

Research Article

Predicting Youth Violence and Distress from Online Exposure: A Symbolic Analysis of Aggregated Data

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Abstract

This study examines associations between adolescents' exposure to violent content on social media and behavioural and mental-health outcomes using aggregated cross-sectional data from the Youth Endowment Fund's 2024 Children, Violence and Vulnerability Survey (N = 10,385 adolescents aged 13–17 years in England and Wales). Logistic regression models were estimated on grouped data within a symbolic data analysis framework to assess three outcomes: violence perpetration, concern about victimization, and psychological distress captured by trouble eating, sleeping, or concentrating. Exposure to online violence was common (78.6%), as were witnessing violence in person (56.4%), victimization (17.5%), and perpetration (16.3%), and engagement with major social media platforms was widespread. In regression analyses, higher engagement with the platform most strongly associated with violent-content exposure was positively related to violence perpetration in the base model ($\beta = 0.703$, $p = 0.013$) but became non-significant after inclusion of an interaction with violent-content exposure, whereas the interaction between platform engagement and viewing violence was strongly associated with concern about victimization ($\beta = 153.795$, $p < 0.001$) and psychological distress ($\beta = 161.422$, $p < 0.001$). Across outcomes, a higher proportion of females was consistently associated with greater perpetration, concern, and distress ($\beta = 1.43$ – 3.41 , $p < 0.001$). Overall, these findings suggest that platform engagement alone is not uniformly associated with harm, but its combination with exposure to violent content corresponds to substantially higher levels of reported perpetration, concern, and psychological distress. Given the aggregated cross-sectional design, results should be interpreted as population-level associations rather than causal effects, while still highlighting important public-health implications and the need for age- and gender-sensitive prevention strategies including media-literacy and digital-safety interventions.

Keywords

Public Health, Social Media, Youth Mental Health, Logistic Regression, Cyberbullying, Violence Perpetration, Fear of Victimization

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1. Introduction

1.1. Growth of Social Media Use and Mental-Health Implications

Social media use among adolescents increased substantially during and after the COVID-19 lockdowns, particularly on platforms such as TikTok, Instagram, and YouTube. Although these platforms facilitate communication and social connection, growing evidence links intensive use to reduced self-esteem, depression, anxiety, problematic use, sleep disruption, unhealthy diet, reduced physical activity, and body-image concerns [1-3]. Constant exposure to idealized images and social comparison can fuel feelings of inadequacy and dependence on peer validation, increasing vulnerability to mental health problems [2, 4].

1.2. Online Aggression, Cyberbullying, and Violence Exposure

Beyond comparison-driven mental-health risks, social media can also enable and amplify online aggression and exposure to violence among young people. Online aggression includes behaviours such as teasing, intimidation, public ridicule, spreading false information, and threats [5, 6] occurring between peers, anonymous users, or public figures. Platform features including anonymity, public commenting, and rapid content sharing may facilitate cyberbullying, harassment, hate speech, and escalation into real-world conflict [7]. Cyberbullying affects approximately 7% of children aged 11–13 and 5.2% of those aged 14–17 and is often more harmful than traditional bullying due to its persistence, wide audience reach, and strong associations with depression, anxiety, and suicidal ideation [8-11].

1.3. Adolescent Vulnerability and Economic Burden of Mental Disorders

Adolescents' dependence on social media driven by the desire for connection, emotional expression, and social belonging has created new public-health challenges [12, 13]. Violence poses a major health risk worldwide, causing not only injury or death but also lasting emotional harm and risky behaviours [13, 14]. In the health production framework, violence acts as a negative input that diminishes health capital through physical, psychological, and behavioural effects [15]. Adolescents' dependence on social media is driven by the desire for connection, emotional expression, and social belonging has created new public health challenges. This dependence also increases exposure to violent content that can negatively affect both mental and physical health and may have lasting developmental consequences [16]. Mental disorders represent a leading cause of disease burden among adolescents and young adults worldwide. In 2021, an estimated 279 million individuals aged 10–24 years were affected, accounting for over 23% of global years lived with disability (YLDs) in this

