Cybervictimisation and mental health conditions in young people: findings from a nationally representative longitudinal cohort

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Summary

Background Cybervictimisation has been linked to poor mental health in young people, but doubts remain about the robustness of this association. We examined mental health outcomes for adolescents who experienced cybervictimisation using a genetically informative longitudinal design to strengthen causal inference by accounting for alternative explanations.

Methods We used data from the Environmental Risk (E-Risk) Longitudinal Twin Study, a nationally representative cohort of 2232 British twins born in 1994–95. We included participants who completed interviews assessing cybervictimisation and mulitple offline forms of victimisation since age 12 years, and a range of mental health conditions at age 18 years. Confounders were measured prospectively from ages 5 years to 18 years. Unmeasured confounders including genetic and shared environmental factors were controlled for using discordant twin analyses. People with lived experience were not involved in this study.

Findings 2066 participants completed assessments at age 18 years, of whom 2063 (99·9%) had data on cybervictimisation. The mean age of the twins at the time of the assessment was 18·4 years (SD 0·4), and 1870 (90·5%) identified as White, 84 (4·1%) as Asian, 40 (1·9%) as Black, eight (0·4%) as mixed race, and 64 (3·1%) as other ethnicities. 419 (20·3%) of 2063 young people reported being moderately or severely cybervictimised between ages 12 years and 18 years, with ten (2·4%) participants reporting online abuse without having experienced offline victimisation. Cybervictimised adolescents were more likely to report generalised anxiety disorder, major depressive disorder, self-harm or suicide attempt, post-traumatic stress disorder, conduct disorder, and psychotic experiences compared with those not cybervictimised. These associations remained after adjusting for confounders, including individual characteristics (sex assigned at birth, minority ethnicity, socioeconomic status, and childhood intelligence quotient), pre-existing vulnerabilities (previous mental health conditions and online and offline victimisation), and concurrent vulnerabilities (problematic digital technology use and loneliness). Offline victimisation accounted for the associations, with modest to substantial attenuation in odds ratios (17·7–28·0% for generalised anxiety disorder and major depressive disorder; 33·5–52·3% for other outcomes). Cybervictimisation was uniquely associated with generalised anxiety disorder independently of genetic and shared environmental factors and offline victimisation (odds ratio 2·14 [95% CI 1·18–3·88]).

Interpretation Amid ongoing policy debates on digital safety and to support targeted intervention strategies, mental health responses to cybervictimisation should consider the broader context of victimisation experienced by young people.

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Introduction

The increasing integration of digital technologies into adolescents' daily lives and the rapid rise of social media use have sparked debates over their safety and impact on mental health.[1–3] Digital transformations are now recognised as key determinants of health, particularly for young people whose lives are deeply embedded in online environments.[4] Although online platforms offer unprecedented opportunities for connection,[5] young people remain vulnerable to the risks they pose, including the passive consumption of harmful content, such as violent or hateful material.[2,6] Growing concerns about youth exposure to digital harm, such as online abuse, have led policy makers, researchers, and the public to call for robust and responsible digital governance strategies.[4,7] Governments worldwide are navigating the challenge of regulating adolescents' online engagement, balancing access with protection.[8] Evidence remains inconsistent and often non-causal, making it difficult to determine whether digital environments are safe despite potential

Research in context

Evidence before this study

Cybervictimisation in adolescence has been increasingly recognised to be associated with poor mental health outcomes, but the robustness of this link remains uncertain. We searched PubMed and PsycINFO up to July 1, 2025, and Web of Science and Scopus up to Oct 13, 2025, including the following terms: ("cybervictimisation" OR "cybervictimization" OR "cyberbullying" OR "online abuse" OR "online harassment") AND ("adolescent" OR "youth" OR "young" OR "teen" OR "adult") AND ("mental health" OR "anxiety" OR "depression" OR "depressive" OR "self-harm" OR "suicide" OR "PTSD" OR "post-traumatic stress disorder" OR "posttraumatic stress disorder" OR "conduct disorder" OR "conduct problems" OR "psychosis" OR "psychotic experiences"). We applied no date or language restrictions. We included peer-reviewed studies examining the association between cybervictimisation and mental health outcomes in young people. This search was supplemented by reviewing reference lists of relevant articles. Most identified studies reported statistically significant associations between cybervictimisation and a range of poor mental health outcomes, including emotional, behavioural, and thought disorders. However, many studies were cross-sectional and did not account for key confounders such as multiple forms of offline victimisation. Very few studies have used genetically informative longitudinal designs, limiting the ability to strengthen the plausibility of causal inferences and to inform early interventions targeting cybervictimisation for effectively reducing the incidence of mental health conditions in young people.

