| Review C Review charac First Author | teristics | teristics and quality assessment (Design Restrictions Include: | | | • | Outcomes Assessed Exposures Assessed Literacy: Listening comprehension Literacy: Phonics |
|--------------------------------------|--|---|--|-------------------------------------|--|---|
| Abrami Adelantado Renau | 2020 | Experimental designs Include: Cross-sectional studies | None specified None specified | 2009–2019 | Children; • Adolescents | Literacy: Reading (Abracadabra; in schools) comprehension Literacy: Reading fluency Literacy: Vocabulary knowledge Learning: General Literacy: General Literacy: General General Ceneral |
| Aghasi Andrade | 2020 | Include: Observational Include: Interventions | None specified None specified | 2007–2016 2010–2017 | All (14.2-15.8) Children; Adolescents | Numeracy: General Numeracy: General Video games: General Healthy behavior: Self-efficacy Psychological health: Depression Psychological health: Enjoyment Self-perceptions: General Self-perceptions: Self-esteem |
| Arztmann Aspiranti | 2022 | None specified Include: Interventions | None specified None specified | 2008–2020 2013–2015 | School-age | |
| Baradaran Mahdavi Bartel | 2021 | Include: Observational Exclude: Experimental None | None specified None specified | 1999–2019 2004–2014 | (9.0-16.0) Adolescents | p, |
| Beck Silva Benavides- | 2022 | Include: Randomised controlled trials and quasi-RCTs. Include: Randomised | None specified None specified | 1999–2019 2006–2018 | 10 - 19 years • | Sleep: Time to fall asleep TV programs and movies: General Video games: General Intervention: Nutrition (in schools) Numeracy: Mathematics Intervention: Mathematics |
| Varela Blok Bossen | 2002 | controlled trials None Include: Randomised controlled trials | None specified None specified | 1990–2000 2011–2018 | (5.4-11.5) Children | Literacy: Reading fluency Body composition Cardiometabolic health: Fitness Physical activity: General Physical health: Muscular fitness |
| Boyland Byun | 2016 | Include: Experimental Include: All quantitative designs | None specified None specified | 2004–2015 2006–2014 | (6.0-10.4) School-age Children | Diet: Food intake Advertising: Unhealthy food Numeracy: General Video games: Numeracy Cognition: Executive |
| Cao | 2020 | Include: designs with control groups | None specified | 2002–2019 | 3-12 years (3.4-14.3) | functioning Cognition: Executive Functioning (cognitive flexibility) Cognition: Executive Functioning (inhibition) Cognition: Executive Functioning (working memory) |
| Carter | 2016 | Include: All quantitative designs Include: | None specified | 2011–2015 | Adolescents (10.6-17.0) | |
| Champion | 2019 | Randomised controlled trials Include: Experimental; | None specified | 2003-2017 | Children (11.4-15.9) | Physical activity: General Physical activity: Moderate-to-vigorous intensity Risky behavior: Alcohol consumption Risky behavior: Smoking Screen time: General Intervention: Lifestyle risk behaviour (at school) |
| Chauhan Chen | 2014 2017 | Quasi- experimental Include: pre-post designs with or without control group Include: Experimental designs | None specified None specified None specified | 2002–2012 2001–2016 2008–2019 | Children Elementary school students | Numeracy: General geometry software Learning: General • Screen use: General (in schools) Learning: General • Video games: Educational (with competition) |
| Cheung Cheung | 2012 | Include: Randomised controlled trials Include: Experimental; Quasi- experimental Include: | None specified None specified | 1982–2010 1980–2010 | School-age | Literacy: Reading (in schools) Numeracy: General Intervention: Mathematics (in schools) |
| Cho Claussen Clinton | 2018 2022 | experiemental designs with control group Include: Longitudinal; Retrospective Include: randomised | None specified None specified None specified | 2008–2013 2004–2018 2011–2016 | None specified | Learning: Second language Psychological health: ADHD Psychological health: ADHD Symptoms (Inattention) Screen use: General (mobile phone for language learning) Screen use: General Screen use: General Screen use: General Screen use: Reading (vs paper) |
