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REVIEW ARTICLE

Social Media Use and Adverse Mental Health and Sleep Effects among Adolescents and Adults: A Systematic Review

Mainoo A^{1*}, Lokko FNT¹, Short JL³, Frankenfeld CL² and Cheskin LJ¹

¹Department of Nutrition and Food Studies, College of Public Health, George Mason University, Fairfax, VA, USA

²Center for Interdisciplinary & Population Health Research, Maine Health Institute for Research, Scarborough, ME, USA

³Department of Psychology, George Mason University, Fairfax, VA, USA

Abstract

Aim: To review the association between social media use and adverse mental health and sleep effects among adolescents and adults.

Background: Previous research indicates that US adolescents and adults spend on average 8 – 10 hours a day on their smartphones. There is considerable variability in social media use within and outside the US. Much and often most of this time is spent on social media platforms. While there are studies that suggest that social media use can have adverse mental health and sleep impacts, few have investigated the relationships in depth, and fewer still are longitudinal analyses.

Results: Systematic search generated 9,202 research studies, of which 73 were included in this literature review based on examination of the following assessed variables: anxiety, depression, loneliness, social media network use and sleep quality. Strong positive associations between social media use and adverse mental health and sleep effects among adolescents and adults were detected overall in these studies.

Conclusion: This literature review confirms and strengthens the evidence that social media use is associated with adverse mental health and sleep effects among both adolescents and adults. Future research using other study designs is needed to better understand and develop interventions to mitigate the adverse effects on mental health and sleep quality of social media use.

*Corresponding author(s)

Mainoo A, Department of Nutrition and Food Studies, College of Public Health, George Mason University, Fairfax, VA, USA

Email: amainoo2@gmu.edu

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Introduction

Smartphones and social media have become an integral part of society and the daily lives of people around the world. Social media is a way for individuals to build and maintain relationships, have access to news, and is also used for educational and professional purposes. Over 60% of people around the world are active on social media, and the percentage is growing [1]. Previous research has found that teens spend an average of 8 hours per day on social media [2], equivalent to a full-time job, and over 71% of U.S adult's ages 18 - 49 have a Facebook, Twitter and/or YouTube account. With so much time being spent on social media apps, it is important to

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examine the many studies of social media use and its various effects on the mental health and sleep of individuals.

Social media

Social media became widely popular in the early 2000s with networks like Friendster (2002), MySpace (2003), Facebook (2004) and YouTube (2005) offering people a means to connect, share and interact with one another through a digital platform. Millennials became the pioneers of social media with most of them aged 9–22 during its conception and early growth. At that time, social media was the new and hip way for young people to connect. Interestingly, Facebook and YouTube are still popular among Millennials today, current ages in their 30s and early 40s. As time went by, new social media networks emerged, such as Instagram (2010), Snapchat (2011) and Twitter (2006), and have become especially popular among traditionally aged college students. The newest popular social media network TikTok (2016) has also gained popularity among Gen-Z with its short form content [3]. The introduction of the modern-day smartphone in the late 2000s decade quickly replaced the lap-top and desk-top computer as the often-preferred method of accessing the Internet [4], and capable of easy access to social media through smart phone-based applications (apps). Worldwide, an estimated 6.4 billion individuals now own a smartphone equipped with an ever-expanding range of social functions readily available throughout the day: this poses a potentially life-altering distraction [5]. The Pew Research Center found that Snapchat and Instagram users ages 18 to 29 typically report using social media apps daily, and more than 50% report using them multiple times a day [6]. Previous research has shown that teens and young adults spend an average of 8–10 hours per day on smartphones [4], with a majority of those hours spent on social media. This magnitude of use has the potential to disrupt day-to-day life, decrease face-to-face interactions, and has spawned growing concerns on the negative impacts of social media on health-related behaviors.

Sleep quality and mental health

The National Sleep Foundation, and the American Academy of Sleep Medicine and Sleep Research Society guidelines recommend 8 to 10 hours of sleep for teens aged 13–17, and 7 to 9 hours of sleep for those aged 18 and older. In reality, studies suggest that adolescents 13–17 only get an average of 7–7.5 hours of sleep a night [7,8]. The Centers for Disease

Control and Prevention (CDC) 2022 Behavioral Risk Factors (BRFSS) survey found that over 36% of adults do not get enough sleep. According to the National Heart, Lung, and Blood Institute (NHLBI), getting inadequate sleep over time can raise the risk for chronic health problems by affecting the heart and circulatory system, metabolism, respiratory system, and immune system [9].

Numerous studies have investigated the relationship between sleep and mental health. They reveal that children and teens who are sleep deficient may have problems getting along with others, may feel angry and impulsive, have mood swings, increased anxiety, feel sad or depressed, lack motivation or feel stressed [10]. The same can be said for adults, with the additional effect that sleep deficiency makes individuals less productive at work and may hinder safe driving. The lack of sleep has also been shown to increase psychiatric symptoms and risk for suicide [11].

