

Cross-sectional relationship between frequency of social media use and adolescent mental health: Evidence from the UK Millennium Cohort Study

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Abstract

Adolescent mental health is a major concern. This study analysed secondary data from the UK Millennium Cohort Study (MCS), no primary data were collected by the author, to investigate associations between daily social media use and psychological outcomes among 10,270 adolescents. Mental health was assessed via the parent-report Strengths and Difficulties Questionnaire (SDQ), capturing internalising and externalising behavioural problems. Multiple linear regression analyses accounted for survey sampling weights and were adjusted for demographic, socioeconomic, and behavioural factors. Results showed a U-shaped association: externalising problems increased with heavy use (≥ 2 hours/day), while internalising problems were highest among low users, especially non-users. The findings indicate a nuanced relationship between social media use and adolescent mental health, thereby underscoring the need for moderated usage. Moderate use may protect against internalising difficulties, while excessive use appears linked primarily to externalising problems. Policies promoting balanced use mitigate behavioural problems and support healthier engagement.

Keywords: Adolescent mental health; Social media use; Externalising behaviours; Internalising behaviours; Millennium Cohort Study.

Introduction

Adolescent psychological well-being is a major public health concern, with one in seven experiencing mental health disorders such as depression, anxiety, and

behavioural conditions (WHO, 2024). One-third of adolescents are at risk of depression, most conditions emerging before age 14 (Shorey et al., 2022; INSERM, 2020). Social media is near universal: 93-97% of U.S. adolescents use at least one platform (Barry et al., 2017).

In the UK, 91% of adolescents aged 15-16 report regular use (Dixon, 2022; Sisters Hospitallers, 2024), often checking multiple times per hour. Such frequency raises concerns of compulsive use. Adolescent psychological distress has increased, particularly depression, anxiety, and self-harm among girls (Deighton et al., 2019; Cybulski et al., 2021; Morgan et al., 2017). COVID-19 worsened outcomes for adolescents with prior mental health problems, highlighting the need to examine digital engagement.

This UROS project is a secondary data analysis of the UK Millennium Cohort Study (MCS), which was originally collected by the MCS research team. No primary data were collected by the author. The study analyses existing, publicly available data to examine associations between social media use and adolescent mental health.

Project Background

Research on social media use and adolescent mental health has expanded rapidly, but findings remain mixed. Some studies report negative impacts such as increased depression, anxiety, and poor sleep (Kelly et al., 2019; Ulvi et al., 2022), while others suggest moderate use may benefit connection and identity formation (Przybylski & Weinstein, 2017; Coyne, 2020). Context, interaction quality, and individual vulnerabilities are critical (Plackett et al., 2022).

This project uses data from the UK Millennium Cohort Study (MCS), which tracks adolescents longitudinally. This secondary analysis uses MCS sixth-sweep data (age 14, Jan 2015–Apr 2016) to explore cross-sectional and longitudinal associations. The aim is to clarify whether frequent social media use contributes to behavioural problems, including internalising or externalising difficulties.

As an undergraduate psychology student with an interest in clinical work, I am particularly drawn to research on adolescent mental health. This area of research puts an emphasis on real-world factors that influence psychological well-being, including risk and protective factors. Using MCS data, I examined how digital engagement relates to adolescent behaviour nationally. The analysis of these results can inform strategies for young people and were integral in providing context to my UROS study on researching adolescent mental health. Engaging with this research, and analysing secondary data aligns closely with my studies, helping me connect my theoretical knowledge of adolescence development and mental health to practical implications for clinical practise.

Literature Review

Adolescence is a developmental period typically understood to range from around 10 to 19 years, marked by rapid changes in physical, cognitive and socio-emotional changes (Ford et al., 2020; Paus et al., 2008). During this period, individuals often experience heightened vulnerability to emotional and behavioural problems (Silvers, 2022). This is due to the neurobiological and psychosocial transitions they experience (Méndez Leal & Silvers, 2021). Adolescents form identities, negotiate relationships, and establish autonomy, which interact with digital influences to affect mental health (Nesi et al., 2022). Adolescent development, social context, and individual vulnerability interact to affect mental health. Moreover, socio-economic status, family functioning and school environment have also been identified as key moderates of risk, influencing the likelihood of developing psychological difficulties during adolescence (Kim et al., 2016).