Added value of this study

To our knowledge, this study is one of the very few to comprehensively examine poor mental health outcomes associated with cybervictimisation in a nationally representative longitudinal twin cohort of young people, while accounting for measured and unmeasured confounding factors, including various forms of offline victimisation. Using data collected as part of interviews, we found that adolescents who experienced online abuse showed an increased likelihood of a range of mental health conditions across levels of exposure and vulnerability. We also showed that cybervictimisation and poor mental health remained associated when based on reports from participants' co-twin and parent. Our findings refine the understanding of the broader context in which cybervictimisation is linked to mental health conditions in young people, while also providing genetically informative evidence consistent with a potentially causal environmental pathway for anxiety disorder, but not for the other conditions examined in this study.

Implications of all the available evidence

Clinicians and health service providers should be aware that most young people exposed to online abuse also face other types of victimisation experiences. Broadening prevention and intervention strategies to integrate offline victimisation could provide more effective mental health responses. In the context of ongoing debates on youth exposure to digital harm, policy makers and researchers should consider online abuse as part of a wider spectrum of youth victimisation. Further research is needed to better characterise the mechanisms linking cybervictimisation to poor mental health, to inform clinical and policy responses, and to support the most vulnerable adolescents.

mental health risks.[3,7] To inform evidence-based digital health policy, we examined poor mental health outcomes in adolescents who experienced cybervictimisation using a longitudinal twin cohort. To approach causal hypotheses, we accounted for alternative explanations by adjusting for often-overlooked confounders.

Cybervictimisation (ie, repeated and intentional online abuse and harassment) has been identified as a major public health issue that affects between 14% and 58% of young people globally.[9] Despite growing evidence linking cybervictimisation with a range of emotional, behavioural, and thought disorders,[10–16] doubts remain about its unique contribution to poor mental health. Available studies are often cross-sectional and lack adequate control for key confounders, particularly other types of offline victimisation beyond peer bullying. Unmeasured confounders (genetic and shared environmental factors) are also rarely accounted for, limiting our understanding of whether being cybervictimised is a unique environmental factor associated with poor mental health. Research using discordant twin analyses can help to rule out shared familial factors as an explanation for the observed association and inform whether early interventions targeting online abuse might reduce the incidence of mental health conditions in young people. Furthermore, not all adolescents who experience online abuse develop mental health conditions. A closer investigation into the factors associated with higher odds of poor mental health among cybervictimised adolescents can help to identify those most vulnerable. Addressing these gaps offers a unique opportunity to strengthen evidence on the extent to which cybervictimisation contributes to poor mental health in young people, to inform decisions on digital engagement and wellbeing, and to support targeted interventions for victims of online abuse.

We aimed to test whether adolescents who are victimised online are more likely to experience mental health conditions than those who are not cybervictimised; whether these increased odds are accounted for by offline victimisation or by familial factors including genetic background and family environment; and

whether subgroups of adolescents are particularly vulnerable to poor mental health when they experience cybervictimisation.

Methods

Study design and participants

Participants were members of the Environmental Risk (E-Risk) Longitudinal Twin Study, which tracks the development of 2232 British children. The E-Risk sample was drawn from a larger birth cohort of twins born in England and Wales in 1994–95.[17] Full details about the E-Risk Study sample are reported elsewhere.[18] Briefly, the E-Risk Study was constructed in 1999–2000, when 1116 (92·8%) of 1203 eligible families with same-sex twins aged 5 years participated in home-visit assessments. 621 (55·6%) of 1116 twin pairs were monozygotic twins and 495 (44·4%) were dizygotic twins; sex assigned at birth was evenly distributed within zygosity (1092 [48·9%] of 2232 were male and 1140 [51·1%] were female). Families were recruited to represent the UK population of families with newborns in the 1990s, on the basis of residential location throughout England and Wales and mother's age. Teenage mothers with twins were overselected to replace high-risk families (ie, families in which the mother had her first birth aged ≤20 years) who were selectively lost to the register through non-response. Older mothers (aged 26–47 years) having twins via assisted reproduction were underselected to avoid an excess of well educated older mothers.

At all follow-ups, the sample represented the full range of socioeconomic conditions in the UK, as reflected in the families' distribution on neighbourhood-level socioeconomic indices. All participants who had not died or withdrawn from the study were invited to take part in the assessment at age 18 years.[19] Follow-up home visits were conducted when the twins were aged 7 years (2178 [97·6%] of 2232 twins participated), 10 years (2138 [95·8%] participated), 12 years (2144 [96·1%] participated), and in 2012–14 at 18 years (2066 [92·6%] participated). Home visits between ages 5–12 years included assessments with participants as well as their mothers (or primary caretakers); the home visit at age 18 years included interviews with the participants only. Each twin was assessed by a different interviewer. The Joint South London and Maudsley and the Institute of Psychiatry Research Ethics Committee approved each phase of the study (1997/122) and the preregistered analysis plan is available online. Parents gave written informed consent, and twins gave assent at ages 5–12 years and then written informed consent at age 18 years.

