <p>✓ Reading: 0.06*</p> <p>NELS dataset</p> <p>Video games playing</p> <p><i>Weekday</i></p> <p>✓ Math: -0.09*</p> <p>✓ Reading: -0.11*</p> <p>✓ Science: -0.10*</p> <p><i>Weekend day</i></p> <p>✓ Math: 0.03*</p> <p>✓ Reading: 0.02</p> <p>✓ Science: 0.04*</p>
Inal et al ³⁸ 2012	<p>Bivariate correlations coefficients:</p> <p>Internet use</p> <p>✓ Academic achievement: -0.449*</p>	NA
Jackson et al ³⁹ 2008	<p>Linear regression coefficients:</p> <p>Internet use</p> <p>✓ Grade point average: -0.23</p> <p>Mobile phone use</p> <p>✓ Grade point average: NA</p> <p>Video games playing</p> <p>✓ Grade point average: -0.20*</p>	NA
Jackson et al ⁴⁰ 2011	NA	<p>Hierarchical regression adjusted by gender, race, age and income:</p> <p>Internet use</p> <p>✓ Perceived school grades: 0.06</p> <p>✓ Grade point average: 0.09</p> <p>✓ Math: 0.02</p> <p>✓ Reading: 0.32</p> <p>Mobile phone use</p> <p>✓ Perceived school grades: -0.04</p> <p>✓ Grade point average: -0.03</p>

		<ul style="list-style-type: none"> ✓ Math: 0.05 ✓ Reading: -0.04 Video games playing ✓ Perceived school grades: -0.06 ✓ Grade point average: -0.013* ✓ Math: -0.08 ✓ Reading: 0.07
Jeong and Kim ⁴² 2011	Zero-order Pearson correlation coefficients: Video games playing ✓ Grade point average: -0.15***	NA
Keith et al ⁴³ 1986	Bivariate correlations coefficients: TV viewing ✓ Academic achievement: -0.200	NA
Kiatrungrit and Hongsanguansri ⁴⁴ 2014	Pearson correlation coefficients: Computer use ✓ Grade point average: -0.046 Mobile phone use ✓ Grade point average: -0.031 TV viewing ✓ Grade point average: -0.008 Video games playing ✓ Grade point average: -0.094* Screen media ✓ Grade point average: -0.039	NA
Kovacs et al ⁴⁶ 2008	Logistic regression coefficients: TV viewing ✓ Academic failure (≥3 failed subjects): <2 hours per day: 1.38***	NA
Kristjánsson et al ⁴⁸ 2009	NA	Regression coefficients for the structural model with school contentment as mediating factor: TV viewing ✓ Grade point average: -0.11*
Kureishi and Yoshida ⁴⁹ 2013	NA	Estimation model: TV viewing <i>Weekdays</i> ✓ Grade point average: -0.136 <i>Saturday</i> ✓ Grade point average: -0.637

		<i>Sunday</i> ✓ Grade point average: -0.788 <i>Wednesday</i> ✓ Grade point average: -1.108
Leng et al ⁵⁰ 2009	Independent sample t-test on gamers and non-gamers Academic achievement: $t = 2.547^*$	NA
Malhi et al ⁵¹ 2016	NA	NA
Morita et al ⁸ 2016	Univariate correlation coefficients: Screen media <i>Girls</i> ✓ Grade point average: -0.036 <i>Boys</i> ✓ Grade point average: -0.241*	Multiple regression analyses adjusted by household income, mother's education, cram school utilization, weight status and physical fitness: Screen media <i>Girls</i> ✓ Grade point average: 0.021 <i>Boys</i> Grade point average: -0.206*
Özmert et al ¹⁰ 2002	Pearson correlation coefficients: TV viewing ✓ School performance: 0.11*	NA
Özmert et al ⁵⁴ 2011	NA	NA
Peirce ⁵⁵ 1983	Pearson correlation coefficients: TV viewing ✓ Writing: -0.36*	Multiple regression including number of books, parent interest and education. TV viewing ✓ Writing: $F = 9.752^*$
Peiró-Velert et al ⁵⁶ 2014	Spearman correlation coefficients: Computer use ✓ Academic achievement: -0.48 (-0.58, -0.37)* Screen media ✓ Academic achievement: -0.55 (-0.64, -0.45)*	NA
Potter ⁵⁷ 1987	Zero-order Pearson correlation coefficients: TV viewing ✓ Language: -0.01 ✓ Math: -0.08 ✓ Reading: -0.06	Partial correlation coefficients adjusted by intelligence quotient: TV viewing ✓ Language: -0.01 ✓ Math: 0.09