Relationship between social media use and individual health

Social media use is known to interfere with the daily lives of the general population. In recent years, studies have focused on the impact of daily use of social media on sleep and mental health. The purpose of this systematic review is to examine the peer-reviewed literature for studies about the association between social media use and negative mental health and sleep effects. The overall question is: Do high levels of social media use have adverse mental health and sleep effects on adolescents and adults?

Methods

Data sources

The PubMed database, Web of Science, Cochrane Library and Global Health Database were used to search for literature published during the 11 years between January 2014 through December 2024, using the search terms “social media and sleep quality”, “social network and sleep quality” and “social media and health”. The literature search was restricted to human studies written in English. The results are described in the literature flow diagram (Figure 1).

Study selection

The search yielded 9,202 research articles, which were filtered by date and sorted by relevance. Articles

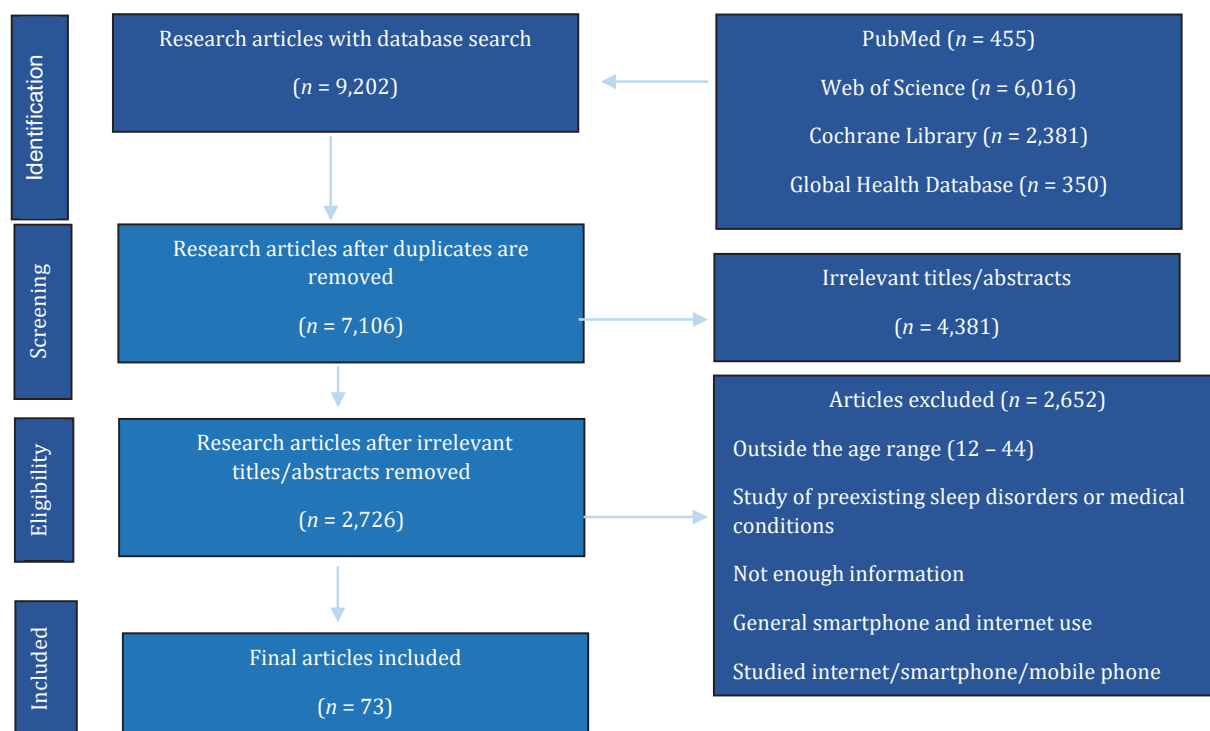


Figure 1 Flow chart of articles from data source.

were excluded if they had irrelevant titles/abstracts, studied populations outside the age range (12- 44), were duplications, were studies of subjects with preexisting sleep disorders or other relevant health conditions, and those lacking sufficient information to assess whether they met inclusion and exclusion criteria (Figure 1).

Studies initially identified needed to meet the following inclusion criteria: (1) The entire study population age range was within the age range of 12- 44 years old. (2) Social media use must have been the dependent variable.

Studies were excluded if: (1) the study examined/ analyzed participants with preexisting sleep disorders/mental health conditions, (2) the study generally focused on smartphone/internet use or Internet/smartphone/mobile phone addiction, (3) the study lacked information to evaluate. Reviews, letters, article commentaries, editorials, meeting reports and conference abstracts were also excluded. Seventy-three (73) publications were ultimately retained for this review.

