

Review article

A meta-analysis of the association between adolescent social media use and depressive symptoms



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ARTICLE INFO

Keywords:
Meta-analysis
Adolescence
Depression
Social media

ABSTRACT

Background: The association of adolescent social media use with mental health symptoms, especially depression, has recently attracted a great deal of interest in public media as well as the scientific community. Some studies have cited statistically significant associations between adolescent social media use and depression and have proposed that parents must regulate their adolescents' social media use in order to protect their mental health. **Method:** In order to rigorously assess the size of the effect that has been reported in the current scientific literature, we conducted a meta-analysis of studies that measured the association between social media use specifically and depressive symptoms amongst early- to mid- adolescents (11–18 years-old). We searched Psychnet, PubMed, and Web of Science with the following terms: online social networks, social media, internet usage, facebook, twitter, instagram, myspace, snapchat, and depression.

Results: We found a small but significant positive correlation ($k = 12$ studies, $r = .11$, $p < .01$) between adolescent social media use and depressive symptoms. There was also high heterogeneity ($I^2 = 95.22\%$) indicating substantial variation among studies.

Conclusions: High heterogeneity along with the small overall effect size observed in the relationship between self-reported social media use and depressive symptoms suggests that other factors are likely to act as significant moderators of the relationship. We suggest that future research should be focused on understanding which types of use may be harmful (or helpful) to mental health, rather than focusing on overall use measures that likely reflect highly heterogeneous exposures.

Introduction

Today's youth are growing up with ready access to online social media via computers, smartphones, and tablets. This novel way of interacting with others has rapidly become widespread, and considerable attention has been given to the potential negative effects that adolescents' use these devices may have on youth mental health, particularly depression (Baker and Algorta, 2016). Recently, it has been argued that it may be social media use specifically, rather than digital device use or screen time more generally, that is most strongly associated with risk for depression (Haidt and Allen, 2020). This is especially relevant for adolescents, as the first incidence of a major depressive episode is most likely to occur during adolescence and young adulthood (Avenevoli et al., 2015), and some data suggest that the incidence of depression has been rising in recent cohorts of adolescent following the widespread adoption of social media (Haidt and Allen, 2020). As such, identifying potential risk factors during this period of life is an especially important endeavor. According to a Pew Research poll conducted

in 2015, 76% of adolescents use social media, and that percentage has likely increased since this poll was taken (Lenhart et al., 2015). Paralleling these increases in engagement with social media, the prevalence of adolescent major depressive episodes (MDEs) has increased from 8.7% in 2005 to 11.3% in 2014 (Mojtabai et al., 2016). This increase in the incidence of depression in adolescence has become a major public health concern, and some have asserted a correlation between the rise in social media use and the rise in depression (e.g., (Pantic et al., 2012, Twenge et al., 2018)).

On the other hand, some research has found potential benefits of social media use in adolescence, such as better self-esteem and perceived social support (Valkenburg et al., 2006). Systematic reviews and meta-analyses have attempted to tease these seemingly contradictory ideas apart. One systematic review focused specifically on adolescents and the associations between social media use and well-being, and determined that there appear to be both positive and negative associations, (date range of studies reviewed: January 2003–April 2013) (Best et al., 2014). Some of the studies reviewed showed benefits to

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Received 18 November 2019; Received in revised form 11 June 2020; Accepted 17 June 2020