| Comeras- Chueca | 2021 | experimental designs include: randomized and non-randomized controlled trials (control group with no intervention or traditional exercise intervention) | None specified | 2008–2019 | Under 18 | Body composition: BMI Cardiometabolic health: Fitness Video games: Physically active |
| Comeras- Chueca | 2021 | Include: randomized and non-randomized controlled with control group with no intervention or traditional exercise intervention | None specified | 2010–2020 | Under 18 (8.0-14.0) | Body composition: BMI Body composition: BMI z-score Body composition: Body fat percentage Body composition: Fat-free mass Body composition: Waist circumference |
| Coyne Cushing Darling | 201820102017 | None Include: All quantitative designs; Experimental Include: Intervention | None specified None specified | 1975–2017 1989–2009 2006–2016 | Children; Adolescents Children; Adolescents Children; Adolescents | Prosocial Behavior: General Healthy behavior: General Intervention: Health behaviours Body composition Diet: Healthy dietary behaviour Physical activity (Concepts) Intervention: To promote health (via mobile phone) |
| Eirich | 2022 | Include: experimental or observational Include: Cohort; | None specified | 1978–2021 | 12 or under (0.5-11.0) | Physical activity: General Psychological health: Externalizing Psychological health: Internalizing Computer use: General |
| Fang | 2021 | Case-control; Cross-sectional Include: Quantitative designs | None specified None specified | 2006–2019 2017–2019 | 1 month - 4.99 years old Children: | Body composition Screen use: General TV programs and movies: General Screen use: General (meeting guidelines) Risky behavior: Sexual activity |
| Ferguson Ferguson Folkvord | 2017 2020 2018 | Include: Experimental, correlational, or longitudinal Include: Interventions | None specified None specified None specified | 2005–2017 2009–2013 2007–2018 | None specified (7.8-17.5) | Risky behavior: Sexual activity (initiation of sex) Agression: General Video games: Violent content Diet: Food intake (calories) Advertising: Advergames |
| Foreman Furenes | 2021 | Include: observational and intervention studies Include: experimental or quasi-experimental | None specified None specified | 2015–2020 2002–2019 | 1-8 years old | Eye health: Myopia Screen use: General Screen use: General (phone or tablet) Literacy: Reading comprehension Literacy: Vocabulary learning |
| Gardella Garzón | 2017 | Include: Cross-sectional Include: Experimental with control group Include: Cohort; | Include: North America None specified | 2006–2014 NA | Adolescents (12.5-16.2) | Learning: Educational achievement problems Learning: School attendance problems Learning: General Internet use: Cyberbullying victimization Intervention: Augmented reality (in schools) |
| Ghobadi Graham | 2015 | Case-control; Cross-sectional Exclude: Interventions Include: Experimental; Quasi- experimental Include: | None specified | 2009–2014 2004–2011 | School-age Children (Primary/Elemei School) | Body composition: |
| Haghjoo Hammersley Hao | | observational designs Include: Randomised controlled trials Include: Experimental with | None specified None specified | 2008–2021 2003–2013 2012–2018 | old Children; Adolescents | Body composition: Overweight/obesity Body composition Intervention: To promote healthy weight (obesity prevention) Learning: Second language vocabulary Intervention: English as foreign language |
| Hassan- Saleh He | 2019 | control group Include: Experimental; Quasi- experimental Include: Randomised controlled trials | None specified None specified | 2008–2016 | Children; Adolescents | |
| Hernandez- Jimenez Hurwitz | 2019 | Include: Experimental; Quasi- experimental None | None specified Include: North America | 2009–2017 1997–2018 | Early childhood/pre- | Body composition Video games: Physically active Literacy: General Intervention: Literacy videos |
| lvie Janssen | 2020 | Include: Correlational studies Include: Experimental; Cross-sectional; Longitudial | None specified None specified | 2012–2019 | Primary/Elemen 11-18 years (14.0-18.0) | Psychological health: Depression Social Media: General Sleep: Duration Screen use: General |