	<ul style="list-style-type: none"> ✓ Overall of language, math and reading: -0.04 ✓ Science: -0.04 ✓ Social studies: -0.04 	<ul style="list-style-type: none"> ✓ Reading: -0.07 ✓ Overall of language, math and reading: 0.04 ✓ Science: 0.04 ✓ Social studies: 0.04
Poulain et al ⁵⁸ 2018	NA	Linear regression adjusted by age, gender, SES, year of data assessment and BMI: Screen media[§] <ul style="list-style-type: none"> ✓ Math: 0.02* ✓ Language: 0.02** ✓ Physical Education: 0.01
Regondola and Barbado ¹³ 2017	Point biserial correlation coefficients: Screen media <i>Girls</i> <ul style="list-style-type: none"> ✓ Grade point average of: 2nd grade: -0.13 3rd grade: 0.34 4th grade: 0.22 5th grade: -0.30 6th grade: 0.14 <i>Boys</i> <ul style="list-style-type: none"> ✓ Grade point average of: 2nd grade: -0.67* 3rd grade: -0.19 4th grade: 0.13 5th grade: 0.08 6th grade: -0.03 	NA
Ribner et al ⁵⁹ 2017	Correlation coefficients: TV viewing <ul style="list-style-type: none"> ✓ Applied problems score: -0.250* ✓ Letter-Word score: -0.146* 	Linear regression adjusted by Raven's Matrix score, income-to-needs ratio, age and sex: TV viewing <ul style="list-style-type: none"> ✓ Applied problems score: -0.13* ✓ Letter-Word score: -0.03
Ridley-Johnson et al ⁶⁰ 1983	Correlation coefficients: TV viewing <ul style="list-style-type: none"> ✓ Math: -0.14* ✓ Reading: -0.14* 	NA
Scott ⁶² 1958	NA	Comparisons between groups adjusted by intelligence quotient and age: TV viewing

		<ul style="list-style-type: none"> ✓ Arithmetic: Low TV viewing: 92.10 High TV viewing: 89.07* ✓ Language: Low TV viewing: 93.37 High TV viewing: 92.27 ✓ Reading: Low TV viewing: 93.81 High TV viewing: 90.91* ✓ Spelling: Low TV viewing: 94.65 High TV viewing: 92.40 ✓ Overall: Low TV viewing: 92.88 High TV viewing: 90.37*
Sharif and Sargent ⁶³ 2006	<p>Spearman correlation coefficients:</p> <p>TV viewing</p> <p><i>Weekday</i></p> <ul style="list-style-type: none"> ✓ Grade point average: 0.01* <p><i>Weekend day</i></p> <ul style="list-style-type: none"> ✓ Grade point average: -0.01* <p>Video games playing</p> <p><i>Weekday</i></p> <ul style="list-style-type: none"> ✓ Grade point average: -0.03* <p><i>Weekend day</i></p> <ul style="list-style-type: none"> ✓ Grade point average: -0.05 	NA
Sharma et al ⁶⁴ 2017	<p>Correlation coefficients:</p> <p>TV viewing</p> <ul style="list-style-type: none"> ✓ Grade point average: -0.111* 	NA
Shejwal and Purayidathil ⁶⁶ 2006	<p>Correlation coefficients:</p> <p>TV viewing</p> <p><i>Girls</i></p> <ul style="list-style-type: none"> ✓ Grade point average: -0.364* <p><i>Boys:</i></p> <ul style="list-style-type: none"> ✓ Grade point average: -0.292* ✓ Mathematical reasoning: -0.135* 	NA