Available online 24 June 2020

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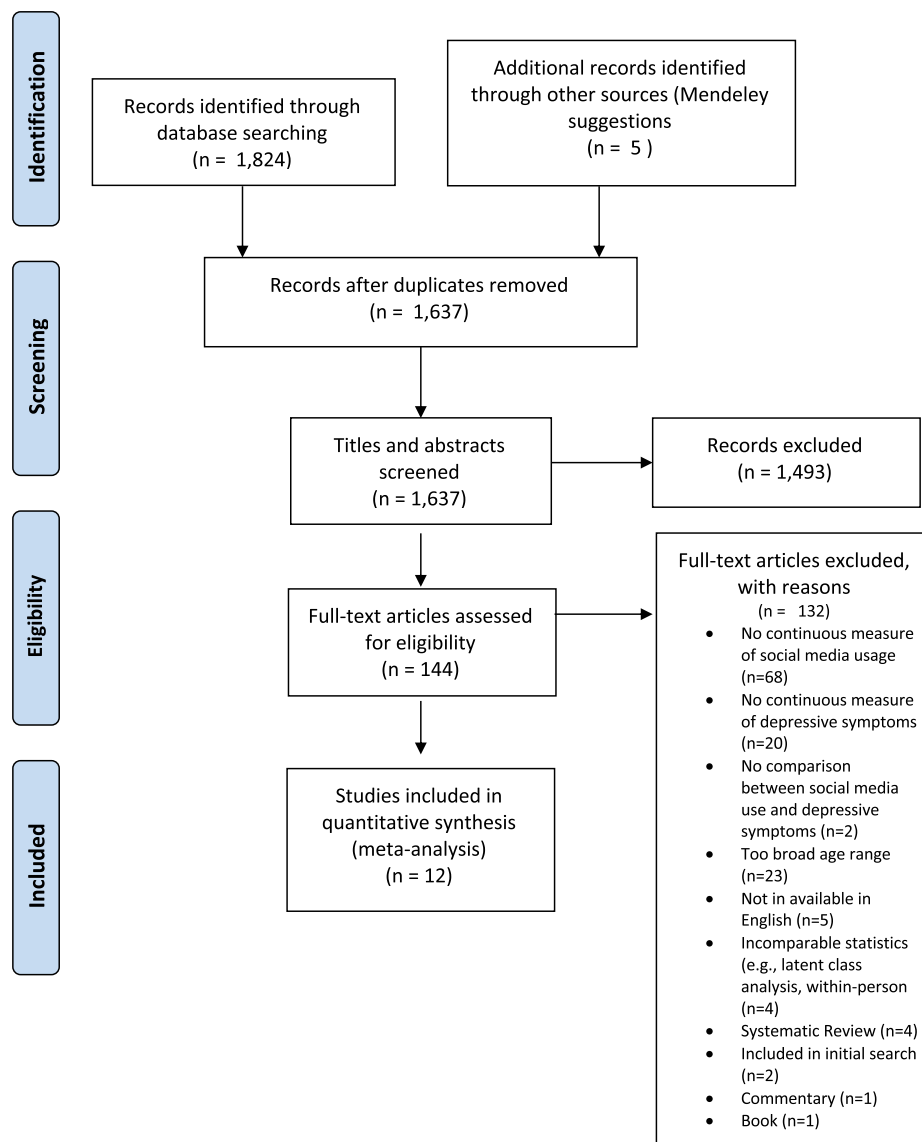


Fig. 1. PRISMA flowchart of literature search.

well-being, such as increased self-esteem and social support (Best et al., 2014). However, others illustrated negative associations with social media use, such as social isolation and depression (Best et al., 2014). A recent nationally representative longitudinal cohort study of adolescents ($n=6595$) found that adolescents who self-reported the use of social media platforms more than three hours per day were more likely to self-report internalizing symptoms at a subsequent follow up assessment approximately one year later (Riehm et al., 2019). A meta-analysis has also investigated the relationship between social networking site usage and depression in adults and found a small, yet significant positive effect (date range of studies reviewed: any time-February 2018) (Yoon et al., 2019). However, another recent study combined three large datasets ($n=355,358$) and found there to be little evidence of the link between social media use and well-being (Orben and Przybylski, 2019a). A second systematic review investigating the relationship between online social networking and depression amongst adults and adolescents determined that, overall, there appear to be both benefits and drawbacks to social media usage (date range of studies reviewed: any time-April 2016) (Baker and Algorta, 2016). A study used a two-time point longitudinal design assessed the relationship between different types of online communication and changes in life satisfaction, face-to-face interactions, and

loneliness (Dienlin et al., 2017). They found that increases in online communication was related to *increases* in face-to-face interaction and a small increase in life satisfaction, however, no association was found between online communication and changes in loneliness.

The current study takes the investigation of these issues a step further by both reviewing the literature on adolescent social media use and depressive symptoms *specifically*, and by analyzing the reported statistical effects of the relationship using the tool of meta-analysis. We chose to focus on depressive symptoms because although many studies have investigated the relationship between social media use and *well-being* during adolescence (e.g., (Best et al., 2014)), relatively few have addressed depressive symptomatology specifically. While well-being and depression are inversely correlated, they are not identical, and depression measures tap into phenomena that are directly relevant to risk for mental health disorders; including (but not limited to) Major Depressive Disorder, which often emerges during adolescence. Although there have been previous narrative reviews (e.g., (Baker and Algorta, 2016)) and one meta-analysis with an adult sample (Yoon et al., 2019), this is the first study to use meta-analytic techniques to examine this association amongst adolescents specifically. Based on previous findings (Baker and Algorta, 2016, Best et al., 2014), we hypothesized a small positive overall effect for the relationship

between social media use and depressive symptoms, but a high degree of heterogeneity of effects across studies.