Procedures

Participants were interviewed at age 18 years about exposure to cybervictimisation and a range of offline victimisation experiences between ages 12 years and 18 years using the Juvenile Victimization Questionnaire 2nd Revision[20] adapted as a clinical interview.[21] Cybervictimisation was assessed using three items including, whether since age 12 years, anyone had used the internet or mobile phone to harass them, spread mean words or pictures online, or make unwanted sexual comments online. Participants who positively endorsed any item were asked to describe their worst experience, and these were coded by an independent panel into three levels of severity: none, moderate, or severe. Offline forms of victimisation (crime, peer or sibling, sexual, family violence, maltreatment, and neglect) were coded similarly and summed into a composite score. Full details of measures and coding procedures are presented in the appendix (pp 3–6).

See Online for appendix

Mental health conditions were assessed at age 18 years through a structured clinical interview including diagnoses of generalised anxiety disorder, major depressive disorder, post-traumatic stress disorder, and conduct disorder according to DSM-IV[22] or DSM-5 criteria.[23] At least one instance of self-harm or suicide attempt or psychotic experiences between ages 12 years and 18 years were also included as poor mental health outcomes. Further details are provided in the appendix (pp 3–6).

We assessed vulnerabilities concurrent with cybervictimisation (problematic digital technology use and loneliness) at age 18 years through self-report questionnaires. Previous mental health conditions were assessed as part of a private interview with participants or their mothers at age 12 years. We assessed childhood cybervictimisation in face-to-face interviews with the twins at age 12 years. Other victimisation experiences (exposure to domestic violence; emotional, physical, and sexual abuse; neglect; and bullying by peers) were assessed repeatedly when children were aged 5 years, 7 years, 10 years, and 12 years, based on interviews with mothers and also compiled dossiers for each participant. Other confounders, including sex assigned at birth, minority ethnicity (Asian, Black, mixed race, or other ethnicities), socioeconomic status (maternal report), and childhood intelligence quotient (IQ; participant assessment), were collected at age 5 years. Informant reports of cybervictimisation and poor mental health at age 18 years were collected through questionnaires completed by the participants' co-twins and parents to examine the sensitivity of findings across informants. Further information are provided in the appendix (pp 3–6).

Statistical analysis

To examine whether cybervictimisation was associated with poor mental health outcomes in young people, we conducted a series of logistic regressions in hierarchical steps with each mental health outcome examined in separate models. We adjusted for sex, minority ethnicity, socioeconomic status, and childhood IQ (model 1), history of the corresponding mental health condition at age 12 years (model 2), cybervictimisation at age 12 years and other forms of victimisation between ages 5 years

For the **analysis plan** see https://sites.duke.edu/moffittcaspiprojects/files/2024/11/Theriault-Couture_ERisk_Cybervictimisation-and-youth-mental-health_final_21NOV2024.pdf

	Participants (n=2066)
Poor mental health	
Age 12 years	
Anxiety	121/2010 (6·0%)
Depression	73/2009 (3·6%)
Self-harm or suicide attempt	56/2013 (2·8%)
Conduct disorder	211/2001 (10·5%)
Psychotic symptoms	118/2007 (5·9%)
Age 18 years	
Generalised anxiety disorder	153/2060 (7·4%)
Major depressive disorder	414/2063 (20·1%)
Self-harm or suicide attempt	295/2064 (14·3%)
Post-traumatic stress disorder	160/2063 (7·8%)
Conduct disorder	309/2053 (15·1%)
Psychotic experiences	623/2063 (30·2%)
Victimisation experiences	
Age 12 years	
Moderate domestic violence	582 (28·2%)
Severe domestic violence	355 (17·2%)
Moderate emotional abuse and neglect	178 (8·6%)
Severe emotional abuse and neglect	62 (3·0%)
Moderate physical abuse	307 (14·9%)
Severe physical abuse	108 (5·2%)
Moderate physical neglect	150 (7·3%)
Severe physical neglect	35 (1·7%)
Moderate sexual abuse	17 (0·8%)
Severe sexual abuse	16 (0·7%)
Moderate bullying	741/2062 (35·9%)
Severe bullying	183/2062 (8·9%)
Moderate cybervictimisation	61/2008 (3·0%)
Severe cybervictimisation	12/2008 (0·6%)
Age 18 years	
Moderate cybervictimisation	286/2063 (13·9%)
Severe cybervictimisation	133/2063 (6·4%)
Moderate crime victimisation	670 (32·4%)
Severe crime victimisation	398 (19·3%)
Moderate peer or sibling victimisation	870/2065 (42·1%)
Severe peer or sibling victimisation	323/2065 (15·6%)
Moderate family violence	136/2062 (6·6%)
Severe family violence	250/2062 (12·1%)
Moderate maltreatment	213/2063 (10·3%)
Severe maltreatment	67/2063 (3·2%)
Moderate sexual victimisation	198/2059 (9·6%)
Severe sexual victimisation	53/2059 (2·6%)
Moderate neglect	80/2062 (3·9%)
Severe neglect	46/2062 (2·2%)
(Table 1 continues in next column)	
(Continued from previous column)	
Concurrent vulnerabilities	
Problematic digital technology use	4·54 (3·9)*
Loneliness	1·57 (1·9)†
Other confounders	
Female sex	1085 (52·5%)
Minority ethnicity	196 (9·5%)
Low socioeconomic status	691 (33·4%)
Childhood intelligence quotient (IQ)	100 (15)‡

Data are n/N (%), n (%), or mean (SD). *Data available for 2055 participants. †Data available for 2051 participants. ‡Data available for 2052 participants.

