Social media use and its impact on adolescent mental health: An umbrella review of the evidence

Valkenburg, P.M.; Meier, A.; Beyens, I.

DOI
10.1016/j.copsyc.2021.08.017

Publication date
2022

Document Version
Final published version

Published in
Current Opinion in Psychology

License
CC BY

Citation for published version (APA):

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: https://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

UvA-DARE is a service provided by the library of the University of Amsterdam (https://dare.uva.nl)
Social media use and its impact on adolescent mental health: An umbrella review of the evidence
Patti M. Valkenburg1, Adrian Meier2 and Ine Beyens1

Abstract
Literature reviews on how social media use affects adolescent mental health have accumulated at an unprecedented rate of late. Yet, a higher-level integration of the evidence is still lacking. We fill this gap with an up-to-date umbrella review, a review of reviews published between 2019 and mid-2021. Our search yielded 25 reviews: seven meta-analyses, nine systematic, and nine narrative reviews. Results showed that most reviews interpreted the associations between social media use and mental health as ‘weak’ or ‘inconsistent,’ whereas a few qualified the same associations as ‘substantial’ and ‘deleterious.’ We summarize the gaps identified in the reviews, provide an explanation for their diverging interpretations, and suggest several avenues for future research.

Addresses
1 Amsterdam School of Communication Research, University of Amsterdam, Netherlands
2 School of Business, Economics and Society, FAU Erlangen-Nuremberg, Germany

Corresponding author: Valkenburg, Patti M (p.m.valkenburg@uva.nl)

Current Opinion in Psychology 2022, 44:58–68
Edited by Lydia Krabbendam and Barbara Braams
This review comes from a themed issue on Adolescent Development (2022)
For complete overview about the section, refer Adolescent Development (2022)
Available online 18 August 2021
http://dx.doi.org/10.1016/j.copsyc.2021.08.017
2352-250X/© 2021 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

Keywords
Meta-review, Social networking sites, SNS, Facebook, Instagram, Well-being, Depression, Depressive symptoms.

Introduction
The past years have witnessed a staggering increase in empirical studies into the effects of social media use (SMU) on adolescents’ mental health (e.g. [1–3]), defined as the absence of mental illness and the presence of well-being [4]. This rapid increase may be due to at least two reasons. First, SMU occupies an ever-growing part of adolescents’ daily lives, whereas, at the same time, adolescents do not easily accept parental regulation of this use [5]. Second, adolescence is the stage in life in which well-being shows the most fluctuations [6], in which risk-taking is at its peak [7], and in which mental disorders, such as depression, typically emerge [8]. As social media (SM) offer adolescents ample opportunities to engage in risky behaviors, join dubious communities, and interact with strangers outside of parental oversight, it is imaginable that parents, policymakers, and researchers alike want to understand the effects of adolescents’ avid SMU on their mental health.

The rapid increase in empirical studies into the effects of SMU on mental health has been paralleled with a comparable increase in literature reviews. Therefore, instead of adding another review of empirical studies, we decided to conduct an umbrella review, also called a meta-review, which is a synthesis of existing literature reviews [9]. Three earlier umbrella reviews have summarized the effects of SMU on mental health [10–12], but two of them did not focus on adolescents, and none included the 19 reviews published in 2020 and 2021. The aims of our umbrella review were to identify and discuss (1) general characteristics of existing reviews, such as the type of review (meta-analytic, systematic, narrative); (2) the conceptualization of SMU and mental health or its constituent outcomes; (3) the interpretation of the effects of SMU on these outcomes (e.g. weak, inconsistent, strong); and (4) the gaps in the evidence base and directions for future research.