2. Methods

Inclusion and exclusion criteria

We included correlational studies that used both continuous measures of depressive symptoms and time spent using social media. Participants in the studies were adolescents between the ages of 11–18 years. Studies must have been available in English. There were no constraints on time period or geographical region on study eligibility.

Search strategy

We searched the following databases on July 21st, 2017: Psychnet: online social networks or social media or internet usage; AND depression (index terms search), PubMed: "online social networks" OR "social media" Or twitter or myspace or instagram or snapchat or facebook and depression (all fields), and Web of Science: "online social networks" or "social media" or "internet usage" or Facebook or Twitter or Instagram or Myspace or Snapchat (all fields). The reference sections of eligible studies were also searched, however, no additional studies were included via this method. Studies suggested by Mendeley software that met the inclusion criteria and were published after the search date were also reviewed. We completed an updated search on January 17th, 2020 with a restricted date range from January 1st, 2017 to present. We reviewed an additional 1,123 studies. One additional study met the inclusion/exclusion criteria (Thorisdottir et al., 2019). We filtered the results to limit studies conducted with adolescents aged 11–18 years old. See Figure 1 for flowchart showing the phases of the literature search and decisions for inclusion and exclusion.

Coding procedures

Studies were examined for eligibility by two independent reviewers. The reviewers resolved disagreement through discussion after independent coding of study characteristics ($n=22$ out of 1224). A Cohen's kappa was conducted to assess intercoder reliability ($k=.685$, $p<.001$). The quality of studies was assessed with questions from the NHLBI: Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies that apply to correlational study design (see Table 1 for list of quality assessment questions; (National Institutes of Health, 2014)). Quality in relation to each of nine questions was rated as good (2), fair (1), or poor (0) by each independent reviewer. Quality rating ranged from 0–18, with higher scores indicating better quality. A standardized data coding system was developed to extract qualitative and statistical information from each study: *Study characteristics*: 1) authors and citation; 2) sample size and description of the sample (e.g., mean age, ethnicity), 3) main aim of the study, 4) study design (e.g., cross-sectional, longitudinal) 5) measure(s) of social media use 6)

Table 1

Quality assessment.

Was the research question/objective/hypothesis/aim in this paper clearly stated?
Was the study population clearly specified and defined?
Were the participants representative of the population of interest?
Were the characteristics (demographics) of participants provided?
Were all the subjects selected or recruited from the same or similar populations (including the same time period)?
Were the measures clearly defined, valid, reliable, and implemented consistently across all study participants?
Are the main findings of the study clearly described?
Were the statistical tests appropriate?
Were key confounding variables measured or addressed on the impact they could have on outcomes?

measure(s) of depression 7) type of statistical tests (e.g., correlation) 8) reported statistical value (correlation). Studies were excluded for the following reasons: 1) no measure of time spent on social media 2) no continuous measure of depressive symptoms 3) not available in English 4) participants older than 18 years-old. Studies that included participants who were younger than 11 or older than 18 were excluded. Studies that did not include a continuous measure of time spent on social media or depressive symptoms were excluded in order to increase the compatibility of methodology and statistical comparison in the meta-analysis. We chose to limit our study to continuous measurement because information about the variance or range in experience is lost when grouping participants' responses (e.g., depressed/non-depressed, problematic social media use/non-problematic social media use) (Young, 2016).

Statistical methods

Correlations (r) between social media usage and depressive symptoms were extracted from each study. Correlations (r) were converted with the Fisher's Z transformation for analysis. An inverse variance, restricted maximum likelihood random effects meta-analysis, with the Knapp-Hartung Adjustment to account for small k , was conducted in order to account for both within- and between-studies variation (Knapp and Hartung, 2003). The Knapp-Hartung Adjustment employs t values rather than Z values and is therefore a more conservative estimate of the overall effect. Heterogeneity was assessed with Cochran's Q and I^2 . Publication bias was assessed with visual inspection of funnel plot. In addition, a p -curve analysis was conducted to assess for potential publication bias based on the distribution of statistically significant p -values. Analyses were performed in R (version 3.3.0) using the metafor package (Viechtbauer, 2010).

Results

Eleven studies, ranging between 2012–2020, with a total of 92,371 participants were included in the meta-analysis (see Table 2 for study characteristics). The random effects meta-analysis with Knapp-Hartung Adjustment ($k=12$) produced a significant small positive effect of the relationship between depressive symptoms and social media usage ($r=.12$, $SE=.04$, $t=3.44$, 95% CI = .04–.20, $p<.01$; Table 2; see Figure 2 for forest plot). There was high heterogeneity ($Q(df=11) = 362.38$, $p<.001$; $I^2=97.38\%$). The statistically significant finding for Q ($Q(df=11) = 362.38$, $p<.001$) indicates considerable variation in the true effect estimates among studies (Table 3). $I^2=97.38\%$ is considered very high and indicates that there are inconsistencies between findings. We separately tested mean age and sample size as moderators in the analysis. Both mean age and sample size accounted for 0% of the variance between studies.