Results

The studies were conducted in different geographical and environmental locations around the

world (North America (21), Asia (14), the Middle East (10), Africa (2), Oceania (3) and Europe (23)) (Table 1).

Studies had sample sizes ranging from 9 to 43,994 individuals. Most used a cross-sectional study design (57 cross sectional studies, 1 prospective cohort, 1 qualitative explorative design, 1 mixed-methods study, 1 experimental study design, 1 randomized, control study and 12 longitudinal studies).

Criteria for study quality

Study quality was assessed using the Appraisal tool for Cross-Sectional Studies (AXIS tool) for cross sectional/ mixed methods study designs, the Newcastle-Ottawa Scale (NOS) for longitudinal study designs, and the Jadad Quality Scoring Scale for experimental/randomized control studies. Higher scores indicated better study quality. For studies to be included in this systematic review they must have achieved an AXIS score of 14 or higher, a NOS score of 5 or higher, or a Jadad score of 3 or higher.

Study quality was assessed by the clarity of the research question and objective to examine social media use and health effects among adolescents and adults, with a defined population that had been selected or recruited from that population and potential confounding variables measured and

Table 1: The characteristics of individual studies included in this systematic review.

Study	Quality score	Site	Study design	Variables assessed	Sample
Azhari A, et al. [30]	18	United Kingdom	Cross sectional study	Anxiety, loneliness, sleep quality and social media networks	(n = 41) 16-19-year-old British female adolescents
Abu-Snieneh HM, et al. [40]	17	Saudi Arabia	Cross sectional study	Sleep quality and social media networks	412 students ranging from 19.0 to 38.0 years.
Alissa NA. [64]	17	Saudi Arabia	Cross sectional study	Energy drink consumption	860 Saudi Arabian adolescents aged 12-18
Aldhawyan AF, et al. [23]	18	Saudi Arabia	Cross sectional study	Sleep quality	842 students aged 17-24 years
Al-Garni AM, et al. [24]	16	Saudi Arabia	Cross sectional study	Depressive symptoms, sleep quality, social media networks	961 students in Aseer region, ages ranged from 15 to 20 years
Al Kazhali M, et al. [78]	19	UAE	Cross sectional study	Frequency and duration of social media used, sleep quality, sleep patterns	464 students participated in the survey.
Amelia T, et al. [83]	17	Indonesia	Cross sectional study	Number of SM accounts, duration of SM use	201 respondents aged 16-20
Apaolaza V, et al. [69]	18	Spain	Cross sectional study	Stress and Anxiety	346 undergraduate students aged between 17-26 years
Ateq K, et al. [57]	18	Saudi Arabia	Cross sectional study	Body Dysmorphic Disorder (BDD)	1,483 Saudi adults 18 and older.
Atusingwize E, et al. [60]	19	Uganda	Cross sectional study	Social media use and alcohol consumption	996 undergraduate students aged 22 years old (SD = 2.43)
Azagba S, et al. [70]	18	United States	Cross sectional study	Depression, anxiety, stress, frequency and duration of media used	Data from the 2022 National Youth Tobacco Survey (n = 23,445) 6 th -12 th grade
Bailey E, et al. [71]	18	Australia	Cross sectional study	Anxiety, stress, depression	Young people aged 16-25 (n = 371, M = 21.1)
Balpande LS, et al. [56]	18	India	Cross sectional study	Anxiety, stress, depression	Undergraduate students 18 to 24 years of age
Beeres DT, et al. [41]	5	Sweden	Longitudinal study	Symptoms of mental ill-health	3,501 adolescents in grade 8
Bergfeld NS, et al. [29]	19	United States	Cross sectional study	Sleep quality and social media networks	Students ages 12-18 from a high school on Long Island, New York (n = 410)
Cauberghe V, et al. [51]	17	Belgium	Cross sectional study	Anxiety and loneliness	Among 2,165 (Belgian) adolescents (13-19 years)
Chalermchutidej W, et al. [14]	5	Thailand	Prospective cohort study	Sleep quality and depression	219 participants female adolescents (aged 12 to 18 years)
Chaveepojnkamjorn W, et al. [15]	18	Central Thailand	Cross sectional study	Sleep quality	777 high school students grades 10-12
Escobar-Viera CG, et al. [46]	18	United States	Cross sectional study	Depression	US young adults aged 18-30 years
Eriksson OJ, et al. [42]	18	Sweden	Cross sectional study	Anxiety	333 participants, An average age of 29 years (median = 26, SD = 9.89)
Faelens L, et al. [53]	6	Belgium	Longitudinal study	Social media use and well-being	Sample size consisted of 98 participants aged 18-35.
Fiedler R, et al. [34]	20	Germany	Cross sectional study	Mood, stress, recovery, social media networks and sleep	53 competitive athletes aged 12-27 years, 14 females and 39 males
Fruehwirth JC, et al. [72]	5	United States	Longitudinal study	Anxiety and depressive symptoms	738 first-year college students aged 18 or older
Gaya AR, et al. [83]	16	Spain	Cross sectional study	Social media networks	1101 Spanish adolescents between 12 and 17 years old