age group. The primary contributors are anxiety, depressive, and conduct disorders, which together comprise nearly two-thirds of all mental-health-related YLDs [17]. Earlier global analyses showed that neuropsychiatric conditions accounted for 45% of total disability among young people, underscoring their long-standing dominance in adolescent morbidity profiles [18]. More recent burden-of-disease estimates attribute around 10% of these mental disorder DALYs to bullying victimization, highlighting peer aggression including cyberbullying as a substantial and preventable determinant of youth mental health bullying related disorders [17]. Cost-of-illness studies reveal that mental health problems among young people impose a substantial economic burden on society. Across the EU, mental ill-health accounts for nearly 4% of GDP, translating to about €600 billion annually when considering healthcare, social care, and productivity losses [19]. In Germany, frequent bullying among adolescents is associated with markedly elevated societal costs approximately €8,462 per victim per year, compared to €3,138 for non-bullied peers, resulting in an excess cost of €5,323 annually. Most of this burden stems from indirect costs due to parental productivity losses and increased healthcare utilization, alongside reduced quality of life. These findings emphasize that bullying, including its cyber forms, not only harms adolescent mental health but also contributes meaningfully to the broader economic burden of mental disorders, underscoring the cost-effectiveness potential of early preventive interventions [20]. In England, the annual cost of mental ill-health in 2022 was estimated at £300 billion, comprised of approximately £110 billion in economic costs (such as lost productivity, sickness absence and staff turnover), £130 billion in human costs (reduced quality of life and premature mortality) and £60 billion in health and care costs (including informal care) for that year [21].

1.4. Pathways Linking Violence Exposure to Long-Term Health Outcomes

The recent line of literature clarifies the pathways how violence disturbs the psychology and leads to increased healthcare expenditure. Violence affects health through both neurological and psychological pathways, altering brain structures involved in stress regulation, emotion processing, and executive function. These disruptions contribute to long-term mental and physical health problems, such as anxiety, depression, and chronic disease [22]. From a health policy and economic perspective, such consequences translate into substantial costs including increased healthcare utilization, reduced productivity, and diminished human capital. The intergenerational transmission of trauma further compounds these effects, perpetuating cycles of poor health and socioeconomic disadvantage [23, 24]. Given the high burden of mental health problems among young people and the growing evidence that

online environments shape behavioural and emotional development, understanding the public health implications of adolescents' exposure to violent content on social media has become increasingly important. Despite extensive research on cyberbullying, comparatively little is known about how broader forms of online violence such as exposure to violent imagery, peer aggression, or hate speech affect youth behaviour and psychological well-being. Adolescence represents a critical neurodevelopmental period characterised by heightened emotional reactivity, evolving self-identity, and strong sensitivity to peer feedback, all of which may intensify vulnerability to harmful online interactions.

1.5. Study Aim and Analytical Approach

This study therefore examines the association between adolescents' exposure to violent content on social media and key outcomes including violence perpetration, concern about violence, and psychological distress. By analysing aggregated data using Youth Endowment Fund (YEF) 2024 Children, Violence and Vulnerability Survey data at the population level, it provides insights into the extent to which social media use may contribute to patterns of aggression and mental health difficulties during this formative stage of life. Understanding these associations is essential not only for refining public health prevention strategies but also for guiding evidence-based policymaking around digital safety, mental health promotion, and social media governance. Furthermore, considering the substantial economic costs linked to adolescent mental disorders, identifying modifiable risk factors such as exposure to online violence can inform cost-effective early interventions that protect mental well-being and reduce long-term societal burden.

The logistic regression analysis is conducted to understand the impact of viewing violence online on likelihood of being a perpetrator of violence. The exposure to violent media is linked to heightened aggressive thoughts, feelings of anger, and aggressive actions. This effect tends to be stronger in individuals who already struggle with emotional, behavioural, learning, or impulse control difficulties [25].