Visual inspection of the funnel plot (Figure 3) illustrated random dispersion of effect sizes among studies, suggesting the absence of small study bias (and, arguably, little publication bias). We also conducted a p -curve analysis to assess publication bias and evidence for a true effect (citation). Figure 4 illustrates a right-skewed distribution, which increased our confidence that the estimate of the overall effect between depressive symptoms and social media usage is indicative of a true effect, albeit a small one.

Discussion

Given that there were relatively few studies that have specifically reported findings on the relationship between social media use and depressive symptoms in adolescence, these findings should be interpreted cautiously. However, based on the current evidence, there appears to be a small but positive association between social media use and depressive symptoms. However, there was high heterogeneity, which suggests that there are substantial differences between studies.

Table 2
Summary of studies included in meta-analysis on the relationship between social media use and depressive symptoms.

Study ID	Authors	Publication year	Study sample size	Correlation (r)	Fisher's Z	Study design	Social media use measure	Depressive symptoms measure	Mean age (SD); Range	Gender ratio (% female)	Demographics	Methodological quality (0-18)
1	Banjanin et al.	2015	336	0.05	0.05	Cross-sectional	Single item frequency: "Participants were also asked questions about their average time spent on social networking." M = 3.11 hours, SD = 2.82 hours	CES-DC	18 (NR); NR	67	Serbian high school students	15
2	Barry et al.	2017	226	0.24	0.2448	Cross-sectional	Single item frequency: times social media was checked per day ("Facebook," "Twitter," "Snapchat," "Tumblr," "Instagram," "Other"); 8-item scale: <i>never to more than 10 times per day</i>	82 item DSM-5 checklist	15.27 (1.02); 15-17	45.1	81.4% White/Caucasian, 6.2% Black/African-American, 2.7% Asian, 2.7% Hispanic, 0.9% Native American/American Indian, 5.3% Multi-racial, and 0.9% "Other"; Median household income = \$60,000	17
3	Blomfield et al.	2014	1,819	-0.09	-0.09	Cross-sectional	Composite of 7 items that asked about frequency of checking and purpose of use (0 = never; 1 = less than once a month; 2 = every few weeks; 3 = 1-2 days a week; 4 = 3-5 days a week; 5 = about once a day; 6 = several times a day)	4 item depressed mood scale (Barber, 2006; Barber et al., 2001; Modecki et al., 2013).	14.6 (1.05); 13-17	55	Australian high school students: 83.4% Caucasian, 7.2% Asian, 1.5% African, and 1.3% Aboriginal and Torres Strait Islander; the remaining participants (6.6%) were drawn from various ethnic groups	16
4	Brunborg et al.	2017	851	0.32	0.3316	Cross-sectional	Composite created with 2 items: (1) How many days per week ranging from <i>every day to not at all in the last 12 months</i> , (2) hours per day ranging from <i>less than one hour to more than 15 hours</i>	9 item severity measure for depression (Patient Health Questionnaire-9 items for Adolescents (Kroenke, Spitzer, & Williams, 2001))	15.5* (NR); 13-18	53.7	Norwegian adolescents	16
5	Frisson et al.	2016	1,621	0.11	0.1104	Cross-sectional	4 item composite score of average weekday/weekend/Wednesday/Friday Facebook use. 11 point Likert-scale ranging from 0 hrs; 0.5 hrs; 0.5-1 hrs; 1-1.5 hrs; 1.5-2 hrs; 2-2.5 hrs; 2.5-3 hrs; 3-4 hrs; 4-5 hrs; <i>more than 5 hrs per day to I'm constantly 'online' and available for interaction</i>	CES-DC	14.76 (1.41); 12-18	48	92% born in Belgium, 5% in another European country, and 3% in a non-European country	18

(continued on next page)

Table 2 (continued)