Methods
The first two authors independently conducted literature searches via Google Scholar to find reviews that appeared from 2019 up to July 2021, combining four sets of search terms that correspond with our inclusion criteria (1) ‘review,’ ‘meta-analysis,’ or ‘synthesis,’ (2) ‘social media,’ ‘social networking site,’ ‘Facebook,’ or ‘Instagram,’ (3) ‘well-being,’ ‘mental health,’ or ‘psychopathology,’ and (4) ‘adolescents,’ ‘youth,’ or ‘children.’ Included studies had to be (1) published reviews that focused on (2) SMU, (3) mental health, and (4) adolescents.

Our operational definition of mental health included indicators of well-being (i.e. happiness, positive affect,
life satisfaction) and two levels of ill-being, clinical (i.e. depression, anxiety disorder) and non-clinical ill-being (i.e. depressive and anxiety symptoms, distress, negative affect). Because of space restrictions, other indicators and precursors of mental health, such as self-esteem, self-harm, suicidality, loneliness, sleep quality, or externalizing problems, were not considered. We defined SMU as the active (e.g. posting) or passive (e.g. browsing), private (one-to-one) or public (e.g. one-to-many) usage of SM platforms, such as Instagram, Snapchat, Facebook, WeChat, and WhatsApp. Studies focusing on overall ‘screen time’ were excluded to avoid conceptual conflation of SMU with, for example, television viewing and/or gaming (e.g. [13]).

Results
Our search yielded 25 reviews, seven meta-analyses, which either included only adolescents [14] or used age as a moderator [15–20]; nine systematic reviews (which reported a systematic search and a synthesis of included studies in tables) [21–29]; and nine narrative reviews [30–38]. Fourteen of these reviews were published in medical/psychiatric journals, eight in psychology journals, and three in social science journals.

Conceptualizations of SMU and well-being
Tables 1–3 at the end of this paper list the predictors and outcomes that each of the meta-analytic (Table 1), systematic (Table 2), and narrative reviews (Table 3) mention in their title or abstract. Although all reviews largely relied on the same evidence base, some studies used SMU in the title or abstract, others ‘digital media use,’ and yet others ‘(digital) technology use.’ Six out of the 25 reviews did not define their predictor. Likewise, 15 reviews failed to define their outcome variables. Some reviews considered well-being as an aspect of mental health [31], whereas others perceived mental health as an aspect of well-being [23]. In addition, several reviews used a broad and sometimes even boundless (operational) definition of mental health, which led to the inclusion of a multitude of outcomes, including marihuana use, identity development, social support, (cyber)bullying, and/or academic performance [22,23,27,30].

Main findings of the reviews
As Table 1 shows, five meta-analyses yielded associations of general use of social network sites (SNS use) with higher levels of adolescent ill-being that ranged from very small to moderate ($r = .05$ to $r = .17$) [14,17–20], and one did not find such an association ($r = .02$ ns, 15). As for well-being, one meta-analysis found that SNS use was weakly associated with higher levels of well-being ($r = +.05$) [19], whereas another found that it was weakly related to lower levels of well-being ($r = -.06$) [17]. However, the latter study aggregated well-being outcomes (e.g. happiness, life satisfaction) with ill-being outcomes (e.g. reversed depression and anxiety scores) in a composite ‘well-being’ score. When this meta-analysis analyzed happiness, life satisfaction, and depression separately, it found that SNS use was associated with both higher levels of well-being and ill-being [17].

In all, the available meta-analytic evidence suggests that SNS use is weakly associated with higher levels of ill-being [14,17–20] but also with higher levels of well-being [17,19], a result that suggests that ill-being is not simply the flip-side of well-being and vice versa, and that both outcomes should be investigated in their own right [11,39]. Finally, all meta-analyses reported considerable variability in the reported associations. For example, in the meta-analysis by Ivie et al. [14], the reported associations of SNS with depressive symptoms ranged from $r = -.10$ to $r = +.33$.