Existing research highlights both the potential risks and benefits of social media during adolescence. Heavy social media use has been consistently linked to depression, anxiety and low self-esteem, particularly among girls (Kelly et al., 2019; Azem et al., 2020; Maria, 2023). These links to negative mental health may arise from social comparison, cyberbullying or disrupted sleep patterns, illustrating how contextual factors shape the impact of digital use (Gordesli et al., 2024; Carter et al., 2016). Although not all outcomes are negative. Moderate social media use can create a sense of belonging and self-expression (Przybylski and Weinstein, 2017). This suggests that not all online interactions are harmful. Digital platforms enable interventions; including online CBT and mindfulness programmes that aim to reduce depression and anxiety (Zhou et al., 2021; Wright et al., 2023). Peer-led and lifestyle-focused approaches also show promise (Birrell et al., 2023; Raeside et al., 2023). Importantly, the effectiveness of these interventions can depend on user engagement and individual differences, highlighting the need to consider developmental readiness and accessibility (Lehtimäki et al., 2021).

This research informs the current project, showing social media as an influential factor in adolescent mental health. By examining data from the UK MCS, collected at age 14 between January 2015 and April 2016, this study aims to clarify how frequency and patterns of social media use relate to internalising and externalising behavioural problems, considering developmental vulnerabilities and environmental influences.

Methodology

Participants

This UROS project conducted a secondary analysis of data from the MCS, a nationally representative longitudinal cohort of children born in the UK between September 2000 and January 2002. MCS collects information on social, economic, and health

circumstances of children as they develop. For this study, only adolescents who participated in the sixth sweep, at approximately 14 years of age, were included. After excluding participants with missing data on key variables, the final sample consisted of 10,270 adolescents with complete information on social media use, mental health outcomes and relevant covariates. The author's contribution lies in the analysis and interpretation of these existing data.

Measures

SDQ

Adolescent mental health was assessed using the parent-reported Strengths and Difficulties Questionnaire (SDQ), a validated 25-item measure. The SDQ includes subscales for emotional symptoms, conduct problems, hyperactivity/inattention, and peer relationship problems. These subscales were summed to create a Total Difficulties Score, with higher scores indicating greater difficulties.

Social media use

Social media use was self-reported by adolescents at the sweep, with parental consent. Participants indicated average daily time spent on social media, including messaging apps and social networking sites. Responses were categorised as: none, <30 minutes, 30–59 minutes, 1–2 hours, 2–3 hours, 3–5 hours, 5–7 hours, and ≥7 hours per day.

Covariates

Covariates included age, sex, ethnicity, parental psychological distress, household socioeconomic status (parental education and occupation), relative poverty, physical activity, and other screen time. These were selected to account for confounding factors known to influence both social media use and mental health outcomes.

Statistical Analysis

Statistical analyses were conducted in Stata using survey-adjusted multiple linear regression models of the secondary data. Initial models examined associations between social media use and SDQ scores, adjusting for age and sex. Subsequent models included additional covariates to assess independent associations while controlling for confounding. Categorical coding of social media use allowed comparison across usage levels. Regression coefficients, 95% confidence intervals, and p-values were reported ($p < .05$). This approach represents my contribution to the MCS data, focusing on the specific relationship between social media exposure and internalising and externalising problems in mid-adolescence.

All analyses were conducted by the author on the secondary MCS dataset; the analytic approach represents the author's contribution in examining associations between social media use and internalising and externalising problems.

Ethical considerations

This UROS project conducted a secondary analysis of existing MCS data. The original MCS study received ethical approval at each sweep, and parents provided informed consent for participation. Participants' privacy and confidentiality were ensured by the MCS research team. Approval for this secondary analysis was obtained from the University of Lincoln Research Ethics Committee (Reference: 2025_20830) and access authorised via the UK Data Service. No additional data were collected from participants by the author.