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Study	Quality score	Site	Study design	Variables assessed	Sample
Gentzler AL, et al. [47]	6	United States	Longitudinal study	Depressive symptoms	237 adolescents ranging in age from 14 to 16 years
Hamilton JL, et al. [37]	5	United States	Longitudinal study	Physical activity and sleep quality	93 adolescent girls aged 12-17 years
Ilakkuvan V, et al. [45]	19	United States	Cross sectional study	Social media use, Alcohol, tobacco, other drug use, depression and anxiety	National sample of young adults aged 18-24 years (n = 1,062)
Jarrar Y, et al. [77]	17	Uganda	Cross sectional study	Anxiety and body dissatisfaction	432 university students since they fall between the ages of 18 and 25
Käckö E, et al. [52]	9	Finland	Qualitative explorative	Loneliness	Nine young adults aged 19-27 resident in Finland
Al Kazhali M, et al. [78]	19	United Arab Emirates	Cross sectional study	Sleep quality	464 student participants
Kingsbury M, et al. [62]	18	Norway	Cross sectional study	Non-suicidal self-injury and suicidal behavior	40,065 Norwegian college and university students, aged 18-25
Kinsella JE, et al. [25]	18	United States	Cross sectional study	Sleep quality	830 emerging adults (ages 18-30) who were recruited for an online survey study
Koban K, et al. [79]	6	Austria	Longitudinal study	Sleep quality	n = 978 participants aged 16-21 years
Lahti H, et al. [48]	20	Finland, Germany, Belgium, Estonia, Czech Republic, and Poland	Collaborative cross sectional study	Depressive feelings and sleep difficulties	22,226 adolescents from six European countries adolescents 13-year-old and 15-year-old
Lee J, et al. [59]	19	United States	Cross sectional study	E-cigarette use	7,872 adolescents aged 13 to 17 years
Lee Y, et al. [81]	19	United States	Cross sectional study	Sleep quality and mental health	180 adolescents 12-15 years old in rural Michigan
Lei H, et al. [73]	17	China	Cross sectional study	Anxiety, depression and fatigue	1,539 Chinese college students ages from 16 to 24
Levenson JC, et al. [32]	5	United States	Longitudinal study	Sleep disturbance, social media use before bed	1,763 young adults aged 19-32 years old
Li X, et al. [26]	6	China	Longitudinal study	Sleep Quality and social media networks	198 university students average age was 21.80 ± 1.20 years.
Liu T, et al. [43]	17	China	Cross sectional study	Anxiety and social comparison	360 young women aged 18-35 years old
Miedzobrodzka E, et al. [39]	19	China	Cross sectional study	Well-being, bedtime procrastination, sleep quality and tiktok	254 students aged 12-17 years old, 223 students aged 18-31 years old
Mohammadbeigi A, et al. [38]	15	Iran	Cross sectional study	Sleep quality and social networks	380 undergraduate students 19-24 years old
Morningstar B, et al. [65]	19	Canada	Cross sectional study	Physical activity	12,358 participants in grades 6 to 10
Nelson R, et al. [84]	16	Australia	Cross sectional study	Mental health	Survey data from 1,304 LGBTIQ + young people aged 16-35
O’Kane SM, et al. [80]	18	Ireland and United Kingdom	Mixed-methods study	Physical Activity, sleep quality, mental health, and social media use	320 female pupils aged 12-14 years
Olivares-Guido CM, et al. [16]	19	Mexico	Cross sectional study	Sleep quality	190 high school students

