



# Psychological Correlates of Sedentary Screen Time Behaviour Among Children and Adolescents: a Narrative Review

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## Abstract

**Purpose of Review** The aims of this narrative review were to (1) synthesise the literature on the relationship between screen time and important mental health outcomes and (2) examine the underpinning factors that can influence this association.

**Recent Findings** Paralleling the rise of mental health issues in children and adolescents is the ubiquitous overuse of screens, but it is unclear how screen time is related to important mental health outcomes and whether this association differs by gender, age and screen type.

**Methods** Medline/PubMed, PsychINFO and Google Scholar databases were searched on December 2019 for articles published mainly in the last 5 years. The search focused on two main concepts: (i) screen time and (ii) mental health outcomes including anxiety, depression, psychological and psychosocial well-being and body image concerns.

**Results** Sixty studies were included in the review. Higher levels of screen time were associated with more severe depressive symptoms. We found moderate evidence for an association between screen time and poor psychological well-being and body dissatisfaction especially among females. Relationships between screen time and anxiety were inconsistent and somewhat gender specific. Social media use was consistently associated with poorer mental health.

**Summary** Higher levels of screen time are generally associated with poorer mental health outcomes, but associations are influenced by screen type, gender and age. Practitioners, parents, policy makers and researchers should collectively identify and evaluate strategies to reduce screen time, or to use screens more adaptively, as a means of promoting better mental health among children and adolescents.

**Keywords** Screen time · Depression · Anxiety · Psychological well-being · Body image · Children · Adolescent

## Introduction

Worldwide, 13.4% of children and adolescents experience mental health disorders [1], indicating that adolescents are at high risk. In fact, 70% of mental illnesses start in early ages [2], and many persist into adulthood [3]. These statistics are alarming given that mental disorders contribute 21.8% of the total burden of disease in high-income countries among children and

adolescents aged 0–14 years [4] and can reduce life expectancy by 20 years [5], thus leading to premature mortality.

Sedentary behaviour is defined as any waking activities that result in an energy expenditure  $\leq 1.5$  metabolic equivalents (METs) while in either a sitting, lying or reclining posture [6]. It includes most sitting-based activities (e.g. reading, eating, listening to music, drawing, etc.) and screen-based leisure time activities (e.g. TV viewing, playing video games, use of computers, cellular phones, tablets and social media) [7–9]. Sedentary behaviour can be measured objectively using accelerometers, which offer an accurate measurement of total sedentary time, and subjectively using questionnaires and diaries which provide detailed information on the quality, context and type of sedentary behaviour [10, 11]. Sedentary behaviour, primarily in the form of screen use among children and adolescents, has increased dramatically in the past decade with the advent of mobile technology, with the majority of youth spending large proportions of the day (6–8 h) in this type of sedentary activity [12, 13].

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It has been recognised that sedentary behaviour has detrimental health effects, including adverse cardiometabolic health outcomes, morbidity and premature mortality [14–17]. Indeed, high levels of sedentary behaviours are correlated with many adverse health outcomes in children and adolescents, including physical and mental well-being [18], elevated body mass index (BMI) [19–21], cardiometabolic function [21, 22] and cognitive development [20]. In this context, Canadian and international guidelines established recommendations to limit the time spent engaged in sedentary pursuits [23–26]. For example, the Canadian 24-h movement guidelines for children and adolescents discourage screen time for children under 2 years old and suggest no more than 1 h daily for children 2–4 years and no more than 2 h for those aged 5–17 years old [27]. Despite these recommendations, the vast majority of children and adolescents do not meet these guidelines and engage in high levels of screen time, with many accruing between 6 and 8 h/day [9, 12, 13, 28–32].

Surprisingly, findings from a recent systematic review found limited evidence to show that objectively measured sedentary behaviour has a negative impact on mental health [33]. However, objectively measured sedentary behaviour combines screen time and many non-screen sedentary behaviours such as reading, homework, listening to music and other sedentary hobbies, so the effects of screen time on mental health have not been adequately isolated. There are many inherent aspects of spending long periods engaged in screen use that can lead to poor mental health, including feelings of social isolation or withdrawal, exposure to unrealistic ideals of beauty, unhealthy social comparisons, sleep reduction and cyberbullying [22, 34–37]. Moreover, there is evidence that different types of screen use may have different impacts on health [38], indicating that the type of screen matters, although this has not been well studied. Research has indicated that digital media users have different needs that impact the selection and the preference of media [39]. According to the differential-susceptibility model proposed by Valkenburg and Peter [40], the effects of media are dependent on a complex combination of cognitive (effort invested), physiological (stimulation received), behavioural (frequency/duration of use) and personality characteristics, which collectively lead individual differences in susceptibility of harmful effects of media consumption [40].

Therefore, given the high prevalence of screen time and mental health problems among children and adolescents and their significant economic [41, 42] and health impact they pose [43, 44], it is timely to better understand how screen time among children and adolescents is related to important mental health outcomes, such as anxiety, depression, body image and psychological well-being. Accordingly, this narrative review aimed to synthesise research in this area, including research using both cross-sectional and longitudinal designs to establish an evidence base that can inform policy, practice and

research regarding the psychological impacts that screen use has on children and adolescents.

## Methods

Electronic databases of Medline/PubMed, PsychINFO and Google Scholar were searched on December 2019 for articles published in the last 5 years. The search mainly focused on the association between recreational screen time sedentary behaviour and mental health outcomes in children and adolescents including anxiety, depression, psychological and psychosocial well-being and body image concerns. Then the articles' titles and abstracts were screened, and full text of potentially relevant articles were retrieved according to eligibility criteria. Information was extracted from each article and summarised in tables categorised by to the study outcomes. A total of 60 articles met the inclusion criteria. Included studies were heterogeneous and varied in terms of the screen time activities including age, sample size and outcome measures.

## Cross-sectional Studies on the Association Between Screen Time and Depressive Symptoms

Depression and anxiety are considered to be among the leading causes of illness, disability and burden in youth according to the World Health Organization [45, 46]. The prevalence of depression increased by 18% [47] between 2005 and 2015, and up to 20% of children and adolescents to meet criteria for anxiety disorders [48]. This is highly concerning especially with emerging research indicating that the onset of depression and anxiety is occurring at younger ages [49–51].