Study ID	Authors	Publication year	Study sample size	Correlation (<i>r</i>)	Fisher's <i>Z</i>	Study design	Social media use measure	Depressive symptoms measure	Mean age (SD); Range	Gender ratio (% female)	Demographics	Methodological quality (0-18)
6	Morin-Major et al.	2016	94	-0.097	-0.097	Longitudinal (data incorporated in this meta-analysis were cross-sectional)	Single item frequency: How many hours per week spent on Facebook; 6 point Likert scale (1) below 1 h, (2) between 1 and 5 h, (3) between 6 and 10 h, (4) between 11 and 15 h, (5) between 16 and 20 h and (6) above 21 h.	Child depression inventory (CDI)	14.5 (1.76); 12-17	53.2	Canadian, White, French speaking adolescents; Middle to high socioeconomic strata	17
7	Niu et al.	2018	764	0.206	0.209	Cross-sectional	Composite of: 8 items adapted to Qzone use from from Facebook intensity scale, two open ended questions about time per day spent on Qzone and number of friends on Qzone, and response to "Qzone is a part of my everyday activity" 5 item Likert scale ranging from <i>strongly disagree</i> to <i>strongly agree</i>	CES-D (Chinese version)	14.23 (1.75); 12-18	46.9	Chinese adolescents	17
8	Oberst et al.	2017	1,468	0.158	0.1593	Cross-sectional	5-item Social network intensity scale: e.g., "Visiting social networking sites is part of my everyday activity," 7-point-Likert scale from <i>never to always</i> "	Hospital Anxiety and Depression Scale (HADS)	16.59 (62); NR	74.3	Spanish-speaking Latin-American countries; 90.7% reported "high educational attainment, as the majority of them reported attending secondary school"	15
9	Pantic et al.	2012	160	0.15	0.1511	Cross-sectional	Single item frequency: "Average daily time spent on social networking sites," $M = 1.86$ hrs, $SD = 2.08$ hrs	BDI-II	18.02 (29); NR	68.1	Pozarevac, Central Serbia	15
10	Thorisdottir, et al.	2019	10,563	0.202	0.248	Cross-sectional	Single item frequency: "On average, how many hours a day do you spend on social media (e.g., Facebook, Snapchat, Twitter, and Instagram)?" Participants answered on an 8-point scale, ranging from <i>almost no time (= 1) to 6 hours or more (= 8)</i> .	10 items from the depression dimension scale of the Original Symptom Checklist Derogatis, Lipman, Covi, 1973)	15* (NR); 14-16	50.3	Icelandic adolescents	15
11	Twenge et al.	2018	75,371	0.05	0.05	Cross-sectional	Single item frequency: How often do you visit social networking sites; 5 point Likert scale (never = 1, a few times a year = 2, once or twice a month = 3, at least once a week = 4, and almost every day = 5).	Six items from the Bentler Medical and Psychological Functioning Inventory depression scale (Newcomb, Huba, & Bentler, 1981)	15.5* (NR); 13-18	50.2	Nationally representative U.S. sample	15

(continued on next page)

Table 2 (continued)

Study ID	Authors	Publication year	Study sample size	Correlation (<i>r</i>)	Fisher's Z	Study design	Social media use measure	Depressive symptoms measure	Mean age (SD); Range	Gender ratio (% female)	Demographics	Methodological quality (0-18)
12	Woods et al.	2016	467	0.11	0.1104	Cross-sectional	6 item composite score created with questions that asked about "the frequency and duration of social media use; the spread of social media use throughout the day; the number of different social media sites and devices." E.g., "How often do you use social media? 6-point scale from "less than once a month" to "daily" and "How many hours do you use social media on a typical day?" 6-point scale from "less than 1 hour" to "6+ hours".	Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983)	14*** (NR); 11-17	NR	Scottish adolescents	16

Not reported (NR); *mean age calculated from provided age range (14-16); **mean age calculated from provided age range (13-18); *** mean age calculated from provided age range (11-17).

*mean age calculated from provided age range (13-18); ** mean age calculated from provided age range (11-17).