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Study	Quality score	Site	Study design	Variables assessed	Sample
Petalas DP, et al. [54]	5	Netherlands	Longitudinal study	Well-being, anxiety, stress	Dutch adolescents ($n = 1,974$) and young adults ($n = 1,695$) aged 12-25 years old
Puukko K, et al. [50]	7	Finland	Longitudinal study	Depression	2891 Finnish adolescents age range 13-19 years
Sagrera CE, et al. [75]	18	United States	Cross sectional study	Social Media use and body image	5,070 respondents aged 14-19 years old
Saman JA, et al. [19]	17	Iran	Cross sectional study	Sleep Quality and social media networks	321 university students, mean age of the participants was 21.03 ± 1.81 years
Sanzari CM, et al. [58]	18	United States	Cross sectional study	Body image and disordered eating behaviors	626 undergraduate students at a large University in the northeastern United States
Scott H, et al. [28]	19	United Kingdom	Cross sectional study	Sleep Quality and social networks	11,872 adolescents aged 13-15 years
Sennock S, et al. [36]	6	Germany	Experimental study design	Sleep quality and memory	20 students between 12 and 14 years engaged in these activities for 45 min before bedtime
Serenko A, et al. [31]	20	United Kingdom	Cross sectional study	Sleep duration and eating behavior	Sample of $n = 11,406$ ranging from 13 to 15 years old
Settanni M, et al. [85]	19	Italy	Cross sectional study	ADHD symptoms	310 students attending grades 6-11
Sfeir M, et al. [74]	18	Lebanon	Cross sectional study	Anxiety, depression, bulimia nervosa	363 university students aged 18 - 37 years
Shannon H, et al. [44]	6	Canada	Longitudinal study	Anxiety, stress and depressive symptoms	Students above the age of 18, 78 participants completed a follow-up visit,
Shimoga SV, et al. [66]	19	United States	Cross sectional study	Physical activity and sleep quality	American 8th-, 10th-, and 12th-grade students ($n = 43,994$)
Şimşek Y, et al. [20]	16	Sweden	Cross sectional study	Age and sleep quality	150 adolescents aged 12-20 years
Sun S, et al. [63]	20	China	Cross sectional study	Emotional eating behaviors	815 middle school students average age of the participants was 13.01 years (SD = 0.49)
Turel O, et al. [55]	5	United States	Randomized control study	Stress	University students $n = 555, 238$ women, $M_{age} = 24.01$
Ranganath P, et al. [61]	19	Norway	Cross sectional study	Alcohol consumption	Upper secondary school students ($n = 3528$, ages 16-21) in Bergen
Rosenbaum DL, et al. [76]	17	United States	Cross sectional study	Social media use and body image	Sample size of 154 women in early motherhood, as defined by giving birth within the past 5 years
Wang TJ, et al. [21]	18	Taiwan	Cross sectional study	Facebook and sleep quality	Sample size of 277, 18-35 age group
Wang C, et al. [22]	5	United States	Longitudinal study	Sleep quality	619 undergraduates at the University of Notre Dame in their first two years of college.
Wartberg L, et al. [86]	16	Germany	Cross sectional study	Problematic alcohol use, problematic social media use, mental health	633 adolescents aged 12-17
Watkins RA, et al. [35]	17	United States	Cross sectional study	Sleep quality and performance	87 student-athletes
Wong HY, et al. [17]	20	Hong Kong	Cross sectional study	Anxiety, stress, internet gaming and sleep quality	Sample size 300, aged 18-24 years

Table 1: The characteristics of individual studies included in this systematic review.

Study	Quality score	Site	Study design	Variables assessed	Sample
Vernon L, et al. [33]	18	Australia	Cross sectional study	Sleep disruptions and sleep quality	1,886 students in Australia aged between 12 and 18 years
Yang H, et al. [27]	19	China	Cross sectional study	Loneliness and sleep quality	1436 adolescent aged 15-18 years old
You Y, et al. [87]	19	Netherlands	Cross sectional study	Health-related quality of life	3397 children (mean age 13.5, SD 0.4 years)
Zhao N, et al. [49]	18	China	Cross sectional study	Secondary traumatic stress, depression, and anxiety	512 Chinese college students 18-30 years
Zhuang J, et al. [18]	19	China	Cross sectional study	Fatigue and sleep quality	2,661 college students (mean age = 19.97 years)

accounted for. Examination of potential confounding factors, including race/ethnicity, caffeine intake, gender, stress and socioeconomic status were additional criteria. The exposure of interest was social media use, and the population of interest was those in the age range of 12 – 44 years. The outcomes of interest were mental health and sleep effects.

Most of the sleep studies included used the Pittsburgh Sleep Quality Index (PSQI) to evaluate overall sleep quality. Each of the questionnaire’s 19 self-reported items belongs to one of seven subcategories: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction [12,13]. Higher scores indicate poorer sleep quality and a global score of >5 indicates poor sleep quality.

Sleep quality and social media use

Thirty out of the 34 studies that evaluated some component of sleep quality found that social media use was significantly associated with decreased sleep quality [14-40,48,66,78-81]. Most studies used the PSQI questionnaire to assess sleep quality [14-30]. Evaluating PSQI score subcategories, Olivares-Guido CM, et al. [16] and Serenko A, et al. [31] observed that increased mean hours of daily social media use was linked to longer sleep latency and shorter sleep duration [16,31]. Zhuang J, et al. [32] also measured fatigue using the Fatigue Assessment Scale (FAS) and found high social media use was positively correlated with fatigue. An 18-month longitudinal study of 1,763 US adults aged 19 to 32 found that social media use 30 minutes before bedtime was strongly associated with disturbed sleep among these young adults. Young adults in the high sleep disturbance category were also more likely to check social media often 30 minutes before bedtime. Şimşek Y, et al. [20] found

that the presence of electronic devices in the bedroom and use of social media before sleep were associated with a higher likelihood of poor sleep quality by PSQI. Aldhawyan AF, et al. [23] observed lower PSQI scores among participants who used social media for educational purposes as compared to those who used social media for other purposes. Bergfeld NS, et al. [29] found the content of social media posts and a high number of social media followers was correlated with higher PSQI scores.