While the meta-analyses interpreted the effect sizes predominately in statistical terms (e.g. small or moderate effect size), the systematic and narrative reviews left more room for diverging interpretations. As Tables 2 and 3 show, most of the conclusions of the 18 systematic and narrative reviews agreed that the effects of SMU are small, and the findings are inconsistent across studies. However, some reviews were less nuanced in their conclusions and used qualifications of the effect sizes such as ‘substantial,’ ‘detrimental,’ and ‘deleterious’ [25,30,38]. Some of these reviews also conflated the associations of general time spent with SM with problematic SMU [21,22,25], which is questionable because problematic SMU is a complex phenomenon that entails more than spending a great deal of time with SM. In fact, time spent with SM explains only 6% of problematic SMU [40]. Problematic SMU is characterized by an enduring preoccupation with SM, an inability to stop using SM, persistent neglect of one’s health (e.g. lack of sleep) and important life areas (e.g. family, friends, schoolwork) [40]. For further conclusions of the systematic and narrative reviews, see Tables 2 and 3.

Identified gaps in the literature and proposed avenues for future research
As Tables 1–3 show, 21 out of the 25 reviews agreed that the evidence on which their conclusions are based is primarily cross-sectional so that causal conclusions are not warranted. Other identified gaps involved the lack of attention to mediators to explain the association of SMU with mental health (e.g. [24,32,37]), and the lack of attention to risk and protective factors that may uncover which adolescents are particularly susceptible to the effects of SMU (e.g. [28,32,37]). Most reviews, therefore, called for longitudinal studies to determine the causal direction of the effects of SMU on mental health (e.g. [14,15], and [22]), as well as for research designed to investigate why and for whom SMU is associated with mental health (e.g. [15], [26], [33]).
Many reviews observed an over-reliance on self-report measures of SMU and its outcomes (e.g. [21], [33], [37]), which may have introduced various biases. This may necessitate a shift toward more objective measures of SMU, such as log-based measures. Some reviews also noted the typically small and homogenous samples (e.g. [21], [33], [41]) and the lack of attention to the content of SM interactions (e.g. [27], [34], [35]), which is likely a more important predictor than time spent with SM [11]. Another future avenue was to use research methods that distinguish between-person associations from within-person associations of SMU with mental health [14,27,31].

Finally, more research needs to investigate how SMU can be used to promote mental health among youth [27,34] (see Tables 1–3, for further gaps in the literature).

Discussion
In this umbrella review, we synthesized the results of 25 recent reviews into the effects of SMU on adolescent mental health. Given that adolescents’ SMU is continually changing, it is important to provide regular research updates on this use and its potential effects. In addition to the many important future directions raised in earlier reviews, we discuss three crucial avenues for future research.

Defining SMU, defining mental health
First, future research needs to consistently define the predictors and outcomes under investigation. Several reviews regularly switched between terms such as digital media use, technology use, and SMU without specifying to which media activities these terms refer. In some studies, emailing and gaming were part of the definitions of SMU, whereas others covered only time spent on SNSs. Such imprecise definitions may greatly hinder our understanding of the effects of SMU on mental health because different types of SMU may lead to different effects on mental health outcomes. For example, time spent on SNS is associated with higher levels of depression [17], whereas emotional connectedness to SNS (‘intensity of use’) [15] and the number of friends on SNS [16] are unrelated to depression. In the world of SM, everything is rapidly new and rapidly old, and, therefore, it is all the more important to define the specific types of SMU under investigation and to hypothesize how and why these types of SMU could affect mental health outcomes.

Likewise, in several reviews, both mental health and well-being were used as catchall terms that were left undefined, which sometimes led to the discussion of a potpourri of cognitive and affective outcomes that each deserve to be investigated in their own right. Our umbrella review confirmed that similar types of SMU can lead to opposite associations with different mental health outcomes [17]. Both SMU and mental health are highly complex constructs. Although most studies have focused on the associations of SMU with depression or depressive symptoms, all other constituent mental health outcomes, including their risk (e.g. loneliness) and resilience factors (e.g. self-esteem), also deserve our full research attention, provided that they are clearly defined and demarcated from other mental health outcomes.

