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Smartphone use and well-being of adolescent girls: a population-based study

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ABSTRACT

Background and objectives Recent studies have reported an increasing incidence of anxiety among adolescent girls, and associated this with self-reported social media use. This study aimed to measure smartphone and social media use objectively and to evaluate its associations with measures of mental health and well-being.

Methods In autumn 2022, we recruited a cohort of 1164 first-year female students from 21 socioeconomically diverse high schools. Students responded to an online survey comprising validated questionnaires (Bergen Social Media Addiction Scale (BSMAS), Generalised Anxiety Disorder-7, and Body Appreciation Scale 2) and visual analogue scales of current health, mood, tiredness, and loneliness. We also requested that they attach screenshots depicting their smartphone use.

Results Among participants (mean age 16.3 years), 16% (n=183) had possible social media addiction and 37% (n=371) exceeded the cut-off for possible anxiety disorders. The BSMAS scores were associated with higher anxiety (r=0.380) and poorer body image (r=−0.268), poorer health (r=−0.252), lower mood (r=−0.261), greater tiredness (r=0.347), and greater loneliness (r=0.226) (p<0.001 for all). Among the 564 adolescents (48%) who sent screenshots of their smartphone use, average daily use was 5.8 hours (SD 2.2), including 3.9 hours (SD 2.0) of social media. Participants who sent screenshots had a higher grade point average than participants without screenshot data, but similar BSMAS and well-being measures.

Conclusions Consistent with other studies, we found social media addiction was common among adolescent girls and was associated with poorer mental health and well-being. Measures should be taken to protect adolescents from the potential harmful effects of social media use.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Recent studies have indicated increasing anxiety among adolescent girls and associated this with social media use. We found no previous studies combining objectively collected data on smartphone or social media use and validated measures of social media addiction and well-being.

WHAT THIS STUDY ADDS

⇒ In a population-based cohort, smartphone use approached 6 hours daily and one in six adolescent girls had possible social media addiction. Social media addiction scores were associated with poorer well-being.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Objectively measured smartphone and social media use should be assessed in both research and practice settings, while policymakers should limit the addictive elements of social media.

INTRODUCTION

Anxiety and other mental disorders are significant contributors to adolescent morbidity in high-income countries.[1 2] Since 2013, reports from high-income countries have indicated a significant rising trend in the prevalence of anxiety, especially among girls.[1 2] In some countries, mental health problems are already the leading cause of absence from work among young adults.[3] During the COVID pandemic, anxiety rates among adolescent girls continued to increase.[4]

In a decade, the rapid evolution of technology and applications have led to an unprecedented increase in both the frequency of use and cumulative time spent on social media. A longitudinal study from the UK from 2013 to 2015 found that very frequent social media use, more than three times daily, predicted later psychological distress.[5] In time-use diaries from 2015, 73% of participants used social media for less than 30 min daily, and highest social media use was defined as 120 min daily or more.[6] A longitudinal study from the USA conducted between 2014 and 2016 found that more than 3 hours of social media use, compared with no use, was associated with an increased risk of internalising problems 1 year later (relative risk 1.60).[7] In 2021, American adolescents daily spent on average 3.5 hours on social media and, in 2023, the US Surgeon General's advisory increased awareness of the connection between social media and youth mental health.[8 9]

Anxiety related to social media use may be related to several factors, one of which is addiction.[10] Social media addiction conforms to the same criteria as other behavioural addictions: time spent, craving, attempted control, withdrawal symptoms, and social problems.[11] International prevalence estimates of social media addiction range between 5% and 31%.[10] We found no studies combining objectively collected data on social media use with mental health outcomes. The research community has called for more detailed, objective measures of smartphone and social media use and for utilising validated assessment tools whenever possible.[12 13]