Table 1: **Summary of baseline characteristics and prevalence of covariates, exposures, and outcomes for study participants**

and 12 years (model 3), problematic digital technology use and loneliness at age 18 years (model 4), and offline forms of victimisation experienced between ages 12 years and 18 years (model 5). Each successive model retained all covariates from the previous model (see appendix p 2 for details). We conducted sensitivity analyses to test whether associations remained after accounting for shared method variance: we repeated model 1 using informant-reported cybervictimisation with self-reported mental health, and self-reported cybervictimisation with informant-reported mental health. As a sensitivity check, we applied a Bonferroni correction to account for multiple comparisons, setting the threshold for significance at $\alpha=0\cdot0083$ ($0\cdot05/6$).

To investigate whether cybervictimisation was uniquely associated with mental health conditions beyond shared environmental and genetic factors, we used the discordant twin design.[24,25] Using mixed-effects regression models, this method enables the simultaneous estimation of two effects: the family-wide effect, capturing between-twin pair differences in exposure and reflecting shared familial factors (genetic or environmental), and the unique effect, capturing within-twin pair differences and indexing exposure-specific differences to cybervictimisation, thereby isolating non-shared environmental contributions. We computed relative differences in exposure levels based on the three-category measure of cybervictimisation (none, moderate, or severe), both within-twin and between-twin pairs. First, we conducted the analysis with all twins to estimate both family-wide and unique effects in a representative cohort of young people. Second, we repeated the analysis focusing on monozygotic twin pairs to test the unique association between cybervictimisation and poor mental health while controlling for all genetic relatedness. Third, we restricted the analysis to monozygotic twins additionally adjusting for other forms of victimisation to examine whether being cybervictimised is a unique environmental factor associated with mental health conditions, over and above offline victimisation.

To identify adolescents most vulnerable to poor mental health when victimised online, we included interactions between cybervictimisation and potential moderators in separate models. Potential moderators included sex, previous mental health conditions, and exposure to other forms of victimisation across childhood.

	Participants*	Model 1, adjusted for sex, minority ethnicity, SES, and childhood IQ	Model 2, additionally adjusted for previous poor mental health	Model 3, additionally adjusted for childhood online and offline victimisation	Model 4, additionally adjusted for problematic digital technology use and loneliness	Model 5, additionally adjusted for other forms of victimisation	Percentage attenuation in OR (models 4–5)†
Generalised anxiety disorder							
Moderate cybervictimisation	1968	4·47 (2·94–6·78)	4·46 (2·93–6·81)	4·30 (2·83–6·54)	2·48 (1·55–3·96)	2·04 (1·24–3·36)	17·7%
Severe cybervictimisation	1968	5·09 (3·03–8·55)	5·09 (3·01–8·59)	4·81 (2·85–8·13)	3·45 (1·94–6·14)	2·69 (1·45–4·98)	22·0%
Major depressive disorder							
Moderate cybervictimisation	1971	3·40 (2·54–4·55)	3·22 (2·40–4·32)	3·12 (2·33–4·18)	2·00 (1·45–2·77)	1·44 (1·03–2·02)	28·0%
Severe cybervictimisation	1971	3·29 (2·15–5·03)	3·19 (2·08–4·90)	3·05 (1·98–4·70)	2·24 (1·42–3·55)	1·39 (0·84–2·29)	38·0%
Self-harm or suicide attempt							
Moderate cybervictimisation	1968	4·59 (3·32–6·35)	4·38 (3·15–6·09)	4·19 (3·03–5·81)	2·87 (1·99–4·12)	1·75 (1·19–2·58)	39·0%
Severe cybervictimisation	1968	3·96 (2·58–6·09)	3·96 (2·58–6·09)	3·73 (2·41–5·77)	2·81 (1·73–4·57)	1·38 (0·82–2·32)	50·9%
Post-traumatic stress disorder							
Moderate cybervictimisation	1971	5·49 (3·68–8·18)	··‡	5·18 (3·48–7·73)	3·66 (2·39–5·59)	2·05 (1·32–3·17)	44·0%
Severe cybervictimisation	1971	6·75 (4·14–10·99)	··‡	6·17 (3·78–10·08)	4·93 (2·92–8·34)	2·35 (1·36–4·07)	52·3%
Conduct disorder							
Moderate cybervictimisation	1963	2·55 (1·82–3·58)	2·39 (1·69–3·36)	2·33 (1·65–3·29)	1·63 (1·13–2·35)	0·96 (0·64–1·43)	41·1%
Severe cybervictimisation	1963	3·85 (2·44–6·09)	4·25 (2·62–6·89)	4·05 (2·46–6·67)	3·33 (2·03–5·46)	1·71 (1·01–2·88)	48·6%
Psychotic experiences							
Moderate cybervictimisation	1974	4·87 (3·66–6·48)	4·70 (3·53–6·25)	4·54 (3·42–6·04)	3·40 (2·53–4·56)	2·26 (1·65–3·09)	33·5%
Severe cybervictimisation	1974	4·22 (2·79–6·38)	4·06 (2·67–6·18)	3·87 (2·55–5·87)	3·11 (2·02–4·80)	1·66 (1·05–2·63)	46·6%