Capturing the content and quality of SM interactions
Several reviews have pointed at a need to move away from possibly biased self-report measures toward more objective measures of SMU use, such as log-based measures of time spent with SM. Indeed, self-report measures of time spent with SM correlate only moderately with similar log-based measures [42,43]. However, although log-based measures are often seen as the gold standard, they have their own validity threats, such as technical errors and the erroneous tracing of SM apps running in the background when the screen is turned off [42,43]. This means that the modest correlations between self-reports and log-based measures could be due to validity issues of self-reports but also of objective measures. More importantly, though, most log-based measures only capture time spent with SM apps, which is just as crude a predictor of mental health as comparable self-report measures. If logging measures only reiterate the ‘screen time’ approach of most self-report research, they provide only a limited way forward.

To arrive at a true understanding of the effects of SMU on mental health, future research needs to adopt measures that capture adolescents’ responses to specific content or qualities of SM interactions. In experimental settings, this can be realized by using mock SM sites, such as the Truman Platform (https://socialmedialab.cornell.edu/) or the mock SM site developed by Shaw et al. [44]. In non-experimental settings, there are three approaches that can be combined with survey or experience sampling studies: (1) The ‘Screenomics’ approach developed by Reese et al. [45], which entails end-to-end software that randomly collects screenshots of adolescents’ smartphones, and extracts text and images; (2) phone-based mobile sensing [46], which captures sound via the microphone and text entered via the keyboard; and (3) analysis of SM ‘data download packages’ [47], the archives of SM interactions that each SM user is allowed to download. While each of these methods is promising, they require sophisticated technical skills and specific expertise. Therefore, they can best be achieved in collaborative interdisciplinary projects, which are also better equipped to realize larger samples.