Many cross-sectional studies [36, 52–73] (Table 1) have examined the relationship between screen time and symptoms of depression and/or anxiety among children and adolescents. Out of 23 cross-sectional studies, the majority of studies ( $n = 17$ ) showed that high exposure to at least one type of screen use was associated with more severe depression and/or anxiety symptoms [36, 52, 53, 57, 59–64, 67, 68–73], while only a few studies reported negative associations [58] or mixed associations based on gender [54, 55, 56, 65, 66]. Research on preschooler's screen time and mental health such as depression and anxiety is lacking.

In cross-sectional studies, almost all types of screen use were significantly associated with a higher level of depressive symptoms among young people, especially adolescents, with aggregated time spent engaged in television, computer and mobile phone use showing the strongest associations, indicating an additive effect of screen use. For example, one of the largest cross-sectional studies ( $n = 9702$ ) [53] on adolescents found that screen use was associated with an increased odds of

**Table 1** Characteristics of studies on depression and anxiety

Author, year, country of study	Study design	Sample characteristics	Screen time activities	Depression Measures and findings	Anxiety Measures and findings
Cross-sectional studies					
Barry et al., 2017 [70], USA	Cross-sectional	226 (113 adolescent–parent) Age 14–17 years	Social media	Measures: DSM-V checklist Findings: Social media (number of accounts, frequency of checking) was moderately, positively associated with depression as reported by parents.	Measures: DSM-V checklist Findings: Social media (number of accounts, frequency of checking) was moderately, positively associated with anxiety as reported by parents.
Bélaire et al., 2018 [53], Canada	Cross-sectional	9702 adolescents Age 14–15 years	TV DVDs Video games	Measures: Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R) Findings: higher odds of having moderate and severe symptoms of depression were found among those who exceeded recommended sedentary screen time	Measures: DSM-III-R Findings: higher odds of having moderate to severe symptoms of anxiety were found among those who exceeded recommended sedentary screen time
Frison and Eggermont, 2015 [69], Belgium	Cross-sectional	910 adolescents Mean age 15.44 years	Facebook	Measures: The Center for Epidemiological Studies Depression Scale for Children (CES-DC) Findings: positive correlation was found between passive Facebook use and depressed mood among girls, and active Facebook use and depressed mood among boys. Perceived online social support mediated this association.	
Goldfield et al., 2016 [52], Canada	Cross-sectional	358 overweight and obese adolescents Age 14–18 years Mean age 15.6 years	Computer Video games TV	Measures: Children’s Depression Inventory (CDI) Findings: Time spent playing video games and recreational computer time but not TV viewing was associated with depressive symptoms.	
Hanprathet et al., 2015 [68], Thailand	Cross-sectional	832 adolescents Mean age 16.7 years	Facebook addiction	Measures: The Thai General Health Questionnaire Findings: Facebook addiction among adolescents could be associated with severe depression.	Measures: The Thai General Health Questionnaire Findings: Facebook addiction among adolescents could be associated with anxiety.
Hayward et al., 2016 [54], Australia	Cross-sectional	3295 adolescents Mean age 15.1 years	TV Computer	Measures: Moods and Feelings Questionnaire–Short (SMFQ) Findings: positive association was found between screen time and depressive symptoms for girls only	
Hoare et al., 2017 [55], Australia	Cross-sectional	5500 adolescents Age 11–17 years Mean age 14.5 years	Internet Social media	Measures: Diagnostic and Statistical Manual of Mental Disorders Version IV (DISC IV) Findings: Spending more than 7 h/day on the internet was significantly associated with depressive symptoms among females.	
Kelly et al., 2018 [56], UK	Cross-sectional	10,904 adolescents Age 14 years	Social media	Measures: SMFQ Findings: The magnitude of association between social media use and depressive symptoms was larger for girls than for boys.	
Khan and Burton, 2017 [57], Bangladesh	Cross-sectional	898 adolescents Age 12–17 years Mean age 14.3 years	Computer TV DVD Social media	Measures: CESD Findings: High recreational screen time and not meeting physical activity recommendations were	

**Table 1** (continued)

Author, year, country of study	Study design	Sample characteristics	Screen time activities	Depression Measures and findings	Anxiety Measures and findings
Kovess-Masfety et al., 2016 [58], Europe	Cross-sectional	3195 children Age 6–11 years	Video games	associated with depressive symptoms. Measures: Dominic Interactive (DI) Findings: High video game usage was associated with lower prevalence of mental health difficulties.	Measures: DI Findings: High video game usage was associated with lower prevalence of mental health difficulties.
Li et al., 2017 [72], China	Cross-sectional	1015 adolescents Grade 7–9 Age not reported	Social media	Measures: Chinese version of the Center for Epidemiological Studies Depression scale Findings: A significant association was found between social media addiction and depression. Insomnia partially mediated this association.	
Li et al., 2019 [59], USA	Cross-sectional	2865 adolescents Mean age 15.53	Social messaging Web surfing TV/movie watching Gaming	Measures: CES-D Findings: All four screen-based activities had direct associations with adolescent depressive symptoms.	
Maras et al., 2015 [60], Canada	Cross-sectional	2482 adolescents Grade 7 to 12	TV Computer Video games	Measures: Children's Depression Inventory (CDI) Findings: Duration of screen time was associated with severity of depression. Video game playing and computer use but not TV viewing were associated with more severe depressive symptoms.	Measures: Multidimensional Anxiety Scale for Children-10 (MASC10) Findings: Duration of screen time was associated with severity of anxiety. Video games playing was associated with severity of anxiety.
Sampasa and Lewis, 2015 [67], Canada	Cross-sectional	753 adolescents Mean age 14.1 years	SNS: Facebook Twitter Instagram MySpace	Measure: The Kessler (K-10) Scale (measures anxiety and depression) Findings: The use of SNSs more than 2 h per day was associated with an increased level of psychological distress.	Measures: K-10 Scale Findings: The use of SNSs more than 2 h per day was associated with an increased level of psychological distress.
Sampasa and Hamilton, 2015 [36], Canada	Cross-sectional	5126 Age 11–20 years Mean age 15.2 years	SNS: Facebook Twitter Instagram MySpace	Measure: K-10 Scale Findings: The use of SNSs was associated with an increased level of psychological distress. Findings showed that cyberbullying fully mediated this association.	Measures: K-10 Scale Findings: The use of SNSs was associated with an increased level of psychological distress. Findings showed that cyberbullying fully mediated this association.
Trinh et al., 2015 [61], Canada	Cross-sectional	2660 adolescents Mean age 15.8 years	TV Computer Mobile Games Internet	Measures: CES-D Findings: Exceeding screen time recommendations was significantly related to depressive symptoms especially in males.	
Twenge and Campbell, 2018 [63], USA	Cross-sectional	40,337 children and adolescents Age 2–17 years	Mobile Computer Electronic devices and games TV	Measures: US National Survey of Children's Health (NSCH) Findings: Among 14- to 17-year-olds, high users of screens (7+ h/day vs. low users of 1 h/day) were more than twice as likely to ever have been diagnosed with depression in the last 12 months.	Measures: NSCH Findings: Among 14- to 17-year-olds, high users of screens (7+ h/day vs. low users of 1 h/day) were more than twice as likely to ever have been diagnosed with anxiety in the last 12 months.
Twenge et al., 2018 [62], USA	Cross-sectional	506,820 adolescents Age 13–18 years	Electronic devices Social media	Measures: six items from the Bentler Medical and Psychological	