Shin ⁶⁷ 2004	Correlation coefficients: TV viewing ✓ Applied problem: -0.12* ✓ Calculation: -0.10* ✓ Letter-word: -0.10* ✓ Passage comprehension: -0.11*	NA
Skoric et al ¹¹ 2009	NA	Hierarchical regressions adjusted by gender and race: Video games playing <i>Weekday</i> ✓ English: 0.19* ✓ Mathematics: -0.11 ✓ Science: 0.05 <i>Weekend day</i> ✓ English: -0.08 ✓ Mathematics: 0.07 ✓ Science: -0.05
Syväoja et al ⁹ 2013	Pearson's correlation coefficients: Screen media ✓ Grade point average: -0.276*	Linear regression adjusted by the mother's and father's education, family income, marital status, and children's learning difficulties. Screen media ✓ Grade point average: -0.193*
Syväoja et al ⁶⁸ 2018	Correlation coefficients: Screen media ✓ Grade point average: -0.294 (-0.354, 0.234)	Linear regression adjusted by sex, age, mother's education and learning difficulties. Screen media ✓ Grade point average: -0.173 (-0.243, -0.104)*
Van Schie and Wiegman ⁷⁰ 1997	Correlation coefficients: Video games playing ✓ Arithmetic skills: 0.02 ✓ Language skills: 0.08 ✓ General school performance: 0.05	Partial correlation coefficients adjusted by intelligence: Video games playing ✓ Arithmetic skills: 0.02 ✓ Language skills: -0.03 ✓ General school performance: -0.01
Vassiloudis et al ⁷¹ 2014	Spearman correlation coefficients: TV viewing ✓ Grade point average: -0.28* Video games playing ✓ Grade point average: -0.10*	Block stepwise linear regression analysis entering adherence to Mediterranean diet, BMI, hours of sleep, physical activity level, self-esteem, father's and mother's educational level, mother's ethnicity and family income. TV viewing

		✓ Grade point average: -0.068
Walberg and Weinstein ⁷² 1982	Spearman correlation coefficients: TV viewing ✓ Grade point average: -0.12*	Partial correlation coefficients adjusted by attitude, SES, homework, extracurricular activities, school-related instructions, class and home environment, sex and race: TV viewing ✓ Grade point average: -0.07*
Walberg and Tsai ⁷³ 1984	Correlation coefficients: TV viewing ✓ Reading: 0.139*	NA
Welch et al ⁷⁵ 1986	Intercorrelation coefficients: TV viewing ✓ Grade point average: -0.10	Raw regression weights entering ability, motivation, quality and quantity of instruction, class and home environment, gender and race: TV viewing ✓ Grade point average: -0.13
<p>* Significant associations. NA: not available. TV: television viewing; Screen media indicates a composite measure of 2 or more screen activities; BMI: body mass index; SES: socioeconomic status. [†] Values with the same superscript are significantly different from each other. [§] Lower academic values indicate better performance.</p>		

eTable 3. Study Quality Assessed by the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies

Author	Items of quality assessment tool for observational cohort and cross-sectional studies														Total score
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Adelantado-Renau et al ²⁵	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	8
Busch et al ²⁶	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	8
Caldas and Bankston ²⁷	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	7
Clarke and Kurtz-Costes ²⁸	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	5
Cooper et al ²⁹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Dumuid et al ³⁰	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	9
Drummond and Sauer ¹²	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	4
Esteban-Cornejo et al ³¹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	8
Faught et al ³²	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	7
Ferguson ³³	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	5
Fetler ³⁴	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
García-Hermoso and Marina ³⁵	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	8
Hastings et al ³⁶	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Hartanto et al ³⁷	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Inal et al ³⁸	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	4
Jackson et al ³⁹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	4
Jackson et al ⁴⁰	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	7
Jaruratanasirikul et al ⁴¹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	5
Jeong and Kim ⁴²	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	5
Keith et al ⁴³	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	5

