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Social media use and depressive and anxiety symptoms in adolescents: An umbrella review

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SOCIAL MEDIA USE AND DEPRESSIVE AND ANXIETY SYMPTOMS IN ADOLESCENTS: AN UMBRELLA REVIEW

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Dissertation submitted to the Master's in Psychology, Clinical and Health Psychology specialization, Faculty of Psychology and Education Sciences of the University of Porto, supervised by Professor Fernando Ferreira-Santos (FPCEUP) and co-supervised by Professor Artemisa Rocha Dores (Escola Superior de Saúde da Universidade Técnica do Porto).

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Resumo

Esta *umbrella review* sintetizou e avaliou criticamente a evidência sobre as associações entre diferentes formas de utilização das redes sociais e sintomas depressivos e/ou de ansiedade em adolescentes de 10 a 19 anos. Foram pesquisadas sete bases de dados para identificar revisões sistemáticas com ou sem meta-análise. Os resultados foram sintetizados narrativamente por desfecho e tipo de exposição. A qualidade metodológica foi avaliada através da *checklist* do JBI, e a sobreposição das publicações entre as revisões foi quantificada. Foram incluídas dez revisões, quatro com meta-análise. As associações foram predominantemente positivas, mas não uniformes. Duas das meta-análises reportaram associações positivas com sintomas depressivos para a utilização baseada no tempo ou na frequência (r = .12, IC 95% [.04, .20]) e para a utilização problemática das redes sociais em estudantes do ensino secundário (r = .28, IC 95% [.15, .41]); a heterogeneidade foi elevada na primeira meta-análise. A evidência relativa à ansiedade foi menos extensa e consistente, e a estimativa meta-analítica referente exclusivamente a adolescentes para a ansiedade social não foi significativa. Sete revisões apresentaram qualidade metodológica moderada a elevada ou elevada, segundo a classificação descritiva desta revisão, mas os estudos primários foram predominantemente transversais e basearam-se em autorrelato. A sobreposição global foi ligeira (CCA = 2.4%), embora alguns pares de revisões apresentassem sobreposição substancial. A utilização das redes sociais assume formas diversas, e a evidência foi mais robusta quanto à existência de associações do que à sua direção temporal ou causalidade, e não foi identificado um limiar universal de utilização prejudicial.

Palavras-chave: uso de redes sociais; uso problemático de redes sociais; adolescentes; depressão; ansiedade; revisão umbrella

Abstract

This umbrella review synthesized and critically evaluated the evidence on associations between different forms of social media use and depressive and/or anxiety symptoms among adolescents aged 10–19 years. Seven databases were searched for systematic reviews with or without meta-analysis. Findings were synthesized narratively by outcome and exposure; methodological quality was appraised using the JBI checklist, and publication-level overlap across review evidence bases was quantified. Ten reviews were included, four with meta-analysis. Associations were predominantly positive but not uniform. Two included meta-analyses reported positive associations with depressive symptoms for time- or frequency-based use (r = .12, 95% CI [.04, .20]) and for problematic social media use among high-school students (r = .28, 95% CI [.15, .41]); heterogeneity was high in the former meta-analysis. Evidence for anxiety was less extensive and consistent, and the adolescent-only meta-analytic estimate for social anxiety was not significant. Seven reviews met the criteria for moderate-to-high or high methodological quality according to the descriptive classification used in this review, but the primary studies were predominantly cross-sectional and relied on self-report. Overall overlap was slight (CCA = 2.4%), although some review pairs overlapped substantially. Social media use is not a single exposure: the evidence was stronger for the presence of associations than for their temporal direction or causality, and no universal threshold was identified.

Keywords: social media use; problematic social media use; adolescents; depression; anxiety; umbrella review

Introduction

Over the past decade, social media has become one of the main contexts in which adolescents interact with their peers. This is especially relevant during adolescence, when belonging, peer acceptance and the development of identity become particularly important (Allen et al., 2014; Blakemore & Mills, 2014). Social media platforms allow users to create personal profiles, form visible networks of connections, and produce, share and interact with content (Kerr et al., 2025; Seabrook et al., 2016). With smartphones, these interactions are no longer restricted to a particular time or place. They can continue throughout the day, making social media part of adolescents' everyday social lives.

There are clear benefits to this. Social media can help adolescents maintain friendships, communicate with peers, find others with shared interests, and seek or offer social support. It also provides space for identity exploration, self-presentation and self-disclosure (Allen et al., 2014; Best et al., 2014; Uhls et al., 2017). Some forms of online communication may also be less threatening for socially anxious users because they reduce immediate nonverbal cues and allow more time to construct a response and manage self-presentation (Nan et al., 2024; Nesi et al., 2018a). For adolescents who feel isolated or find face-to-face communication difficult, these possibilities may provide an additional route to social connection (Best et al., 2014; Nan et al., 2024).

However, some platform features are particularly relevant to adolescent vulnerabilities. Likes, comments, views, and follower counts make social approval immediate, visible, and partly measurable. Although editing and selecting content gives users control over self-presentation, it also creates an asymmetrical basis for comparison with others' curated portrayals (Irmer & Schmiedek, 2023; Nesi et al., 2018a). Repeated exposure to idealized, appearance-related content has been associated with poorer body image and self-evaluation (Holland & Tiggemann, 2016; Kleemans et al., 2018).

Social media can also extend bullying beyond face-to-face settings, making negative experiences public, persistent, and difficult to escape (Nesi et al., 2018b; Uhls et al., 2017). Night-time use has been associated with poorer sleep, while constant awareness of others' activities may increase fear of missing out (FoMO) and repeated checking (Nesi et al., 2018b; Przybylski et al., 2013; Woods & Scott, 2016). These risks coexist with potential benefits: previous research has reported both beneficial and harmful associations with adolescent well-being (Best et al., 2014; Uhls et al., 2017).

Concerns about social media should not be reduced to the number of hours spent online. For some adolescents, use becomes difficult to control and begins to interfere with daily activities or functioning. Casale et al. (2023) describe problematic social media use (PSMU) as difficulty regulating social media use when this is accompanied by negative consequences in everyday functioning. There is no single term for this construct. The literature also refers to *social media addiction*, *social networking site addiction*, *addictive social media use* and *social media disorder*, among other expressions. Some instruments operationalize PSMU using features drawn from models of behavioral addiction, including salience, mood modification, tolerance, withdrawal, conflict and relapse (Cataldo et al., 2022). These features do not, however, imply that PSMU is a formally recognized standalone disorder: neither the DSM-5-TR nor the ICD-11 lists social media addiction or social media use disorder as a distinct diagnosis (American Psychiatric Association, 2022; World Health Organization, 2022). In this review, PSMU is used as the preferred general term when it can reasonably encompass the construct being measured, while the terminology of the original reviews is retained where necessary.

The literature does not assess social media use in a single way. Alongside PSMU, studies use measures of time, frequency, intensity, emotional investment and specific activities (Cataldo et al., 2022; Keles et al., 2020). Although these indicators capture different aspects of use, they are not mutually exclusive: the same adolescent may spend considerable time on social media, use it frequently, report high intensity or emotional investment, engage in particular activities, and experience PSMU. Time spent describes duration but does not by itself indicate loss of control or interference with daily functioning, whereas PSMU emphasizes impaired control and functional consequences, which may themselves contribute to distress (Cataldo et al., 2022). These dimensions may relate to depressive and anxiety symptoms through different mechanisms that can coexist and interact. Time and frequency may increase opportunities for both supportive and adverse experiences; emotional investment and repeated checking may be linked to FoMO or feedback seeking; specific activities and content may involve supportive communication, social comparison, or cyberbullying (Nesi et al., 2018a, 2018b; Piteo & Ward, 2020); and night-time use may disrupt sleep (Woods & Scott, 2016). When these dimensions co-occur, their relationships with symptoms may reflect interacting rather than isolated processes (Nesi et al., 2018a).

Among the mental health outcomes examined in this literature, depressive and anxiety symptoms are particularly relevant because they commonly emerge during adolescence and can interfere with relationships, education and everyday functioning. Depressive symptoms may

include depressed or irritable mood and loss of interest or pleasure, often accompanied by low energy, disturbed sleep or difficulty concentrating. Anxiety symptoms may involve excessive fear or worry, tension and avoidance (American Psychiatric Association, 2022; World Health Organization, 2025a, 2025c). These symptoms can occur within a diagnosed disorder but may also be present below diagnostic thresholds and still be associated with distress or impaired functioning. The present review therefore considers both clinical and subclinical depressive and anxiety symptoms.

Research interest in the relationship between adolescent social media use and depressive and anxiety symptoms is reflected in the growing number of systematic reviews on the topic, some of which also consider broader indicators of psychological distress (Keles et al., 2020; Piteo & Ward, 2020; Sarmiento et al., 2020). Their aims are not identical: some consider depression and anxiety together, whereas others focus on one outcome or include related constructs such as psychological distress.

The conclusions of reviews in this area are not entirely consistent. Best et al. (2014), although published before the recent expansion of research in this area, drew attention to important contradictions in the literature available at the time. Piteo and Ward (2020), on the other hand, found positive associations between social media use and depressive and anxiety symptoms, but noted that effect sizes tended to be small and that many of the primary studies had methodological limitations. The authors also suggested that perceived social support, social comparison and FoMO might help to explain these associations. Similarly, Sarmiento et al. (2020) emphasized that individual, contextual and media-related factors may influence how young people experience social media. Both reviews noted that further research was needed to understand these processes.

Some of these inconsistencies may reflect conceptual and methodological variation in the primary studies included in the reviews. In particular, some PSMU instruments include indicators such as mood modification and withdrawal, including negative emotional states when use is restricted, which may create conceptual overlap with the depressive or anxiety symptoms under study (Cataldo et al., 2022). Furthermore, when both social media use and mental health symptoms are assessed through self-report, common-method variance may inflate the observed associations (Ivie et al., 2020; Podsakoff et al., 2003). Previous reviews have also noted the limited evidence from designs capable of clarifying causal relationships (Best et al., 2014; Piteo & Ward, 2020; Sarmiento et al., 2020). Many reviews on the topic were also published within a relatively short period. It is therefore important to understand how they

differ, what each one adds to the literature, and whether they are based on different primary studies or largely on the same evidence.

An umbrella review allows existing reviews to be compared, their methodological quality to be appraised, and evidence gaps to be identified. Earlier umbrella reviews considered broader domains of adolescent mental health and included systematic, scoping, and narrative reviews and meta-analyses (Sala et al., 2024; Tølbøll, 2026; Valkenburg et al., 2022). In the present review, our aim was to provide a more specific focus on depressive and anxiety symptoms in adolescents aged 10–19 and to consider only systematic reviews with or without meta-analysis, in order to focus on the strongest level of evidence.