2. Data and Methods

2.1. Data Source and Study Population

This study employs a quantitative analysis starting with summary and descriptive statistics followed by logistic regression analysis. YEF 2024 Children, Violence and Vulnerability Survey data that gathered insights from over 10,000 teenagers aged 13–17 across England and Wales. The survey captures young people's experiences of violence, exposure to social media content, and access to support systems. The analysis focuses on group-level associations between social media use, exposure to online violence, and behavioural or psychological outcomes among adolescents. Because individual-level microdata was not available, and to ensure ethical handling of

sensitive information, the study applies statistical methods suitable for aggregated data to examine population-level trends while reducing noise and data dimensionality.

2.2. Statistical Analysis

Due to restricted access to individual-level microdata from the Youth Endowment Fund survey (for privacy/ethical reasons), logistic regression was fitted to aggregated predictors using a symbolic data analysis (SDA) framework with composite likelihood estimation. SDA summarizes large/complex datasets into "symbols" (e.g., histograms), where each symbol represents a distribution of micro-observations rather than single values—reducing dimensionality while preserving variability. [26].

To assess associations between exposure to violence, social media use, and psychosocial outcomes, a series of group-level logistic regression models were estimated. Dependent variables included; concern about violence, fear-related disruption of daily activities (e.g., eating, sleeping, concentrating), and violence perpetration. Key independent variables comprised; the number of TikTok users per age group (in thousands), the rate of exposure to online violence (per 1,000 adolescents), and their interaction term, while controlling for the proportion of females in each group.

Let g index age–gender groups. For each group, the number of adolescents reporting the outcome y_g out of n_g individuals was assumed to follow a binomial distribution:

$$y_g \sim \text{Binomial}(n_g, p_g)$$

and the log-odds of the group-level probability p_g were modelled as:

$$\text{logit}(p_g) = \beta_0 + \beta_1 T_g + \beta_2 F_g + \beta_3 V_g + \beta_4 (T_g \times V_g) + \gamma T X_g$$

Where:

- 1) T_g = TikTok measure for group g (e.g., TikTok users per 1,000 or proportion using TikTok)
- 2) F_g = proportion female in group g
- 3) V_g = viewed-violence measure (e.g., rate per 1,000 or proportion)
- 4) X_g = other group-level covariates / fixed effects

Standard errors were clustered at the age–gender group level to account for within-group correlation. TikTok was selected as the focal platform because it represents one of the most widely used social media platforms among adolescents, and YEF reporting indicates that approximately 50% of TikTok users report exposure to violent content on the platform [27].

The unit of analysis consisted of aggregated age–gender groups, yielding 10 group-level observations per outcome model. Predictor variables were scaled to improve interpreta-

bility, with TikTok engagement and exposure to online violence expressed per 1,000 adolescents and the proportion of females expressed per 10-percentage-point increase.

3. Results

3.1. Sample Characteristics

Table 1 presents the background characteristics of the study participants and the main variables used in the analysis for the sample of 10,385 adolescents aged 13–17. The table summa-

rizes demographic composition, regional distribution, education status, household structure, behavioural risk factors, exposure to violence, and social media use across age groups. Overall, the sample shows a balanced gender distribution and high levels of engagement in formal education, with most adolescents attending mainstream secondary school or post-16 education. Exposure to violence both online and in person was common, while a smaller proportion reported victimization or perpetration in the past year. Social media use was widespread, particularly on major platforms such as YouTube, WhatsApp, TikTok, Instagram, and Snapchat. Collectively, these descriptive statistics provide the contextual foundation for the regression analyses reported in the subsequent section.

Table 1. Summary Statistics.

