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From Social Media to Artificial Intelligence: Improving Research on Digital Harms in Youth

Supplementary Table 1: Key findings from a rapid review of published reviews, describing and critically appraising the 25 most impactful recent review papers of technology effects on young people's mental health (reference list below table).

STUDY	METHODS	FINDINGS
[1] Berger et al., 2022[1] Review Type: Systematic Outcome: Health and well-being Target Population: LGBTQIA+ youths Altmetric Score: 799	Systematic review of 26 studies reporting research on social media use and mental health in LGBTQIA+ youths. Most studies were qualitative (15), 8 quantitative and 3 mixed methods. Quantitative studies were mostly cross-sectional (6), with 2 cohort studies. Systematic - risk of bias integrated with results	Studies were judged as moderate to high quality. Social media was regarded as a positive means to connect with LGBTQIA+ communities; most studies focused on identity management; social media use was associated with better mental health and well-being in LGBTQIA+ youths.
[2] Sanders et al., 2023[2] Review Type: Systematic Outcome: Education and health, including depression Target Population: Children and adolescents Altmetric Score: 718	Umbrella (systematic) review of 102 meta-analyses of risks associated with youths' screen-time, including 12 reporting depression outcomes. Systematic - risk of bias integrated with results	Social media was associated with poorer psychological well-being, although only 6 meta-analyses on depression outcomes met the standards for inclusion in meta-analysis; most included meta-analyses had high heterogeneity and medium to high risk of bias.
[3] Eirich et al., 2022[3] Review Type: Systematic Outcome: Internalising and externalising problems Target Population: Children up to 12 years old Altmetric Score: 337	Systematic review and meta-analysis of associations between screen-time (including television and video games) with behaviour problems in children up to 12 years old. 87 studies (98 samples) met the eligibility criteria, including both cross-sectional (50 samples) and longitudinal (40 samples) designs. Systematic - study quality integrated with results	Higher duration of screen-time was associated with more externalising and internalising problems. Significant heterogeneity of effects was accounted for by weaker correlations with longitudinal studies that controlled for baseline outcomes, compared to those that did not control for baseline and cross-sectional studies. Also, effects sizes for the association between screen time and externalizing problems decreased as study quality increased.

[4] Alonzo et al., 2020[4] Review Type: Systematic Outcome: Mental health, sleep quality Target Population: Young people (aged 16-25) Altmetric Score: 268	Systematic review of 36 studies assessing associations between social media use, sleep quality, and mental health (anxiety, depression, psychological distress) in young people aged 16-25. Both cross-sectional and longitudinal studies were included. Quality assessed but no exclusions or quality comparisons in synthesis	Overall, excessive social media use was associated with both poor mental health and poor sleep, and poor sleep was also associated with poor mental health. Some longitudinal studies suggested that the role of social media on mental health was mediated via poor sleep. Recommendations are for further research to assess directionality of effects.
[5] Liu et al., 2022[5] Review Type: Systematic Outcome: Depression Target Population: Adolescents Altmetric Score: 257	Dose-response systematic review and meta-analysis of odds ratios for the association between social media time and depression in adolescents. Cross-sectional (21) and longitudinal (5) studies were included. Quality assessed but no studies excluded from meta-analysis	Overall, social media time was positively associated with depression symptoms. High heterogeneity was partially accounted for by gender. Five studies included in dose-response analysis suggested that each extra hour of social media was associated with a 13% increase in depressive symptoms. Recommendations are to interpret findings with caution as situational factors may also contribute and more causal studies are required.
[6] Fassi et al., 2024[6] Review Type: Systematic Outcome: Internalising symptoms Target Population: Clinical and community adolescent samples Altmetric Score: 185	Systematic review and meta-analysis of 143 studies quantifying the association between social media use (time spent or type of engagement) and internalizing symptoms (anxiety, depression) in clinical (11%) and community adolescent samples. Both cross-sectional and longitudinal analyses included, not experimental studies or trials. Quality assessed but no exclusions or quality comparisons in synthesis	Internalizing symptoms were positively correlated with both time spent and user engagement in both community and clinical samples. Recommendations to increase research on social media effects with clinical samples in order to make better comparisons with nonclinical populations.
[7] Li et al., 2022[7] Review Type: Systematic Outcome: Depression risk Target Population: Children and adults Altmetric Score: 183	Meta-analysis of 18 cohort studies reporting associations between screentime and depression risk, using a random-effect model and test of heterogeneity. Population and scope very broad for a systematic review. Systematic - study quality integrated with results	Screentime significantly predicted depressive symptoms (risk ratio = 1.1), with high heterogeneity (I 2 = 83%). Heterogeneity is accounted for by a range of factors, with notably weaker associations when baseline mental health is adjusted for. Heterogeneity declined significantly as study quality improved.