This umbrella review aimed to synthesize and critically evaluate evidence from systematic reviews and meta-analyses on the association between social media use and depressive and/or anxiety symptoms in adolescents. More specifically, it addressed the following questions: (1) What associations have been reported between different forms of social media use and depressive and/or anxiety symptoms? (2) To what extent do the conclusions of the reviews agree or differ, and what conceptual or methodological factors may explain these differences? (3) Which moderators and mediators have been reported? (4) What is the methodological quality of the available reviews? (5) To what extent do the evidence bases of the included reviews overlap? and (6) What limitations and research gaps have been identified?

Methods

Design and protocol

This study was conducted as an umbrella review of systematic reviews, with or without meta-analysis, examining the association between social media use and symptoms of depression and/or anxiety in adolescents. The methodological approach was guided by the JBI Manual for Evidence Synthesis for umbrella reviews (Aromataris et al., 2020) and the review was reported in accordance with the Preferred Reporting Items for Overviews of Reviews (PRIOR) statement (Gates et al., 2022).

The review protocol was preregistered on the Open Science Framework (OSF; doi:10.17605/OSF.IO/K5TJ6) before study selection and was subsequently updated and registered in PROSPERO (CRD420261299514) during the screening to provide a structured record in a registry specifically designed for systematic reviews. The PROSPERO record was

treated as the operative protocol. The review title was revised during preparation of the final manuscript to reflect the broader range of social media use exposures already covered by the eligibility criteria; neither the eligibility criteria nor included reviews were changed. Other deviations from the registered methods are described in the relevant subsections below.

Eligibility criteria

Eligible reports were systematic reviews with or without meta-analysis, defined by explicit eligibility criteria, a structured evidence search, and a systematic selection process. Narrative, scoping or mapping, and umbrella reviews; protocols; editorials; commentaries; opinion articles; and primary studies were excluded.

Eligibility criteria were defined a priori using the PICOS framework, although no comparator was required because the review focused on associations between an exposure and mental health outcomes.

The target population was adolescents aged 10–19 years, consistent with the World Health Organization's definition of adolescence (World Health Organization, 2025b). Reviews using narrower age ranges within adolescence were eligible. Reviews covering broader or mixed age ranges were eligible only when more than half of the included studies or participants, as reported by the review authors, fell within the 10–19-year age range, or when findings relating to adolescents were reported separately or could be clearly identified in a subgroup analysis or synthesis. The inclusion of some primary studies involving adolescents was not, by itself, sufficient for eligibility.

The exposure of interest was social media use, including both problematic social media use and broader measures such as time spent, frequency, intensity, emotional investment, or specific patterns of use. For eligibility purposes, social media was defined as a publicly accessible platform that allows users to create personal profiles, view and connect with other users through public or semi-public profiles, and continuously consume and interact with content (Kerr et al., 2025; Seabrook et al., 2016). Reviews examining only general internet use, screen time, gaming, or other digital media without a clearly identifiable social media component were excluded.

Reviews had to examine associations of social media use with depressive and/or anxiety symptoms, including clinical diagnoses and subclinical measures. Broader constructs, such as psychological distress or internalizing symptoms, were eligible only when depression or anxiety was explicitly assessed or discussed. Reviews reporting exposure and outcome separately, without examining an association, were excluded.

Reviews published in English, Portuguese, Spanish, or French were eligible. No publication date restrictions were applied to ensure that all potentially eligible reviews were considered.

Search strategy and study selection

The following electronic databases were searched: PubMed, Scopus, Web of Science, the Cochrane Database of Systematic Reviews, PsycINFO, PsycArticles, and Psychology and Behavioral Sciences Collection. The latter three databases were searched through EBSCOhost. The searches combined terms relating to four concepts: social media or social networking platforms; depression, anxiety, or internalizing symptoms; adolescence; and systematic reviews or meta-analyses. The core strategy was adapted to the controlled vocabulary, syntax, and available filters of each database. Searches were conducted between November and December 2025. The complete search strings, database-specific filters, search dates, and numbers of retrieved records are presented in Appendix A (Table A1). Backward citation tracking was also conducted by screening the reference lists of potentially eligible reviews and relevant umbrella reviews identified during the search. Citation tracking was completed on 20 December 2025. No separate search of grey literature was conducted.

Search results were exported to Zotero for reference management and duplicate removal. The remaining records were imported into Rayyan, where further duplicates identified before or during screening were removed.

Study selection was conducted manually in two stages: title and abstract screening, followed by full-text assessment. At both stages, all records were assessed independently by three reviewers, including the first author and two additional members of the review team. Unanimous pre-consensus agreement was defined as the proportion of records for which all three reviewers recorded the same initial decision (*Include*, *Exclude*, or *Maybe*). Agreement was 76.5% (176/230) during title and abstract screening. Individual decisions from all three reviewers were available for 40 of the 43 full-text reports, with an agreement of 57.5% (23/40). During the full-text assessment, reviewers applied a predefined checklist based on the eligibility criteria. One primary reason for exclusion was recorded for each excluded report. Disagreements were resolved through discussion among the reviewers. All reviews that met the eligibility criteria were retained, even when their scope overlapped. Overlap in their included evidence bases was examined after study selection and considered during interpretation.

Data extraction and methodological quality appraisal

Data were extracted using a structured codebook developed in Microsoft Excel. The codebook was refined to capture descriptive, methodological, and substantive information from

each included review. Extracted data covered review and primary-study characteristics; eligibility criteria; definitions and measures of social media use, depression, and anxiety; main findings and effect estimates; moderators and mediators; methodological quality; reported limitations; and funding and conflicts of interest. Review-level and primary-study-level information were recorded separately, and missing or unclear information was documented. The complete data extraction codebook is provided in Appendix B (Tables B1 and B2).

The same three reviewers independently extracted data before reconciliation. Pre-consensus agreement (proportion of cells in which all three recorded identical information) was 95.2%. All discrepancies were discussed and resolved by consensus. Information that was absent from the review reports or supplementary materials was coded as *Not reported,* whereas fields that did not apply to a particular review were coded as *Not applicable*. No additional information was requested from the authors of the included reviews. The final reconciled dataset, including all decisions reached through consensus, is available on the Open Science Framework (Oliveira, 2026; see Appendix C). Data were extracted from the review reports and retained as reported by each review; no formal cross-review reconciliation of discrepant information concerning the same primary publication was undertaken.

Methodological quality of the included reviews was assessed using the JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses (Joanna Briggs Institute, 2017). Each of the 11 items was rated as *Yes*, *No*, or *Unclear*. For the descriptive classification developed in this review, items 3–8, concerning the search strategy and sources, critical appraisal, data extraction, and synthesis methods, were considered central to review conduct. High methodological quality required at least nine *Yes* ratings and *Yes* ratings on all six central items. Moderate-to-high quality required at least eight *Yes* ratings, with no central item rated *No* but at least one rated *Unclear*. Moderate quality required at least eight *Yes* ratings and one or two central items rated *No*. Low-to-moderate quality corresponded to six or seven *Yes* ratings and fewer than four central items rated *No*, whereas low quality corresponded to five or fewer *Yes* ratings or four or more central items rated *No*. *Unclear* indicated insufficient reporting and was therefore distinguished from a definite unmet criterion (*No*). These categories were used for descriptive comparison and do not constitute official JBI ratings.

Although the preregistered protocol specified AMSTAR-2, the JBI checklist was selected instead because it was considered better suited to reviews that mainly synthesized observational and associative evidence rather than healthcare interventions. This change constituted a deviation from the preregistered methods and was made before the appraisal was conducted, rather than in response to its findings. The first author (YO) conducted the initial

appraisal of all included reviews, which was independently checked by a second reviewer (FFS). Disagreements were resolved by consensus. No formal certainty-of-evidence assessment was conducted.

The primary studies included in the reviews were not independently reappraised. Instead, the appraisal instruments, quality judgments, and methodological limitations of the primary studies reported by the review authors were extracted and considered when interpreting the evidence.

Data synthesis and assessment of overlap

Given the clinical and methodological heterogeneity across the reviews, a structured narrative synthesis was used. Findings were grouped by outcome – depressive symptoms, anxiety symptoms, or both – and by the operationalization of social media use. Problematic social media use was distinguished from time, frequency, intensity, content, and other use patterns. Effect estimates from meta-analyses were retained as reported by the original reviews and, where available, prioritized over simple counts of findings from individual studies. For reviews without meta-analysis, the direction and consistency of associations were summarized narratively. The descriptive association categories reported in Table 2 summarize the direction and overall pattern of findings within each review and do not represent effect magnitude or certainty of evidence. Moderators, mediators, reported limitations, and research gaps were grouped thematically. Consistency across reviews was interpreted in light of synthesis type, methodological quality, heterogeneity, limitations of the included evidence, reported publication-bias assessments, and overlap. No second-order meta-analysis, new assessment of publication bias, or sensitivity analysis of the overview synthesis were conducted.

Although not prespecified in the protocol, publication-level overlap across the included reviews was assessed during evidence synthesis to evaluate the independence of their evidence bases. This descriptive addition did not alter the eligibility criteria or the planned synthesis of associations. Overlap was quantified using a publication-level citation matrix and the corrected covered area (CCA; Pieper et al., 2014), overall and pairwise. Each identifiable publication in a review's evidence base was one matrix record, regardless of design, age composition, or outcome; secondary reviews and full mixed-age publications were therefore retained. When a reported total could not be reconciled with identifiable publications, only identifiable records were entered and the discrepancy documented.

The CCA was calculated as follows:

$$CCA = \frac{N - r}{(r \times c) - r},$$

where N represents the total number of publication occurrences across the reviews, including repeated occurrences, r is the number of unique publications, and c is the number of included reviews.

CCA was calculated overall and for each review pair (c = 2). Following Pieper et al. (2014), overlap was classified as slight (CCA ≤ 5%), moderate (>5% to ≤10%), high (>10% to ≤15%), or very high (>15%). Pairwise values were displayed using the GROOVE graphical classification (Bracchiglione et al., 2022). Agreement between reviews with substantial overlap was not treated as fully independent corroboration.