Results

The MCS sample included 10,270 adolescents ($M = 14.3$ years, $SE = 0.7$), with an approximately equal sex distribution (51.9% boys, 48.1% girls). Most participants were White (84.3%), followed by Pakistani/Bangladeshi (3.2%), Black/Black British (3.4%), Indian (1.8%), Mixed ethnicity (5.3%), and Other/Undeclared (2.9%) as shown in Table 1.

Survey-adjusted multiple linear regression analyses examined associations between daily social media use and behavioural outcomes, adjusting sequentially for the covariates. A U-shaped association emerged for total behavioural difficulties: both lower (<1 hour/day) and higher durations (≥ 2 hours/day) were associated with higher total difficulties compared to moderate use (1–2 hours/day) (see Table 2).

For externalising behaviours, higher social media use was associated with increased difficulties. Adolescents using social media for 7+ hours daily showed significantly higher externalising problem scores ($\beta = 1.3$, 95% CI: 0.9–1.8) compared to moderate users. This aligns with research linking high digital engagement to impulsivity, attention problems, and exposure to online risks such as cyberbullying or hostile interactions (Odgers & Jensen, 2020; Onyeaka et al., 2022). Frequent use may amplify externalising behaviours via reduced structured offline routines and reinforced impulsivity (Przybylski & Weinstein, 2017).

In contrast, internalising behaviours were highest among adolescents with very low social media use (<1 hour/day), with non-users showing the greatest difficulties ($\beta = 1.6$, 95% CI: 1.2–2.0). Higher social media use did not significantly increase internalising scores once confounders were controlled. Limited engagement may reflect reduced peer interaction or social withdrawal, while moderate use could support social connection and identity formation. Quality and context of engagement likely moderate these associations, with supportive engagement buffering emotional difficulties and passive or negative interactions exacerbating them (Frison & Eggermont, 2020).

Gender, socioeconomic, and lifestyle factors also influenced outcomes. Boys showed higher externalising scores, girls higher internalising scores, and socioeconomic disadvantage predicted higher internalising difficulties. Physical activity appeared protective, mitigating internalising symptoms.

Findings highlight a nuanced relationship between social media use and adolescent mental health, emphasizing moderation rather than restriction. Interventions should target digital literacy, self-regulation and resilience alongside structured offline activities (Öner Çelikkaleli et al., 2025). Limitations include the cross-sectional nature of the sweep, preventing causal inference, and reliance on self- and parent-reported data (Riehm, Feder & Tormohlen, 2019). Future research should integrate longitudinal and experimental approaches, consider platform-specific behaviours, and examine moderators such as gender, socioeconomic status, and lifestyle to identify vulnerable adolescents (Frison & Eggermont, 2020; Wade et al., 2021).

UROS Experience

During my UROS experience, I engaged in a range of activities beyond my psychology studies. This engagement with secondary data as part of my UROS project provided me with valuable insights into research and professional practise. I participated in workshops focused on developing my practical research skills, including data analysis, study design and communication with my supervisor. This exposure allowed me to connect my theoretical knowledge to real-world application. Enhancing my methodological rigor and ethical considerations in psychological research, which I can then utilise for my dissertation.

In addition to the academic aspect, I collaborated with a senior lecturer, strengthening my teamwork and communication skills. Being part of a research-based environment encouraged my curiosity, problem-solving and critical thinking. This is because I was observing my lecturer formulate questions, test our hypotheses and interpret our findings.

This experience will have a lasting impact on my personal and professional development. It has increased my confidence when approaching complex tasks, improved my ability to work in a team and created a deeper appreciation for research. Engaging in this experience outside of my studies also reinforced the importance of balancing independent work with guided mentorship, preparing me for future research projects and training. Overall, UROS was invaluable in shaping my growth as a reflective, skilled and motivated psychology student.

Conclusion

This study highlights the complex relationship between social media use and adolescent mental health, using secondary data from the MCS. Higher daily use was linked to externalising behaviours such as hyperactivity and conduct problems, while significant elevations in internalising problems are visible for those who use social media for less than 1 hour daily. Findings suggest behavioural difficulties may be influenced by digital engagement than emotional problems, shaped by factors like social comparison and online context. Findings may suggest a nuanced relationship between social media use and mental health among adolescents, thus warranting moderation in its use. Interventions should combine digital literacy, resilience training, and lifestyle supports to foster healthier online behaviours and promote adolescent well-being.