Kiatrungrit and Hongsanguansri ⁴⁴	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	3
Kim et al ⁴⁵	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	8
Kovacs et al ⁴⁶	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	4
Kovess-Masfety et al ⁴⁷	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	8
Kristjánsson et al ⁴⁸	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	8
Kureishi and Yoshida ⁴⁹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Leng et al ⁵⁰	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	4
Malhi et al ⁵¹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	5
Martínez-Gómez et al ⁵²	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	8
Morita et al ⁸	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	9
Muñoz-Miralles et al ⁵³	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Özmerit et al ¹⁰	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Özmerit et al ⁵⁴	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	4
Peirce ⁵⁵	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	4
Peiró-Velert et al ⁵⁶	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Potter ⁵⁷	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Poulain et al ⁵⁸	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	7
Regondola and Barbado ¹³	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	4
Ribner et al ⁵⁹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	5
Ridley-Johnson et al ⁶⁰	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	3
Sánchez-Martínez and Otero Puime ⁶¹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Scott ⁶²	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	3
Sharif and Sargent ⁶³	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	8
Sharma et al ⁶⁴	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	7
Shashi Kumar et al ⁶⁵	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	3

Shejwal and Purayidathil ⁶⁶	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	4
Shin ⁶⁷	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Skoric et al ¹¹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	7
Syväoja et al ⁹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	7
Syväoja et al ⁶⁸	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	7
Trinh et al ⁶⁹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	7
Van Schie and Wiegman ⁷⁰	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	5
Vassiloudis et al ⁷¹	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	9
Walberg and Weinstein ⁷²	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Walberg and Tsai ⁷³	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	6
Wang et al ⁷⁴	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	7
Welch et al ⁷⁵	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	5
Yan et al ⁷⁶	●	●	●	●	●	●	NA	●	●	NA	●	NA	NA	●	7
Green colour indicates “yes”, red indicates “no”, and “yellow” indicates “not reported”. NA: not applicable because of the cross-sectional design of the studies.															

eTable 4. Random-Effects Meta-Regression Model to Examine Whether the Associations Between Screen-based Activities and Composite Scores Are Associated With the Children’s and Adolescents’ Age (in Years)

	β (95% CI)	P
Screen-based activity		
Screen media	-0.0005 (-0.131, 0.130)	>.99
TV viewing	-0.056 (-0.117, 0.006)	.07
Video games playing	-0.009 (-0.121, 0.104)	.82

β: standardized coefficient; CI: confidence intervals; TV; television; Screen media indicates a composite measure of 2 or more screen activities.