Understanding inconsistent interpretations
Although the majority of the reviews concluded that the reported associations of SMU with mental health were small to moderate, some others interpreted these associations as serious [30], substantial [48] or detrimental [25]. Such disagreeing interpretations can also be
<table>
<thead>
<tr>
<th>Study</th>
<th># Studies &amp; covered years</th>
<th>Discipline journal</th>
<th>Outcome^a</th>
<th>Definition predictor</th>
<th>Definition outcome</th>
<th>Main results and interpretations</th>
<th>Main gaps in the literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cunningham et al. (2021)</td>
<td>62 studies (2011–2018)</td>
<td>Medicine/Psychiatry</td>
<td>Depressive symptoms</td>
<td>Yes (SNS)</td>
<td>Yes</td>
<td>( r = .02 ) ns (time spent) for adolescents, based on moderation analysis ( r = .09 ) ns (intensity of use), not moderated by age ‘Weak, not clinically meaningful’ effects ( r = .09 ) ns (intensity of use), not moderated by age ‘Weak, not clinically meaningful’ effects</td>
<td>• Predominantly cross-sectional evidence • Over-reliance on time spent on SM • Not enough focus on mediators or explanations</td>
</tr>
<tr>
<td>Huang (2021)</td>
<td>123 studies (2009–2020)</td>
<td>Psychology</td>
<td>Well-being and distress (ill-being)</td>
<td>Yes (online network size)</td>
<td>Yes</td>
<td>( r = .15^* ) (network size) with happiness ( r = .10^* ) (network size) with life satisfaction ( r = .01 ) ns (network size) with depression No association was moderated by age ‘Substantially meaningful relations’</td>
<td>• Little attention to the quality of online networks</td>
</tr>
<tr>
<td>Ivie et al. (2020)</td>
<td>12 studies (2012–2019)</td>
<td>Medicine/Psychiatry</td>
<td>Depressive symptoms</td>
<td>Yes (SMU)</td>
<td>No</td>
<td>( r = .12^* ) (time spent and frequency of use) ‘Small effect,’ ‘high variability’</td>
<td>• Predominantly cross-sectional evidence • Over-reliance on self-report measures • Little attention to within-person effects • Predominantly cross-sectional evidence • Little attention to the quality of SM interactions</td>
</tr>
<tr>
<td>Liu et al. (2019)</td>
<td>93 studies (2006–2018)</td>
<td>Communication</td>
<td>Psychological well-being (= aggregate of life satisfaction, happiness, self-esteem, anxiety, depression, stress, and loneliness)</td>
<td>Yes (SNS)</td>
<td>Yes</td>
<td>( r = -.06^* ) (time spent) with psych, well-being ( r = .14^* ) (time spent) with happiness ( r = .09 ) ns (time spent) with life satisfaction ( r = .13^* ) (time spent) with depression No association was moderated by age ‘No sweeping conclusions’</td>
<td>• Predominantly cross-sectional evidence • Predominantly cross-sectional evidence • Little attention to the quality of SM interactions</td>
</tr>
<tr>
<td>Vahedi and Zannella (2021)</td>
<td>55 studies (2009–2017)</td>
<td>Psychology</td>
<td>Depressive symptoms</td>
<td>Yes (SNS)</td>
<td>Yes</td>
<td>( r = .17^* ) (frequency of checking SNS), not moderated by age ‘Small positive association’</td>
<td>• Predominantly cross-sectional evidence • Most studies based on undergraduate student samples (continued on next page)</td>
</tr>
<tr>
<td>Study</td>
<td># Studies &amp; covered years</td>
<td>Discipline journal</td>
<td>Outcome(^a)</td>
<td>Definition predictor</td>
<td>Definition outcome</td>
<td>Main results and interpretations</td>
<td>Main gaps in the literature</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------</td>
<td>--------------------</td>
<td>---------------</td>
<td>----------------------</td>
<td>-------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Yin et al. (2019)</td>
<td>63 studies (2006–2016)</td>
<td>Social sciences</td>
<td>Well-being and distress (ill-being)</td>
<td>No (SNS)</td>
<td>Yes</td>
<td>(r = .05^<em>) (SNS use) with well-being &lt;br&gt;(r = .06^</em>) (SNS use) with ill-being &lt;br&gt;No association was moderated by age &lt;br&gt;‘Very small correlations’ &lt;br&gt;(r = .11^<em>) (time spent with SNS) &lt;br&gt;(r = .10^</em>) (frequency of checking SNS) &lt;br&gt;No association was moderated by age &lt;br&gt;‘Small’ to ‘medium effects’</td>
<td>predominantly cross-sectional evidence  &lt;br&gt;few studies on affective well-being</td>
</tr>
</tbody>
</table>