| Kates Kim | | None Include: experimental or quasi-experimental Include: Within subject design; | None specified None specified | 2008–2016 | Preschool to Grade 3 (3-9 years old) School-age | Learning: General Learning: Literacy and numeracy Literacy: General Numeracy: General Screen use: Educational apps Numeracy: General Intervention: Mathematics (via |
| Kroesberge Kucukalkan Lanca | | between subject design Include: Experimental Include: Cohort; Case-control; Cross-sectional; Intervention trials. | None specified None specified | 1985–1999 2007–2016 2007–2016 | (Primary/Element, (7.0-11.3) School-age Children (Primary/Element) Children; | Numeracy: General computer in classrooms) Numeracy: General • Intervention: Mathematics |
| Li | 2010 | Exclude: Case reports; Retrospective studies. Include: Experimental; Quasi-experimental | None specified | 1991–2005 | School-age Children | Numeracy: General • Intervention: Mathematics • Body composition: |
| Li Li | | None specified Include: Randomised controlled trials | None specified None specified | 2005–2019 | preschoolers | Overweight/obesity Sleep: Duration Developmental: Gross motor (locomotor) Developmental: Gross motor (non-locomotor) Intervention: Active video games for motor skills |
| Li Liao | | Include: experimental or quasi-experimental Include: All quantitative designs Include: | None specified Include: Taiwan | 2014–2021 1990–2003 | specified School-age | Learning: Computational thinking • Computer use: Programming exercises • Intervention: Education (via computer) |
| Liao Liu | 2016 | Randomised controlled trials Include: Crosssectional; Casecontrol; Longitudinal Include: All | None specified None specified | 1999–2012 | Adolescents (4.0-14.7) All (10.9-18.0) | Body composition Psychological health: Depression Psychological health: Anxiety Psychological health: Depression Social Media: Instant messaging |
| Liu Liu Liu | 2019 2022 | quantitative designs Include: studies with control group Include: Observational | None specified None specified None specified | 2007–2014 NA 2012–2021 | (13.3-16.6) None specified | Depression Psychological health: Satisfaction Cognition: Creativity Psychological health: Depression Social Media: Instant messaging Video games: General Screen use: General Social Media: Instant messaging Video games: General Screen use: General Social Media: Instant messaging Video games: General |
| Lu | 2021 | Include: Cross- sectional only | China | 2014–2018 | Adolescents | Psychological health: Negative coping style Psychological health: Positive coping style Intervention: Education (general) Screen use: General (mobile phone addiction) |
| Madigan | 2020 | Include: Observational Exclude: Qualitative | None specified | 1973–2019 | Children (0.5-10.6) | Screen use: General (coviewing) TV programs and movies: Coviewing TV programs and movies: Educational TV programs and movies: General TV programs and movies: General (in background) |
| Мајог | 2021 | Include: Randomised controlled trials Include: Cross- | Low- or middle- income per World Bank | 2007–2020 | 1-6 years and | Learning: General Intervention: Literacy (Abracadabra; in schools) Cognition: Cognitive Functioning Cognition: Executive Functioning Developmental: General |
| Mallawaara | 2022 | sectional or longitudinal | None specified | 2014–2020 | entry (1.4-5.4) | Developmental: Language or speech Psychological health: Psychosocial factors Psychological health: Self-regulation Sleep: General Aggression: Towards peers |
| Mares Mares | 2005 | None Exclude: Experimental | None specified Exclude: North America | 1969–1989 1973–2010 | • | |
| Marker Marshall | 2022 | None specified None | None specified None specified | 2001–15 1985–2002 | (6.0-12.2) Children; | Learning: Physical and social environment Body composition Body composition Physical activity: General Video games: General TV programs and movies: General Video games: General |