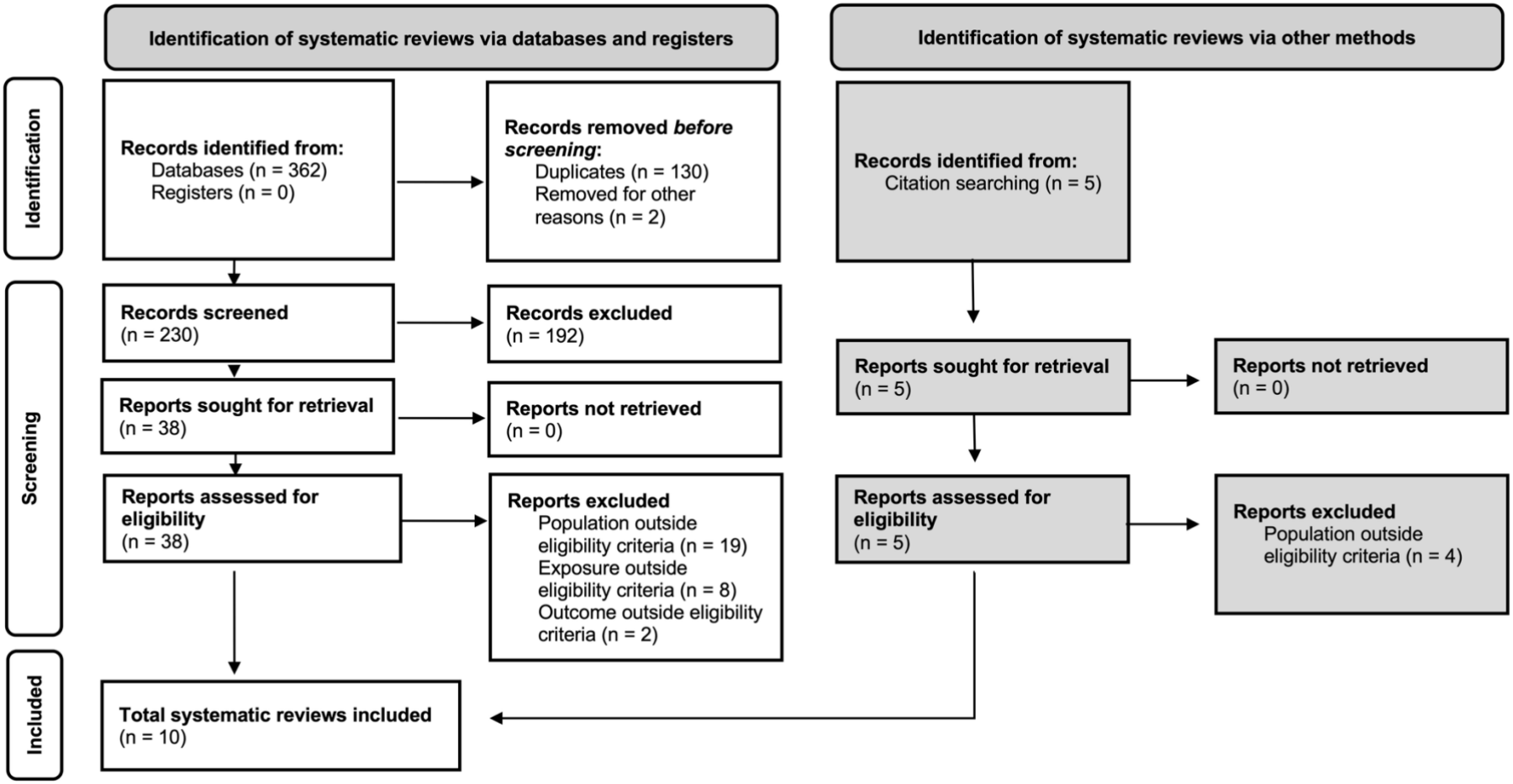
Results

Study selection

The database search identified 362 records. After 130 duplicates and 2 records removed for other reasons were excluded, 230 records were screened by title and abstract. Of these, 192 were excluded. Full-text reports were sought for the remaining 38 records, all of which were retrieved and assessed for eligibility. Of these, 29 were excluded: 19 because the population did not meet the eligibility criteria, 8 because the exposure was not eligible, and 2 because the outcome was not eligible. Citation searching identified five additional reports, all of which were retrieved and assessed for eligibility. Four were excluded because their populations did not meet the eligibility criteria. Overall, 10 systematic reviews were included in the umbrella review, nine identified through the database search and one through citation searching. The study selection process is presented in Figure 1.

Figure 1

Flow Diagram of the Identification and Selection of Systematic Reviews



Note. Adapted from the PRISMA 2020 flow diagram for new systematic reviews (Page et al., 2021) and modified for an umbrella review in accordance with the PRIOR reporting guideline (Gates et al., 2022).

Characteristics of included reviews

Table 1 summarizes the 10 reviews, published from 2020 to 2026; Table 2 presents their findings. Six reviews used narrative synthesis and four conducted meta-analyses, with 11 to 68 unique included studies. Most focused directly on adolescents. Nan et al. (2024) reported an adolescent subgroup from seven adolescent-only studies, and Yigiter et al. (2024) a high-school subgroup from five studies. Full-review sample sizes ranged from 14,935 to 268,740; Damodar et al. (2022) did not report an aggregate sample. Yigiter et al.'s subgroup included 3,508 participants, whereas Nan et al. did not report subgroup size.

Primary studies covered multiple countries or regions in eight reviews; Yigiter et al. (2024) included Turkish studies, and Damodar et al. (2022) did not report geography. Reported designs were predominantly cross-sectional, with fewer longitudinal and some qualitative or mixed-methods studies. Damodar et al. also included secondary evidence. Design reporting was incomplete in Mulisa et al. (2026) and was not reported by Yigiter et al.

Time or frequency was the most common exposure, alongside problematic use, emotional investment, type of activity, network size, and specific content. Facebook appeared in all reviews (100%), followed by Instagram (80%), Snapchat (60%), Twitter (50%), and YouTube (30%); some studies used unspecified platforms. Measures were mainly self-reported, and only three reviews identified any direct or objective tracking.

Depression or depressive symptoms were examined in nine reviews (90%) and anxiety or social anxiety in seven (70%). Related outcomes, including psychological distress and loneliness, were retained as distinct constructs rather than treated as interchangeable with depression or anxiety.

Table 1

Characteristics of the Included Reviews

Review	Synthesis method	Included studies (n)	Aggregate sample (N)	Population	Platforms analyzed	Social media exposure(s)	Outcome(s)	Primary study designs
Alfredson et al. (2024)	Narrative synthesis	19	199,780	Adolescents aged 13−18 years; multiple countries	Facebook, Instagram, Snapchat	Frequency/time indicators and risk-based or problematic use measures	Depression, anxiety, and psychological distress	Cross-sectional (*n* = 13); longitudinal (*n* = 6)
Damodar et al. (2022)	Narrative synthesis	23	Not reported	Adolescents aged 13−18 years; region not reported	Facebook, Twitter, Instagram, MySpace, Snapchat	Screen time and amount of use, measured mainly by self-report or direct tracking	Depression and anxiety	Literature reviews (*n* = 10); systematic reviews (*n* = 9); observational (*n* = 2); experimental (*n* = 1); meta-analysis (*n* = 1)
Ivie et al. (2020)	Meta-analysis	11 studies; 12 effect estimates	92,371	Adolescents aged 11−18 years; multiple countries	Facebook, Instagram, Snapchat, Tumblr	Continuous measures of time spent on or frequency of social media use	Depressive symptoms and depressed mood	Cross-sectional (*n* = 11); longitudinal (*n* = 1), analyzed cross-sectionally in the meta-analysis
Keles et al. (2020)	Narrative synthesis	13	21,231	Adolescents aged 13−18 years; school/general samples; multiple countries	Facebook; mostly unspecified social media platforms	Time, activity/engagement, investment, and problematic or addictive use	Depression, anxiety, and psychological distress	Cross-sectional (*n* = 12); longitudinal (*n* = 1)
Liu et al. (2022)	Meta-analysis with dose-response analysis	26	55,340	Participants aged 10−20 years; mainly school/community samples; multiple countries	Facebook, Instagram; and unspecified platforms	Time spent on social media, mainly assessed by self-report	Depressive symptoms, depressed mood, and depression risk	Cross-sectional (*n* = 21); longitudinal (*n* = 5)

Review	Synthesis method	Included studies (n)	Aggregate sample (N)	Population	Platforms analyzed	Social media exposure(s)	Outcome(s)	Primary study designs
Mulisa et al. (2026)	Narrative synthesis	32	268,740	Adolescents aged 11–19 years; mainly school/community samples; multiple regions	Facebook, Instagram, Twitter, TikTok, Snapchat, YouTube	Time/frequency, problematic use, and exposure to specific content or platforms	Depression, anxiety, and other mental health outcomes	Quantitative (*n* = 21); qualitative (*n* = 9); mixed methods (*n* = 3), as reported
Nan et al. (2024)	Meta-analysis	27 total; 7 adolescent-only	38,163 overall; adolescent subgroup not reported	Mixed-age review with an adolescent subgroup (approximately 10–19 years); mainly student samples; multiple continents	General social media; Facebook, Instagram, Twitter, Renren, YouTube, WhatsApp, Snapchat, Telegram	Frequency, time, and intensity of social media use	Social anxiety	Cross-sectional (*n* = 25); longitudinal (*n* = 2)
Piteo & Ward (2020)	Narrative synthesis	19	150,836	Young people aged 10–22 years; multiple countries	Facebook, Twitter, Instagram, Snapchat, MySpace	Time/frequency, emotional investment, type of activity, and problematic use	Depressive and anxiety symptoms	Cross-sectional (*n* = 14); longitudinal (*n* = 4); cohort (*n* = 1)
Sarmiento et al. (2020)	Narrative synthesis	68 unique; 77 outcome-specific	51,074 for depression/anxiety; 77,221 including loneliness	Adolescents aged 12–18 years; multiple countries	Xanga, Tuenti, Facebook, Tumblr	Time/frequency, network size, investment, problematic use, active/passive use, and specific social media activities	Depressive symptoms, anxiety/social anxiety, and loneliness	Cross-sectional (*n* = 50); longitudinal (*n* = 10); content analysis (*n* = 4); qualitative (*n* = 2)
Yigiter et al. (2024)	Meta-analysis	38 total; 5 high-school subgroup	14,935 overall; 3,508 high-school subgroup	High-school subgroup from Turkey; age range not reported	Facebook, Instagram, Twitter, YouTube, LinkedIn	Problematic social media use assessed with standardized scales	Depression and depressive symptoms	Not reported

Note. Counts refer to the full review unless an adolescent subgroup is specified. Samples should not be summed because primary studies overlap. For Sarmiento et al. (2020), only 65 of the 68 reported publications were uniquely identifiable in the review's study table. For Mulisa et al. (2026), design reporting was incomplete: 6 longitudinal and 5 cross-sectional studies were identified, and reported methodological categories summed to 33 rather than 32.