Data are OR (95% CI) unless otherwise stated. IQ=intelligence quotient. OR=odds ratio. SES=socioeconomic status. *Number of participants with complete data on all variables included in models 1–5, separately for each mental health outcome. †Percentage attenuation calculated as [(OR model 4 – OR model 5)/OR model 4] × 100. As a sensitivity check for multiple comparisons, we applied a Bonferroni correction (α=0·0083, 0·05/6). Overall, the results showed similar patterns of significant associations. Some associations were no longer significant in model 4: conduct disorder (moderate cybervictimisation, p=0·0090), and in model 5: depression (moderate cybervictimisation, p=0·035), conduct disorder (severe cybervictimisation, p=0·045), and psychotic experiences (severe cybervictimisation, p=0·031). ‡Analyses for post-traumatic stress disorder did not control for post-traumatic stress disorder at age 12 years because this was not assessed in this sample.

Table 2: **Associations between cybervictimisation and poor mental health in young people**

All analyses were controlled for sex, minority ethnicity, socioeconomic status, and childhood IQ. For individual-level analyses, we used robust SEs accounting for clustering of twins within families. When data were missing, we used pairwise deletion for descriptive analyses to retain all available data. For the main analyses, we used list-wise deletion to ensure data from the same participants were included across models. All statistical tests were two tailed, and significance was set at p values less than 0·05.

All analyses were conducted in Stata (version 18).

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results

The study sample included 2066 participants who took part in the E-Risk study assessments at age 18 years, of whom 2063 (99·9%) had data on cybervictimisation. We found no differences between participants who did and did not take part at age 18 years in terms of socioeconomic status assessed when the cohort was initially defined (χ^2=0·86, p=0·65), IQ scores at age 5 years (*t*=0·98, p=0·33), or emotional or behavioural problems at age 5 years (*t*=0·40, p=0·69 and *t*=0·41, p=0·68, respectively). The proportions of monozygotic (1162 [56·2%] of 2066) and male same-sex (981 [47·5%] of 2066) twins were almost identical to those found in the original sample at age 5 years. The mean age of the twins at the time of the assessment was 18·4 years (SD 0·4), and all interviews were conducted after their 18th birthday. The majority (1870 [90·5%] of 2066) of the sample identified as White, 84 (4·1%) as Asian, 40 (1·9%) as Black, eight (0·4%) as mixed race, and 64 (3·1%) as other ethnicities (see appendix p 6 for details).

419 (20·3%) of 2063 young people reported being cybervictimised between ages 12 years and 18 years: 286 (13·9%) moderately and 133 (6·4%) severely (table 1). Females were over-represented among those who were severely cybervictimised (103 [77·4%] of 133) and, to a lesser extent, moderately cybervictimised (161 [56·3%] of 286). In nearly all cases, cybervictimisation in adolescence co-occurred with other forms of victimisation: 409 (97·6%) of 419 adolescents who experienced online abuse also reported at least one form of offline victimisation. Ten (2·4%) of 419 participants reported being cybervictimised without exposure to any forms of offline victimisation.

Young people exposed to cybervictimisation during adolescence, moderate or severe, had increased odds for