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Appendices

Table 1. Descriptive characteristics of study population

Characteristics	Number (N= 10270)	Weighted percentage
Age (years)	10270	14.3 (0.0) ^a
Sex		
Boys	5126	51.9
Girls	5144	48.1
Ethnicity		
White	8492	84.3
Pakistani and Bangladeshi	499	3.2
Black or Black British	281	3.4
Indian	232	1.8
Mixed	478	5.3
Other	198	1.9
Undeclared	90	1.0
Parental educational/vocational level		
No Qualifications	718	10.6
NVQ Level 1	451	5.9
NVQ Level 2	1969	22.8
NVQ Level 3	1323	12.7
NVQ Level 4	3803	32.1
NVQ Level 5	1738	12.8
Overseas Qualification	268	3.0
Socioeconomic status		
Managerial/Professional occupations	6142	53.2
Intermediate occupations	1332	13.8
Routine/ Manual occupations	1432	16.6
Unemployed/unclassified	1364	16.4
Relative household poverty using OECD index		
Above 60% median	7644	69.7
Below 60% median	2626	26.3
Frequency of moderate to vigorous physical activity per week		
Everyday	1886	19.1
5 – 6 days	2013	18.9
2 – 4 days	3484	33.4
1 – 2 days	2453	23.8
Not at all	434	4.8
Time spent on computer gaming per day		
None	1907	17.5
<0.5 hours	1399	13.0
0.5 – <1 hour	1191	10.9
1 – <2 hours	1537	15.0

Characteristics	Number (N= 10270)	Weighted percentage
2 – <3 hours	1426	14.2
3 – <5 hours	1323	13.2
5 – <7 hours	697	7.3
≥7 hours	790	8.9
Time spent watching TV or computer videos per day		
None	117	1.3
<0.5 hours	330	3.2
0.5 – <1 hour	879	8.0
1 – <2 hours	2061	19.8
2 – <3 hours	2459	23.4
3 – <5 hours	2430	23.3
5 – <7 hours	1125	11.5
≥7 hours	869	9.5
Time spent on social networking sites per day		
None	767	7.5
<0.5 hours	1266	12.0
0.5 – <1 hour	1438	13.4
1 – <2 hours	1748	16.6
2 – <3 hours	1590	15.2
3 – <5 hours	1460	14.2
5 – <7 hours	993	10.1
≥7 hours	1008	11.0
Kessler score	10270	4.6 (0.1) ^a
Internalising problems score	10270	3.9 (0.1) ^a
Normal (<6 points)	8432	80.6
Borderline/Abnormal (≥6 points)	1838	19.4
Externalising problems score	10270	4.6 (0.1) ^a
Normal (<8 points)	9031	85.0
Borderline/Abnormal (≥8 points)	1239	15.0
Total Behavioural problems score	10270	8.5 (0.1) ^a
Normal (<14 points)	8632	81.3
Borderline/Abnormal (≥14 points)	1638	18.7

^a Reported as Mean (Linearised Standardised Error)

Table 2. Relationship between duration of social media use and total behavioural problems

	Regression coefficient (95% Confidence Interval)	
	Model I	Model II
Daily duration of social media use		
None	2.8 (2.1 – 3.5) [‡]	1.9 (1.1 – 2.6) [‡]
<0.5 hours	0.6 (0.1 – 1.2) [*]	0.2 (-0.2 – 0.7)
0.5 – <1 hour	0.5 (-0.1 – 1.0)	0.6 (0.1 – 1.0) [*]
1 – <2 hours (Reference)	0	0
2 – <3 hours	0.0 (0.0 – 1.0) [*]	0.4 (0.0 – 0.8)
3 – <5 hours	0.5 (0.3 – 1.4) [#]	0.4 (-0.1 – 0.9)