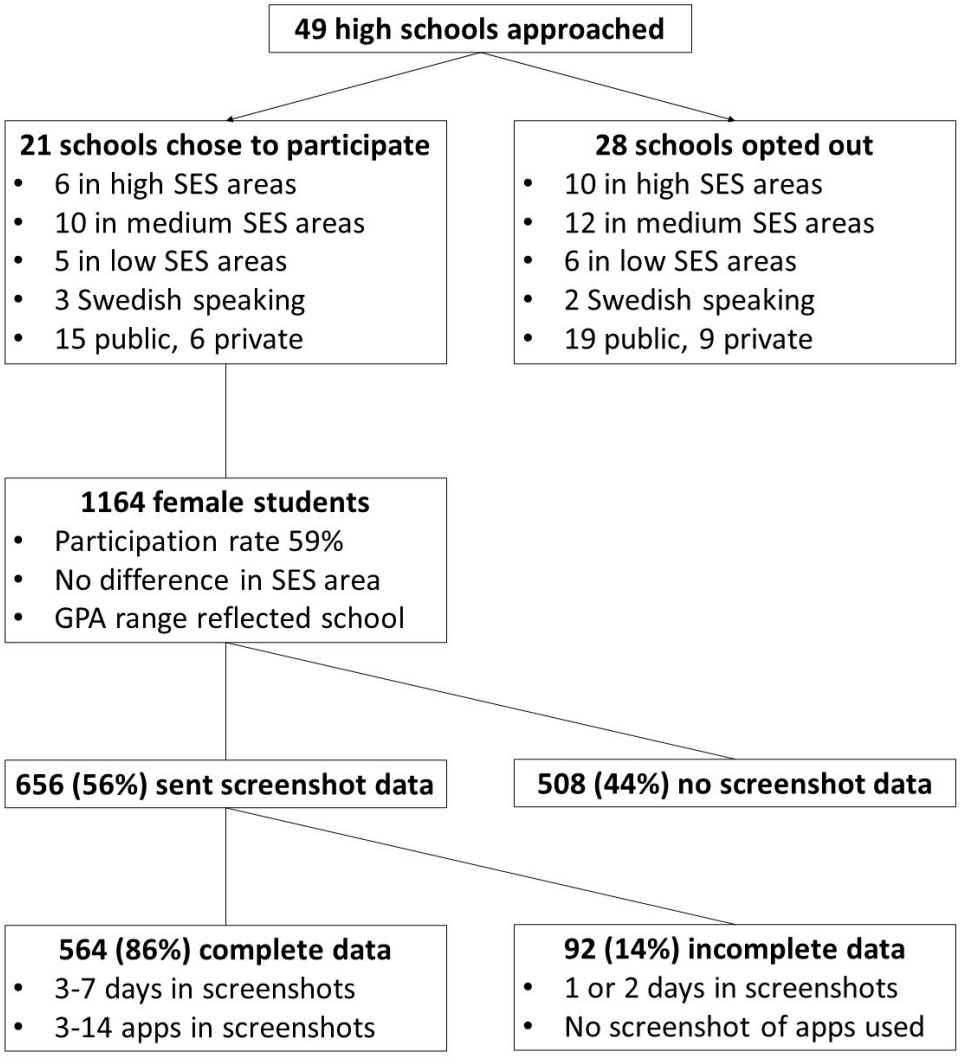

Figure 1 Flow chart of data collection. In Finland, all education is publicly funded until a person turns 18 or completes their upper secondary education (ie, academic high school or vocational education). Private schools offer the same education as public schools based on the national education plans, and they cannot charge fees for tuition. GPA, grade point average; SES, socioeconomic status.

Because both anxiety and social media use are more prevalent among girls, we aimed (1) to measure objectively the time adolescent girls spend using their smartphones and especially social media,(2) move beyond simple measures of duration by measuring possible social media addiction using a validated scale, and (3) estimate the associations of social media use and social media addiction with well-being. We hypothesised that social media use and addiction would be associated with increased anxiety, tiredness and loneliness, and worse body image, health and mood among adolescent girls.

METHODS

Setting and design

The School, Sport, and Social media study (3S) is a population-based, prospective cohort study. The study documents were developed in collaboration with the nine young members of the Youth Research Advisory Board of the Helsinki University Hospital, Helsinki, Finland. After the authors drafted the questionnaire and information and consent forms, the board reviewed them and all documents were revised based on the feedback from the board. Here, we report the findings from the first wave of data collection.

After ethics approval and the approval of the respective municipal educational administrations, we contacted all 49 high schools of three large cities in the capital region of Finland (Helsinki, Espoo, and Vantaa; background population 1.2 million). The principal of each school decided whether the school would participate.