**Table 1** (continued)

Author, year, country of study	Study design	Sample characteristics	Screen time activities	Depression Measures and findings	Anxiety Measures and findings
			Internet TV	Functioning Inventory depression scale Findings: The increase in new media screen time was associated with depression.	
Twenge and Campbell, 2019 [64], UK and USA	Cross-sectional	221,096 adolescents from UK and US samples Age: UK sample: 15 years US sample: 8th, 10th, and 12th graders (age not reported)	Smartphones Computers Social media Gaming Internet	Measures: “During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?” Findings: Heavy users (vs. light) of digital media were 48% to 171% more likely to report being depressed.	
Wang et al., 2018 [73], China	Cross-sectional	365 adolescents Age 14–18 years	Social media	Measures: CES-D Findings: Social media addiction was positively associated with depression.	
Wang et al., 2019 [65], China	Cross-sectional	578 adolescents Mean age 15 years	Mobile games addiction	Measures: Brief Symptom Inventory (BSI) Findings: Mobile game addiction was positively associated with depression.	Measures: Child Social Anxiety Scale Findings: Mobile game addiction was positively associated with social anxiety especially among males.
Yan et al., 2017 [71], China	Cross-sectional	2656 adolescents Age 13–18 years	Social media		Measures: Middle School Student Mental Health Scale to measure anxiety Findings: A positive association was found between the time spent on social media and anxiety.
Zhang et al., 2019 [66], China	Cross-sectional	16,205 adolescents Age 12–18 years	TV Digital media	Measures: “Have you felt depressed during the last seven days?” Findings: Adolescents who spent more time on screen were significantly more likely to have depressive symptoms. New digital media had a greater association among girls for depression.	
Cross-sectional and longitudinal studies					
Bickham et al., 2015 [74], USA	Cross-sectional and longitudinal T1: 2009 T2: 2010	126 adolescents Mean age at T1 = 14 years	TV Computer Mobile	Measures: The Beck Depression Index (BDI) Findings: A significant positive association was found between mobile use and depression. More TV and mobile use reported at baseline was associated with a higher participants’ depression score after 1 year.	
Carter et al., 2015 [75], USA	Cross-sectional and longitudinal T1: 12–18 years T2: 13–19 years T3: 18–26 years	6504 adolescents Mean age at T1 = 15.53 years	TV Computer Video games	Measures: Center for Epidemiological Studies Depression Scale (CES-D) Findings: A positive association between screen time and depressive symptoms was found only at baseline. No longitudinal association was found.	

**Table 1** (continued)

Author, year, country of study	Study design	Sample characteristics	Screen time activities	Depression Measures and findings	Anxiety Measures and findings
Gunnell et al., 2016 [76], Canada	Cross-sectional and longitudinal Follow-up: every 1 to 2 years for several years between 2006 and 2013	1160 adolescents Age 10–21 years Mean age 13.54 years at T1	TV Video games Computer	Measures: Children's Depression Inventory (CDI) Findings: A cross-sectional association was found between screen time and depression; however, initial screen time did not predict changes in depression over time.	Measures: MASC-10 Findings: A cross-sectional association was found between screen time and anxiety; however, initial screen time did not predict changes in anxiety over time.
Longitudinal studies					
Boers et al., 2019 [77], Canada	Longitudinal Follow-up: annually for 4 years	3826 adolescents Mean age 12.3	Video games Social media TV Computer	Measures: BSI Findings: time-varying associations was found between social media, television, and depression.	
Etchells et al., 2016 [78], UK	Longitudinal Follow-up at age 15	5400 children and adolescents Age 8/9–15 years	Video games	Measures: Development and Well-Being Assessment (DAWBA) Findings: Moderate levels of playing video games that are more likely to include violent content in childhood was weakly associated with an increased risk of depression.	
Grontved et al., 2016 [79], Denmark	Longitudinal Follow-up: 6 and 12 years follow-up between 1997 and 2010	435 adolescents to young adults Mean age 8.8 at T1	TV Computer	Measure: Major Depression Inventory (MDI) Findings: Prolonged TV viewing, but not computer use, was associated with more depression symptoms.	
Houghton et al., 2018 [80], Australia	Longitudinal Follow-up: 6 times in 2 years from 2013 to 2015	1749 adolescents Age 10–17 at T1	Social networking and web browsing Gaming TV	Measures: CDI Findings: Small positive associations were evident between depressive symptoms and later screen use and between screen use and later depressive symptoms.	
Khouja et al., 2019 [81], UK	Longitudinal T1: 16 years T2: 18 years	14,665 adolescents Age 16 years at T1	TV Texting Computer	Measures: Clinical Interview Schedule (CIS-R) Findings: Increased computer use at age 16 was associated with a small increased risk of depression at age 18.	Measures: CIS-R Findings: Increased computer use at age 16 was associated with a small increased risk of anxiety at age 18.
Li et al., 2018 [82], China	Longitudinal T1: March 2014 T2: after 9 months	5365 adolescents at T1 Mean age 13.9 years at T1	Social networking sites	Measures: CES-D Findings: A bidirectional association was found between online social networking addiction and depression.	
McVeigh et al., 2016 [83], Australia	Longitudinal Follow-up at ages 5, 8, 10, 14, 17, and 20 years	2441 children and adolescents	TV	Measures: Depression Anxiety Stress Scales (DASS-21) Findings: no association was found between TV watching and mental health	Measures: DASS-21 Findings: no association between TV watching and mental health
Ohannessian, 2018 [84], USA	Longitudinal Follow-up 1 year after T1	441 adolescents Mean age 17.14 at T1	Video games		Measures: Screen for Child Anxiety Related Disorders (SCARED) Findings: Boys who played video games the most had the lowest levels of anxiety, whereas girls who played video games the most had the highest levels of anxiety. Gender and social context moderated these association.