Category	Subgroup	Age 13	Age 14	Age 15	Age 16	Age 17	N
Gender	Male	1185 (11.41%)	1240 (11.94%)	1176 (11.32%)	914 (8.80%)	819 (7.89%)	5334
	Female	976 (9.40%)	859 (8.27%)	861 (8.29%)	1142 (11.00%)	1213 (11.66%)	5051
Region	City (total urban)	1197 (21.93%)	1227 (22.48%)	1152 (21.10%)	978 (17.92%)	905 (16.58%)	5459
	Inner city area	504 (21.80%)	580 (25.09%)	493 (21.32%)	405 (17.52%)	330 (14.27%)	2312
	Suburban area	694 (22.04%)	647 (20.55%)	659 (20.93%)	574 (18.23%)	575 (18.26%)	3149
	Town	690 (19.04%)	660 (18.22%)	652 (18.00%)	804 (22.19%)	817 (22.55%)	3623
	Village / rural	274 (21.00%)	212 (16.25%)	234 (17.93%)	275 (21.07%)	310 (23.75%)	1305
	In any education	2097 (21.01%)	2039 (20.42%)	1988 (19.91%)	1978 (19.81%)	1881 (18.84%)	9983
	Mainstream secondary ($\leq$ age 16)	1915 (26.48%)	1854 (25.64%)	1793 (24.79%)	1391 (19.23%)	280 (3.87%)	7233
Education Type	College / 6th form / apprenticeship	53 (2.33%)	71 (3.13%)	73 (3.21%)	523 (23.02%)	1552 (68.31%)	2272
	Other	170 (25.11%)	163 (24.07%)	165 (24.37%)	104 (15.36%)	75 (11.08%)	677
	Not in education / or unknown	24 (0.23%)	12 (0.12%)	7 (0.07%)	38 (0.37%)	124 (1.19%)	205
	Single Parents	519 (19.92%)	507 (19.46%)	438 (16.81%)	590 (22.64%)	552 (21.18%)	2606
Household Structure	Married	1341 (20.52%)	1343 (20.55%)	1343 (20.55%)	1246 (19.06%)	1263 (19.32%)	6536
	Cohabiting	301 (24.37%)	249 (20.16%)	258 (20.89%)	229 (18.54%)	198 (16.03%)	1235
	Been in a gang	165 (22.21%)	216 (29.07%)	181 (24.36%)	102 (13.73%)	79 (10.63%)	743
Gang Membership	Not been in a gang	1928 (20.62%)	1833 (19.61%)	1800 (19.25%)	1896 (20.28%)	1892 (20.24%)	9349
	Not sure/skipped	49 (20.68%)	49 (20.68%)	49 (20.68%)	44 (18.57%)	46 (19.41%)	237
	Carried a weapon	125 (23.54%)	147 (27.68%)	122 (22.98%)	74 (13.94%)	63 (11.87%)	531
Weapons carrying	Not carrying a weapon	1841 (20.34%)	1805 (19.94%)	1756 (19.40%)	1830 (20.22%)	1820 (20.11%)	9052
	Not sure	35 (20.71%)	46 (27.22%)	44 (26.04%)	19 (11.24%)	25 (14.79%)	169