Students are aged 15–16 years at the start of high school. At the end of 2021, the population of 15-year-old girls in these cities totalled 6030.[14] After ninth grade, academic high school positions are provided for about 66% of the birth cohort, while the rest continue to vocational education. Education is publicly funded, although some schools are operated by independent organisations. In Finland, school grades range from 4 to 10 (4 means failing a subject and 10 means high achievement) and, in the study area, a minimum grade point average (GPA) of 7.0 at the end of ninth grade is required for entry into high school (school years 10–12).

In 2021, 99% of the population aged 16–24 years owned a smartphone in Finland.[14]

Study population

We visited the participating high schools at the start of the autumn term 2022 and, after providing information on the study to first year female students, collected consent forms from voluntary participants. Participants completed a survey using RedCap, a secure online tool for surveys and databases. Surveys were available in both official languages, Finnish and Swedish. Participants received a movie ticket (value 9€ (£7.70)) after survey completion. Based on power calculations, we aimed to recruit 1000 participants. Assuming a 10% prevalence of social media addiction,[10] this would allow detection of a 3-point difference between groups in outcome measures at 0.05 level.

Twenty-one geographically and socioeconomically diverse schools chose to participate. The 1164 participating adolescents comprised 59.1% of female high school students in the participating high schools and 29.3% of all female high school students in the study area.

Measures

Demographic data included date of birth, self-reported gender (non-binary), school name and GPA at the end of the previous spring term.

Smart phone and social media use

Participants estimated their daily smartphone use and were then asked to attach screenshots of the tools (iPhone Screen Time, Huawei Digital Balance, Android Digital Wellbeing) measuring their smartphone use to the survey which allowed participation regardless of phone brand. From the screenshots, we recorded the number of days with screen time data available, daily smartphone pickups, number of most frequently used applications, and time spent using each of them. We divided the total screen time by the number of days for a variable of average daily screen time. We summed the time used on similar types of applications (eg, social media, shopping) and divided this sum by the number of days with data available to find the average daily time spent on different activities. Please see online supplemental table 1 for the classification of applications. We also calculated the proportion of total screen time explained by the data that were available from the screenshots.

Social media addiction

The Bergen Social Media Addiction Scale (BSMAS) was forward and backward translated into Finnish and Swedish and used to measure possible addiction.[15] BSMAS is a generalised modification of the previously validated Bergen Facebook Addiction Scale.[16] BSMAS is a 6-item tool with a 5-point Likert scale ('very rarely' to 'very often'). Total scores range from 6 to 30, with higher points indicating higher risk of social media addiction. The developers of BSMAS suggest that scoring 'often' or 'very often' (ie, 4 or 5 points) for at least four of the six items indicates addiction.

Anxiety

Anxiety was measured using the 7-item generalised anxiety disorder scale (GAD-7), which has been broadly used internationally and in both Finnish and Swedish.[17] Items are scored on a 4-point Likert scale ('not at all' to 'nearly every day'). Total scores range from 0 to 21, with higher points indicating higher levels of anxiety. A cut-off of 10 has a sensitivity of 89% and a specificity of 82% for diagnosis of generalised anxiety disorder (GAD), and 68% sensitivity and 88% specificity for any anxiety disorder.[18] Scores 10–14 may indicate moderate anxiety and scores ≥15 severe anxiety.[17]

Table 1 Characteristics of 1164 study participants

Self-reported gender, n (%)	
Female	1110 (95.3)
Male	12 (1.0)
Other	42 (3.6)
Age, mean (SD)	16.3 (0.5)
Middle school GPA, median (range)	9.0 (7.0–9.5)

In the study area, school grades vary between 4–10, and a minimum GPA of 7.0 is required for high school entry.
GPA, grade point average.

Body appreciation

The Body Appreciation Scale-2 (BAS-2) was available in Finnish and Swedish and was used to measure positive body image.[19 20] The BAS-2 consists of 10 items, each scored on a 5-point Likert scale ('never' to 'always'). Total scores range from 10 to 50, and higher scores indicate more positive body image.

General well-being

Participants evaluated their current health, mood, tiredness, and loneliness on visual analogue scales from 0 to 100 mm.[21 22] Tiredness and loneliness were reverse scored. In the results, higher scores indicate better well-being.

Statistical analysis

Descriptive statistics included frequencies for self-reported gender and adolescents who scored above the predefined cut-offs for possible addiction or anxiety. Means with SD were used for continuous variables with normal distribution and medians with IQR in case of uneven distribution. Pearson correlation coefficients between continuous variables were calculated according to the hypotheses. Welch's t-test was used to compare groups with possible social media addiction and no addiction. Adolescents who sent screenshots and those who did not were compared in a 'sensitivity analysis'. IBM SPSS Statistics version 25 was used for analyses.