Methodological quality and overlap of included publications across reviews

Methodological quality varied across the included reviews, ranging from low to high (see Table D1 in Appendix D). Before final decisions, pre-consensus agreement between reviewers was 93/110 item-level ratings, corresponding to 84.5% agreement. According to the descriptive classification used in this review, three reviews were classified as high methodological quality, four as moderate-to-high, one as moderate, one as low-to-moderate, and one as low. Most reviews had clear objectives or review questions, appropriate eligibility criteria, relevant search sources, and suitable synthesis methods. Higher-quality reviews generally reported more comprehensive or clearly structured searches, procedures to minimize data-extraction errors, and formal critical appraisal of the included studies. All four reviews that conducted a meta-analysis also formally assessed publication bias (Ivie et al., 2020; Liu et al., 2022; Nan et al., 2024; Yigiter et al., 2024). In contrast, lower-quality reviews more often showed limitations related to incomplete search reporting, absence of formal quality appraisal of primary studies, lack of independent critical appraisal, unclear or absent procedures to minimize data extraction errors, and no publication bias assessment (e.g., Damodar et al., 2022; Sarmiento et al., 2020). Some reviews also lacked a reported protocol (e.g., Ivie et al., 2020; Liu et al., 2022; Piteo & Ward, 2020; Yigiter et al., 2024), although the JBI checklist does not include a separate item on protocol registration.

Across reviews, primary evidence was predominantly cross-sectional and self-reported, with inconsistent exposure measurement, limited confounder control, and little longitudinal or experimental evidence (e.g., Keles et al., 2020; Nan et al., 2024; Piteo & Ward, 2020; Sarmiento et al., 2020). The included reviews reported primary-study quality as poor, fair, or mixed, although some conducted no formal appraisal. These limitations constrain causal interpretation. Review-specific appraisal tools and judgments are available in the OSF *Final_Extraction* worksheet (Oliveira, 2026; see Appendix C).

Across the 10 included reviews, 226 unique publications could be individually identified, corresponding to 274 publication occurrences. Most publications (n = 196; 86.7%) were included in only one review, while 30 (13.3%) appeared in two or more reviews. The overall corrected covered area was 2.4%, indicating slight overlap. Pairwise overlap was slight for 32 of the 45 review pairs, moderate for nine, high for one (13.3%), and very high for three (18.8%–24.0%). Overall, the reviews were largely based on distinct bodies of evidence, although overlap between some reviews was considered when interpreting similar findings. The pairwise overlap matrix is presented in Appendix E (Table E1).

Main findings and consistency across reviews

Reported associations were predominantly positive but varied by exposure and outcome; this description refers to the direction and overall pattern of findings rather than to the magnitude of associations or certainty of evidence. Associations with depressive symptoms were most consistent for problematic, addictive, or compulsive use; time-, frequency-, and activity-based findings were more variable. Anxiety evidence was less extensive and less often quantified.

Depressive symptoms

Meta-analyses reported positive but generally small associations for different exposures. Ivie et al. (2020) found a small cross-sectional association between continuous time/frequency and depressive symptoms (r = .12, 95% CI [.04, .20], k = 12 estimates from 11 studies, N = 92,371), with very high heterogeneity, $Q(11) = 362.38$, $p < .001$, $I^2 = 97.4\%$. Liu et al. (2022) found higher odds of depressive symptoms or depression risk with greater daily use (OR = 1.60, 95% CI [1.45, 1.75], 26 studies, N = 55,340), with high heterogeneity ($Q(29) = 105.90$, $p < .001$, $I^2 = 72.6\%$). A dose-response analysis of five studies indicated 13% higher odds per additional hour/day (OR = 1.13, 95% CI [1.09, 1.17]). For PSMU, Yigiter et al.'s (2024) high-school subgroup showed a small positive association (r = .28, 95% CI [.15, .41], k = 5, calculated N = 3,508); subgroup heterogeneity was not reported.

The narrative reviews supported this pattern and showed why the exposure distinction matters. The higher-quality reviews by Keles et al. (2020) and Piteo and Ward (2020), together with Alfredson et al. (2024), found more consistently positive associations for problematic, addictive, or emotionally invested use than for time or frequency alone. Piteo and Ward (2020), for example, found positive associations in all five studies of problematic or addictive use, with correlations generally between .24 and .39. Time or frequency-based findings included positive, null, and occasional inverse associations. Associations also varied by activity. One study summarized by Piteo and Ward found small positive associations for passive use (r = .12) and active public use (r = .13), whereas active private use was not associated with depressive symptoms; findings for other specific activities were inconsistent. Sarmiento et al. (2020) likewise found positive results for overall and problematic use but mixed results for specific activities. The methodologically stronger reviews therefore supported a positive association, especially for problematic use, while noting that effect sizes were generally small and findings varied across the primary studies. Damodar et al. (2022), the lowest-quality review, also reported predominantly positive conclusions, but statistical significance was not established and only 34.8% of its included publications provided quantitative data.

Anxiety symptoms

Evidence for anxiety was more limited and heterogeneous than that for depression. The higher-quality narrative reviews generally reported positive associations, but from few studies and varied exposures. Piteo and Ward (2020) identified only two cross-sectional studies. Daily time ($r = .21$), night-time use ($r = .27$), emotional investment ($r = .32$), number of SNS accounts ($r = .45$), and checking frequency ($r = .21$) were positively associated with anxiety symptoms. Keles et al. (2020) reported some associations involving time and engagement indicators, but the overall pattern for time-based measures across anxiety and psychological distress was mixed. Sarmiento et al. (2020) reported positive associations in five correlational studies that treated anxiety or social anxiety as the predictor and greater or more problematic social media use as the outcome. Among six studies that treated anxiety as the outcome, four reported positive associations, one an inverse association, and one no association.

In the adolescent-only subgroup, Nan et al. (2024) found no statistically significant association between time-, frequency-, or intensity-based social media use and social anxiety ($r = .03$, 95% CI [−.04, .10], $k = 7$). Narrative reviews covered broader outcomes and exposures but did not provide comparable quantitative estimates. Alfredson et al. (2024) included one primary study in which users of highly visual platforms had more internalizing symptoms than non-users, whereas Facebook users and non-users did not differ significantly. Mulisa et al. (2026) reported findings on both anxiety and depression but provided no pooled or outcome-specific comparative estimates. These positive narrative findings do not directly contradict Nan et al.'s null adolescent estimate because they concerned broader anxiety-related constructs, whereas Nan et al. examined social anxiety specifically.

Table 2

Main Findings of the Included Systematic Reviews and Meta-Analyses

Review	Type of synthesis or evidence	Methodological quality	Exposure	Outcome	Main quantitative or narrative finding	Association
Alfredson et al. (2024)	Narrative synthesis	Moderate-to-high	Time or frequency-based measures	Depressive and anxiety symptoms; psychological distress	Among seven studies using time-based measures, four reported positive associations and three reported mixed positive and null findings. In one study, time spent on social media was associated with depressive symptoms among females, with little evidence of an association among males. One study found greater internalizing symptoms among users of highly visual platforms (Instagram/Snapchat) than among non-users, but no significant difference between Facebook users and non-users.	**Mixed**
			Risk-based or problematic use measures (e.g., PSMU, addiction, maladaptive use, Facebook intrusion)	Depressive symptoms; psychological distress	Risk-based measures showed a more consistently positive pattern than time-based measures. Both studies using the FIQ reported positive associations with depression. Among four studies using the BSMAS, two reported positive associations with depression or psychological distress and one reported mixed findings; the remaining study used latent profile analysis and did not provide a directly classifiable directional association.	**Predominantly positive**
Damodar et al. (2022)	Narrative synthesis	Low	General social media use (overall review findings)	Depressive and anxiety symptoms	Across 23 publications, 19 (82.6%) acknowledged a positive association between social media use and depression, and 18 (78.3%) acknowledged a positive association with anxiety. However, the significance of these associations was not established, and only 34.8% of publications included quantitative data.	**Predominantly positive**
			Time or frequency-based measures (dose-response evidence)	Depressive and anxiety symptoms	Only three of the 23 publications (13.0%) established a positive dose-response relationship between screen time and depressive or anxiety symptoms. Results were not reported separately by outcome, and no publication evaluated temporal direction.	**Insufficient evidence**
Ivie et al. (2020)	Meta-analysis	High	Continuous measures of time or frequency of social media use	Depressive symptoms	Eleven studies contributed 12 effect estimates (N = 92,371). Social media use showed a small positive association with depressive symptoms, r = .12, 95% CI [.04, .20], p < .01, with very high heterogeneity, $Q(11)$ = 362.38, p < .001, I^2 = 97.4%. Funnel-plot inspection and p-curve analysis did not suggest substantial publication bias.	**Predominantly positive**

Review	Type of synthesis or evidence	Methodological quality	Exposure	Outcome	Main quantitative or narrative finding	Association
Keles et al. (2020)	Narrative synthesis	High	Time spent on social media	Depressive and anxiety symptoms; psychological distress	Across six studies examining time spent, three reported positive associations, two reported no association, and one reported an inverse association.	**Mixed**
			Activity or engagement indicators	Depressive and anxiety symptoms	Two studies reported positive associations for active or passive Facebook use, number of SNS accounts, or checking frequency, whereas one reported no association for the number of selfies or online friends.	**Predominantly positive**
			Investment and problematic or addictive use	Depressive symptoms and depressed mood	All three studies examining investment reported positive associations with depressed mood. Similarly, all three studies examining addictive/problematic use reported positive associations with depression.	**Predominantly positive**
Liu et al. (2022)	Meta-analysis with dose-response analysis	Moderate-to-high	Time spent on social media	Depressive symptoms or risk of depression	Across 26 studies (30 reports; N = 55,340), greater time spent on social media was associated with higher odds of depressive symptoms or depression risk, OR = 1.60, 95% CI [1.45, 1.75], p < .001, with high heterogeneity, $Q(29) = 105.90$, $p < .001$, I^2 = 72.6%. Results were similar in cross-sectional and longitudinal studies. The dose-response meta-analysis, based on five studies (seven reports), found a linear association, with 13% higher odds per additional hour/day, OR = 1.13, 95% CI [1.09, 1.17], $p < .001$. Sensitivity analyses supported the robustness of the findings; publication-bias tests produced mixed results, although trim-and-fill did not impute studies.	**Predominantly positive**