all poor mental health outcomes at age 18 years after controlling for sex, minority ethnicity, socioeconomic status, and childhood IQ (model 1; table 2). The magnitude of these associations varied across mental health conditions: compared with non-cybervictimised participants, severely cybervictimised adolescents had a six times increase in their odds of meeting diagnostic criteria for post-traumatic stress disorder (odds ratio [OR] 6·75 [95% CI 4·14–10·99]), a five times increase for generalised anxiety disorder (5·09 [3·03–8·55]), and a four times increase of reporting psychotic experiences (4·22 [2·79–6·38]). The odds for mental health conditions reduced but remained robust and elevated after further adjustment for previous poor mental health, childhood online and offline victimisation experiences, and problematic digital technology use and loneliness (models 2–4; table 2). Overall, the odds for mental health conditions remained statistically significant for the combination of informant-reported cybervictimisation with self-reported poor mental health and the reverse pairing (tables 2, 3; appendix pp 7–8). Adjusting for other forms of adolescent victimisation reduced the associations with mental health conditions (model 5; table 2). Among severely cybervictimised adolescents, associations with generalised anxiety disorder, post-traumatic stress disorder, conduct disorder, and psychotic experiences remained statistically significant, whereas those for major depressive disorder and self-harm or suicide attempt did not. For moderately cybervictimised adolescents, statistically significant associations persisted with all poor mental health outcomes except conduct disorder. Across models, the estimated attenuation in ORs ranged from 17·7% to 52·3% (models 4–5; table 2; see appendix p 2 for the calculator formula). Reductions were modest for generalised anxiety disorder and major depressive disorder, but more pronounced for self-harm or suicide attempt, post-traumatic stress disorder, conduct disorder, and psychotic experiences.

The association between cybervictimisation and poor mental health was accounted for by both familial factors and the unique experience of being cybervictimised (table 3). Twin pairs with greater exposure to cybervictimisation were more likely to experience mental health conditions than pairs who reported lower or no exposure. Moreover, greater exposure for one twin relative to their co-twin was associated with increased odds of all mental health conditions, except for self-harm or suicide attempt.

When we limited the analyses to monozygotic twins, the unique association between cybervictimisation and generalised anxiety disorder, major depressive disorder, conduct disorder, and psychotic experiences held, whereas the association with post-traumatic stress disorder was no longer statistically significant (table 3). Because monozygotic twin pairs are genetically identical, these findings indicate that being cybervictimised has, at least in part, a unique environmental association with poor mental health outcomes in young people. The associations can be

	All twins		Monozygotic twins only		Monozygotic twins, adjusted for other forms of victimisation	
	Number of pairs	OR (95% CI)	Number of pairs	OR (95% CI)	Number of pairs	OR (95% CI)
Generalised anxiety disorder						
Family-wide effect	1003	2·83 (2·08–3·85)	567	2·29 (1·48–3·53)	565	1·34 (0·80–2·23)
Unique effect	1003	2·29 (1·54–3·40)	567	2·63 (1·45–4·77)	565	2·14 (1·18–3·88)
Major depressive disorder						
Family-wide effect	1006	2·30 (1·83–2·90)	569	2·51 (1·86–3·39)	567	1·31 (0·93–1·86)
Unique effect	1006	1·83 (1·38–2·43)	569	1·52 (1·04–2·24)	567	1·22 (0·81–1·83)
Self-harm or suicide attempt						
Family-wide effect	1007	3·80 (2·96–4·86)	570	3·91 (2·82–5·41)	568	1·85 (1·27–2·69)
Unique effect	1007	1·30 (0·97–1·74)	570	1·16 (0·78–1·74)	568	0·85 (0·55–1·32)
Post-traumatic stress disorder						
Family-wide effect	1007	4·33 (3·22–5·83)	569	4·26 (2·86–6·36)	567	1·89 (1·16–3·09)
Unique effect	1007	1·43 (1·00–2·04)	569	1·40 (0·84–2·33)	567	0·99 (0·58–1·72)
Conduct disorder						
Family-wide effect	1001	2·24 (1·70–2·96)	565	2·22 (1·53–3·21)	563	0·99 (0·63–1·57)
Unique effect	1001	1·93 (1·37–2·72)	565	2·05 (1·28–3·27)	563	1·56 (0·95–2·56)
Psychotic experiences						
Family-wide effect	1009	4·24 (3·37–5·33)	570	5·23 (3·83–7·15)	568	2·68 (1·92–3·74)
Unique effect	1009	1·50 (1·16–1·94)	570	1·64 (1·14–2·34)	568	1·29 (0·88–1·90)

OR=odds ratio. Family-wide effect=between-twin pair difference. Unique effect=within-twin pair difference. SES=socioeconomic status. IQ=intelligence quotient. N=number of twin pairs with complete data on all variables included in the models. All analyses controlled for sex, minority ethnicity, SES, and childhood IQ.

Table 3: **Family-wide and unique associations between cybervictimisation and poor mental health in young people**

illustrated by examining the percentage of mental health conditions in monozygotic twin pairs in which one twin reported being cybervictimised while their co-twin did not (figure). Generalised anxiety disorder was present in 24 (16·7%) of 144 cybervictimised twins compared with six (4·2%) of 144 non-cybervictimised co-twins (153 [7·4%] of 2060 in the whole sample). Major depressive disorder was observed in 48 (33·3%) of 144 cybervictimised twins versus 30 (21·0%) of 143 non-cybervictimised co-twins (414 [20·1%] of 2063 in the whole sample). Conduct disorder was present in 35 (24·5%) of 143 cybervictimised twins compared with 19 (13·4%) of 142 non-cybervictimised co-twins (309 [15·1%] of 2053 in the whole sample). Psychotic experiences were reported by 78 (54·2%) of 144 cybervictimised twins compared with 55 (38·2%) of 144 non-cybervictimised co-twins (623 [30·2%] of 2063 in the full sample; figure). Differences were statistically significant for generalised anxiety disorder ($\chi^2[1]=6·00$, p=0·014), major depressive disorder ($\chi^2[1]=30·00$, p<0·0001), conduct disorder ($\chi^2[1]=19·00$, p<0·0001), and psychotic experiences ($\chi^2[1]=55·00$, p<0·0001).