**Table 1** (continued)

Author, year, country of study	Study design	Sample characteristics	Screen time activities	Depression Measures and findings	Anxiety Measures and findings
Riehm et al., 2019 [85], USA	Longitudinal Follow-up annually for 3 waves from September 2013 to October 2016	6595 adolescents Age 12 to 15 years at T1	Social media	Measures: GAIN-SS Findings: Spending more than 3 h per day using social media may increase the risk for mental health problems, particularly internalising problems.	Measures: GAIN-SS Findings: Spending more than 3 h per day using social media may increase the risk for mental health problems, particularly internalising problems.
Vernon et al., 2016 [86], Australia	Longitudinal Follow-up annually for 3 years	874 adolescents at T1 Mean age 14.4 years at T1	Social networking sites	Measures: Depressed mood scale (adapted from the longitudinal Michigan Study of Adolescent Life Transitions) Findings: Increased investment in social media predicted higher depressed mood in adolescents, which was mediated by the higher levels of sleep disruptions.	
Viner et al., 2019 [87•], UK	Longitudinal Follow-up: three waves of follow-ups from age 13 to 16	12,866 adolescents Age 13–14 years at T1	Social media		Measures: General Health Questionnaire (GHQ12) and National Statistics (ONS) well-being Findings: Frequent social media use was predictive of later anxiety especially among girls. This association is not directly related to social media use but with the harmful content on social media or by displacement of healthy behaviours like sleep and physical activity.
Zink et al., 2019 [88], USA	Longitudinal Follow-up 1 year after T1	2525 adolescents Mean age 14.6 years at T1	TV Computer Video games	Measures: Revised Children's Anxiety and Depression Scale (RCADS) Findings: Screen time was not associated with major depressive disorders.	Measures: RCADS Findings: reciprocal association was found between computer/videogame use and anxiety

moderate and severe symptoms of depression and anxiety. These results were similar to other large cross-sectional studies [60, 63]. Maras et al. demonstrated that higher levels of screen time, as measured by an aggregate of TV viewing, recreational computer use and video gaming, were associated with more severe symptoms of depression and anxiety among the youth [60], consistent with cross-sectional findings from other studies among children and adolescents [52, 61, 75, 76]. Associations with emotional distress may differ by screen type, as leisure computer use was more highly associated with anxiety and depression outcomes than television viewing in some studies [52, 60], but cross-sectional findings from a longitudinal study found that high levels of TV viewing and not recreational computer use were more strongly associated with depressive symptoms in adolescents and children [74].

Internet-based video gaming has recently become a popular activity among adolescents, especially males, making it an

important type of sedentary behaviour to investigate. A recent study on 578 adolescents reported that high use of internet video gaming was associated with more severe anxiety and depression among adolescents, with males being more affected than females [65]. These results are consistent with other studies showing a strong association between computer games and symptoms of depression [52, 60]. However, a recent European study on gaming among school children between 6 and 11 years found that gaming was not significantly associated with self-reported mental health problems such as depression and anxiety [58]. The conflicting findings may be due, in part, to differences in “dose” of video gaming and age, as the studies with adolescents reported much higher usage of gaming compared with those involving pre-adolescent samples.

In addition to online video gaming, new digital media like social media networking sites have also been recognised to be

associated with mental health issues like depression and/or anxiety [36, 56•, 67•, 68–73]. A recent nationally representative study [56•] reported that adolescents who frequently use social media were more likely to have high levels of depressive symptoms, with stronger correlations reported among females. The association between social networking sites (SNS), psychological distress and suicide attempts was found to be indirect and mediated by cyberbullying victimisation in a large study ( $N = 5126$ ) of adolescents (aged 11–20 years) [36]. Insomnia was another mediating factor reported by Li et al., who found a positive association between Facebook addiction and depression among 1015 Chinese adolescents [72]. Furthermore, another cross-sectional study indicated that both active and passive use of Facebook were associated with an increased depressed mood. However, this association was influenced by gender where girls who use Facebook passively and boys who use Facebook actively in a public setting were more likely to develop depression. Also, this study indicated that perceived social support mediated the relationship between social media and depression [69]. The number of social media accounts and the frequency of checking were also found to be additional factors that impact the association between social media and depression and anxiety according to data from parents [70]. These factors and mediators require further investigation in future research.

Concerning the age group, the majority of studies assessed screen use and depression among adolescents, or combined children and adolescents without examining these populations separately, so associations in children are unclear. The greater inquiry in adolescents might be attributed to adolescents reporting higher screen use than children [89] or being more prone to experiencing depression than children [90].

### Longitudinal Studies on Screen Use and Anxiety/Depressive Symptoms

Several longitudinal studies examined the association between screen time and depression and anxiety among children and adolescents [74–88] (Table 1). Some recent studies were in line with cross-sectional ones and found a positive association between screen use, depression [74, 77•] and anxiety among adolescents [85, 88]. For example, a longitudinal study done on 3826 adolescents found a time-varying relationship between social media, television and depressive symptoms [77•]. Each additional hour spent on social media usage in a given year was linked to a 0.41-unit increase in depressive symptoms for that same year, indicating a dose–response relationship. Also, a similar within-person association was found with television watching [77•]. Furthermore, a large longitudinal study with 6595 adolescents aged 12 to 15 years old reported that spending more than 3 h daily on social media significantly increased the risk for mental health problems,

particularly internalising problems such as depression and anxiety [85]. While 8 longitudinal studies [74, 77•, 79, 82, 85–88] found an association between some types of screen activities and depression and/or anxiety, other studies found little [78, 80, 81] or no evidence [75, 76, 83] that screen time is longitudinally associated with depression and/or anxiety. For example, a longitudinal study involving children and adolescents that examined the association between television watching and mental health indicated no significant association [83].

Interestingly, many cross-sectional and longitudinal studies found that the association between screen time and depression [54, 55, 56•] and anxiety [84•] differed by gender. Many studies found that females with high levels of screen time use reported the highest level of depressive symptoms, while weaker or even no associations were found in males [54, 55]. Another study found higher symptoms of anxiety with playing video games among girls and lower symptoms among boys [84•] which contradicts the findings from Wang et al. [65] who reported that high online video game use was related to higher symptoms of depression and anxiety among males. It should be noted that the sample of youth from the study by Wang et al. engaged significantly in more time of online gaming, thereby highlighting that video gaming may be especially psychologically harmful with excessive use.