Scott H, et al. [28] and Vernon L, et al. [33] found that high social media use was significantly associated with frequent nighttime awakenings and sleep disturbances, respectively. Fiedler R, et al. [34] and Watkins RA, et al. [35] found the lowest sleep quality among young athletes with high social media usage compared to athletes with shorter social media usage.

A few studies did not find social media use and sleep quality to be statistically significantly related. Using an experimental study design, Sennock S, et al. [36] aimed to investigate the influence of pre-sleep social media use on objectively assessed sleep quality in adolescents. After having participants engage with social media for 45 min before bedtime, they found no change in sleep efficiency, sleep onset latency and awakening after sleep onset. Hamilton JL, et al. [37] examined daily and average effects of physical activity and social media use on sleep among adolescent females. They found no effects of mean social networking use on sleep duration and no effect of any type of social media use on sleep quality.

Social networks/apps and sleep quality

Two of the included studies used the PSQI questionnaire to assess sleep quality cross-sectionally. Mohammadbeigi A, et al. [38] examined 380 undergraduate students’ use of specific social



media applications (Viber, WhatsApp, Instagram, Line and Tango) and sleep quality. They found that the use of Viber, WhatsApp, Line and Tango were significantly correlated with higher PSQI scores (i.e., poorer sleep quality), though Instagram use was not. Azhari A, et al. [30] studied specific social media app use/posting (Snapchat, Facebook, Instagram and Twitter) and sleep quality among British female adolescents. Of these apps, only frequency of Facebook posts was significantly associated with poor sleep quality. Wang TJ, et al. [21] also studied Facebook use and sleep quality and found that participants browsing on Facebook for up to an hour at a time reported poorer sleep quality. Miedzobrodzka E, et al. [39] examined TikTok use among 477 Chinese students aged 12 - 31 years. Subjects were divided into two groups: general TikTok users, and those defined as exhibiting TikTok self-control failure. They found that both groups exhibited a significant increase in sleep procrastination. Al-Garni AM, et al. [24] also studied TikTok use in relation to sleep quality and found that TikTok users were at risk of poorer sleep than participants who did not. Additionally, poor sleepers showed significantly higher mean number of social network accounts used compared to good sleepers [24]. In a longitudinal study by Li X, et al. [26], the use of social network sites significantly predicted sleep problems. Bergfeld NS, et al. [29] studied high school students from Long Island, New York and found Snapchat to be the only platform to predict poorer sleep (via increased sleep latency).

Fiedler R, et al. [34] studied 53 competitive athletes and examined the relationship between use of social media networks (WhatsApp, TikTok, Instagram, and Snapchat) and mood, stress, recovery, and sleep. TikTok and WhatsApp were found to negatively impact sleep quality, while participants that used Instagram had higher calmness and valence on average, and no impact on sleep quality. Watkins RA, et al. [35] and Abu-Snieneh HM, et al. [40] did not find any statistically significant relationship between the social networks used by participants and sleep quality.

Anxiety and social media use

Sixteen studies assessed the association between anxiety and social media use. Of these, 13 were cross-sectional studies and 3 were longitudinal [17,30,41-45,49,54,56,69-74]. Of these 16, 14 studies found significant associations between social media use and anxiety [14,17,30,41-43,49,54,56,69-74]. Based on a Social Media Questionnaire, Azhari A, et al.

[30] determined that 27% of participants could be classified as users with Social Media Disorder (SMD). Those users with SMD reported greater anxiety than those without SMD. There was also a correlation between Facebook posting and anxiety. Wong HY, et al. [17] and Beeres DT, et al. [41] found social media use was correlated with depression, anxiety and stress. Erliksson OJ, et al. [42] and Liu T, et al. [43] observed that symptoms of social anxiety were significantly correlated with passive and total social media use.

Shannon H, et al. [44] conducted a longitudinal survey-based study among Canadian college students and found that increased problematic social media use was not significantly associated with changes in anxiety. Another North American cross-sectional study by Ilakkuvan V, et al. [45] examined college aged young adults and found no significant differences between high social media users and other social media use groups for anxiety symptoms.