After adjusting for other forms of adolescent victimisation (table 3), the unique association with cybervictimisation was no longer statistically significant for major depressive disorder, conduct disorder, and psychotic experiences. However, the unique association remained statistically significant for generalised anxiety disorder; twins with greater exposure to online abuse relative to their co-twin had over twice the odds of meeting the criteria for generalised anxiety disorder (OR 2·14 [95% CI 1·18–3·88]).

Associations between cybervictimisation and mental health conditions did not differ between males and females, nor did they vary according to previous mental health conditions. We observed significant interactions in the association of cybervictimisation and childhood offline victimisation with self-harm or suicide attempt (n=2048). Compared with their peers without a history of childhood victimisation, adolescents with such a history who were moderately cybervictimised had nearly three times the odds of self-harm or suicide attempt (OR 2·98 [95% CI 1·20–7·39], p=0·019), whereas those who were severely cybervictimised had decreased odds (0·24 [0·09–0·65], p=0·0050). However, very few participants (n<15) reported self-harm or suicide attempt and adolescent cybervictimisation in the context of previous victimisation.

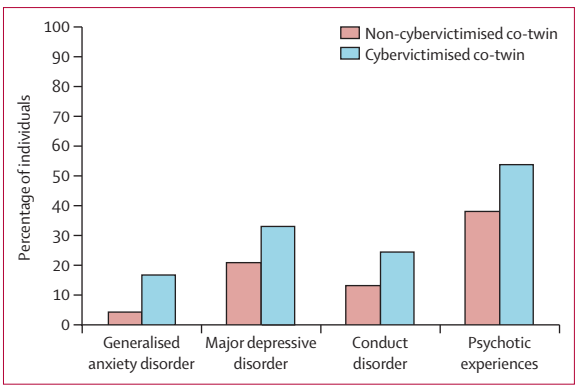

Figure: **Prevalence of poor mental health outcomes among monozygotic twin pairs discordant for adolescent cybervictimisation**
Percentages reflect the unadjusted prevalence of poor mental health outcomes among the 144 monozygotic twin pairs discordant for cybervictimisation.

Discussion

Advances in digital technologies have provided vital spaces for social interactions and connectedness, yet they have also created new avenues for individuals to abuse one another. Our findings indicate that being the victim of online abuse and harassment during adolescence—the period when people are most likely to use social media regularly[1]—is independently associated with poor mental health, yet robustly linked only with anxiety after control for key confounders including unmeasured familial factors. Cybervictimisation's distinctive features, such as potential anonymity, a limitless audience, and abuse that can persist or spread across time and space, might make it especially harmful for young people by leaving them with little control over the experience. Our study also underscores that understanding the unique association between cybervictimisation and mental health conditions requires consideration of the wider context of young people's lives. Our findings show that although the association between adolescent cybervictimisation and poor mental health was not explained by pre-existing or concurrent vulnerabilities, a meaningful proportion of this association was accounted for by offline forms of victimisation, with modest to substantial reductions across mental health conditions. In the light of current policy debates on digital safety, these findings call attention to consider online abuse within a wider pattern of poly-victimisation,[26] whereby adolescents targeted online often face other types of abuse that might compound their mental health risks.

Using a stringent study design that controls for a wide range of genetic and environmental confounders, our findings provide further evidence that exposure to cybervictimisation uniquely contributes to anxiety in young people, consistent with previous twin research.[10] Even after accounting for multiple types of offline victimisation beyond bullying, being a victim of online abuse still conferred elevated odds of anxiety disorder, supporting a distinct and potentially causal environmental pathway. Surprisingly, this was not the case for depression, despite the common genetic and environmental influences linking these emotional disorders.[27] One explanation is that anxiety, due to its heightened sensitivity to environmental stressors, might be particularly affected by experiences of online abuse.[28] Thus, early interventions targeting online abuse among

adolescents might be effective in preventing the onset and reducing the incidence of anxiety disorder.

Using longitudinal data collected as part of interviews with a nationally representative sample of young people, our study showed that cybervictimisation rarely happened in isolation. In line with previous research,[5,29] most adolescents reporting online abuse were also victimised offline, suggesting that cybervictimisation could represent an indicator of risk for wider victimisation experiences. We found that the associations between poorer mental health and cybervictimisation were relatively similar for moderate and severe exposure, and there was little evidence that certain adolescents were particularly vulnerable to worse outcomes. Our results indicate that experiencing online abuse, regardless of severity, is associated with adverse mental health outcomes within the general adolescent population. These findings highlight the need to investigate other potential high-risk subgroups and factors that might be protective among adolescents who experienced cybervictimisation.