Category	Subgroup	Age 13	Age 14	Age 15	Age 16	Age 17	N
Drug Use	Never Used	1768 (21.55%)	1651 (20.13%)	1599 (19.49%)	1570 (19.14%)	1616 (19.70%)	8204
	Ever Used	202 (15.71%)	262 (20.39%)	263 (20.47%)	308 (23.97%)	250 (19.46%)	1285
	Not Sure	15 (33.33%)	9 (20.00%)	5 (11.11%)	9 (20.00%)	7 (15.56%)	45
Viewed Violence Online	Hasn't Viewed	484 (24.46%)	416 (21.02%)	392 (19.81%)	306 (15.46%)	381 (19.26%)	1979
	Has Viewed	1424 (19.63%)	1454 (20.04%)	1425 (19.64%)	1523 (20.99%)	1428 (19.68%)	7254
	Not sure	80 (26.94%)	46 (15.49%)	39 (13.13%)	74 (24.92%)	58 (19.53%)	297
Witnessed Violence In Person	Not Witnessed in past year	912 (20.50%)	843 (18.95%)	847 (19.04%)	873 (19.62%)	973 (21.87%)	4448
	Witnessed in past year	1221 (21.21%)	1218 (21.13%)	1160 (20.14%)	1149 (19.94%)	1012 (17.57%)	5760
	Not Sure	11 (14.86%)	18 (24.32%)	6 (8.11%)	15 (20.27%)	24 (32.43%)	74
Victim of Violence	Not Victim in past year	1702 (20.55%)	1639 (19.78%)	1602 (19.34%)	1644 (19.84%)	1698 (20.49%)	8285
	Victim in past year	455 (25.90%)	460 (26.19%)	434 (24.71%)	408 (23.23%)	332 (18.90%)	1757
	Not sure	6 (37.50%)	1 (6.25%)	2 (12.50%)	4 (25.00%)	3 (18.75%)	16
Perpetrator of Violence	Not Perpetrator in past year	1761 (20.27%)	1690 (19.45%)	1685 (19.39%)	1762 (20.28%)	1792 (20.63%)	8690
	Perpetrator in past year	394 (23.22%)	409 (24.10%)	379 (22.33%)	286 (16.85%)	229 (13.49%)	1697
	Not sure	247 (22.52%)	203 (18.51%)	168 (15.31%)	235 (21.42%)	244 (22.25%)	1097
Use of Social Media	Youtube	1684 (20.43%)	1547 (18.77%)	1546 (18.75%)	1736 (21.06%)	1729 (20.96%)	8242
	WhatsApp	1485 (19.25%)	1451 (18.81%)	1444 (18.72%)	1653 (21.44%)	1681 (21.79%)	7714
	Tiktok	1325 (18.42%)	1278 (17.77%)	1354 (18.82%)	1643 (22.84%)	1593 (22.15%)	7193
	Instagram	920 (14.80%)	1034 (16.63%)	1209 (19.45%)	1476 (23.74%)	1576 (25.36%)	6215
	Snapchat	1063 (17.70%)	973 (16.19%)	1103 (18.35%)	1456 (24.23%)	1414 (23.53%)	6009
	Facebook	818 (16.64%)	924 (18.79%)	1021 (20.77%)	1073 (21.82%)	1081 (21.98%)	4917

Note: Education categories were grouped to improve interpretability and avoid sparse cells; “other education” includes special educational needs schools, pupil referral/alternative provision, and home-schooled adolescents. Social media platform use was measured as a multi-response variable, and only the most widely used platforms are presented. Social media is multi-response (respondents pick ≥ 1 platform), so raw counts > individuals (N=10,385). Percentages are row-wise within category (e.g., YouTube 1684/8242 total YT users =20.43% age 13), not column totals. Column sums >100% expected/normal.