High heterogeneity may reflect differences in study characteristics such as sample population, study design and measurement tools. High heterogeneity, indicated by the high I^2 statistic, may also indicate that there are salient moderators that are influencing this relationship, such as individual differences between adolescents, gender differences, developmental differences, temperament, socioeconomic factors, and sleep, to name a few. However, the heterogeneity estimates should be interpreted with caution because of the low power due to the small number of studies included in this meta-analysis. Some research suggests that *Q* over-estimates heterogeneity in meta-analyses with small sample sizes and may under-estimate heterogeneity with large sample sizes (Higgins et al., 2003). There is a large body of research on vulnerabilities to depression in adolescence and, given the small effect size and high heterogeneity between the studies, social media use may be associated depressive symptoms for some, but not all, adolescents. For example, the effect may be stronger for female adolescents, given that adolescents females are twice as likely to experience depression than males (Albert, 2015), and females tend to use social media in a different way, and to a different degree, than do males (Barker, 2009). Unfortunately, the majority of the studies we reviewed did not assess gender differences. Temperament is another factor that is robustly associated with adolescent onset mental illness and may influence the relationship between social media use and depression (e.g., (Klein et al., 2015, Lonigan et al., 2003, Oldehinkel et al., 2004)). Temperament is easily measured (typically with a questionnaire) and could provide some valuable insight into whether specific temperamental traits may interact with social media use to confer higher risk. Furthermore, there may be salient mediators of the relationship between social media use and depression that help explain the association. For example, there has been a surge in the investigation of the association between sleep and mental health in adolescence (Blake et al., 2018) and some researchers speculate that it may not be the content or use of social media in general that is conferring risk, but the fact that social media use is interfering with sleep (Woods and Scott, 2016). As such, it is possible that it could be sleep disruption, not social media use itself, that increases risk of depressive symptoms. Indeed, one of the main findings of one of the studies included in this meta-analysis was that the effect of nighttime specific social media use significantly worsened adolescents' sleep compared to general social media use (Woods and Scott, 2016).

To our surprise, the studies included in this meta-analysis were conducted in many different countries. This could be considered a strength in that there has been assessment on the impacts of social media use across the globe. However, one potential downside is that there is a paucity of studies that attempt to replicate these findings in any given country. Additionally, all but one of the studies in this analysis used a cross-sectional correlational design, so we cannot infer the temporal relationship between social media usage and depressive symptoms. One possibility that is difficult to rule out based on correlation design is that the association could be epiphenomenal. For example, it could be that there is a common risk factor (e.g., temperament, gender) that results in both greater use of social media and higher levels of depressive symptoms, but that there is no causal relationship between social media use and depression *per se*. Moreover, correlational studies are subject to interpretations of reverse causality. It could be that increases in social media use lead to greater depressive symptoms, but another equally valid conclusions from a statistical point of view is that adolescents experiencing more depressive symptoms are more likely to use social media to a greater extent. Recently, relevant longitudinal studies are starting to emerge (Orben and Przybylski, 2019b), so in the future a meta-analysis of longitudinal effects may become viable, which will be particularly informative.

Another notable limitation of the current set of studies is that they all use self-report questionnaires in their assessment of social media use and depressive symptoms and these measures are subject to self-report biases or inaccurate reporting of usage. One recent study used time use diary methods to examine the relationship between screen use and

Social Media Usage and Depressive Symptoms

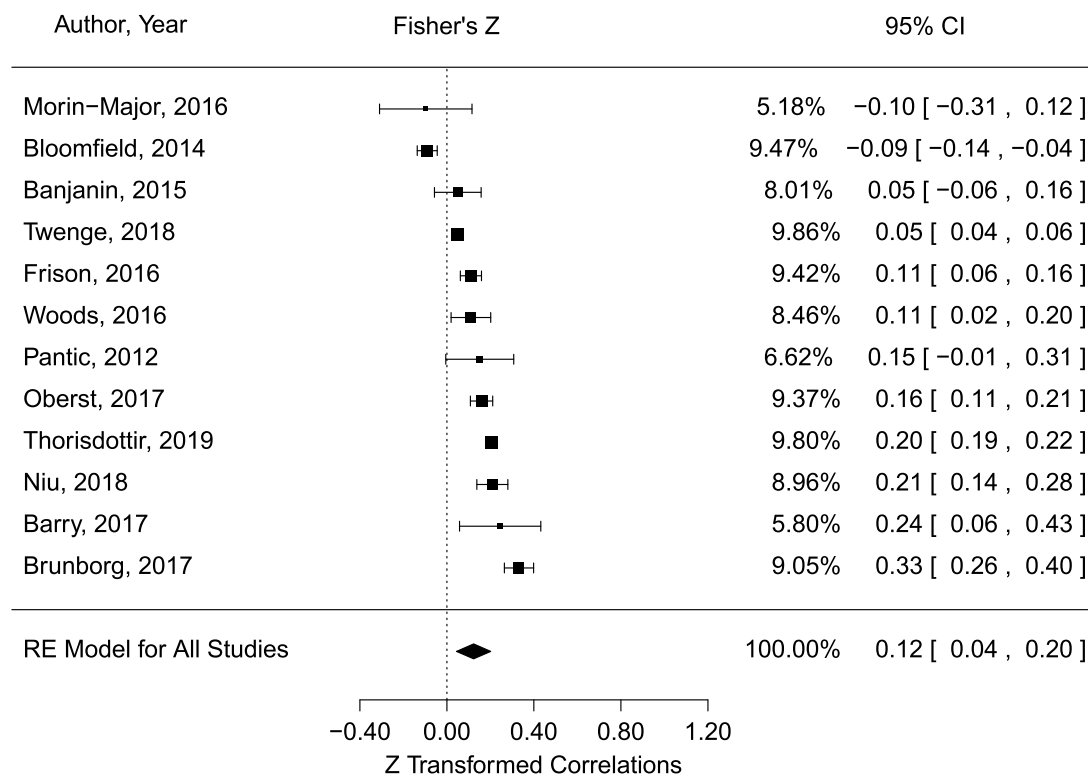


Fig. 2. Forest plot of the associations between social media use and depressive symptoms by year.