The current study has some limitations. First, our measure of cybervictimisation relied on adolescents' self-reported description of their worst experience of online abuse and harassment over the previous 6 years, collected between 2012 and 2014. Although mainly retrospective and not as comprehensive as multi-item questionnaires or as direct as data from social media platforms, we combined the brevity of a widely used questionnaire with the relative objectivity of a standardised coding system to assess severity, showing high inter-rater reliability.[21] Future studies should consider using prospective measures to more comprehensively capture the dynamics of cybervictimisation over time and to minimise potential recall bias. Patterns of cybervictimisation might also differ now given the rapidly evolving nature of digital platforms. However, adolescents in the UK were already highly connected during that period: the 2013 Oxford Internet Survey[30] reported widespread use of social media platforms among young people, and the 2013 Office for National Statistics survey[31] found that most accessed the internet via mobile devices. Furthermore, our focus on severity captures enduring aspects of online abuse regardless of the platform used. Second, despite rigorous control for shared familial factors, it cannot be ruled out that other non-shared experiences unique to each twin within monozygotic pairs beyond offline victimisation might contribute to the link between cybervictimisation and anxiety disorder in young people. Third, cyber-victimisation and mental health conditions were self-reported concurrently with overlapping reporting periods, potentially introducing common-method bias. Nevertheless, associations were replicated with parents and co-twins' reports and adjusted for previous victimisation and poor mental health to reduce concerns that pre-existing vulnerabilities solely explain the observed association. Fourth, our results are based on a sample of twins of predominantly European descent and might not generalise to singletons and to other race groups. However, the prevalence of cybervictimisation among young people in our study matches recent UK population-based surveys,[32] and the findings on the association between cybervictimisation and mental health outcomes in twins are similar to those in studies of singletons.[13] Future research is needed to replicate these findings in more ethnically diverse populations. Finally, our study did not benefit from the input of individuals with lived experience—ie, who have personal, first-hand experience of mental health conditions. This might affect the transferability and practical relevance of the findings.

This study has implications for informing research and policy because our findings suggest that online abuse represents a unique environmental contributing factor for anxiety disorder in young people. They also highlight the importance of accounting for alternative explanations when examining the relation between cybervictimisation and mental health conditions. Failing to consider such factors, especially offline victimisation, could lead to biased or inflated estimates because it appears to contribute meaningfully to the observed association. In line with the calls from the *Lancet* Commissions for a value-based and balanced approach to online harms,[2,4] our findings support a cautious stance in addressing cybervictimisation and its implications for mental health. This is particularly crucial amid ongoing debates on regulating social media use and new technologies within both academic and government policy discussions.[7,8] Although online abuse raises concerns, it was not as frequent as it might be widely believed in our representative sample of young people, nor was it the main driver of poor mental health; aside from anxiety and depression, a substantial part of the association stemmed from offline victimisation. Our findings suggest that reducing instances of online abuse might alleviate the likelihood of mental health conditions in young people, with potentially greater benefits when combined with efforts to tackle offline victimisation. Thus, health service providers should broaden the focus of targeted prevention and intervention responses beyond social media and screen use by considering the wider context when addressing poor mental health in victims of online abuse. Further research is needed to better characterise the mechanisms linking cybervictimisation to mental health, including individual, social, and contextual factors such as peer and school influences to inform clinical and policy responses for vulnerable adolescents.

Contributors

FT-C had a lead role in conceptualisation, data curation, formal analysis, and writing, reviewing, and editing of the manuscript. LA had a lead role in conceptualisation, funding acquisition, investigation, methodology, and supervision, and a supporting role in data curation and writing, reviewing, and editing of the manuscript. FB, ND, HLF, TM, and CLO had a supporting role in writing, reviewing, and editing of the manuscript. HLF led the adaptation of the adolescent victimisation measure and contributed to rating the severity of participants' exposure.

FB and TM directly accessed and verified the data reported in this manuscript. All authors had full access to the data and accept final responsibility for the decision to submit for publication.

Declaration of interests

CLO declares honoria from the Anxiety & Depression Association of America for giving a keynote presentation. All other authors declare no competing interests.

Data sharing

The dataset reported in this Article is not publicly available because of no informed consent or ethical approval but is available on request to the corresponding author by qualified scientists. Requests require a concept paper describing the purpose of data access, ethical approval at the applicant's institution, and provision for secure data access (for further details, see https://eriskstudy.com/data-access). All data analysis scripts and results files are available for review upon request to the corresponding author. For the purposes of open access, the corresponding author has applied a Creative Commons Attribution (CC BY) licence to any Accepted Author Manuscript version arising from this submission.

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