Table 2 Estimated (n=1164) and objective (n=564) smartphone use

Estimated time (minutes/day) on social media, mean (SD)	312 (138)
Days with objective data available, median (IQR)	6 (3–7)
Applications in screenshots, median (IQR)	7 (6–10)
Minutes/day on smartphone, mean (SD)*	350 (133)
Social media, mean (SD)	231 (121)
Browser use, median (IQR)	11 (0–23)
Entertainment/streaming, median (IQR)	6 (0–31)
Education, median (IQR)	0 (0–6)
Creativity, median (IQR)	0 (0–5)
% phone use explained by screenshot data, median (IQR)	84.1 (75.2–91.3)

*Total minutes were available for all participants who sent screenshots. Applications included in the analyses were the 3–14 applications which individual participants used most frequently. These included 20 social media, 4 browser, 14 entertainment/streaming, 12 educational, and 4 creativity applications. In addition, screenshots included 88 different games, 6 online shopping applications, 6 health/sport applications, 5 news applications, and 4 travel applications, but the number of users was so small that the IQR of minutes/day for these applications was 0. Please see online supplemental table 2 for classification of applications.

Table 3 Social media addiction, anxiety, and body appreciation

BSMAS total score, mean (SD)	17.2 (4.6)
Possible social media addiction, n (%)	183 (16.6)
GAD-7 total score, median (IQR)	7 (4–12)
Possible anxiety disorder, n (%)	371 (37.2)
Severe anxiety, n (%)	138 (13.8)
BAS-2 total score, median (IQR)	34 (28–40)

Definition for possible social media addiction: scoring 4–5 (of maximum 5) points on at least four of the six items of the BSMAS. Cut-off for possible anxiety disorder: 10 of maximum 21 points on GAD-7. On BAS-2, higher scores indicate more positive body image (maximum 50).
Missing data: BSMAS n=61, GAD-7 n=167, BAS-2 n=136.
BAS-2, Body Appreciation Scale; BSMAS, Bergen Social Media Addiction Scale; GAD-7, Generalised Anxiety Disorder Scale.

Table 5 Correlations between the Bergen Social Media Addiction Scale Scores and wellbeing measures

	Pearson R
GAD-7 total score	0.38
BAS-2 total score	−0.268
VAS health	−0.252
VAS mood	−0.261
VAS tiredness	0.347
VAS loneliness	0.226

All differences p<0.001.

BAS-2, Body Appreciation Scale, VAS, visual analog scale; GAD-7, Generalised Anxiety Disorder Scale; r, correlation coefficient.

RESULTS

The flow chart of data collection is shown in figure 1 and participant characteristics are presented in table 1.

Adolescents estimated their daily time on social media to be 312 (SD 138) min, or 5.2 hours (table 2).

Data on average daily smartphone use based on at least 3 days of usage were available for 656 adolescents (56.4%) and 7 days of data for 298 (25.6%). Average daily smartphone use was 350 min, or 5.8 hours, and average time spent using social media was 231 min, or 3.9 hours. Within subject time estimates and objective data showed a medium correlation (r=0.418, p<0.001). No significant difference was found between weekdays or weekends or between data based on 3 to 6 or 7 days of usage (online supplemental table 2).

Detailed data on the most used applications were available for 564 adolescents (48.5%). In all, 205 adolescents (36.3% of those with data available) used social media for less than 3 hours daily, while 77 (13.6%) used social media for 6 hours or more. Data on the frequency of smart phone pick-ups was only available for 74 participants (13.1%); these ranged from 58 to 356 times daily (median 145). For 115 adolescents (20.4%) the most frequently used applications included games which they played for a median of 24 min (range 1–211) per day.

Based on the BSMAS, 183 adolescents (16.6%) had possible social media addiction (tables 3 and 4).

On the GAD-7, 371 adolescents (37.2%) scored above the cut-off for potential anxiety disorder.

In unadjusted analyses, daily time on social media was associated with lower GPA (r=−0.280, p<0.001), higher social media addiction scores (r=0.200, p<0.001), higher anxiety (r=0.123, p=0.008), and poorer body image (r=−0.108, p=0.017). Social media addiction scores were associated with higher anxiety, poorer body image, poorer health, lower mood, greater tiredness and greater loneliness (table 5).