The difference in results and clear gender differences in longitudinal studies might be related to diverse types of screen use, dose, age and variation in the baseline level of anxiety and depression among adolescents. For example, a study by Kelly et al. in 2018 involved 10,904 adolescents, indicating that females spent a high proportion of their time on social media and that the magnitude of association between social media use and depressive symptoms was larger for females than for males [56•], consistent with the findings in similar studies and reviews [87••, 91]. Research has indicated that high social media use may confer an increased risk of depression in adolescent females due to interference in sleep habits [37], exposure to teasing or cyberbullying or unrealistic beauty ideals leading to unfavourable social comparisons and low self-esteem [92]. These gender differences might also be related, in part, to the higher baseline levels of anxiety/depression among adolescent females than males [93] as the prevalence of depression and anxiety after puberty is twice as high for females compared with males [94], as well as a higher prevalence of social media use among adolescent girls.

Although consistent gender differences emerged for social media use, a recent longitudinal study on video games and anxiety among older adolescents showed that while moderate use of video gaming was associated with higher anxiety symptoms among females, this was not the case in males [84•]. While the reason is still unclear, the authors hypothesise that boys may enjoy the social interaction and sense of competition between players more than girls. On the other hand, it is



noteworthy that the degree of internet usage or video game “dose” may have an important impact on affective symptoms, as youth with extensive screen exposure in the form of internet use/video gaming exhibited significantly more mental health issues than those with low usage, regardless of gender [95].

Very few studies have examined reciprocal relationships between screen time and depression and anxiety symptoms among children and adolescents. However, a large longitudinal study among adolescents showed a reciprocal relationship between computer and videogame usage and increased level of generalised anxiety disorders [88]. That is, youth with emotional distress characterised by anxiety may spend more time indoors and engage in various forms of screen time as a way of coping, and these media activities may further exacerbate their psychological distress, thereby creating a vicious cycle.

In summary, there is strong cross-sectional and moderate longitudinal evidence for an association between screen time and depressive symptoms among children and adolescents, but associations differ by age, type of screen use, gender and other moderators. Most of the studies focused on depressive symptoms, so further longitudinal studies are warranted to better understand the association between different types of screen time and anxiety.

### Cross-sectional Studies on Screen Time and Psychological Well-Being

Psychological well-being refers to satisfaction with life and experiencing positive emotions [96], including positive self-perceptions and positive relationships [97]. Research has linked psychological well-being with academic performance [98], physical health [99] and mental health. Thus, it is essential to understand how screen time is associated with psychological well-being among children and adolescents to effectively inform clinical practice, policy and research.

As shown in Table 2, several cross-sectional studies examined the role of screen time on childrens and adolescents’ well-being [63, 64, 100–107]. Negative associations between digital technology use and adolescents’ and childrens’ well-being were found in many studies [63, 64, 100, 101, 105–107], while a few found no relationship between the use of screen time and well-being [102–104]. A high-quality, large study ( $n = 120,115$ ) in youth from the UK found that moderate digital technology use did not correlate strongly with mental well-being [103]. However, analysis of three large surveys of adolescents in the UK and USA ( $n = 221,096$ ) [64] revealed that those who use screens for less than 1 h a day reported more favourable psychological well-being than high users (more than 5 h/day). Interestingly, this study indicated that individuals who did not engage in digital media activities at all had poorer well-being than light users [64].

While results were more consistent among adolescents, studies on young children reported mixed findings. A cross-

sectional study in China looked at the relationship between excessive screen time and psychological well-being in 20,324 children aged 3–4 years found a dose–response relationship whereby every additional hour of screen-based pursuits was associated with poorer psychosocial well-being. This association was mostly mediated by the parent–child interaction. According to this study, excessive exposure to screen may have the strongest effect on the frequency of engagement in interactive activities between the parents and the child which in turn can be a risk factor for child psychosocial problems [106•]. On the other hand, null findings were reported in a smaller study examining the associations between moderate levels of TV viewing and psychological well-being among children aged 0–5 years [102]. Similarly, in a large cross-sectional study ( $n = 19,957$ ), little or no evidence was found to support a link between screen use and psychological well-being among young children [104].

### Longitudinal Studies on Screen Time and Psychological Well-Being

Several longitudinal studies (Table 2) have found that higher amounts of recreational screen time predicted lower psychological well-being among children and adolescents [87••, 107–112]. A study investigated possible dose–response associations between media use and later psychological well-being among children aged between 2 and 6 years. This study reported that higher levels of electronic media predicted lower psychological well-being, with television viewing being more strongly associated with well-being than e-games and computer use [110]. Another longitudinal study indicated that the high use of social media was associated with poorer well-being, and the relationship was stronger for females than males [87••, 109••]. This gender difference was also apparent in other studies examining the effect of excessive use of video gaming, also called video gaming disorder on psychological and psychosocial well-being. A recent longitudinal study found that video gaming disorder predicted a decrease in psychosocial well-being especially social competencies among boys compared to girls [112]. Similar to those stated above for anxiety and depression, mechanisms underpinning this gender difference might simply reflect differences in use between females and males [87••, 91] which leads to a higher risk of being exposed to cyberbullying [56•, 87••, 113, 114]. Also, the types of games chosen might be associated with gender differences as girls tend to choose puzzle and educational games while boys tend to choose fighting, strategy and action games which might increase their vulnerability to the negative impact of disordered gaming [115]. Another possible mechanism that may explain the association between screen time and mental well-being is sleep, as inadequate sleep is associated with higher use of screen time among