Table 3
Meta-analysis key statistics.

Random effects	Estimate	SE	T-value	p-value	95% CI
	0.231	0.04	3.44	0.006	.04-.20
Heterogeneity estimates	Q-value	df	p-value	I ² (%)	
	362.38	11	0.001	97.38	

wellbeing, and consistent with the current findings, found a significant but very small association between high screen use and lower well-being (Orben and Przybylski, 2019b). The use of self-report methodology for assessment of time spent on social media is problematic in general. A meta-analysis on the relationship between self-reported media usage and actual use showed that adolescents, in particular, are poor reporters (Scharkow, 2019). Not only are self-report measures poorly correlated with actual use, single-use measures do not appear to accurately predict behavior (Ellis et al., 2019). For example, Ellis et al. (2019) found that even internet addiction scales were not able to predict “rapid [device] checking” behaviors that one would expect with addiction. Furthermore, measurements of overall usage do not capture the ways in which adolescents use social media. Some research has suggested that there are differences in mental health related outcomes related to nuances of use, such as active versus passive use, (e.g., Escobar-Viera et al., 2018)). Furthermore, self-reported retrospective recall of device use is likely to covary with self-reported estimates of mental health symptoms because of overlapping method and rater bias (Podsakoff et al., 2003), thereby potentially inflating the apparent association between these variables.

In addition, the studies in this analysis included adolescents who ranged in age from 11 to 18 years old, which could be problematic for a number of reasons. Firstly, the presentation of depression often

manifests quite differently for younger versus older adolescents (American Psychiatric Association, 2013). For example, young adolescents with depression often display irritability as one of the core features, while reports of sadness (one of the hallmark symptoms of depression) may not be present (American Psychiatric Association, 2013). Secondly, parents may not allow younger adolescents as frequent access to social media accounts as older adolescents. The age limit for Facebook, Instagram, and Snapchat users is 13 years old, therefore, the youngest adolescents are still not *technically*, allowed access. The current research base thus cannot account for developmental differences both in depressive symptomatology and access. Additionally, the studies included in this meta-analysis ranged from between 2012–2020. Given that the rates of adolescent social media use have increased dramatically (Lenhart et al., 2015) and are likely to continue to increase, it is possible that earlier studies are not capturing the nature of adolescent social media use today.

The current findings suggest that there is a small, but significant relationship between social media use and depression in adolescence. Future studies could use experimental designs in order to test for a causal relationship between social media use and depression. A study using an experimental design measured the effects of abstaining from Facebook for four weeks in an adult population and found that there was a slight decrease ($SD = 0.09$) in depression (Allcott et al., 2020). It should be noted, however, that depression was measured with a single question: “How much of the time during the last four weeks... [have you felt depressed]” (pg., 642, (Allcott et al., 2020)). Also, it would be important to understand the relationship on a much smaller time scale (e.g., minutes to hour to days) to see whether mood influences social media engagement or vice versa in adolescents. In a sample of college students, researchers assessed the temporal relationship between passive social media use and depressive symptoms and found that passive