| Martins Martins | | Include: All quantitative designs Include: Cross-over or parallel randomized controlled trials Include: | None specified None specified | 2003–2018 | | Aggression: Towards peers Screen use: General TV programs and movies: Mealtime Intervention: To promote |
| Mazeas McArthur McArthur | 2022 2012 | Randomised controlled trials Include: Randomised controlled trials and quasi-RCTs. Include: Randomised controlled trials | None specified None specified Include: English | 2015–2019 1994–2009 1994–2015 | (10.3-17.8) All (6.7-16.2) Children; | Physical activity: General physical activity (via gamification) Literacy: Phonics Intervention: Literacy (phonics; via computer) Literacy: General Intervention: Literacy |
| Mei | 2018 | controlled trials and quasi-RCTs. Include: cross-sectional, case-control, and cohort studies Include: Experimental with | speaking countries None specified | 2004–2018 | Adolescents 11-20 (13.5-16.8) | Sleep: Duration Sleep: Problems Sleep: Time to fall asleep Screen use: General (excessive) Screen use: Virtual reality simulations (Educational) Screen use: Virtual reality |
| Merchant | 2014 | Experimental with control group | None specified | NA | • | Learning: General Screen use: Virtual reality worlds (Educational) Video games: Virtual reality (Educational) Psychological health: Internalizing Risky behavior: Alcohol consumption Risky behavior: Delinquency |
| Mori Neitzel | | None specified Include: random assignment or | None specified Include: United States, Europe, | 2013–2018 | <18 years (12.3-16.7) Kindergarten- | Risky behavior: Drug use Risky behavior: Sexual activity Risky behavior: Sexual activity (contraception use) Risky behavior: Sexual activity (multiple partners) Risky behavior: Smoking Itheracy: Reading Intervention: Reading |
| Neitzel Oldrati | 2022 | assignment or quasi-experimental Include: Group-control experimental design | Israel, Australia, and New Zealand None specified | 2004–2020 | Grade 6 School-age Children | Cognition: Cognitive Functioning Cognition: Executive Functioning Cognition: Verbal skills Cognition: Visuospatial skills Numeracy: General (technology supported) Intervention: Cognitive training |
| Paik Pearce | 1994 2016 | | None specified None specified | NA 1986–2012 | Children; Adolescents | Psychological health: Adjustment TV programs and movies: Violent content Psychological health: Internalizing TV programs and movies: Violent content |
| Peng Poorolajal | 2011 | None Include: | None specified None specified | 2001–2010 | Children; Adolescents Children; | Cardiometabolic health: Maximum oxygen consumption Physical activity: Energy expenditure Physical activity: Heart rate TV programs and movies: General |
| Poorolajal Powers Prescott | 2020 2013 | Include: Observational Include: Experimental or quasi-experimental designs Include: Longitudinal | None specified None specified None specified | 1995–2018 1985–2012 2008–2017 | Adolescents None specified | Body composition General Video games: General Cognition: Information processing Video games: General Video games: General Video games: Video games: Violent content |
| Reynard Rodriguez- Rocha | 2022 | None specified Include: Experimental; Quasi- experimental | None specified None specified | 2016–2020 1999–2018 | 8-14 years All (4.5-15.4) | Psychological health: Emotion experience Psychological health: Emotion regulation Diet: Fruit and vegetable intake Intervention: To improve emotional regulation (via digital games) Intervention: Fruit and vegetable |
| Sadeghirad Scherer Schroeder | 2016 2020 2013 | Include: Randomised controlled trials Include: Experimental or quasi-experimental designs Include: Experimental; | None specified None specified None specified | 1978–2014 1973–2017 2001–2009 | (3.8-11.0) None specified (6.5-16.8) | Diet: Unhealthy food choice Advertising: Unhealthy food Learning: Programming skills Intervention: Education (programming) Learning: General Intervention: With digital characters |
| Schroeder Scionti Shin | 2013 2019 | Quasi- experimental Include: Interventions | None specified None specified | 2001–2009 2009–2019 | Children (4.3-6.1) Children; | Cognition: Executive functioning Intervention: Cognitive training Intervention: To promote health (via mobile phone app) Diet: Sugary drinks Intervention: To promote health |