**Table 2** Characteristics of studies on psychological well-being

Author, year, country of study	Study design	Sample characteristics	Screen time activities	Psychological well-being Measures and findings
<b>Cross-sectional studies</b>				
Booker et al., 2015 [100], UK	Cross-sectional	4899 adolescents Age 10–15 years	SNS Game console Computer game use TV, DVDs	Measures: Happiness with six domains of life SDQ Findings: Chatting on social networking sites and game console usage were associated with higher odds of socio-emotional problems. Higher total screen-based media use was associated with lower odds of happiness and higher odds of socio-emotional difficulties.
Herman et al., 2015 [101], Canada	Cross-sectional	7725 adolescents Age 12–17 years	Computer Video games TV, DVDs	Measures: Self-rated mental health: one item ‘would you say your mental health in general is excellent, very good, fair or poor?’ Findings: Adolescents who did not meet Canadian guidelines for sedentary behaviour and exceeded screen time were 30–50% more likely to rate their mental health sub-optimally compared to those who met guidelines.
Lee and Carson, 2018 [102], South Korea	Cross-sectional	1774 children Age 0–5 Years	TV	Measures: Happiness and stress were used to measure psychological well-being. Findings: TV viewing was not associated with psychosocial well-being.
Przybylski and Weinstein, 2017 [103], UK	Cross-sectional	120,115 adolescents Age 15 years	DVDs TV Games Computers Mobile Social networking Internet	Measures: Warwick–Edinburgh Mental Well-Being Scale (WEMWBS) Findings: Relationships between digital-screen time and mental well-being were nonlinear. Moderate engagement in digital activities was not harmful although high levels of engagement may have a measurable, but small negative influence.
Przybylski and Weinstein, 2019 [104], USA	Cross-sectional	19,957 children Age 2–5 years	Computer Mobile Video games TV Electronic devices	Measures: questionnaire drafted by developmental specialists Findings: Evidence did not support an association between screen time and psychological well-being.
Suchert et al., 2015 [105], Germany	Cross-sectional	1296 adolescents. Mean age 13.7 years	TV Mobile Video games Computer	Measures: CES-D Findings: negative associations were found between sedentary screen time behaviour and mental well-being especially among adolescent girls
Twenge and Campbell, 2018 [63], USA	Cross-sectional	40,337 children and adolescents Age 2–17 years	Mobile Computer Electronic devices and games TV	Measures: NSCH Findings: Among 14- to 17-year adolescents, high users of screens (7+ h/day vs. low users of 1 h/day) were more than twice as likely to ever have been treated for psychological or behavioural issues in the last 12 months. Moderate use of screens (4 h/day) was also associated with lower psychological well-being. Moderate use of screens (4 h/day) was also associated with lower psychological well-being.
Twenge and Campbell, 2019 [64], UK and USA	Cross-sectional	221,096 adolescents from UK and US samples Age: UK sample: 15 years US sample: 8th, 10th, and 12th graders (age not reported)	Smartphones, computers, social media, gaming, Internet	Measures: 14-item Warwick–Edinburgh Mental Well-Being Scale Findings: Heavy users (vs. light) of digital media were 48% to 171% more likely to be in low psychological well-being.
Zhao et al., 2018 [106], China	Cross-sectional	20,324 children Age 3–4 years	Video programs Electronic games TV Computer Mobile	Measures: SDQ Findings: Excessive screen exposure was associated with poor psychosocial well-being in preschool children via a number of mediators, like sleep, BMI and mostly by reducing parent–child interaction.

**Table 2** (continued)

Author, year, country of study	Study design	Sample characteristics	Screen time activities	Psychological well-being Measures and findings
			iPad	
Cross-sectional and longitudinal studies				
Allen and Vella, 2015 [107], Australia	Cross-sectional and longitudinal T1: 2010 T2: 2012	7818 children 6–10 years at T1	TV Video games	Measures: SDQ Findings: Screen-based sedentary behaviour was related to the development of psychosocial difficulties in early and late childhood. Important moderators: household income, parental education level and neighbourhood socio-economic position
Longitudinal studies				
Babic et al., 2017 [108], Australia	Longitudinal T1: between April and June 2014 T2: between October and December 2014	322 adolescents Mean age 14.4 at T1	TV, DVDs, computer, and tablet/mobile	Measures: Flourishing Scale Findings: Changes in total recreational screen time and computer use were negatively associated with psychological well-being. A positive association was found with TV/DVD use and psychological difficulties.
Booker et al., 2018 [109••], UK	Longitudinal Follow-up: 5 waves from age 10 to 15 years	9859 adolescents Age 10 to 15 years	Social media	Measures: Happiness with six domains of life Strengths and Difficulties Questionnaire (SDQ) Findings: significant correlation was found between interacting on social media and well-being among females Higher social media interaction at age 10 was associated with declines in well-being thereafter for females, but not for males.
Hinkley et al., 2014 [110], Europe	Longitudinal T1: from September 1, 2007, to June 30, 2008 T2: from September 1, 2009, to May 31, 2010	3604 children Age 2–6 years	TV Computer Games	Measures: SDQ Questionnaire for Measuring Health-Related Quality of Life in Children and Adolescents–Revised Version (KINDL) Findings: Higher levels of early childhood electronic media use especially TV viewing were associated with children being at risk for poorer outcomes with some indicators of well-being.
Kim, 2017 [111], Korea	Longitudinal T1: 2007 T2: 2008	2844 adolescents Age 12–15 years	SNS and online communication	Measures: students' self-reported questionnaire Findings: strong negative relationship was found between online activities (chatting, e-mailing, participating in communities or clubs and using bulletin boards) and self-reported mental well-being
van den Eijnden et al., 2018 [112], Netherlands	Longitudinal Follow-up: T1: February to March 2015 T2: 2016 T3: 2017	538 adolescents Age 12–15 years Mean age 12.9 years at T1	Social media disorder Internet gaming disorder	Measures: Perceived social competence: the 5-item Dutch version of the Harter's Self Perception Profile of Adolescents 5-item Satisfaction with Life Scale developed by Diener, Emmons, Larsen and Griffin Findings: Disordered use of social media and internet games predicted a decrease in the psychosocial well-being of adolescents in terms of life satisfaction and perceived social competencies. More vulnerability among boys was found in terms of disordered gaming.
Viner et al., 2019 [87••], UK	Longitudinal Follow-up: three waves of follow-ups from age 13 to 16	12,866 adolescents Age 13–14 years at T1	Social media	Measures: General Health Questionnaire (GHQ12) and National Statistics (ONS) well-being Findings: Frequent social media use was predictive of later lower well-being especially among girls.

children and adolescents [116]; thus, the displacement of sleep, especially among girls, can mediate the association between screen time and mental well-being [56•, 87••].

Furthermore, replacing direct interaction with friends with low-quality, superficial communication of most online interaction online interaction may result in poor social

connectedness and lower quality of relationships, which consequently may negatively affect psychological well-being [117].

Taken together, the majority of the reviewed studies, including those using longitudinal designs, indicate a negative association between screen time and psychological well-being, with most of the studies being conducted in adolescents. More inconsistent results emerged from large-scale cross-sectional studies, perhaps due to greater heterogeneity in study measures of well-being, data analyses and sample characteristics [102, 104]. The evidence base among pre-adolescents and young children is moderate, but we highly recommend further longitudinal examination of the relationship between screen time and psychological well-being is needed to gain a better understanding of this association.