The only difference found between adolescents who sent screenshots and those who did not was the higher GPA among adolescents who sent screenshots (online supplemental table 3).

DISCUSSION

In this study, daily smartphone use among study participants approached 6 hours, and objectively measured and self-reported times used on social media showed a medium correlation with each other. Daily time on social media was associated with lower GPA, increased anxiety, lower body image, and lower well-being.

Smartphone and social media use have increased very rapidly. When a cohort of British adolescents was followed from 2013 to 2015, the proportion of adolescents who used social media regularly more than three times daily increased from 42.6% to 68.5%.[5] In a UK study from 2015, 65% of 15-year-olds used social media for less than 30 min per day.[6] In a small Swedish study conducted in 2019, objectively measured smartphone use among 10- to 15-year-olds averaged 161 min per day,[23] compared with 350 min in our study.

Recently, experts have expressed that total screen time is irrelevant compared with what the screen time comprises.[24] In this cohort, adolescents spent nearly 6 hours daily on their smartphones, and educational and creative purposes accounted for a minority of this time. In Finnish schools, students mostly use laptop computers for their studies and homework. Considering the average length of school days and amount of homework, multitasking on smartphones was very likely to occur. Media

Table 4 Group comparisons between adolescents with no social media addiction (n=920) and adolescents with possible addiction (n=183) as means (SD)

	No addiction	Addiction	t	df	Mean dif.	95% CI
Daily smartphone use, minutes	343 (132)	383 (140)	2.615	548	40.0	10.0 to 70.1
Daily social media use, minutes	225 (117)	269 (136)	3.200	548	44.0	17.0 to 71.1
GAD-7 total score	7.5 (5.1)	11.4 (5.8)	7.977	985	3.9	2.9 to 4.9
BAS-2 total score	34.5 (8.6)	31.1 (9.4)	−4.523	1018	−3.4	−4.8 to 1.9
VAS health	73.2 (20.5)	64.3 (22.0)	5.135	1065	8.8	5.4 to 12.2
VAS mood	55.9 (25.6)	45.6 (25.4)	4.835	1059	10.2	6.1 to 14.4
VAS tiredness	29.0 (20.4)	17.4 (15.5)	8.559	1065	11.6	8.9 to 14.3
VAS loneliness	59.7 (25.8)	50.5 (25.8)	4.308	1061	9.2	5.0 to 13.4

P value for difference in daily smartphone use=0.009, other differences p<0.001.
Higher GAD-7 indicates higher anxiety. Higher BAS-2 indicates more positive body image. For all VAS scores, higher scores indicate better well-being.
BAS-2, Body Appreciation Scale; df, degrees of freedom; Mean dif., mean difference; GAD-7, Generalised Anxiety Disorder Scale; VAS, Visual Analogue Scale.

multitasking concurrently with studying has been associated with study-related stress.[25 26] Another pathway between social media use and poorer well-being may be the social comparisons that worsen body satisfaction.[27] Although we had no data on the time of-day adolescents used social media, sleep length is another factor connecting social media use and well-being.[5] Among Chinese youth (age 11–25), each minute of objectively measured social media use was associated with 0.3 min less objectively measured sleep the following night.[28]

Differences are probable in the use of different types of screens. Smartphones provide a convenient platform for social media but their portable nature also increases the chances of addictive behaviour and harmful multitasking.[26] Internet gaming disorder has been added to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition,[29] but the immobile nature of personal computers usually used in gaming could be a protective factor compared with heavy users of social media.

To the best of our knowledge, this is the first study to combine objectively measured smartphone use with validated measures of social media addiction and well-being. Our study's strengths also include the population-based cohort and high participation rate. We carefully compared participating and non-participating schools as well as adolescents with and without screenshots that provided detailed data on their smartphone use. The greatest limitation of our study is its cross-sectional nature which means potential for both confounders and reverse causation. The results should be interpreted with due caution. We lack knowledge on why many schools chose not to participate. Although the participating schools were from socioeconomically diverse neighbourhoods and included schools with different admission requirements, the study participants only represent adolescents who had chosen the academic high school track and the results may not be generalisable to the whole population. In repeated national surveys, however, girls in high school and in vocational education have reported similar health and well-being.[30] We had no exclusion criteria for participation and some of the study participants may have had pre-existing mental health problems that could confound the results. Adolescents with mental health problems may have been less likely to participate, thus contributing to bias. Also, GPA was self-reported. Our method of assessing smartphone use was challenging for the adolescents and time-consuming for researchers, but European data protection requirements impeded the use of foreign applications for this purpose. Less than half of study participants sent screenshots depicting their smartphone use as requested. Participants who sent screenshots had higher GPA than participants who sent no screenshots or whose screenshots were incomplete, but no difference was found in other measures. Previously, heavy social media use has been associated with lower academic performance and lower socioeconomic status.[31 32]