eTable 5. Sensitivity Analysis by Removing the Studies One by One

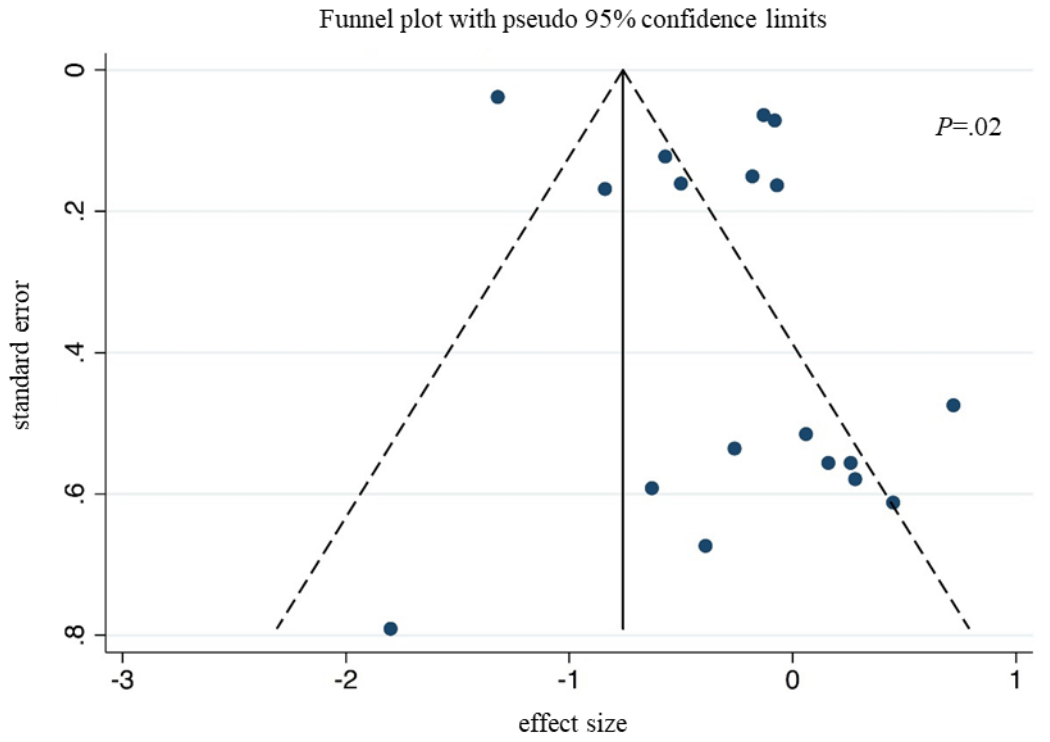
	ES (95% CI)	I²
Screen media – composite scores		
García-Hermoso & Marina 2017 (Boys)	-0.24 (-0.63, 0.14)	96.6
García-Hermoso & Marina 2017 (Girls)	-0.29 (-0.68, 0.09)	96.5
Kiatrungrit & Hongsanguansri 2014	-0.30 (-0.68, 0.08)	95.6
Morita et al 2016 (Boys)	-0.27 (-0.66, 0.12)	96.6
Morita et al 2016 (Girls)	-0.30 (-0.68, 0.08)	96.4
Peiró-Velert et al 2014	-0.25 (-0.43, 0.08)	63.1
Regondola & Barbado 2017 (2 ^o Girls)	-0.24 (-0.61, 0.13)	96.6
Regondola & Barbado 2017 (2 ^o Boys)	-0.29 (-0.66, 0.09)	96.6
Regondola & Barbado 2017 (3 ^o Girls)	-0.28 (-0.66, 0.09)	96.6
Regondola & Barbado 2017 (3 ^o Boys)	-0.34 (-0.71, 0.03)	96.5
Regondola & Barbado 2017 (4 ^o Girls)	-0.31 (-0.69, 0.06)	96.6
Regondola & Barbado 2017 (4 ^o Boys)	-0.32 (-0.69, 0.05)	96.6
Regondola & Barbado 2017 (5 ^o Girls)	-0.31 (-0.68, 0.07)	96.6
Regondola & Barbado 2017 (5 ^o Boys)	-0.27 (-0.65, 0.20)	96.6
Regondola & Barbado 2017 (6 ^o Girls)	-0.30 (-0.68, 0.07)	96.6
Regondola & Barbado 2017 (6 ^o Boys)	-0.31 (-0.69, 0.06)	96.6
Syväoja et al 2013	-0.26 (-0.66, 0.13)	96.6
Syväoja et al 2018	-0.30 (-0.68, 0.09)	95.4
TV viewing – composite scores		
Adelantado-Renau et al 2019	-0.19 (-0.29, -0.10)	97.7
Caldas and Bankston 1999 (African-American Students)	-0.20 (-0.30, -0.12)	96.2
Caldas and Bankston 1999 (White Students)	-0.19 (-0.31, -0.08)	97.7
Cooper et al 1999	-0.19 (-0.29, -0.09)	97.7
Ferguson 2011	-0.21 (-0.31, -0.11)	97.6
Fetler 1984	-0.18 (-0.30, -0.08)	97.6
Keith et al 1986	-0.17 (-0.26, -0.09)	95.6
Kiantrungrit & Hongsanguansri 2014	-0.20 (-0.30, -0.10)	97.6
Özmert et al 2002	-0.21 (-0.31, -0.12)	97.5
Potter 1987	-0.20 (-0.30, -0.10)	97.6
Sharif & Sargent 2006 (Weekday)	-0.20 (-0.30, -0.10)	97.4
Sharif & Sargent 2006 (Weekend day)	-0.20 (-0.30, -0.10)	97.5
Sharma et al 2017	-0.19 (-0.29, -0.08)	97.7
Shejwal & Purayidathil 2006 (Boys)	-0.17 (-0.27, -0.07)	97.6
Shejwal & Purayidathil 2006 (Girls)	-0.16 (-0.26, -0.07)	97.6
Vassiloudis et al 2014	-0.17 (-0.27, -0.07)	97.6
Walberg & Weinstein 1982	-0.19 (-0.29, -0.09)	97.7