\(^a\) Outcome mentioned in title or abstract; SNS = social networking sites; ns = not significant; \(^*\) = significant at least at \(p < .05\).
<table>
<thead>
<tr>
<th>Study</th>
<th>Studies</th>
<th>Academic Field</th>
<th>Focus on Social Media Use (SMU)</th>
<th>Focus on Mental Health and Well-Being</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keles et al. (2020)</td>
<td>13 studies</td>
<td>Psychology</td>
<td>Depression, anxiety, distress</td>
<td>Yes (SMU), and problematic SMU</td>
<td>Time spent on SM and problematic use are prominent risk factors for all three outcomes.</td>
</tr>
<tr>
<td>Vidal et al. (2020)</td>
<td>42 studies</td>
<td>Medicine/Psychology</td>
<td>Depression</td>
<td>Yes (SMU), with a focus on SNS, but also includes screen time, internet use, etc.</td>
<td>The majority of studies demonstrate a positive and bidirectional association between SMU and depression.</td>
</tr>
<tr>
<td>Schorming et al. (2020)</td>
<td>79 studies</td>
<td>Psychology</td>
<td>Mental health and well-being</td>
<td>Yes (SMU), with a focus on depression, also includes screen time, etc.</td>
<td>The relation of SMU and mental health is complex: there is a culture of fear around social media, with a focus on its negative elements.</td>
</tr>
<tr>
<td>Neophytou et al. (2019)</td>
<td>44 studies</td>
<td>Medicine/Psychiatry</td>
<td>Mental health</td>
<td>Yes (screen time, focus on SMU) mix-up of SMU and problematic SMU</td>
<td>Excessive screen time (&gt;2–3 h per day), including SM, can have detrimental effects on mental health.</td>
</tr>
<tr>
<td>Pite and Ward (2020)</td>
<td>19 studies</td>
<td>Medicine/Psychiatry</td>
<td>Depression and anxiety symptoms</td>
<td>Yes (SNS), includes problematic SNS use</td>
<td>The effect size tends to be small and informed by studies of poor quality.</td>
</tr>
<tr>
<td>Schønning et al. (2020)</td>
<td>79 studies</td>
<td>Psychology</td>
<td>Mental health and well-being</td>
<td>Yes (SMU)</td>
<td>The relation of SMU and mental health is complex: there is a culture of fear around social media, with a focus on its negative elements.</td>
</tr>
<tr>
<td>Vidal et al. (2020)</td>
<td>42 studies</td>
<td>Medicine/Psychology</td>
<td>Depression</td>
<td>Yes (SMU), with a focus on SNS, but also includes screen time, internet use, etc.</td>
<td>The majority of studies demonstrate a positive and bidirectional association between SMU and depression.</td>
</tr>
<tr>
<td>Pite and Ward (2020)</td>
<td>19 studies</td>
<td>Medicine/Psychiatry</td>
<td>Depression and anxiety symptoms</td>
<td>Yes (SNS), includes problematic SNS use</td>
<td>The effect size tends to be small and informed by studies of poor quality.</td>
</tr>
<tr>
<td>Webster et al. (2020)</td>
<td>22 studies</td>
<td>Sociology</td>
<td>Subjective well-being</td>
<td>Yes (SMU)</td>
<td>Mixed associations across studies: Online social networks themselves are not bad for subjective well-being.</td>
</tr>
</tbody>
</table>