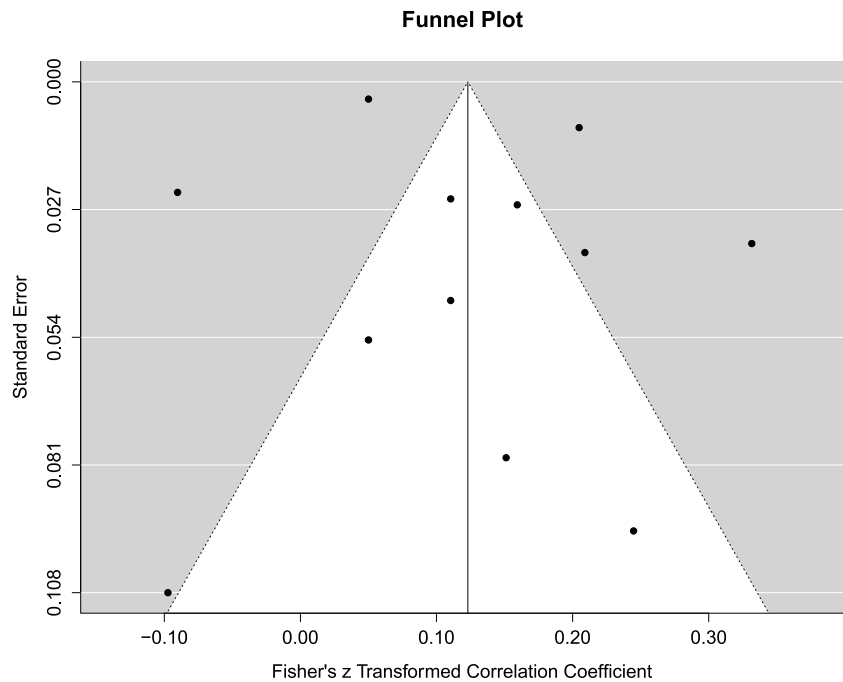


Fig. 3. Funnel plot.

social media use was not predictive of depression (Aalbers et al., 2019). In addition, longitudinal study could investigate within-person changes in depressive symptoms and social media use over a much larger scale (e.g., years). Currently, with the literature at hand, we can only make between subject assertions (i.e., potentially trait-like differences in social media use associated with trait-like depression levels). Studies would also benefit from using data other than self-report to increase the validity of the findings (e.g., collecting social media usage data directly

from adolescents’ devices, depressive symptoms assessed through clinical interview), as self-report of time spent using digital devices is often not accurately reported (e.g., (Boase and Ling, 2013, Kobayashi and Boase, 2012, Vanden Abeele et al., 2013)). The mediators and moderators discussed above could be potential variables of interest that should be investigated. In addition, studies should assess children in different stages of adolescence in order to account for both developmental differences and access to social media accounts.

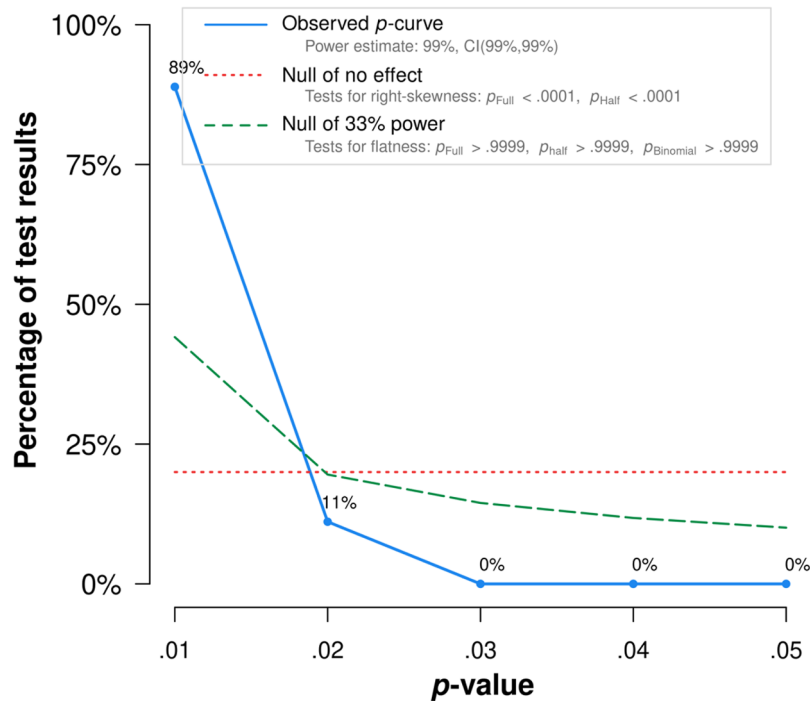


Fig. 4. P-curve analysis.

The small effect size and high variability between studies should prompt caution in interpreting the association observed here. The association between social media use and depression is considerably smaller than effects associated with other known risk factors, including stress (Kendler et al., 1999), family history of mental disorder (Weissman et al., 1997), parenting-child and peer relationships (Branje et al., 2010) and sleep disruption (Raniti et al., 2017) amongst many others. As such, prevention programs and public policy would be better served focusing on these well-established risk factors with larger effect sizes than contributing to a moral panic about the effect of technology use, especially given the lack of supporting data. Although it is likely that social media can have deleterious effects in some cases, we need to understand much more deeply the mechanisms and moderators of these effects before strong recommendations can be drawn.

Declaration of Competing Interest

The authors report no conflict of interest.

Role of Funding Source

No funding source used for this research.

Acknowledgments

None.

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