| Shin Slavin | 2019 | Include: Include: Randomised controlled trials; Quasi- experimental; Observational | None specified None specified | 2000–2011 | School-age Children (Primary/Eleme | Physical activity: General (via mobile phone) Screen time: General (via mobile phone) Intervention: To promote health (via text message) Science: General Intervention: Science (in schools) |
| Strouse Takacs | 2021 | Include: experimental and quasi-experimental designs Include: Experimental; Quasi- experimental | None specified None specified | 1994–2019 1980–2014 | years (0.8-6.5) NA | • Screen use: Video (vs face-to-face) • Learning: General • e-Books: Narration |
| Takacs | 2019 | Include: Randomised controlled trials and quasi-RCTs. | None specified | 2001–2016 | Children | Cognition: Executive Functioning (accuracy) Cognition: Executive Functioning (cognitive flexibility) Cognition: Executive Functioning (inhibition) Cognition: Executive Functioning (working memory) |
| Tekedere Tokac Vahedi | 2019 | Include: desgins with a control group Include: Interventions (prepost or controlled). | None specified None specified | 2010–2015 2006–2016 2015–2016 | PreK-12th grade School-age Children (Middle/High | Learning: General Intervention: Augmented reality (in schools) Numeracy: Mathematics Video games: Educational Risky behavior: Media literacy (web-based) |
| Vanedi | | Exclude: Cross-sectional Exclude: Qualitative; Case studies Include: | None specified None specified | 2015–2016 | Adolescents (12.6-18.0) | N KICKN DEDANIOL, KICK LAKIDU |
| Wang Wouters | | longitudinal, cohort, case- control, cross- sectional, or controlled trials Include: experimental designs Include: | None specified None specified | 2016–2020 2005–2012 | None specified | Eye health: Visual impairment phone) Learning: Motivation Video games: Educational Video games: Educational (with |
| Wouters Xie | 2018 | Experimental with control group Include: Experimental; Quasi- experimental; Pre- test post-test Include: experimental, quasi- | None specified None specified None specified | 1993–2007 2010–2018 2010–2018 | specified Children (1.8-5.9) | Learning: General Learning: General Intervention: Education (via touch screen) Learning: General Screen use: Touchscreens |
| Xie Yin Zhang | 2019 | quasi- experimental, or pre-post test None specified Include: Cohort; Case-control; | None specified None specified None specified | 2006–2016 | (1.8-5.8) None specified | Psychological health: General Psychological health: Positive mental health Body composition Screen use: Touchscreens Social Media: General TV programs and movies: General |
| Zhang | 2022 | Cross-sectional Include: longitudinal or cohort designs Include: Observational or | None specified Mainland China, | 2001–2021 | 2-19 years (3.8-17.1) | Psychological health: Other mental health problems Body composition Cardiometabolic health: Poor fitness Cardiometabolic health: Risks Screen use: General |
| Zhang | 2022 | Observational or experimental designs Exclude: Non-empirical studies; Qualitative; Systematic reviews or meta-analyses | Hong Kong, Macau and Taiwan None specified | 2009–2020 | grade 1-12) All | Cardiometabolic health: Risks Eye health: Myopia Physical health: Health Issues Psychological health: Emotion problems Healthy behavior: General Healthy behavior: Self-efficacy Psychological health: Enjoyment Video games: Health promoting content |
| Zou | 2021 | • | None specified | 2009–2021 | | Computer use: General Screen use: General Screen use: General (mobile phone) TV programs and movies: General Video games: General |
| Zucker de Oliveira | 2009 | Include: Randomised controlled trials; Quasi- experimental; Observational Include: Observational | None specified None specified | 1997–2006 2010–2014 | Children • (Primary/Eleme | Literacy: Decoding Literacy: Reading comprehension Cardiometabolic health: Metabolic Syndrome • e-Books: General • Screen use: General |
| ¹ Where prov | | , nut | | | | |