Depression and social media use

Fourteen studies examined the correlation between social media use and depression. Ten were cross-sectional studies, 4 were longitudinal studies and half were conducted in North America [24,44-50,56,70-74]. Most studies observed positive correlations between increased social media use and increased depression or depressive symptoms. Escobar-Viera CG, et al. [46] studied young adults in the US who identify as lesbian, gay or bisexual and found higher rates of depression. They found this association was partially explained by negative social media experiences. Gentzler AL, et al. [47] researched the use of different social networks and found that frequent use of Instagram, TikTok, and YouTube were associated with more depressive symptoms. Lahti H, et al. [48] found that higher family support was associated with a lower likelihood of problematic social media use among adolescents. Studying the effect of COVID-19 on social media use, Zhao N, et al. [49] found that social media use and the stress of the COVID-19 pandemic was significantly associated with depression.

Puukko K, et al. [50] conducted a longitudinal study of 2,891 Finnish adolescents aged 13-19 years old who responded to questionnaires between 2014- 2018. Although social media use and depressive symptoms increased over time, there was no association between individual levels of social media use and depressive symptoms. Ilakkuvan V, et al. [45] found



that study participants categorized as creative social media users had lower odds of depressive symptoms in comparison to other social media use groups.

Loneliness and social media use

Very few studies examined the association between loneliness and social media use, and those that did had mixed findings. Cauberghe V, et al. [51] found lonely people were using social media more often to keep in touch with others. However, the indirect effect of loneliness on happiness through social media coping was not significant. Käcko E, et al. [52] found that study participants can have negative experiences of involuntary loneliness and positive experiences of voluntary loneliness during social media use. Yang H, et al. [27] observed problematic social network usage, and that rumination mediated the link between loneliness and sleep quality.

Stress/well-being and social media use

Eight studies examined the association between stress/well-being and social media use [17,44,53-56,69,71]. Four of these were cross sectional studies, 3 were longitudinal and 1 was a randomized, controlled study. All but one found higher levels of social media use were associated with psychological distress. Faelens L, et al. [53] conducted a longitudinal study among 98 participants aged 18-35 and observed both Facebook and Instagram use predicted reduced wellbeing. Petalas DP, et al. [54] found the number of social networks and shared online and offline friends seemed to positively correlate with small increases in mental health, while screen time and the number of followers and followees were associated with decreases in mental health. Turel O, et al. [55] performed a randomized, controlled study on 413 university students at California State University (Fullerton) and divided students into two groups: treatment (abstain/control) and social media use (typical/excessive). The treatment group was asked to abstain from using Facebook for a one-week period and the other group were told to use social media as usual. Results showed short-term abstinence from social media led to a reduction in stress. Balpande LS, et al. [56] found no statistically significant association between stress and frequency of social media use.

Body image issues and social media use

Five studies examined the association between body image issues and social media use [57,58,75-77]. All were cross-sectional studies, and all found

social media use to be linked to more adverse body image issues. Female participants were observed to have a stronger positive association between social media use and body image issues than males. Body Dysmorphic Disorder (BDD) is a chronic psychiatric disorder characterized by excessive preoccupation with minimal physical deformities. Ateq K, et al. [57] studied the relationship between social media use and BDD among Saudi adults. They observed participants with BDD who spent 4-7 hours or more a day on Instagram and Snapchat had significantly higher Dysmorphic Concern score than those who spent < 1 hour a day. Sanzari CM, et al. [58] surveyed 626 undergraduate students in the United States and found that higher exposure to weight loss social media content and number of social network accounts were associated with increased frequency of binge eating and laxative use.

Risky health behaviors and social media use

Four studies found evidence that social media use can expose and influence individuals to risky health behaviors and attitudes. Lee J, et al. [59] analyzed data from the Florida Youth Tobacco Survey and found daily use of Snapchat and Instagram to be associated with vaping and vaping experimentation. A cross-sectional study of undergraduate students in Uganda, Atusingwize E, et al. [60] observed that higher frequency of general social media use was associated with regular drinking. Ilakkuvan V, et al. [45] found study participants that categorized as creative social media users, mainstream social media users and professional social media users who showed a high use of LinkedIn had twice the odds of using alcohol compared to low social media users. Ranganath P, et al. [61] found a higher number of bad experiences on social media were positively associated with alcohol consumption and frequent binge drinking.

Suicidal behaviors and social media use

Kingsbury M, et al. [62] studied the association between types of social media use and Non-Suicidal Self-Injury (NSSI) and suicidal behaviors. They found active social use in the public sphere (posting updates/pictures/articles) was associated with increased odds of NSSI ideation, NSSI, and suicide attempts. Weaker associations were discovered between passive social media use and NSSI outcomes.