	Regression coefficient (95% Confidence Interval)	
	Model I	Model II
5 – <7 hours	1.6 (0.9 – 2.2) ‡	0.8 (0.1 – 1.4) *
≥7 hours	3.0 (2.3 – 3.6) ‡	1.3 (0.6 – 2.1) #
Sex		
Boys (Reference)	0	0
Girls	-0.8 (-1.2 – -0.5) ‡	-0.6 (-1.0 – -0.2) #
Age (years) ^a	-0.4 (-0.9 – 0.1)	-0.4 (-0.8 – 0.0) *
Ethnicity		
White	–	0
Pakistani and Bangladeshi	–	-0.7 (-1.3 – 0.1) *
Black or Black British	–	-0.1 (-0.8 – 0.7)
Indian	–	-0.4 (-1.5 – 0.6) *
Mixed	–	-0.6 (-1.2 – 0.0)
Other	–	0.4 (-0.6 – 1.5)
Undeclared	–	0.7 (-0.9 – 2.2)
Parental educational/vocational level		
No Qualifications (Reference)	–	0
NVQ Level 1	–	0.9 (-0.1 – 1.8)
NVQ Level 2	–	0.2 (-0.6 – 0.9)
NVQ Level 3	–	-0.8 (-1.6 – 0.0)
NVQ Level 4	–	-0.8 (-1.5 – -0.1) *
NVQ Level 5	–	-1.5 (-2.2 – -0.8) *
Overseas Qualification	–	-0.2 (-1.2 – 0.9) ‡
Socioeconomic status (NSSEC 3)		
Managerial/Professional occupations	–	-1.0 (-1.7 – -0.3) #
Intermediate occupations	–	-0.1 (-0.7 – 0.6)
Routine/ Manual occupations	–	-0.2 (-0.9 – 0.4)
Unemployed/unclassified	–	0
Relative household poverty using OECD index		
Above 60% median	–	0
Below 60% median	–	1.1 (0.6 – 1.6) ‡
Kessler score		0.4 (0.4 – 0.4) ‡
Frequency of moderate to vigorous physical activity per week		
Everyday	–	-0.6 (-1.1 – -0.1) *
5 – 6 days	–	-1.2 (-1.7 – -0.8) ‡
3 – 4 days	–	-0.9 (-1.3 – -0.5) ‡
1 – 2 days	–	
Not at all	–	1.6 (0.7 – 2.5) ‡
Time spent on computer gaming per day		
None	–	0
<0.5 hours	–	-0.7 (-1.2 – -0.2) *
0.5 – <1 hour	–	-0.4 (-1.0 – 0.1)
1 – <2 hours	–	-0.1 (-0.6 – 0.5)
2 – <3 hours	–	0.3 (-0.3 – 0.9)
3 – <5 hours	–	0.5 (-0.2 – 1.2)
5 – <7 hours	–	0.62 (-0.2 – 1.4)
≥7 hours	–	0.6 (-0.2 – 1.4)

	Regression coefficient (95% Confidence Interval)	
	Model I	Model II
Time spent watching TV or computer videos per day		
None	–	0
<0.5 hours	–	0.7 (-0.2 – 1.6)
0.5 – <1 hour	–	0.2 (-0.3 – 0.7)
1 – <2 hours	–	0.5 (0.1 – 1.0) *
2 – <3 hours	–	0.1 (-0.4 – 0.5)
3 – <5 hours	–	0.4 (-0.2 – 1.0)
5 – <7 hours	–	1.0 (0.3 – 1.6)
≥7 hours	–	1.0 (0.3 – 1.6) #
Hours spent using internet at home		
None	–	0
<0.5 hours	–	0.9 (-0.2 – 1.9)
0.5 – <1 hour	–	0.1 (-0.4 – 0.7)
1 – <2 hours	–	0.0 (-0.5 – 0.5)
2 – <3 hours	–	-0.3 (-0.9 – 0.3)
3 – <5 hours	–	0.1 (-0.5 – 0.8)
5 – <7 hours	–	-0.1 (-0.7 – 0.7)
≥7 hours	–	-0.1 (-0.7 – 0.7)

‡*p*<.001; #*p*<.01; **p*<.05

Model I – Partially adjusted model (sex and age)

Model II – Fully adjusted model