### Cross-sectional Studies on Screen Time and Body Image

Body dissatisfaction is defined as a negative attitude towards appearance, body weight, size or shape and is one of the most robust aspects of the broader concept of body image. Body image concerns are highly prevalent during adolescence when one's body shape and weight strongly influence one's self-esteem, and these concerns are especially salient among females [118]. Body image concerns are well known to be detrimental contributors to well-being [119] and significant predictors of psychiatric conditions such as eating disorders and [118] and depression, as well as low self-esteem [120, 121]. With social media platforms such as Facebook, Snapchat and Instagram, body image has become an important target in these activities [122], where individuals post their most flattering photos and view those of others [123], creating an online environment that could be detrimental to body image [124]. Spending time on social media puts adolescents under a higher risk of comparing themselves to more attractive peers [125], and as a result, these unfavourable social comparisons of physical appearance may elicit or exacerbate body image concerns [126, 127]. Screen time, mainly social media use, has received significant attention in research for its potential impact on body dissatisfaction [128]; therefore, it is highly essential to understand how the use of this and other forms of digital media may contribute to adolescents' body image.

As shown in Table 3, cross-sectional research indicated that screen time [56, 126, 129–133] especially that spent on social media is associated with body image concerns among adolescents. For example, a large study comprised of high school girls ( $n = 1087$ ) aged 13–15 years showed that those who use social media frequently reported significantly greater body image concerns such as internalisation of the thin ideal, drive for thinness and body surveillance compared to non-users [131]. Another recent cross-

sectional study among adolescents [130] also indicated an association between social media and body dissatisfaction; however, this study found that this association was impacted by the social environment (e.g. relationship with the mother). Specifically, adolescents who reported positive relationships with their mothers had less body dissatisfaction in relation to social media use than those with more negative maternal relationships [130].

### Longitudinal Studies on Screen Time and Body Image

Although many cross-sectional [126, 131–133] and longitudinal research [136] has focused on females who report high levels of body image concerns, some recent longitudinal studies included both genders [134, 135]. For example, a study on 604 adolescents aged 11–18 years indicated that both genders experienced the same extent of body dissatisfaction when using social media networking sites frequently [134]. Another longitudinal study involving 1840 adolescents aged between 12 and 19 years showed that passive Facebook usage (consuming information without direct exchanges like posting status or commenting) was associated with more social comparison among adolescent males and females over time [135]. While social comparison has been clearly implicated in playing an important mechanistic role in the association between screen time and body image concerns, other factors were highlighted in the literature as indicated previously about the buffering effects of positive parent–adolescent relationships [130].

Interestingly, media literacy, which is about being able to think critically about media [137] and being able to assess whether a media content such as an image is realistic or not [138], was suggested as another important protective factor that attenuated the adverse effects on body image among adolescents when exposed to unrealistic thin-ideal media images [139]. Thus, media literacy programs should be examined in more depth using experimental and longitudinal designs as this may represent a promising strategy that protects youth from developing an unhealthy body image known to predict other psychiatric disorders.

### Limitations and Strengths

Although this narrative review is representative of key findings from a broad body of literature with the aim to examine the research objectives, there are a few limitations that are noteworthy. This study was not a systematic review of the literature, but rather a narrative review performed by a single reviewer. There may be relevant studies that have been excluded. However, the present review is unique in critically

**Table 3** Characteristics of studies on body image

Author, year, country of study	Study design	Sample characteristics	Screen time activities	Body image Measures and findings
Cross-sectional studies				
Añez et al., 2018 [129], Spain	Cross-sectional	1501 adolescents Age 13–17 years	TV Computer (leisure and homework)	Measures: Body Dissatisfaction subscale of the Eating Disorders Inventory-3 (EDI-3) Findings: Computer leisure time was negatively associated only with girls' body dissatisfaction.
De Vries et al., 2019 [130], Netherlands	Cross-sectional	404 adolescents Age 12–19 years	Facebook Instagram	Measures: The body dissatisfaction subscale of the Body Attitude Test Findings: Social media use was positively associated with body dissatisfaction, but this relationship was weaker among adolescents who reported a more positive mother–adolescent relationship. Positive father–adolescent relationship did not moderate the association between social media use and body dissatisfaction.
Kelly et al., 2018 [56], UK	Cross-sectional	10,904 adolescents Age 14 years	Social media	Measures: On a scale of 1 to 7, how do you feel about the way you look? Which of these do you think you are?" (underweight, about the right weight, slightly overweight, very overweight), "Have you ever exercised to lose weight or to avoid gaining weight?", "Have you ever eaten less food, fewer calories, or foods low in fat to lose weight or to avoid gaining weight?". Findings: Social media screen time was associated with body image concerns among girls more than boys.
Meier and Gray, 2014 [126], USA	Cross-sectional	103 female adolescents Age 12–18 years	Social networking sites Facebook	Measures: The 5-item Sociocultural Internalization of Appearance Questionnaire for Adolescents (SIAQ—A) The Physical Appearance Comparison Scale (PACS) Weight Satisfaction subscale of the Body-Esteem Scale for Adolescents and Adults (BES) Self-Objectification Questionnaire Findings: It is not the total time spent on FB or the Internet, but the amount of FB time allocated to photo activity that was associated with greater thin ideal internalisation, self-objectification, weight dissatisfaction and drive for thinness.
Tiggemann and Slater, 2013 [131], Australia	Cross-sectional	1087 female adolescents Age 13–15 years	Facebook	Measures: body surveillance drive for thinness and Internalization of beauty ideals Findings: Facebook users scored significantly more highly on all body image concern measures than non-users. Number of Facebook friends was significantly correlated with all body image concern measures.
Tiggemann and Slater, 2014 [132], Australia	Cross-sectional	189 young female adolescents Age 10–12 years	TV Magazine Facebook MySpace Other social networking sites	Measures: Sociocultural Internalization of Media Ideals Scale Body Surveillance Scale of the Objectified Body Consciousness Scale—Youth Body Esteem Scale for Children Dieting: ("Do you watch exactly what you eat?" "Do you try to eat less at meal times than you would like to eat?") "Have you ever been on a diet to lose weight?" Findings: SNS use correlated with internalisation, body surveillance and negative body esteem. Time spent on these social networking sites produced stronger correlations with body image concerns than did overall Internet exposure.
Vandenbosch and Eggermont, 2012 [133], Belgium	Cross-sectional	558 female adolescents Age 13–18 years	Sexually objectifying music TV, primetime TV programs, social networking sites	Measures: Noll and Fredrickson's original Self-Objectification Questionnaire Internalization subscale of the Sociocultural Attitudes Toward Appearance Scale Body surveillance subscale from the Objectified Body Consciousness Scale for Adolescents