Food consumption and social media use

Three cross-sectional studies examined the



association between consumption of various foods and social media use, and all found positive correlations. Sun S, et al. [63] found that increased social networking use and emotional eating were significantly correlated. Serenko A, et al. [31] observed that social media use had a negative association with healthy eating behaviors, especially for female study participants. In addition, Alissa NA, et al. [64] found a positive association between social media use and consumption of energy drinks.

Physical activity/health and social media use

There is mixed evidence for the hypothesis that increased social media use will decrease individual physical activity leading to negative health outcomes. Morningstar B, et al. [65] observed that both those teens categorized in the non-active social media use and those in the problematic social media use groups had lower odds of meeting physical activity recommendations when compared to moderately active social media users. Shimoga SV, et al. [66] found that in physically active students, frequent social media use was associated with a higher likelihood of vigorous daily exercise.

Discussion

This systematic review synthesized prior research studies exploring the association between social media use and adverse mental health and sleep effects among adolescents and adults. As described, most studies reviewed found statistically significant evidence for an association between social media use, poor sleep quality, reduced mental health and/or certain risky health behaviors. However, there was variability between studies regarding these relationships.

Sleep quality

Many of the included studies examined the relationship between social media use and sleep quality, and a strong majority of them came to the same conclusion: that increased social media use decreases sleep quality. Sleep latency and sleep duration were the most affected sleep quality variables. However, as studies had different measurement methods for both social media use and sleep quality, comparability between studies is impaired. For example, many studies used the PSQI questionnaire to assess sleep quality among participants. However, a few studies used different versions of this questionnaire. A study using a shortened version of PSQI questionnaire does

not assess all or the same variables as a study using the full version. The original PSQI questionnaire was written in English, and some studies in this review used Chinese and Thai versions of the PSQI questionnaire, raising uncertainty of whether the translated questionnaire accurately conveyed item meaning between languages. Furthermore, for studies that did not use the PSQI questionnaires, it is difficult to compare the assessed sleep quality to studies that did.

Many studies showed that use of various specific social media networks had a negative association with sleep quality. However, many social media networks were measured, and their findings were inconsistent. Not every study measured the same aspects of social media networks, such as followers, posting, content and messaging. We hesitate to state that any particular social media network was associated with decreased sleep quality. The popularity of a particular social media network may differ in each country as well, further complicating the analysis.

Social media use and mental health

Although most of the studies evaluating mental health found a positive association with social media use, there were mixed results for the different aspects of mental health. Stronger associations were found when evaluating social media use and stress/well-being, depression and body image issues. Cross-sectional, longitudinal and randomized controlled trial study designs all found a negative association between social media use and stress/well-being, depression and body image issues. Like Turel O, et al. [55] findings, one randomized control study (Lambert J, et al. [67]) had participants take a one week break from social media and found significant improvements in well-being, depression, and anxiety. As for loneliness and social media use, more studies of both intervention and non-intervention design need to be conducted to further understand these relationships.

Risky health behaviors

Strong associations between social media use and increased alcohol consumption and unhealthy eating habits were generally found. As all of the studies evaluating alcohol consumption and unhealthy eating habits were cross-sectional, more longitudinal and intervention studies are needed to confirm this association. One study in this review evaluated suicidal behaviors and one study evaluated



cigarette/ e-cigarette use. Even though negative associations between social media use and suicidal behaviors and cigarettes/ e-cigarettes usage were found, more studies of both interventional and non-interventional design are needed to further elucidate this relationship.

Interestingly, social media use was found to have a positive association with physical activity. Both studies evaluating social media use and physical activity were cross-sectional study designs. A randomized control trial study Pope ZC, et al. [68] had similar findings when evaluating whether smartwatch and theoretically-based or social media-delivered health education would improve college students' physical activity and dietary behaviors. Both interventions were successful in improving health behaviors/outcomes among college students.

Limitations

The limitations of this systematic review include the following: first, potential publication bias among the included studies, which might result in a greater likelihood of publishing studies that found adverse effects of social media use. Second, 56 out of the 73 studies in this review were cross-sectional. Measuring data at a single point in time makes it problematic to confidently conclude that there was a causal relationship between social media use and adverse health effects. However, other study designs included in the systematic review came to the same conclusion, strengthening the claims in the cross-sectional studies. Third, different methods and questionnaires were used to measure social media use, limiting comparability between studies. Fourth, 49 out of the 73 studies had participant Populations College aged and younger. Thus, there were fewer studies of middle-aged adults. Lastly, many of the studies used surveys or questionnaires to collect data, which can lead to survey bias. Nonetheless, the results are worthy of consideration and indicate the areas needing further study.

Conclusion

This systematic review confirms that certain aspects of social media use are associated with adverse mental health and sleep effects among both adolescents and adults. Future research using other study designs is needed to better understand and develop interventions to mitigate the adverse mental health and sleep quality effects of social media use.

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