[8] Santos et al., 2023[8] Review Type: Systematic Outcome: Mental health Target Population: Adolescents Altmetric Score: 174	Narrative systematic review of 50 studies reporting associations between 'screen exposure' and mental health, 38 cross-sectional and 12 longitudinal. No dataflow diagram and very limited search terms. Narrative synthesis not easy to interpret. Not systematic, published after 5 revisions. Quality not reported	Authors conclude that smartphones are the most commonly used device and that social media use is associated with poorer wellbeing overall, and with risk of depression in girls. Recommendations for future research to compare effects between device types.
[9] Shannon et al., 2022[9] Review Type: Systematic Outcome: Problematic social media use Target Population: Adolescents and young adults Altmetric Score: 168	Systematic review and meta-analysis of 18 cross-sectional studies reporting associations between problematic social media use (measured similar to addiction) and mental health (depression, anxiety, stress). Heterogeneity was assessed by age, gender and publication year. Quality assessed but low quality studies not excluded or tested in meta-analysis	Problematic social media use was associated with depression, anxiety and stress. Substantial heterogeneity for all three outcomes, not accounted for by age, gender, or publication year.
[10] Tang et al., 2021[10] Review Type: Systematic Outcome: Internalising symptoms Target Population: Adolescents Altmetric Score: 115	Systematic review of 35 longitudinal studies investigating effects of screentime (duration, frequency) on internalising mental health symptoms (depression, anxiety, wellbeing, psychological distress) in adolescents. No explicit tests of heterogeneity. Appendices are missing. Quality assessed but minimal and poor quality studies not excluded or tested in synthesis	Associations between screentime and subsequent depression were very small, and limited evidence of reverse association, such that depression predicts later screen use. Associations varied by device type and use. Even less evidence of screen use predicting other outcomes. Recommendations for further research on content type and motivations.
[11] Ivie et al., 2020[11] Review Type: Systematic Outcome: Depressive symptoms Target Population: Adolescents (11-18 years) Altmetric Score: 88	Random effects meta-analysis of 12 studies reporting associations between social media use and depressive symptoms in adolescents (aged 11-18 years). Correlations used in meta-analysis were all cross-sectional. Search terms, eligibility and reporting is limited. Heterogeneity not broken down to investigate moderators Quality assessed but weakly and not considered in synthesis	Small positive association found between social media use and depressive symptoms, with high heterogeneity. Recommendations to investigate moderators.