Review	Type of synthesis or evidence	Methodological quality	Exposure	Outcome	Main quantitative or narrative finding	Association
Mulisa et al. (2026)	Narrative synthesis	Moderate-to-high	Social media content (images, videos, text, and voice) and heterogeneous indicators of general use, excessive screen time, and problematic or compulsive use	Depressive and anxiety symptoms, and broader mental-health outcomes	Across 32 studies (N = 268,740), 17 addressed anxiety and 14 depression. Image content was described as showing the strongest relationship with mental health, followed by video; one study linked voice content to mental-health problems. Excessive screen time and cyberbullying were the most frequently reported pathways. No pooled or comparative effect estimates were provided.	**Predominantly positive**
Nan et al. (2024)	Meta-analysis	Moderate	Time, frequency, or intensity-based measures	Social anxiety symptoms	In adolescent-only samples (k = 7), social media use was not significantly associated with social anxiety symptoms, r = .03, 95% CI [−.04, .10]. This estimate was significantly weaker than that for non-adolescent samples, r = .19, 95% CI [.09, .28], k = 20; $Q_b(1)$ = 8.04, p = .005. Adolescent-subgroup N, heterogeneity, and publication bias were not reported.	**No clear association**
Piteo & Ward (2020)	Narrative synthesis with reported effects	High	Time or frequency-based measures	Depressive symptoms	Among seven cross-sectional studies with effect-size data, five reported positive associations (r = .05-.46), one an inverse association (r = −.09), and one no significant association. Two longitudinal studies found small positive unadjusted associations, but some associations were no longer significant after controlling for other variables. In one study, depressive symptoms also predicted later SNS use, suggesting a possible reverse direction.	**Predominantly positive**
			Activity type (passive or active; public or private use)	Depressive symptoms	Passive use (r = .12) and active public use (r = .13) were positively associated with depressive symptoms, whereas active private use was not. Longitudinal findings were bidirectional: Instagram browsing predicted later depressive symptoms, whereas depressive symptoms predicted later Instagram posting and private Facebook use.	**Mixed**
			Emotional investment and problematic or addictive use	Depressive symptoms	Two studies reported positive associations for emotional investment (r = .22-.24). All five studies examining problematic or addictive use also reported positive associations, with reported correlations generally ranging from r = .24 to .39.	**Predominantly positive**

Review	Type of synthesis or evidence	Methodological quality	Exposure	Outcome	Main quantitative or narrative finding	Association
			Time or frequency-based measures, number of SNS accounts, and emotional investment	Anxiety symptoms	Across two cross-sectional studies, daily time (r = .21), night-time use (r = .27), emotional investment (r = .32), number of SNS accounts (r = .45), and checking frequency (r = .21) were positively associated with anxiety symptoms; all ps < .05. No longitudinal studies assessed anxiety symptoms.	**Predominantly positive**
Sarmiento et al. (2020)	Narrative synthesis	Low-to-moderate	Overall-use measures and problematic or addictive use	Depressive symptoms	Five studies using broad overall-use measures and four correlational studies examining problematic or addictive social media use reported positive associations with depressive symptoms. For problematic or addictive use, temporal direction could not be established.	**Predominantly positive**
			Use, network, and profile indicators	Depressive symptoms	Two correlational studies reported no associations for time or amount of Facebook use, network size or number of friends, number of selfies, self-presentation, or peer interactions.	**No clear association**
			Active or passive use and specific activities or experiences	Depressive symptoms	Findings depended on the activity and context. Passive Facebook use and some negative experiences were associated with more depressive symptoms, whereas public or private interaction accompanied by perceived friend support predicted fewer symptoms. Across eight longitudinal studies, directional findings were mixed: some social media activities or experiences predicted later depressive symptoms, whereas some findings supported the reverse direction.	**Mixed**
			General or problematic use and specific experiences	Anxiety or social anxiety	Five correlational studies treating anxiety or social anxiety as the predictor all reported positive associations with greater or more problematic social media use. Of six studies treating anxiety as the outcome, four reported positive associations, one an inverse association, and one no significant association. Four longitudinal studies more often supported anxiety or social anxiety preceding changes in social media use than the reverse, although two studies of cybervictimization reported opposing effects on later social anxiety.	**Mixed**

Review	Type of synthesis or evidence	Methodological quality	Exposure	Outcome	Main quantitative or narrative finding	Association
Yigiter et al. (2024)	Meta-analysis	Moderate-to-high	Problematic social media use (PSMU)	Depressive symptoms	The high-school subgroup showed a small positive association, r = .28, 95% CI [.15, .41], k = 5, calculated N = 3,508. In the full mixed-age sample, the association was also small and positive, r = .32, 95% CI [.28, .36], k = 38, N = 14,935, with high heterogeneity (I^2 = 84.5%).	**Predominantly positive**

Note. Association categories are descriptive and do not indicate the magnitude of associations or certainty of evidence. Additional rows within the same review distinguish exposure-outcome combinations and are not independent reviews. All meta-analyses used random-effects models. BSMAS = Bergen Social Media Addiction Scale; CI = confidence interval; FIQ = Facebook Intrusion Questionnaire; I^2 = percentage of variability attributable to between-study heterogeneity; k = number of studies or reports; N = participants; OR = odds ratio; PSMU = problematic social media use; Q = Cochran's heterogeneity statistic; Q_b = between-groups heterogeneity test; r = correlation coefficient; SNS = social networking site.

Consistency across reviews

Reviews converged most clearly on a generally small positive association between problematic/addictive use and depressive symptoms. Time, frequency, intensity, emotional investment, activities, content, and platforms produced less uniform findings and should not be treated as one exposure. Depression conclusions were broadly similar across synthesis types, but no universal pattern applied across all forms of use or to anxiety.

The higher-quality reviews supported the same general pattern: Ivie et al. (2020), Keles et al. (2020), and Piteo and Ward (2020) reported small or predominantly positive associations while emphasizing variability across primary studies. However, the similar conclusions of these reviews were not fully independent: Piteo and Ward had very high pairwise overlap with Ivie et al. (24.0%) and Keles et al. (23.1%), whereas overlap between Ivie et al. and Keles et al. was moderate (8.7%). The quantitative evidence from Liu et al. (2022) was also not fully independent of this group, given its very high overlap with Ivie et al. (18.8%) and moderate overlap with Piteo and Ward (9.8%). Lower-quality reviews generally reported findings in the same direction but provided less quantifiable support. Review authors attributed discrepancies to differences in the definitions and measurement of social media use and outcomes, the age and gender composition of samples, the platforms and activities examined, study designs, and eligibility criteria (Alfredson et al., 2024; Ivie et al., 2020; Keles et al., 2020; Liu et al., 2022; Piteo & Ward, 2020; Sarmiento et al., 2020). Liu et al., for example, found variation according to the depression measure used, whereas Alfredson et al. and Sarmiento et al. noted that rapid changes in platform use may limit comparability across periods.

Between-study variability was substantial. Heterogeneity was very high in Ivie et al. (2020) and high in Liu et al. (2022), indicating that the estimated magnitude varied considerably across the included studies and that the pooled estimates should not be assumed to apply uniformly. All four meta-analyses assessed publication bias. Ivie et al. found no clear indication of small-study effect or publication bias, Liu et al. obtained mixed results, Nan et al. (2024) detected bias, and Yigiter et al. (2024) described it as relatively low. Because most primary studies were cross-sectional, temporal direction could not be established.

Moderators and mediators

Evidence on moderators and mediators varied across reviews. Given the substantial between-study heterogeneity reported in several meta-analyses, all four meta-analyses examined moderators, although the variables tested did not consistently account for this variability. No review meta-analyzed mediation effects, and narrative reviews reported potential moderators and mediators from primary studies, usually based on limited evidence.

Gender was the most frequently examined moderator. Liu et al. (2022) found a stronger association between time spent on social media and depression risk among girls (*OR* = 1.72, 95% CI [1.41, 2.09]) than boys (*OR* = 1.20, 95% CI [1.05, 1.37]), $Q_b(2) = 40.44$, $p < .001$. Alfredson et al. (2024) also reported that positive associations were more common among females. Both Piteo and Ward (2020) and Sarmiento et al. (2020), drawing on the same primary study, reported that passive Facebook use was associated with depressed mood among girls but not boys, whereas active public use was associated with depressed mood among boys but not girls (Frison & Eggermont, 2016). However, a statistically significant gender difference was found only for passive use; the contrasting subgroup results for active public use did not establish a significant difference between boys and girls. For anxiety, Sarmiento et al. (2020) reported that most gender-specific associations were significant only among girls, although one primary study found a positive association only among boys. By contrast, the proportion of female participants in Nan et al. (2024) and the male-gender ratio in Yigiter et al. (2024) were not significant study-level moderators. These analyses compared overall effect sizes across studies with different gender compositions rather than gender-specific estimates within the same samples.

Age findings were inconsistent. Liu et al. (2022) found a subgroup difference, $Q_b(2) = 9.28$, $p < .01$, although associations were positive and similar across groups. Mean age did not moderate Ivie et al. (2020), and Yigiter et al. (2024) found no sample-group differences. In Nan et al. (2024), the association with social anxiety was weaker in adolescent-only than in older samples, but the adolescent estimate was not significant. Thus, the reviews did not establish a consistent age-related pattern, either within adolescence or across broader age groups.

Some measurement and study characteristics were also examined as potential moderators. Liu et al. (2022) found moderation by depression measure, $Q_b(5) = 56.70$, $p < .001$; most estimates were positive, but the two-study BDI estimate was non-significant (*OR* = 1.52, 95% CI [0.96, 2.41]). Region, overall versus platform-specific time, and sample size were non-significant. In full mixed-age analyses, Nan et al. (2024) found larger effects with more reliable social-media measures, while Yigiter et al. (2024) found larger effects in theses than articles.

Single studies suggested that social context and activity may moderate associations. Low perceived support strengthened the longitudinal association between negative Facebook experiences and depressive symptoms six months later, while low peer popularity strengthened associations between depressive symptoms and social comparison or feedback-seeking (Sarmiento et al., 2020). Findings also differed across passive browsing, public interaction, and

private messaging, sometimes by gender (Piteo & Ward, 2020; Sarmiento et al., 2020), but reviews sometimes shared the same evidence.

Mediation evidence also came from few primary studies. Perceived online or friend support mediated associations between specific forms of Facebook use and depressive symptoms (Keles et al., 2020; Piteo & Ward, 2020; Sarmiento et al., 2020). Sleep disruption or insomnia mediated associations of problematic investment or addiction with depression; Sarmiento et al. separately reported partial mediation by sleep disturbance for before-bed use. Single-study models also identified social comparison and FoMO (Piteo & Ward, 2020), and cybervictimization and feelings of exclusion (Sarmiento et al., 2020), as mediators. However, the studies differed in which variable was treated as the predictor or outcome. In one primary study reported by Keles et al. and Piteo and Ward, rumination mediated the association between SNS addiction and depression, and this pathway was stronger among adolescents with lower self-esteem (Wang et al., 2018). Models varied in predictor-outcome direction, and repeated findings sometimes reflected shared primary studies; no single mediator was established.

Reported limitations and research gaps

The main primary-study limitation was predominantly cross-sectional, observational evidence, which limited firm conclusions about temporal direction or causality (Ivie et al., 2020; Keles et al., 2020; Liu et al., 2022; Sarmiento et al., 2020). Recurring concerns included self-reported measures, scarce objective data, small or convenience samples, and limited demographic, cultural, or geographical representation (Alfredson et al., 2024; Ivie et al., 2020; Liu et al., 2022; Nan et al., 2024; Piteo & Ward, 2020).