CONCLUSION

Although we report results from a cross-sectional setting, the implications of nearly 6 hours of daily smartphone use and its associations with adolescent well-being are serious. Self-reported screen time showed a medium correlation with objectively measured use, and future studies should aim to quantify smartphone use objectively. While some advocate for increased mental health services to tackle the rise in adolescent anxiety,[33] no services will suffice unless the root causes are addressed. Consequently, we found the US Surgeon General's advisory on social media and youth mental health a welcome reminder of the precautionary principle and an important call to action.[9] Professionals should support caregivers in establishing tech-free zones and in fostering in-person relationships. Policymakers should strengthen safety standards and urge technology companies to prioritise safety and health in the development of social media.

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Contributors SK, SM and EH conceived and designed the study. SK conducted data analyses. SK, SM and EH interpreted the results. SK is the guarantor of this study.

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Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by the HUS Regional Committee on Medical Research Ethics (HUS/117/2022). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. Due to data protection requirements of our institution, pseudonymous data may be shared within the EU.

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REFERENCES

1 Reiner RC, Olsen HE, Ikeda CT, *et al*. Diseases, injuries, and risk factors in child and adolescent health, 1990 to 2017: findings from the Global Burden of Diseases, Injuries, and Risk Factors 2017 study. *JAMA Pediatr* 2019;173:e190337.
2 GBD 2019 Mental Disorders Collaborators. Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease study 2019. *Lancet Psychiatry* 2022;9:137–50.
3 Finnish Centre for Pensions. Mental disorders the most common reason for retirement on a disability pension. 2020. Available: https://www.etk.fi/en/ajankohtaista/mental-disorders-the-most-common-reason-for-retirement-on-a-disability-pension/ [Accessed 19 Jun 2023].
4 Racine N, McArthur BA, Cooke JE, *et al*. Global prevalence of depressive and anxiety symptoms in children and adolescents during COVID-19. A meta-analysis. *JAMA Pediatr* 2021;175:1142–50.
5 Viner RM, Gireesh A, Stiglic N, *et al*. Roles of cyberbullying, sleep, and physical activity in mediating the effects of social media use on mental health and wellbeing among young people in England: a secondary analysis of longitudinal data. *Lancet Child Adolesc Health* 2019;3:685–96.
6 Barthorpe A, Winstone L, Mars B, *et al*. Is social media screen time really associated with poor adolescent mental health? A time use diary study. *J Affect Disord* 2020;274:864–70.
7 Riehm KE, Feder KA, Tormohlen KN, *et al*. Associations between time spent using social media and internalizing and externalizing problems among US youth. *JAMA Psychiatry* 2019;76:1266–73.