Note: Outcome mentioned in title or abstract; SNS = social networking sites.
<table>
<thead>
<tr>
<th>Study</th>
<th>Discipline journal</th>
<th>Outcome</th>
<th>Definition predictor</th>
<th>Definition outcome</th>
<th>Main results and interpretations</th>
<th>Main gaps in the literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abi-Jaoude et al. (2020)</td>
<td>Medicine/Psychiatry</td>
<td>Mental health</td>
<td>No, but focus on smartphone and SMU</td>
<td>No, discusses 30+ outcomes, ranging from mental distress to academic performance</td>
<td>SMU leads to increases in mental distress, and suicidality among youth; ‘there is a dose–response relationship.’</td>
<td>Predominantly cross-sectional evidence</td>
</tr>
<tr>
<td>Dienlin and Johannes (2020)</td>
<td>Medicine/Psychiatry</td>
<td>Well-being</td>
<td>Yes (digital technology use), includes but is not limited to SMU</td>
<td>Yes, but discusses a myriad of other outcomes than those defined (e.g. ADHD, academic performance)</td>
<td>Effects are ‘likely in the negative spectrum,’ ‘but too small to matter.’</td>
<td>Over-reliance on self-report measures; Little attention to explanations and moderators; Little attention to within-person effects; Predominantly cross-sectional evidence; Little research on children and preadolescents; Little research on buffering and vulnerability factors</td>
</tr>
<tr>
<td>McLean et al. (2019)</td>
<td>Medicine/Psychiatry</td>
<td>Well-being</td>
<td>Yes (posting and browsing selfies)</td>
<td>Yes, ‘psychological functioning, such as affect and self-esteem’</td>
<td>Viewing selfies may negatively impact well-being. But research is too limited to assess the impact of selfies on well-being.</td>
<td>Predominantly cross-sectional evidence</td>
</tr>
<tr>
<td>Odgers and Jensen (2020) [30]</td>
<td>Medicine/Psychiatry</td>
<td>Mental health</td>
<td>No, digital technology use, time online, SNS use are used interchangeably</td>
<td>No, mental health with a focus on depression and anxiety, among many other outcomes</td>
<td>Small and inconsistent associations. Even the associations of the most rigorous studies ‘are unlikely to be of clinical or practical significance.’</td>
<td>Predominantly cross-sectional evidence; Over-reliance on self-report measures; Small and nonrepresentative samples; Bias towards high-resource samples</td>
</tr>
<tr>
<td>Odgers and Jensen, 2020 [31]</td>
<td>Medicine/Psychiatry</td>
<td>Mental health</td>
<td>No, digital media use, SMU, and online engagement are used interchangeably</td>
<td>No, mental health, well-being, internalizing behavior, and depression are used interchangeably</td>
<td>‘Associations are typically confounded, with the most rigorous studies detailing very small to null associations.’</td>
<td>Predominantly cross-sectional evidence; Too many studies on general screen time; Little attention to potential positive effects</td>
</tr>
<tr>
<td>Study</td>
<td>Field</td>
<td>Domain</td>
<td>Methods Used</td>
<td>Findings</td>
<td>Limitations</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------</td>
<td>-----------------</td>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Odgers et al.</td>
<td>Psychology</td>
<td>Well-being</td>
<td>No, digital media use, SMU, SNS use, and smartphone use are used interchangeably</td>
<td>No, social and emotional well-being and mental health are used interchangeably</td>
<td>'Empirical support for the story of increasing deficits, disease, and disconnection is limited.'</td>
<td></td>
</tr>
<tr>
<td>Orben (2020)</td>
<td>Medicine/Psychiatry</td>
<td>Psychological well-being</td>
<td>No, but focus on SMU</td>
<td>No, outcomes included depression, social support, social connections, life satisfaction, anxiety, self-esteem and loneliness</td>
<td>The association is &quot;negative but very small.&quot; And &quot;the direction is unclear.&quot;</td>
<td></td>
</tr>
<tr>
<td>Smith et al.</td>
<td>Psychology</td>
<td>Well-being</td>
<td>Yes (SMU)</td>
<td>No, well-being, emotional well-being, loneliness, and belonging are used interchangeably</td>
<td>The relationships ‘are multifaceted and complex.’</td>
<td></td>
</tr>
<tr>
<td>Twenge (2019)</td>
<td>Psychology</td>
<td>Depression symptoms</td>
<td>No, technology use, digital media use and SMU are used interchangeably</td>
<td>No, depressive symptoms, mental health, psychological well-being are used interchangeably</td>
<td>Associations are ‘considerable’ and ‘substantial.’</td>
<td></td>
</tr>
</tbody>
</table>

* Outcome mentioned in title or abstract.
witnessed in three recent publications on SMU and mental health by Twenge et al. [49], Orben and Przybylski [3], and Kreski et al. [50], all relying on the same UK-based data set. Such divides in interpretations of the same modest effect sizes are certainly not new in the media effects field. For example, as of the 1980s, there has been a fierce debate among scholars about the effects of game violence on aggression (e.g., see the dispute in Psychological Bulletin about whether this effect is trivial or meaningful [51,52]). Oftentimes, the involved scholars do not disagree that much about the size of the reported effects but just on how to interpret them.

What has often been ignored in such debates is that the effect sizes are just what they are: statistics observed at the aggregate level. Such statistics are typically derived from heterogeneous samples of adolescents who may differ greatly in their susceptibilities to the effects of environmental influences in general [53] and media influences in particular [54]. After all, each adolescent is subject to unique dispositional, social-context, and situational factors that guide their SMU and moderate its effects [55]. Such person-specific antecedents and effects of SMU cannot be captured by the aggregate-level statistics that have been reported in the majority of empirical studies and reviews, including the current one.