Exposure and outcome definitions and measures varied substantially. Overall-use or duration measures rarely distinguished platform, activity, content, or social context (Ivie et al., 2020; Piteo & Ward, 2020; Sarmiento et al., 2020). Authors therefore recommended longitudinal and experimental designs, more objective and consistent measurement, and qualitative research on mechanisms and lived experience (Ivie et al., 2020; Keles et al., 2020; Liu et al., 2022; Nan et al., 2024; Piteo & Ward, 2020; Sarmiento et al., 2020; Yigiter et al., 2024).

Further research priorities included distinguishing PSMU from quantitative indicators; examining activities, content, mechanisms, and demographic or developmental differences; and considering healthy as well as harmful engagement (Alfredson et al., 2024; Ivie et al., 2020; Piteo & Ward, 2020; Sarmiento et al., 2020). Alfredson et al. highlighted the need to examine changing and visually oriented platforms, whereas Sarmiento et al. recommended focusing on cross-platform affordances (e.g., anonymity, asynchronicity, editability, and selective self-

presentation) rather than specific applications. Review-level limitations included possible publication bias or missed studies and restricted languages, databases, populations, exposures, outcomes, regions, or publication periods (Alfredson et al., 2024; Liu et al., 2022; Nan et al., 2024; Sarmiento et al., 2020; Yigiter et al., 2024).

Discussion

The present umbrella review showed predominantly positive but non-uniform associations between social media use and depressive or anxiety symptoms in adolescents. Findings were most consistent for PSMU and depressive symptoms; time/frequency associations were generally small or variable. Anxiety evidence was less extensive and depended partly on whether general or social anxiety was assessed. Social media use should therefore not be treated as a single exposure: the pattern changed according to how both use and mental health symptoms were defined and measured.

The greater consistency found for PSMU compared with time-based measures (Alfredson et al., 2024; Keles et al., 2020) may indicate that impaired control and disruption of everyday life are more relevant than the amount of time spent on social media alone. Unlike time or frequency, PSMU measures include experiences such as conflict, using social media to regulate mood, and discomfort when unable to use social media. These features may be more closely related to depressive symptoms than duration alone. However, the greater consistency may also partly reflect conceptual overlap between PSMU and mental health symptoms. Common-method variance may further contribute when both PSMU and depressive symptoms are measured by self-report. In addition, prior depressive symptoms may contribute to more problematic patterns of social media use. The linear dose-response association reported by Liu et al. (2022) indicates that time should not be dismissed. However, this finding was based on observational evidence with high heterogeneity and does not establish causality or a universal threshold between safe and harmful use.

A global measure of time also combines experiences that differ in their social and emotional meaning: e.g., two hours of social media use may involve potentially supportive or neutral experiences, such as private communication, support from friends, or entertainment, but they may also involve social comparison, feedback seeking, exposure to idealized content, cybervictimization, or use late at night. When these are reduced to a single duration score,

potentially harmful, neutral, and protective experiences can contribute to the same average association. Small associations with time may therefore arise because duration measures combine experiences with very different meanings and consequences. Findings concerning active and passive, or public and private, use suggest that these distinctions may matter, but the evidence is not yet consistent enough to identify which patterns are more harmful (Keles et al., 2020; Piteo & Ward, 2020; Sarmiento et al., 2020). Mulisa et al. (2026) described image content as showing the strongest relationship with mental health, followed by video, although no comparative effect estimates were reported. How adolescents use social media, what they encounter there, and the circumstances of use may therefore be more informative than duration alone.

The anxiety findings require a separate interpretation. The non-significant association reported for the adolescent subgroup in Nan et al. (2024) concerned social anxiety specifically and does not necessarily conflict with findings on broader anxiety symptoms. By comparison, Piteo and Ward (2020) reported positive associations between broader anxiety symptoms and several indicators of social media use, although the evidence came from only two cross-sectional studies. Sarmiento et al. (2020) reported mixed findings when anxiety or social anxiety was examined as an outcome, while the limited longitudinal evidence more often supported anxiety or social anxiety preceding later patterns of use. Nevertheless, both directions are theoretically plausible. Anxiety – particularly social anxiety – may lead adolescents to prefer online interaction because it reduces immediate evaluative cues and allows greater control over self-presentation (Nan et al., 2024), whereas adverse online experiences, such as exclusion and cybervictimization, may in turn maintain or intensify symptoms (Sarmiento et al., 2020). Although the available evidence does not establish a reciprocal cycle, findings in both directions leave this possibility open. Contextual factors should also be considered: family context, peer relationships, school experiences, stress, socioeconomic circumstances, and opportunities for offline interaction may shape both mental health symptoms and patterns of social media use. Recognizing this does not make social media irrelevant but places its possible role within adolescents' wider social context.

Gender findings also depended on the type of analysis. Liu et al. (2022) found stronger associations for girls in gender-stratified analyses, whereas Nan et al. (2024) and Yigiter et al. (2024) found no moderation by the proportion of female participants in a study. These findings are not directly contradictory because study-level sample composition is not equivalent to comparing girls and boys within studies. Where stronger associations are found among girls, they may reflect differences in exposure to particular activities, content, and social pressures

rather than a uniform intrinsic vulnerability. Beyond these gender findings, individual studies examined possible pathways involving social comparison, FoMO, sleep disturbance, and perceived social support (Keles et al., 2020; Piteo & Ward, 2020; Sarmiento et al., 2020). Some reviews also discussed these factors more broadly as possible mechanisms, but their roles and hypothesized directions varied across studies, and the evidence was too fragmented to support a general explanatory model.

The evidence provides greater confidence in the existence of an association between PSMU and depressive symptoms than in its magnitude, temporal direction, or causal nature. Most primary studies were cross-sectional and relied on self-report, which limits temporal inference and introduces measurement error and common-method variance. Control of confounding was often incomplete, and variation in exposure and outcome instruments contributed to the substantial heterogeneity reported in the meta-analyses. Review quality also varied, and strong reviews could not correct primary-study limitations. Slight overall overlap indicated largely complementary evidence, but high overlap in some pairs reduced the independence of their agreement. Moreover, because overlap was assessed at the publication level, it did not capture indirect overlap among primary studies contained within secondary reviews included by Damodar et al. (2022).

Future research should distinguish PSMU from frequent or long-duration use, apply validated adolescent measures, and combine self-report with digital tracking. Studies should also assess what adolescents do on social media, what content they encounter, why and under which circumstances they use it, and which platform features are involved, rather than treating time spent as a proxy for these experiences. Longitudinal within-person designs are needed to test whether changes in use precede symptoms and vice versa, while mediators and moderators require systematic testing. For parents seeking to understand adolescents' social media use, the findings suggest considering not only time spent but also signs of impaired control and interference with daily functioning, negative online experiences, the activities and content involved, and night-time use. However, because this review synthesized evidence on associations, not interventions, it cannot establish whether monitoring or fixed time limits improve mental health.

Methodological strengths of this umbrella review included a clear developmental definition of adolescence, a multi-database search, separation of social media measures, and distinction among depression, general anxiety, and social anxiety. The review also appraised methodological quality and quantified publication overlap. However, no separate search of grey literature was conducted, and the searches were not updated after December 2025; unpublished,

non-indexed, or more recent reviews may therefore have been missed. In addition, no formal certainty-of-evidence assessment was conducted, so the level of confidence in the overall body of evidence was not formally evaluated. The conclusions also depend on the information and judgments reported by the included reviews, because primary studies were not reappraised. Mixed-age reviews without separate adolescent findings may have excluded relevant evidence, and heterogeneous exposure and outcome measures limited comparisons. Finally, because platforms and their features change rapidly, findings from some earlier, Facebook-focused studies may not fully apply to how adolescents use social media today.

Conclusion

This umbrella review synthesized systematic reviews and meta-analyses of associations between different forms of social media use and depressive and/or anxiety symptoms in adolescents. Associations were predominantly positive but varied across exposures and outcomes. Findings were most consistent for PSMU and depressive symptoms, whereas associations involving time or frequency were generally small or variable, despite one meta-analysis reporting a positive linear dose-response association. Evidence concerning anxiety was less extensive and less consistent: the adolescent-only meta-analytic estimate for social anxiety was not significant, while limited findings concerning broader anxiety symptoms were more often positive.

These conclusions should be interpreted with caution because the included reviews varied in methodological quality and the primary studies were predominantly cross-sectional, relied on self-report, and were methodologically heterogenous. Overall publication-level overlap across reviews was slight, although it was considerably higher between some pairs. Taken together, the evidence was more informative about the presence of associations than about their magnitude, temporal or causal direction, or underlying mechanisms.

Social media use should therefore not be treated as a single or uniformly harmful or harmless exposure. Conclusions depend on whether studies assess problematic use, time or frequency, or specific activities and experiences, as well as on the outcome examined. No universal threshold separating safe from harmful use was identified.

Data Availability Statement

The final reconciled data extraction dataset and supplementary materials are publicly available under a CC BY 4.0 license on the Open Science Framework at https://doi.org/10.17605/OSF.IO/UPBDC.

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Competing Interests

The author declares no competing interests.