Welch et al 1986	-0.19 (-0.29, -0.10)	97.7
TV viewing – language		
Adelantado-Renau et al 2019	-0.18 (-0.37, 0.01)	96.1
Fetler 1984	-0.20 (-0.43, 0.04)	94.9
Peirce 1983	-0.13 (-0.31, 0.05)	95.8
Potter 1987	-0.21 (-0.41, 0.00)	96.1
Ribner et al 2017	-0.17 (-0.37, 0.03)	95.9
Ridley-Johnson et al 1983	-0.17 (-0.37, 0.02)	96.1
Shin 2004	-0.19 (-0.39, 0.02)	96.0
Walberg & Tsai 1984	-0.22 (-0.30, -0.14)	61.1
TV viewing – mathematics		
Adelantado-Renau et al 2019	-0.27 (-0.36, -0.18)	69.8
Fetler 1984	-0.25 (-0.38, -0.12)	74.4
Potter 1987	-0.26 (-0.36, -0.16)	74.7
Ribner et al 2017	-0.22 (-0.25, -0.18)	0.0
Ridley-Johnson et al 1983	-0.24 (-0.34, -0.15)	75.4
Shejwal & Purayidathil 2006 (Boys)	-0.24 (-0.34, -0.15)	75.4
Shin 2004	-0.25 (-0.37, -0.13)	75.5
Video games playing – composite scores		
Adelantado-Renau et al 2019	-0.15 (-0.22, -0.07)	66.7
Ferguson 2011	-0.16 (-0.23, -0.08)	67.1
Hastings et al 2009	-0.15 (-0.22, -0.08)	67.0
Jeong & Kim 2011	-0.13 (-0.20, -0.06)	57.0
Kiatrungrit & Hongsanguansri 2014	-0.14 (-0.22, -0.07)	65.2
Leng et al 2009	-0.12 (-0.18, -0.06)	46.3
Sharif & Sargent 2006 (Weekday)	-0.17 (-0.25, -0.09)	58.4
Sharif & Sargent 2006 (Weekend day)	-0.16 (-0.26, -0.07)	66.9
Van Schie and Wiegman 1997	-0.17 (-0.24, -0.10)	60.8
Vassiloudis et al 2014	-0.14 (-0.22, -0.07)	65.5
Statistically significant values are shown in bold. ES: effect size; CI: confidence intervals; I ² : heterogeneity; TV: television; Screen media indicates a composite measure of 2 or more screen activities.		

eFigure. Funnel Plots Assessing Publication Bias for Studies Analysing the Association of A) Overall Screen Media, B) Television Viewing, and C) Video Games Playing, With Academic Performance Areas