If we accept the propositions of media-specific susceptibility theories [54], it is plausible to assume that both optimistic and pessimistic conclusions about the effects of SMU are valid — they just refer to different adolescents. In fact, recent studies that have adopted an idiographic (i.e., N = 1 or person-specific) media effects paradigm [56] have found that a small group of adolescents experienced negative effects of SMU on well-being (around 10–15%) and another small group experienced positive effects (also around 10%–15%). Reassuringly though, most adolescents experienced no or negligible effects [57].

A person-specific approach to media effects requires a large number of respondents and a large number of within-person observations per respondent. Indeed, statistical power is expensive. However, due to rapidly advancing technological (e.g., phone-based experience sampling methods) and methodological developments (e.g., N = 1 time series analyses), such approaches are increasingly within everyone’s reach, especially when researchers pool resources in interdisciplinary teams. A person-specific media effects paradigm may not only help academics resolve controversies between optimistic and pessimistic interpretations of aggregate-level effect sizes, but it may also help us understand when, why, and for whom SMU can lead to positive or negative effects on mental health. And above all, it may help us facilitate personalized prevention and intervention strategies to help adolescents maintain or improve their mental health.

Credit author statement
Patti M. Valkenburg: Conceptualization, Literature search; Creating tables; Writing paper; Adrian Meier: Literature search; Commenting on draft versions of paper; Checking tables; Inc Beyens: Commenting on draft versions of paper; Checking tables.

Conflict of interest statement
None of the authors declared a conflict of interest.

References
Papers of particular interest, published within the period of review, have been highlighted as:
* of special interest
** of outstanding interest

This is the first study showing that the effect of social media use differs from adolescent to adolescent. It is also among the first to disconfirm the hypothesis that passive social media use (i.e., browsing) is negatively associated with well-being. It found, for example, that 46% of adolescents felt happier after browsing, whereas only 10% of adolescents felt less happy after browsing. The remaining 44% did not feel more or less happy after browsing.

This study demonstrates that it is important to distinguish within-person associations from between-person associations among adolescents. Investigating within-person associations is important when investigating the effects of (social) media use, because media effects are within-person changes due to (social) media use, and such changes can best be investigated by means of within-person methods of analysis.


This meta-review proposes two comprehensive frameworks that help organize the vast and conceptually diverse literature on social media and mental health. The Extended Two-Continua Model of Mental
Health integrates clinical and positive psychology perspectives on mental well- and illness. The Taxonomy of Computer-Mediated Communication integrates key approaches to the study of social media effects by distinguishing six main levels of analysis.


This is, to our knowledge, the only meta-analysis that focused on adolescents. Most of the remaining meta-analyses included both adults and adolescents and did not find moderating effects of age. This lack of moderation effects could, however, be due to the relatively low number of studies on adolescents in these meta-analyses, which may have caused power problems. Moreover, most studies on adults have focussed on young adults (e.g., students), which has introduced a rather restricted age range into this literature. As Table 1 shows, Ivie et al. reported a modest effect size of social media use on depressive symptoms


This is a recent meta-analysis that compared self-report measures and objective measures of time spent with social media. It gives a balanced view on the pros and cons of objective measures.


44. Shaw DJ, Pennington CR, Ngombe N, Kessler K, Kaye LK: It’s not what you do, it’s the way that you do it: an experimental task delineates among styles of behaviour on social networking sites and psychosocial measures. Psychol Rev 2021.

This is a good review chapter on mobile sensing methods. It compares different mobile sensing methods, and discusses the pros and cons of mobile sensing to capture the content and quality of social media interactions.


48. Twenge JM: Why increases in adolescent depression may be linked to the technological environment. Curr Opin Psychol 2020, 32:89–94.


This is the first study that used a person-specific approach to explain why social media browsing leads to increases in well-being among some adolescents and decreases in well-being among others. It shows, for example, that adolescents more often experienced a negative effect of browsing on well-being when they felt envy during browsing, and that they more often experienced a positive effect when they enjoyed their social media experience.