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Appendix A

Search Strategies and Record Identification

Table A1

Complete Search Strategies Used to Identify Eligible Systematic Reviews

Database or method (interface)	Search date	Complete search strategy	Filters applied	Records retrieved
PubMed (NCBI)	8 December 2025	("Social Media"[Mesh] OR "Social Networking"[Mesh] OR "social media" OR "social network*" OR "social networking" OR Instagram OR TikTok OR Snapchat OR Facebook OR Twitter) AND ("Depression"[Mesh] OR "Anxiety"[Mesh] OR depress* OR "depressive symptoms" OR anxiety OR "anxious symptoms" OR "internalizing symptoms") AND ("Adolescent"[Mesh] OR adolescen* OR teenager* OR youth OR youngster*) AND ("systematic review" OR "meta-analysis" OR "systematic literature review")	Article type: Review, Systematic Review, Meta-Analysis; languages: English, French, Portuguese, and Spanish; age: Child and Adolescent.	54
Scopus (Elsevier)	14 November 2025	TITLE-ABS-KEY(("social media" OR "social network*" OR Instagram OR TikTok OR Snapchat OR Facebook OR Twitter) AND (depress* OR "depressive symptoms" OR anxiety OR "anxious symptoms" OR "internalizing symptoms") AND (adolescen* OR teenager* OR youth OR youngster*) AND ("systematic review" OR "meta-analysis"))	Document type: Review. Excluded keywords: Adult; Coronavirus Disease 2019; Pandemic; COVID-19; Posttraumatic Stress Disorder; Pandemics; SARS-CoV-2; Pregnancy; Lockdown; Childhood Obesity; Newborn; Middle Aged; Infant; Child, Preschool.	76
Web of Science (Clarivate)	14 November 2025	TS=(("social media" OR "social network*" OR Instagram OR TikTok OR Snapchat OR Facebook OR Twitter) AND (depress* OR "depressive symptoms" OR anxiety OR "anxious symptoms" OR "internalizing symptoms") AND (adolescen* OR teenager* OR youth OR youngster*) AND	None.	142

Database or method (interface)	Search date	Complete search strategy	Filters applied	Records retrieved
		("systematic review" OR "meta-analysis"))		
Cochrane Database of Systematic Reviews (Wiley)	14 November 2025	("social media" OR "social network*" OR Instagram OR TikTok OR Snapchat OR Facebook OR Twitter) AND (depress* OR "depressive symptoms" OR anxiety OR "anxious symptoms" OR "internalizing symptoms") AND (adolescen* OR teenager* OR youth OR youngster*) AND ("systematic review" OR "meta-analysis")	None.	1
PsycINFO (EBSCOhost)	14 November 2025	(DE "Social Media" OR DE "Social Networks" OR "social media" OR "social network*" OR Instagram OR TikTok OR Snapchat OR Facebook OR Twitter) AND (DE "Depression" OR DE "Anxiety" OR DE "Affective Disorders" OR depress* OR "depressive symptoms" OR anxiety OR "anxious symptoms" OR "internalizing symptoms") AND (DE "Adolescence" OR adolescen* OR teenager* OR youth OR youngster*) AND (DE "Meta Analysis" OR DE "Systematic Review" OR "systematic review" OR "meta-analysis")	No additional filters were applied because the available filters excluded potentially eligible reviews.	64
PsycArticles (EBSCOhost)	14 November 2025	("social media" OR "social network*" OR "social networking" OR Instagram OR TikTok OR Snapchat OR Facebook) AND (depress* OR "depressive symptoms" OR anxiety OR "anxious symptoms" OR "internalizing symptoms") AND (adolescence OR adolescent* OR teenager* OR youth OR youngster*) AND ("systematic review" OR "meta-analysis")	No additional filters were applied because the available filters excluded potentially eligible reviews.	3
Psychology and Behavioral Sciences Collection (EBSCOhost)	14 November 2025	(DE "Social Media" OR DE "Social Networks" OR "social media" OR "social network*" OR "social networking" OR Instagram OR TikTok OR Snapchat OR Facebook) AND (DE "Depression" OR DE "Anxiety"	No additional filters were applied because the available filters excluded potentially eligible reviews.	22

Database or method (interface)	Search date	Complete search strategy	Filters applied	Records retrieved
		OR DE "Affective Disorders" OR depress* OR "depressive symptoms" OR anxiety OR "anxious symptoms" OR "internalizing symptoms") AND (DE "Adolescence" OR adolescence OR adolescent* OR teenager* OR youth OR youngster*) AND (DE "Meta Analysis" OR DE "Systematic Review" OR "systematic review" OR "meta-analysis")		
Backward citation tracking	20 December 2025	The reference lists of included reviews and relevant umbrella reviews identified during the database search were screened manually.	Not applicable.	5

Note. Search counts represent records retrieved before deduplication and eligibility screening. The seven electronic database searches yielded 362 records, and backward citation tracking identified five additional reports. The PubMed strategy reported is the final strategy conducted on 8 December 2025; an earlier test strategy that was not used in the review is omitted. No publication date restriction was applied.

Appendix B

Data Extraction Codebook

General Coding Instructions

The original data extraction was completed in Portuguese using a structured Microsoft Excel workbook. The final reconciled dataset was subsequently translated into English and harmonized for consistency with the final narrative synthesis and summary tables.

Each review was identified using the format “First author et al., year.” All fields were completed whenever the relevant information was available; cells were not left blank. Unavailable information was coded as “Not reported,” fields that did not apply to the review design were coded as “Not applicable,” and ambiguous information was documented as such.

Before information was coded as missing, the review appendices and supplementary materials were checked. Review-level information was distinguished from information concerning the primary studies included within each review. The notes field was used to document pages or sections checked, calculations, uncertainties, reporting inconsistencies, and interpretative decisions. Any need to add or modify a variable during extraction was documented in the notes field.

Table B1

Overview of Variables Included in the Data Extraction Codebook

Review Identification and Characteristics	Population and Primary-Study Characteristics	Exposure and Outcome Characteristics	Findings and Methodological Information
– Review identifier – Authors – Publication year – Journal – Review type – Review objectives – Inclusion criteria	– Number of included primary studies – Total participants – Age range – Mean age – Age standard deviation – Country or region – Population type – Primary-study designs	– Social media platforms – Definition or operationalization of social media use – Social media measurement – Mental health outcomes – Mental health measurement	– Main findings – Meta-analytic effect metric – Pooled effect estimate – Confidence interval – Number of studies in meta-analysis – Direction and significance of association – Moderators and mediators – Quality appraisal tool – Quality summary – Review limitations – Funding – Conflicts of interest – Notes

Note. Variables are grouped for presentation. The variable codes and detailed coding rules are provided in Table B2.

Table B2

Detailed Data Extraction Codebook

Variable	Code	Description	Response Format and Coding Guidance
Review Identification and Characteristics			
Review identifier	review_id	Unique identifier or citation for the included review.	Free text using the format "First author et al., year" (e.g., Smith et al., 2023).
Authors	authors	Names of the authors of the included review.	Free text (e.g., Smith, A.; Santos, F.; Fernández, J.). Enter authors in the order reported.
Publication year	year	Year in which the included review was published.	Four-digit year (e.g., 2021). Use the year required for citation.
Journal	journal	Name of the journal in which the review was published.	Free text (e.g., Journal of Adolescence).
Review type	review_type	Type of evidence synthesis.	"Systematic review" or "Systematic review with meta-analysis."
Review objectives	review_objectives	Main objective or objectives of the review.	Free text or bullet points. Summarize the objectives stated by the review authors.
Inclusion criteria	inclusion_criteria	Eligibility criteria used in the review.	Free text or bullet points. Record the principal criteria relating to study type, population, exposure, outcomes, language, and publication period, when reported.
Population and Primary-Study Characteristics			
Number of included primary studies	n_included_studies	Number of primary studies included in the review.	Integer (e.g., 27). Check the flow diagram, study-characteristics table, forest plot, and narrative synthesis when necessary.
Total participants	total_participants	Aggregate number of participants across the primary studies included in the review.	Integer (e.g., 10,230) or "Not reported." If not explicitly reported, calculate the total from the study-characteristics table when feasible and document the calculation in notes.
Age range	age_range	Age range represented in the review sample.	Numeric range or free text (e.g., 10–19). Record the age range of the review sample rather than only the authors' definition of adolescence, unless that is the sole information available.

Variable	Code	Description	Response Format and Coding Guidance
Mean age	age_mean	Mean age of participants represented in the review.	Continuous value (e.g., 15.2) or “Not reported.”
Age standard deviation	age_sd	Standard deviation of participant age represented in the review.	Continuous value (e.g., 2.1) or “Not reported.”
Country or region	country_region	Countries or regions represented by the participant samples.	Free text (e.g., United States, Portugal, multiple countries).
Population type	population_type	Type of population included in the review.	Free text (e.g., clinical, general population, school-based).
Primary-study designs	study_design_primary_studies	Designs of the primary studies included in the review.	Free text or bullet points (e.g., randomized controlled trial, cross-sectional, longitudinal, mixed-methods, qualitative). Report study counts by design when available.
Social Media Exposure and Mental Health Outcomes			
Social media platforms	platforms_analyzed	Social media platforms examined in the included primary studies.	List of platforms (e.g., Instagram, TikTok). Record platforms represented in the included evidence rather than platforms appearing only in the search strategy.
Definition or operationalization of social media use	social_media_definition	How social media use was defined or operationalized.	Free text (e.g., frequency, daily use, problematic use, emotional investment). Distinguish broad use indicators from problematic-use constructs when possible.
Social media measurement	social_media_measurement	Measures or instruments used to assess social media use.	Free text (e.g., self-report questionnaire, platform-tracked use, Bergen Social Media Addiction Scale).
Mental health outcomes	mental_health_outcomes	Mental health symptoms or constructs examined.	Free text (e.g., depressive symptoms, anxiety symptoms, depression, anxiety, psychological distress). Identify depression and anxiety separately when possible.
Mental health measurement	mental_health_measurements	Measures or instruments used to assess mental health outcomes.	Free text (e.g., PHQ-9, GAD-7). Record named instruments and the corresponding outcome when useful.

Variable	Code	Description	Response Format and Coding Guidance
Review Findings and Meta-Analytic Results			
Main findings	main_findings	Main results or conclusions reported by the review.	Free-text summary. Capture the direction, consistency, and strength of findings without introducing conclusions not supported by the review.
Meta-analytic effect metric	meta_effect_metric	Effect-size metric used in the meta-analysis.	Free text (e.g., r, OR, RR, SMD, Hedges' g). Enter "Not applicable" when no meta-analysis was conducted.
Pooled effect estimate	meta_effect_value	Pooled effect-size estimate reported in the meta-analysis.	Continuous value (e.g., 0.32 or 1.45). Enter "Not applicable" when no meta-analysis was conducted. When several estimates are reported, identify the relevant exposure–outcome pairing.
Lower confidence-interval bound	meta_ci_lower	Lower bound of the confidence interval for the pooled effect estimate.	Continuous value (e.g., 0.18). Enter "Not applicable" when no meta-analysis was conducted.
Upper confidence-interval bound	meta_ci_upper	Upper bound of the confidence interval for the pooled effect estimate.	Continuous value (e.g., 0.45). Enter "Not applicable" when no meta-analysis was conducted.
Number of studies in meta-analysis	meta_k	Number of primary studies contributing to the meta-analysis.	Integer (e.g., 12). Enter "Not applicable" when no meta-analysis was conducted. This value may differ from n_included_studies.
Direction and significance of association	assoc_direction_significance	Direction and statistical significance of the reported association.	"Statistically significant and positive," "Statistically significant and negative," "Not statistically significant," "Mixed," or "Not reported." Document complex patterns in notes.
Moderators and mediators	moderators_mediators	Moderator or mediator variables examined or discussed.	Free text (e.g., gender, time spent online, social comparison, fear of missing out, sleep). Distinguish variables formally tested from mechanisms discussed only narratively.
Methodological and Contextual Information			
Quality appraisal tool	quality_tool	Instrument used by the review authors to appraise methodological quality or risk of bias in the primary studies.	Free text (e.g., Newcastle–Ottawa Scale, JBI checklist, adapted STROBE tool) or "Not reported." Record relevant adaptations.