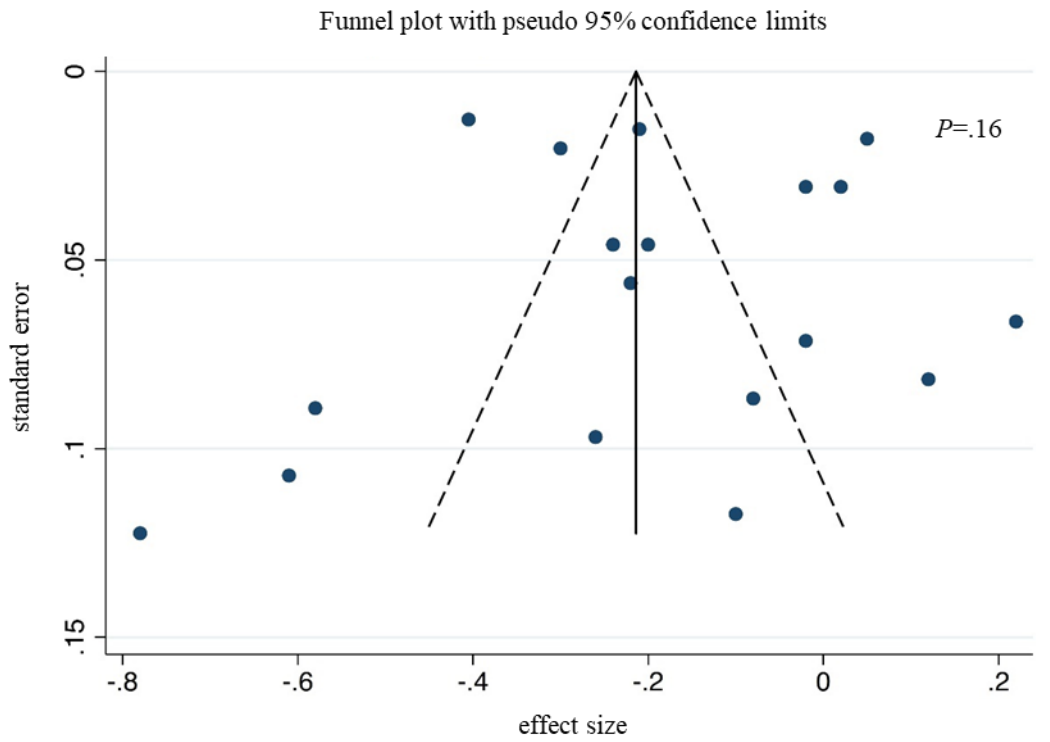
A

Composite scores

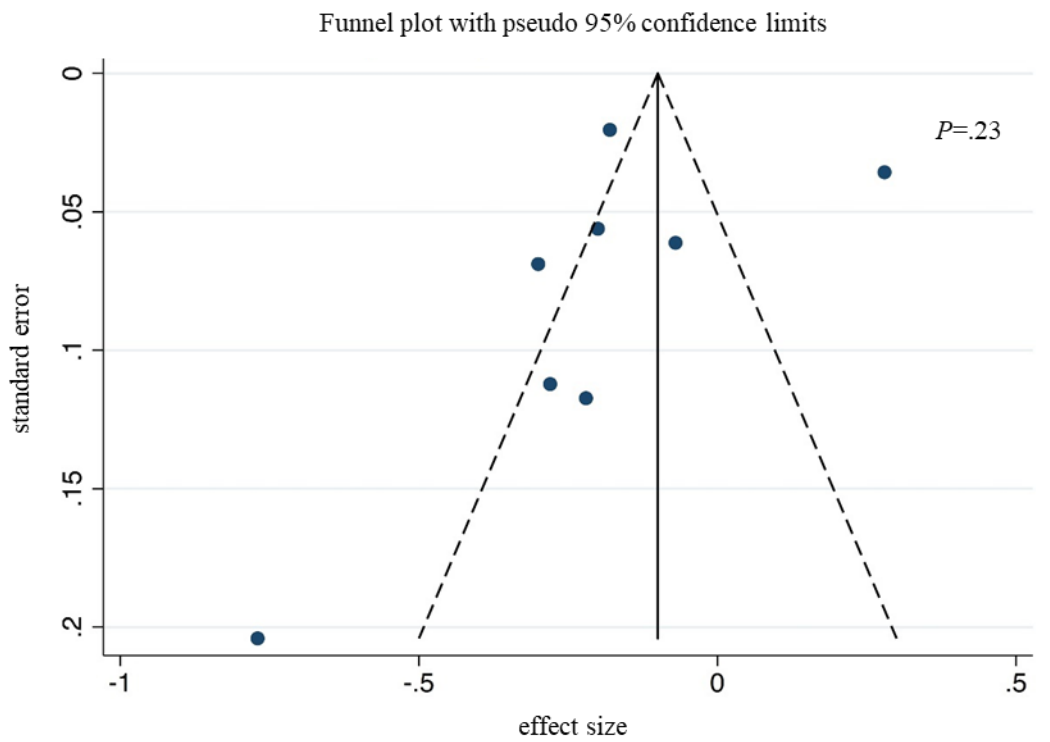


B