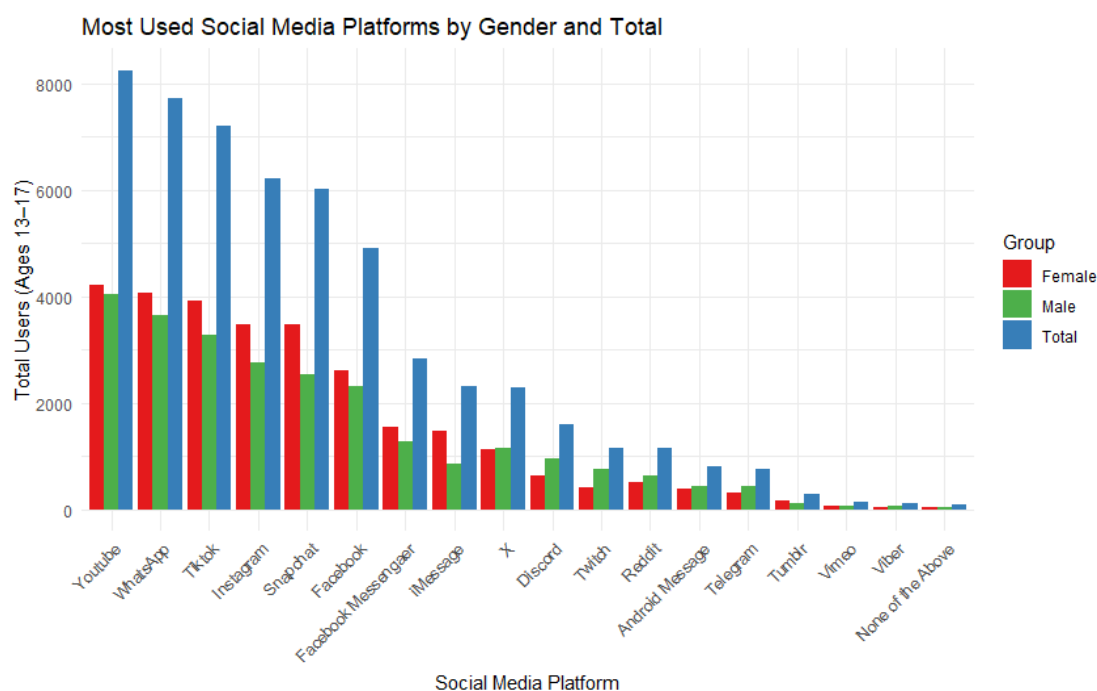


Figure 1. Use of Social Media Platforms by Gender.

Figure 1 presents the most used social media platforms among adolescents aged 13–17, disaggregated by gender and total usage. YouTube, WhatsApp, and TikTok are the most popular platforms across all groups, with YouTube having the highest total number of users. Female users show slightly higher usage of TikTok and Instagram compared to males, while platforms like Discord and Reddit are more commonly used by males. Overall, the chart highlights clear preferences among teenagers, with notable gender differences in platform usage patterns. Although YouTube has the highest number of users it is important to note that YouTube has explicit prohibitions on violent content; however, exposure depends on enforcement and user pathways.

3.2. Regression Results

The results are shown in Table 2. The model examines whether exposure to online violence and gender composition predict the likelihood of adolescents being reported as perpetrators of violence. Because the models are estimated on a limited number of aggregated group-level observations, coefficient magnitudes and clustered standard errors should be interpreted cautiously; however, direction, statistical significance, and consistency across outcomes provide supportive evidence of stable population-level associations.

In the base model for violence perpetration, higher TikTok use was positively associated with perpetration ($\beta = 0.703$, $p = 0.013$). However, this association became non-significant after inclusion of the interaction with exposure to online violence, indicating that the relationship between platform use

and perpetration depends on concurrent exposure to violent content.

For concern about violence, TikTok use showed a negative association in the base model ($\beta = -1.084$, $p < 0.001$), whereas the interaction between TikTok use and online violence exposure was strongly positive and statistically significant ($\beta = 153.795$, $p < 0.001$). This pattern suggests that elevated concern is primarily observed in groups characterized by both high platform engagement and high exposure to violent content.

A similar interaction pattern was observed for psychological distress (eat/sleep/concentration difficulties). While the base association with TikTok use was not statistically significant, the interaction with online violence exposure was large and positive ($\beta = 161.422$, $p < 0.001$), indicating substantially higher distress in groups simultaneously characterized by greater exposure to violent content and higher platform use.

Across all models, a higher proportion of females was consistently associated with greater perpetration, concern about violence, and psychological distress (β range: 1.43–3.41; $p < 0.001$), highlighting gender composition as a robust correlate of violence-related outcomes at the group level.