**Table 3** (continued)

Author, year, country of study	Study design	Sample characteristics	Screen time activities	Body image Measures and findings
Cross-sectional and longitudinal studies				
De Vries et al., 2016 [134], Netherlands	Cross-sectional and longitudinal T1: July through September 2008 T2: December 2009	604 adolescents 11–18 years at T1	Hyves.nl	Findings: SNS use significantly predicted body surveillance. Direct relationships were found between internalisation of beauty ideals and sexually objectifying media.  Measures: Body dissatisfaction Peer appearance-related Feedback Findings: SNS use predicted increased body dissatisfaction in both genders. SNS use predicted increased peer influence on body image via peer appearance-related feedback.
Rousseau et al., 2017 [135], Belgium	Cross-sectional and longitudinal T1: March 2014 T2: October 2014	1840 adolescents Age 12–19 years at T1	Facebook	Measures: The Body Dissatisfaction Subscale of the Body Attitude Test Findings: Adolescents who use Facebook in a passive manner would develop a stronger tendency to engage in social comparison on Facebook, which in turn leads to experiencing higher levels of body dissatisfaction, and vice versa.
Longitudinal studies				
Tiggemann and Slater, 2017 [136], Australia	Longitudinal T1: grade 8 and 9 T2: 2 years later	438 female adolescents Mean age 13.6 at T1	Facebook	Measures: Sociocultural Attitudes Toward Appearance Questionnaire Objectified Body Consciousness Scale–Youth Drive for Thinness Scale of the Eating Disorder Inventory Findings: One aspect of Facebook use was associated with subsequent higher levels of aspects of body image concerns.

analysing both cross-sectional and longitudinal evidence from very recent studies (past 5 years) about the association between sedentary screen time and mental health, thus providing current evidence to inform future research, practice and policy reform designed to improve children's and adolescents' mental health.

## Summary, Conclusions and Recommendations

Findings from the present review suggest that screen time is generally associated with depressive symptoms among adolescents, especially females. Evidence on the association between screen time and anxiety among adolescents was mixed and inconclusive and somewhat screen and gender dependent. However, high screen use was consistently shown to be associated with poorer emotional well-being in longitudinal studies, although mixed evidence was found among cross-sectional studies, especially among young children. We also found that high screen time, especially social media use, was consistently associated with greater body image concerns

among both male and female adolescents, although females appear more negatively affected. Media literacy and positive relationship with parents appear to attenuate the negative role of screen time on body image, likely by reducing internalisation of unrealistic beauty ideals. Due to the small number of studies in pre-adolescent children, especially pre-schoolers, it is not possible to determine with any degree of confidence the association between screen time and mental health indicators in this population.

This review highlights that some types of screens are more consistently problematic for mental health than others depending on the content of the media and the characteristics of individuals and their susceptibility levels to the effects of media. For example, social media usage was consistently shown to be associated with depressive and/or anxiety symptoms [36, 56, 67, 68–73, 82, 86], higher levels of body dissatisfaction [56, 130–132, 134–136] and poorer psychological well-being [87, 109, 111, 112] among adolescents, with evidence showing that these relationships are sometimes stronger in girls than boys. Regarding mechanisms in which social media may negatively affect mental health, evidence suggests this may occur through a process of unfavourable social

comparison, poor sleep and/or cyberbullying [22, 34–36, 69, 72]. Although not well studied, the preliminary research among adolescents, especially males, suggests that high use of internet video gaming is associated with more severe anxiety and depressive symptoms. These findings are consistent with a growing body of evidence to suggest that excessive internet-based gaming can produce marked interference in youth's emotional, familial, social and academic functioning and is being evaluated for inclusion as a behavioural addiction in the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) [140]. Similarly, this review found evidence for associations between excessive computer/internet use and mental health difficulties in adolescents. These findings are consistent with the introduction of new concepts known as “internet addiction disorder” or “internet use disorder”, which are additional types of behavioural addictions characterised by compulsive or pathological internet use that result in marked impairment in functioning. These terms are also being considered for inclusion in the DSM-V [140].

## Recommendations for Practice, Policy and Research

Given that childhood and adolescence are critical periods for physical and psychological development, and children and adolescents are spending excessive amounts of time in recreational screen use, the results of this review have significant implications. Based on evidence from this review, we recommend that parents and health practitioners who work with children and adolescents limit recreational screen use to that delineated in the Canadian 24-h movement behaviour guidelines [27]. The findings obtained here also support the new changes in school policy made by the Provincial Ministry of Education in Ontario, Canada, that banned the use of cell phones in schools. Given screen time is associated with an increased risk of obesity [19–21] and cardiometabolic disease [21, 22] in children and adolescence, and this review provides robust evidence for detrimental associations with several mental health outcomes, further legislation by other provinces around banning cell phones may follow and these policy changes should be empirically evaluated to see if they have beneficial effects on mental health. There is encouraging evidence that media literacy may be an effective method in which parents, teachers and practitioners can attenuate the harmful effects of digital media use, although more intervention studies are needed. Moreover, developing and maintaining a strong parent–child relationship appears to buffer the negative effects of screen time on several mental health indicators, thus should be targeted in treatment and prevention studies.

Many of the studies used cross-sectional designs, so future longitudinal studies with longer follow-ups and inclusion of potential mediators and moderators including the individuals'

cognitive and emotional statuses that happen during media exposure [40] are needed to gain a better understanding of how various forms of screen use impact children's and adolescents' risk of mental health problems over time, and whether effects and mechanisms differ between males and females. In addition, intervention studies designed to determine whether reducing either specific types or duration of screen time or promoting more adaptive use of screens are effective strategies that promote better mental health or prevent mental illness among children and adolescents are needed.

## Compliance with Ethical Standards

**Conflict of Interest** Fatima Mougharbel declares that she has no conflict of interest.

Gary Goldfield declares that he has no conflict of interest.

**Human and Animal Rights and Informed Consent** This article does not contain any studies with human or animal subjects performed by any of the authors.

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- Of importance
- Of major importance

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