[12] Kostyrka-Allchorne et al., 2023[12] Review Type: Systematic Outcome: Wellbeing (including self-regulation) Target Population: Adolescents with pre-existing mental health conditions Altmetric Score: 76	Systematic review of 5 qualitative and 21 quantitative studies focused on the impact of digital experiences on the mental health of adolescents with existing mental health disorders, including depression, self-injury, and eating disorders. Quality assessed but no exclusions or quality comparisons in synthesis	Themes identified within the digital experiences of the clinical population were social connectivity, escape, social comparison, harmful content, cyberbullying, and self-regulation.
[13] Dane & Bhatia, 2023[13] Review Type: Scoping Outcome: Eating disorders Target Population: Young people (aged 10-24) Altmetric Score: 1664	Scoping review of 50 studies from 17 countries, published between 2016 and 2021. 45 quantitative (30 cross-sectional, 6 experimental, 5 mixed methods, 2 ecological momentary assessment, and 2 longitudinal observational studies) and 5 qualitative studies. Conclusions seem strong for a scoping review with no formal quality assessment. Narrative discussion of quality	Positive correlations were found between social media usage and body image concerns, with moderators; interpreted as causal effects of social media use, mediated by social comparison, ideal body internalisation, and self-objectification.
[14] Bozzola et al., 2022[14] Review Type: Scoping Outcome: Depression, diet, psychological problems Target Population: Children and adolescents Altmetric Score: 982	Scoping review, types of studies not clearly summarised. Reference to 68 reports; 15 reviews (2 systematic, 1 validation study, 1 editorial), 8 cross-sectional and 9 longitudinal studies. Ungrounded recommendations, lacking detail or comprehensive search. Quality not reported	Risks reported to be associated with social media use were primarily depression (19 studies), diet (15) and psychological problems (15), but also sleep, addiction, anxiety, sex related issues, behavioural problems, body image, physical activity, online grooming, sight, headache, and dental caries. Recommendations given for health practitioners and paediatricians.
[15] Oswald et al., 2020[15] Review Type: Scoping Outcome: Psychological wellbeing Target Population: Children and adolescents (aged 0-18) Altmetric Score: 560	Systematic scoping review to assess associations between screen-time, green-time, and psychological outcomes, including mental health, in children and adolescents. 186 quantitative studies were included, of which 116 were cross-sectional, 70 used time-series data. 114 assessed screen-time effects, 58 assessed green-time, 14 assessed both. Narrative discussion of quality	Most studies are cross-sectional, measures of screen-time and green-time are highly heterogeneous, and studies rarely include both screen-time and green-time as exposures. Associations judged as consistent, with negative impacts of screen-time and positive impacts of green-time on psychological outcomes, with young people from low socio-economic backgrounds most disproportionately affected. Recommendations for future research include high-quality longitudinal studies and randomised controlled trials to support causal interpretations.

[16] Vidal et al., 2020[16] Review Type: Scoping Outcome: Depression Target Population: Adolescents Altmetric Score: 540	Narrative (thematic) scoping review of 42 studies reporting bi-directional associations between social media use and depression in adolescents. Mostly cross-sectional designs, 7 studies with a time-series element. Quality not reported	Four themes identified for social media use (quantity, quality, social aspects, disclosure of mental health symptoms). Recommendations for future research are longitudinal designs, timely and objective measures, mechanistic investigations, and data from clinical populations.
[17] Ghai et al., 2023[17] Review Type: Scoping Outcome: Depression Target Population: Adolescents Altmetric Score: 87	Scoping review and meta-analysis with specific research questions investigating degree of global representation of adolescents in studies of effects of social media on depression. Heterogeneity was assessed and broken down by region of adolescent population (Global North vs Global South). Within region diversity was compared with visualisations. Quality not reported	The majority of studies examined adolescents in the Global North (70%). The correlation between social media use and depression was positive in the Global North, but there was no effect for Global South populations. Within region diversity was also generally limited and often not reported. Recommendations are to address this lack of generalisability in future studies.
[18] Odgers & Jensen, 2020[18] Review Type: Narrative Outcome: Depression, anxiety Target Population: Adolescents Altmetric Score: 1321	Narrative review, covering narrative reviews, meta-analyses, pre-registered cohort studies, longitudinal and ecological momentary assessment studies. Exposures are broad - digital technologies and social media; outcomes are depression and anxiety. Narrative discussion of quality	Studies investigating effects of mobile device and social media usage on adolescent mental health are mostly correlational; effects are small or inconsistent; findings are not of clinical or practical significance.
[19] Orben, 2020[19] Review Type: Narrative Outcome: Psychological wellbeing Target Population: Adolescents Altmetric Score: 786	Narrative review of 80 systematic reviews and meta-analyses, looking at methodology of research on digital technologies and adolescent well-being. Low quality studies excluded from synthesis	Research on adolescent technology use and well-being is dominated by cross-sectional and low quality studies; studies do not sufficiently take into account different types of technology use; effects are small and inconsistent.