8 Miech RA, Johnston LD, Bachman JG, *et al*. Monitoring the future: a continuing study of American youth (8th- and 10th- grade surveys) [Inter-university Consortium for Political and Social Research (distributor]. 2021. Available: https://www.icpsr.umich.edu/web/NAHDAP/studies/38502/versions/V1 [Accessed 19 Jun 2023].
9 United States, Public Health Service, Office of the Surgeon General. Social media and youth mental health [The US Surgeon General's Advisory]. 2023. Available: https://www.hhs.gov/sites/default/files/sg-youth-mental-health-social-media-advisory.pdf [Accessed 19 Jun 2023].
10 Cheng C, Lau Y-C, Chan L, *et al*. Prevalence of social media addiction across 32 nations: meta-analysis with subgroup analysis of classification schemes and cultural values. *Addict Behav* 2021;117:106845.
11 Hasin DS, O'Brien CP, Auriacombe M, *et al*. DSM-5 criteria for substance use disorders: recommendations and rationale. *Am J Psychiatry* 2013;170:834–51.
12 Haidt J, Twenge J. Social Media and Mental Health: A Collaborative Review. New York University, Available: https://tinyurl.com/SocialMediaMentalHealthReview%20(ongoing) [accessed 19 Jun 2023].
13 Orben A, Blakemore SJ. How social media affects teen mental health: a missing link. *Nature* 2023;614:410–2.
14 Tanoli Z, Alam Z, Vähä-Koskela M, *et al*. Drug Target Commons 2.0: a community platform for systematic analysis of drug-target interaction profiles. *Database (Oxford)* 2018;2018:bay083:1–13:.
15 Andreassen CS, Pallesen S, Griffiths MD. Th relationship between addictive use of social media, narcissism, and self-esteem: findings from a large national survey. *Addict Behav* 2017;64:287–93.
16 Andreassen CS, Torsheim T, Brunborg GS, *et al*. Development of a Facebook Addiction Scale. *Psychol Rep* 2012;110:501–17.
17 Spitzer RL, Kroenke K, Williams JBW, *et al*. A brief measure for assessing generalized anxiety disorder. *Arch Intern Med* 2006;166:1092–7.
18 Kroenke K, Spitzer RL, Williams JBW, *et al*. Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. *Ann Intern Med* 2007;146:317–25.
19 Avalos L, Tylka TL, Wood-Barcalow N. The Body Appreciation Scale: development and psychometric evaluation. *Body Image* 2005;2:285–97.
20 Tylka TL, Wood-Barcalow NL. The Body Appreciation Scale-2: item refinement and psychometric evaluation. *Body Image* 2015;12:53–67.
21 Ahearn EP. The use of visual analog scales in mood disorders: a critical review. *J Psychiatr Res* 1997;31:569–79.
22 Gudex C, Dolan P, Kind P, *et al*. Health state valuations from the general public using the visual analog scale. *Qual Life Res* 1996;5:521–31.
23 Dahlgren A, Sjöblom L, Eke H, *et al*. Screen time and physical activity in children and adolescents aged 10-15 years. *PLoS ONE* 2021;16:e0254255.
24 Reeves B, Ram N, Robinson TN. Screen time: conclusions about the effects of digital media are often incomplete, irrelevant or wrong [The Conversation]. 2020. Available: https://theconversation.com/screen-time-conclusions-about-the-effects-of-digital-media-are-often-incomplete-irrelevant-or-wrong-129960 [Accessed 12 Oct 2023].
25 Salmela-Aro K, Upadyaya K, Hakkarainen K, *et al*. The dark side of internet use: two longitudinal studies of excessive internet use, depressive symptoms, school burnout and engagement among Finnish early and late adolescents. *J Youth Adolesc* 2017;46:343–57.
26 Uncapher MR, Lin L, Rosen LD, *et al*. Media multitasking and cognitive, psychological, neural, and learning differences. *Pediatrics* 2017;140:S62–6.
27 Montag C, Lachmann B, Herrlich M, *et al*. Addictive features of social media/messenger platforms and freemium games against the background of psychological and economic theories. *Int J Environ Res Public Health* 2019;16:2612.
28 Lee PH, Tse ACY, Wu CST, *et al*. Temporal association between objectively measured smartphone usage, sleep quality and physical activity among Chinese adolescents and young adults. *J Sleep Res* 2021;30:e13213.
29 Petry NM, Rehbein F, Ko C-H, *et al*. Internet gaming disorder in the DSM-5. *Curr Psychiatry Rep* 2015;17:72.
30 Helakorpi S, Kivimäki H. Well-being of children and young people – school health promotion study 2021 [National Institute for Health and Welfare statistical report 42/2021]. Available: https://thl.fi/en/web/thlfi-en/statistics-and-data/statistics-by-topic/social-services-children-adolescents-and-families/well-being-of-children-and-young-people-school-health-promotion-study [Accessed 19 Jun 2023].
31 Sampasa-Kanyinga H, Chaput J-P, Hamilton HA. Social media use, school connectedness, and academic performance among adolescents. *J Prim Prev* 2019;40:189–211.
32 Ucar I, Gramaglia M, Fiore M, *et al*. News or social media? Socio-economic divide of mobile service consumption. *J R Soc Interface* 2021;18:20210350.
33 Benton TD, Boyd RC, Njoroge WFM. Addressing the global crisis of child and adolescent mental health. *JAMA Pediatr* 2021;175:1108–10.