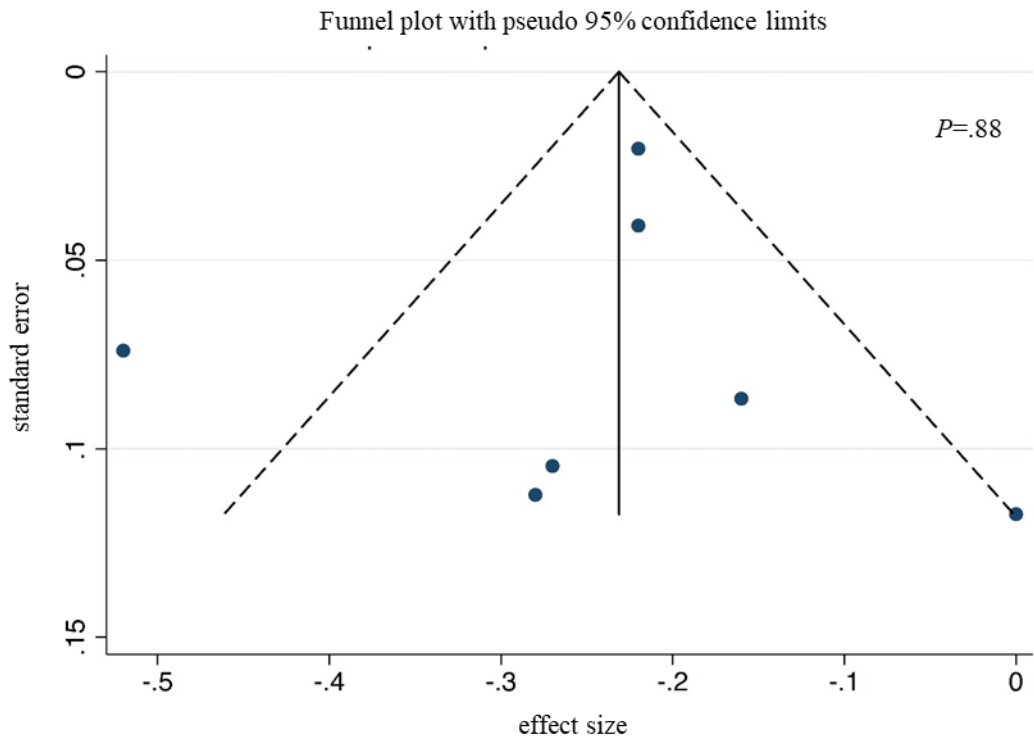
Composite scores



Language



Mathematics



C

Composite scores