[20] Valkenburg et al., 2021[20] Review Type: Narrative Outcome: Mental health Target Population: Adolescents Altmetric Score: 501	Narrative review of 25 reviews of associations between social media use and mental health in adolescents. Included reviews were 7 meta-analyses, 9 systematic reviews, and 9 narrative reviews. Umbrella review but no discussion of study quality or bias. Quality not reported	Most of the reviews analysed interpreted associations as weak or inconsistent. Recommendations for future research included gathering more repeated within-person observations (time-series data) and addressing inconsistent findings to understand when, why, and for whom SMU can lead to positive or negative effects on mental health.
[21] Orben et al., 2024[21] Review Type: Narrative Outcome: Mental health Target Population: Adolescents Altmetric Score: 296	Theoretical review of mechanisms by which social media might amplify the developmental changes that increase adolescent vulnerability to poor mental health. No specific criteria for included studies. Quality not reported	A framework for testing mechanisms is outlined as a set of affordances that should be considered when measuring adolescents' social media usage. This includes sharing risky content, self-presentation, social comparison and responsiveness to feedback.
[22] Mougharbel & Goldfield, 2020[22] Review Type: Narrative Outcome: Depression, anxiety, psychological well-being, psychosocial wellbeing, body image concerns Target Population: Children and adolescents Altmetric Score: 248	Narrative review synthesising 60 studies reporting associations between screen time and mental health outcomes (depression, anxiety, psychological wellbeing, body image concerns). Cross-sectional and longitudinal studies published in the last 5 years (2015-2019) are included. Conclusions seem strong for no quality assessment. Quality not reported	Higher levels of screen-time were generally associated with depressive symptoms, and to some extent poorer wellbeing and body dissatisfaction, but associations with anxiety were not consistent. Social media was more consistently associated with poorer mental health. Heterogeneity was partly accounted for by type of screen usage, gender and age.
[23] Choukas-Bradley et al., 2022[23] Review Type: Narrative Outcome: Mental health and body image concerns Target Population: Female adolescents Altmetric Score: 139	Theoretical review of the role of social media on body-image concerns as a mechanisms impacting mental health. Relevant outcomes are depressive symptoms and disordered eating. Cross-sectional studies are discussed when no stronger evidence is available. Conclusions seem strong as no discussion of study quality. Quality not reported	Conclusion suggests that social media can increase body-image concerns by increased focus on physical appearance of others and self, and that this in turn leads to increased symptoms of depression and disordered eating.

[24] Odgers & Jensen, 2020[24] Review Type: Narrative Outcome: Mental health Target Population: Adolescents Altmetric Score: 83	Theoretical review of reviews and studies on effects of social media use on adolescent mental health. Very broad scope perspective piece. Narrative discussion of quality	Findings presented stress that concerns about negative social media effects are not supported by the science, that online risks tend to mirror or extend offline risks, and that more attention needs to be given to the opportunities to support adolescents, both online and offline.
[25] Odgers et al., 2020[25] Review Type: Narrative Outcome: Social and emotional wellbeing Target Population: Adolescents Altmetric Score: 73	Narrative review discussing the magnitude of effects, considering population level effects versus more vulnerable populations. No systematic search. Narrative discussion of quality	The conclusion highlights that effects of social media are small and do not support causal interpretations, outlines the challenges of looking at population level effects, proposes considering more vulnerable populations, and suggests better collaboration with nongovernmental organisations.

Footnote: The 25 most impactful recent reviews of social media effects on adolescent mental health were identified by sorting search results, in descending order, on Altmetric Attention Score. The Altmetric score reflects the number of people who have mentioned the article online, such as in peer-reviewed publications, in news articles, on social media, in blogs and in policy documents. Results in the table are sorted first by type of review (Systematic, Scoping, Narrative) and then by Altmetric Attention Score (descending).

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