Variable	Code	Description	Response Format and Coding Guidance
Quality summary	quality_summary	Summary of the methodological-quality or risk-of-bias judgments reported by the review authors.	Free text (e.g., high, moderate, low; numerical range; narrative summary) or “Not reported.”
Review limitations	review_limitations	Main methodological or conceptual limitations of the systematic review, as reported or discussed by its authors.	Brief free-text summary or bullet points (e.g., predominance of cross-sectional studies, inconsistent social media measures).
Funding	fundings	Funding source for the included review.	Free text or “Not reported.” Record funder names and grant information when available.
Conflicts of interest	conflicts_of_interest	Conflicts of interest declared by the review authors.	Free text, “None declared,” or “Not reported.” Distinguish an explicit declaration of no conflicts from an absent statement.
Administrative Fields			
Notes	notes	Open field for extractor comments and audit information.	Free text. Record uncertainties, assumptions, reporting inconsistencies, calculations, checked pages or sections, and interpretative decisions.

Note. CI = confidence interval; GAD-7 = Generalized Anxiety Disorder-7; JBI = Joanna Briggs Institute; OR = odds ratio; PHQ-9 = Patient Health Questionnaire-9; RR = risk ratio; SD = standard deviation; SMD = standardized mean difference; STROBE = Strengthening the Reporting of Observational Studies in Epidemiology.

Appendix C

Final Reconciled Data Extraction Dataset

The complete reconciled dataset is available in Microsoft Excel format on the Open Science Framework: https://doi.org/10.17605/OSF.IO/UPBDC.

Appendix D

Methodological Quality Appraisal

Table D1

JBI Critical Appraisal of Included Reviews

Author (Year)	Type of review	JBI item ratings	Overall appraisal and key limitations
Alfredson et al. (2024)	Systematic review / narrative synthesis	1: Yes; 2: Yes; 3: Yes; 4: Yes; 5: Unclear; 6: Yes; 7: Yes; 8: Yes; 9: Unclear; 10: Yes; 11: Yes	**Moderate-to-high methodological quality.** The review had a clear objective, preregistered protocol, appropriate eligibility criteria, broad database search, duplicate screening/data extraction, and suitable narrative synthesis. Main limitations were the use of a STROBE-derived reporting tool rather than a formal risk-of-bias instrument and no formal publication bias assessment, although publication bias was acknowledged as a possible limitation.
Damodar et al. (2022)	Systematic review / narrative synthesis	1: Yes; 2: Yes; 3: Unclear; 4: No; 5: No; 6: No; 7: No; 8: Unclear; 9: No; 10: No; 11: Yes	**Low methodological quality.** The review had a clear objective and broadly appropriate inclusion criteria, but the search was limited to PubMed and English-language articles and was incompletely reported. No formal quality appraisal was conducted, no clear methods to minimize extraction errors, and limited description of the synthesis process. Recommendations for practice were not fully supported by the strength of the available evidence, although future research directions were appropriate.
Ivie et al. (2020)	Systematic review / meta-analysis	1: Yes; 2: Yes; 3: Yes; 4: Yes; 5: Yes; 6: Yes; 7: Yes; 8: Yes; 9: Yes; 10: Yes; 11: Yes	**High methodological quality.** The review had a clear question and eligibility criteria, an adequate search across three databases, appropriate NHLBI quality appraisal, independent critical appraisal, independent coding of study characteristics with reliability assessment, suitable random-effects meta-analysis, assessment of heterogeneity, and formal publication bias assessment using funnel plot inspection. The main limitation was the absence of a registered protocol.
Keles et al. (2020)	Systematic review / narrative synthesis	1: Yes; 2: Yes; 3: Yes; 4: Yes; 5: Yes; 6: Yes; 7: Yes; 8: Yes; 9: No; 10: Unclear; 11: Yes	**High methodological quality.** The review was preregistered, had clear eligibility criteria, searched five relevant databases using structured terms, conducted duplicate data extraction and independent quality appraisal with an appropriate NIH tool, and used narrative synthesis appropriately due to outcome heterogeneity. The main limitations were the lack of formal publication bias assessment and the absence of clear policy or practice recommendations.

Author (Year)	Type of review	JBI item ratings	Overall appraisal and key limitations
Liu et al. (2022)	Systematic review / dose–response meta-analysis	1: Yes; 2: Yes; 3: Yes; 4: Yes; 5: Unclear; 6: Unclear; 7: Yes; 8: Yes; 9: Yes; 10: Yes; 11: Yes	**Moderate-to-high methodological quality.** The review had a clear question and eligibility criteria, adequate search across three relevant databases, duplicate screening/data extraction, appropriate meta-analytic and dose-response methods, and formal assessment of publication bias. Main limitations were the absence of a reported protocol and unclear independent critical appraisal; quality assessment was based on MOOSE/STROBE-derived criteria rather than a formal risk-of-bias tool.
Mulisa et al. (2026)	Systematic review / narrative synthesis	1: Yes; 2: Yes; 3: Yes; 4: Yes; 5: Unclear; 6: Yes; 7: Yes; 8: Yes; 9: No; 10: Yes; 11: Yes	**Moderate-to-high methodological quality.** The review had clear research questions, defined eligibility criteria, PROSPERO registration, relevant search terms, three relevant databases, duplicate data extraction and quality appraisal, and an organized narrative synthesis. Main limitations were the use of PRISMA rather than a formal critical appraisal tool and the absence of publication bias assessment.
Nan et al. (2024)	Systematic review / meta-analysis	1: Yes; 2: Yes; 3: Yes; 4: Yes; 5: No; 6: No; 7: Yes; 8: Yes; 9: Yes; 10: Yes; 11: Yes	**Moderate methodological quality.** The review had a clear objective, PROSPERO registration, explicit eligibility criteria, a broad and reproducible search across several databases and dissertation sources, independent screening/coding procedures, appropriate random-effects meta-analysis, heterogeneity and moderator analyses, sensitivity analysis, and formal publication bias assessment. However, no formal quality appraisal or risk-of-bias assessment of the included primary studies was reported, and therefore independent critical appraisal was not conducted.
Piteo & Ward (2020)	Systematic review / narrative synthesis	1: Yes; 2: Yes; 3: Yes; 4: Yes; 5: Yes; 6: Yes; 7: Yes; 8: Yes; 9: Unclear; 10: Yes; 11: Yes	**High methodological quality.** The review had a clear objective, appropriate eligibility criteria, a reproducible search strategy across four relevant databases, hand-searching of reference lists, independent full-text assessment, checked data extraction, appropriate use of the NHLBI quality assessment tool, and a narrative synthesis justified by methodological heterogeneity. Main limitations were the absence of a reported protocol and the lack of a formal assessment of publication bias.

Author (Year)	Type of review	JBI item ratings	Overall appraisal and key limitations
Sarmiento et al. (2020)	Systematic narrative review	1: Yes; 2: Yes; 3: Yes; 4: Yes; 5: No; 6: No; 7: No; 8: Yes; 9: No; 10: Yes; 11: Yes	**Low-to-moderate methodological quality.** The review had a clear objective, appropriate eligibility criteria, a broad search across EBSCOhost and ProQuest, covering multiple relevant databases, and an appropriate narrative synthesis given the conceptual and methodological heterogeneity of the included studies. However, no formal quality appraisal was reported, there was no independent duplicate appraisal, methods to minimize data extraction errors were unclear, and publication bias was not assessed.
Yigiter et al. (2024)	Systematic review / meta-analysis	1: Yes; 2: Yes; 3: Yes; 4: Yes; 5: Unclear; 6: Unclear; 7: Yes; 8: Yes; 9: Yes; 10: Yes; 11: Yes	**Moderate-to-high methodological quality.** The review had a clear objective and research questions, appropriate eligibility criteria, a broad search across 10 databases including dissertation sources, reported search keywords, transparent coding procedures with high inter-coder reliability, appropriate random-effects meta-analysis, heterogeneity and moderator analyses, and formal publication bias assessment using funnel plot symmetry and PET/PEESE. Main limitations were the absence of a reported protocol and the use of a "best practices" analysis rather than a formal risk-of-bias or methodological quality appraisal tool, making independent critical appraisal unclear.

Note. Item numbers correspond to the JBI checklist domains: 1 = review question; 2 = inclusion criteria; 3 = search strategy; 4 = sources/resources; 5 = appraisal criteria; 6 = independent critical appraisal; 7 = methods to minimize errors in data extraction; 8 = synthesis methods; 9 = publication bias; 10 = policy/practice recommendations; 11 = future research directions. Overall methodological quality was classified using the descriptive rule reported in the Methods and does not represent an official JBI rating. JBI = Joanna Briggs Institute; MOOSE = Meta-analysis Of Observational Studies in Epidemiology; NHLBI = National Heart, Lung, and Blood Institute; PET/PEESE = precision-effect test/precision-effect estimate with standard error; PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses; PROSPERO = International Prospective Register of Systematic Reviews; STROBE = Strengthening the Reporting of Observational Studies in Epidemiology.

Appendix E

Overlap of Included Publications Across Reviews

Table E1

Pairwise Corrected Covered Area Between Included Reviews

Review	1	2	3	4	5	6	7	8	9	10
1. Alfredson et al. (2024)	—									
2. Damodar et al. (2022)	0.0	—								
3. Ivie et al. (2020)	0.0	0.0	—							
4. Keles et al. (2020)	3.2	2.9	8.7	—						
5. Liu et al. (2022)	7.1	0.0	**18.8**	2.6	—					
6. Mulisa et al. (2026)	13.3	0.0	0.0	0.0	5.5	—				
7. Nan et al. (2024)	2.2	0.0	0.0	0.0	1.9	1.7	—			
8. Piteo & Ward (2020)	5.6	2.4	**24.0**	**23.1**	9.8	2.0	0.0	—		
9. Sarmiento et al. (2020)	0.0	0.0	10.0	8.3	7.1	0.0	0.0	7.7	—	
10. Yigiter et al. (2024)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	—

Overlap category

Slight (≤5%)	Moderate (>5% to ≤10%)	High (>10% to ≤15%)	Very high (>15%)

Note. Values are pairwise corrected covered area (CCA) percentages calculated from the publication-level citation matrix. Cell shading follows the graphical classification used in the GROOVE approach: values of 5% or lower indicate slight overlap, values above 5% and up to 10% moderate overlap, values above 10% and up to 15% high overlap, and values above 15% very high overlap (Bracchiglione et al., 2022). The overall CCA was 2.4%. Sarmiento et al. (2020) reported 68 distinct publications, but 65 could be individually identified and entered in the matrix.

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