The large magnitude of several interaction coefficients reflects the scaling of predictors and the limited number of aggregated group-level observations rather than implausibly large effect sizes. When converted to odds ratios, the estimates correspond to substantial but interpretable increases in the likelihood of concern about violence and psychological distress under conditions of both high platform engagement and high exposure to violent content.

Table 2. Correlation between Being a Perpetrator of Violence and Viewing violence online. Dependent Variable: Perpetration of Violence (Yes vs. No).

	Perpetrator (base)	Perpetrator (+interaction)	Concerned (base)	Concerned (+interaction)	EatSleep (base)	EatSleep (+interaction)
Intercept	-4.352*** (p=<0.001)	43.601 (p=0.183)	1.582*** (p=<0.001)	-112.214*** (p=<0.001)	-1.144* (p=0.019)	-119.796*** (p=<0.001)
TikTok users (1000s)	0.703* (p=0.013)	-64.654 (p=0.146)	-1.084*** (p=<0.001)	153.795*** (p=<0.001)	-0.119 (p=0.680)	161.422*** (p=<0.001)
Interaction: TikTok × Viewed_Violence		22.218 (p=0.140)		-52.593*** (p=<0.001)		-54.869*** (p=<0.001)
					2.505*** (p=<0.001)	2.223*** (p=<0.001)
Proportion Female	3.271*** (p=<0.001)	3.409*** (p=<0.001)	1.679*** (p=<0.001)	1.430*** (p=<0.001)	2.505*** (p=<0.001)	2.223*** (p=<0.001)

Note: *p<0.05; **p<0.01; ***p<0.001, standard errors are clustered by age and gender. Coefficients reflect log-odds change *per unit predictor* (TikTok/Violence = per 1,000 adolescents;%Female = per 10% increase). Large interaction β due to scaling/small #groups (10 obs); equivalent ORs shown in Appendix A2. SE clustered age-gender. *p<0.05; **p<0.01; ***p<0.001. SDA composite likelihood

3.3. Robustness Analysis

To assess the stability of these findings, models were re-estimated including fixed effects for region, household structure, criminal activity (drug use, gang membership, and weapon carrying), and victimization status. The inclusion of these controls did not materially alter the main results. Higher TikTok use, greater exposure to online violence, and a larger proportion of females remained significantly associated with violence-related outcomes, and the interaction between TikTok use and online violence exposure remained statistically significant. These results indicate that the observed associations are robust to adjustment for key group-level confounders.

4. Discussion

This study examined associations between adolescents' exposure to violent content on social media and behavioural as well as psychological outcomes using aggregated population-level data. Overall, higher exposure to online violence was associated with greater likelihood of violence perpetration, increased concern about victimization, and elevated psychological distress. These patterns are consistent with prior research indicating that exposure to violent media can reinforce aggressive cognitions and behaviours, particularly among adolescents with pre-existing emotional or behavioural vulnerabilities [25]. At the same time, the observed relationships may reflect bidirectional or self-selection mechanisms, whereby youth who are already prone to aggression or impulsivity may be more likely to engage with violent online content [28]. Broader contextual influences—such as socioeconomic disad-

vantage, community violence, and limited parental monitoring—may further shape both online exposure and real-world behaviour, suggesting that social media violence operates as one component within a wider ecological system rather than a single causal determinant [29].

Beyond behavioural outcomes, social media engagement combined with exposure to violent content was associated with heightened concern about becoming a victim of violence. Repeated exposure to threatening or harmful material in digital environments may amplify perceived vulnerability even in objectively safe contexts. The extent of this psychological impact may depend on adolescents' digital literacy, including their ability to critically interpret online information, recognize harmful interactions, and respond appropriately to cyberbullying or misinformation. Educational approaches that strengthen critical thinking, empathy, and responsible online behaviour have therefore been proposed as protective strategies, with schools playing a central role in fostering digital citizenship and ethical online participation [30].

Complementary preventive influences may arise from strong family communication, emotional support, and conflict-resolution skills, which are associated with reduced involvement in cyberbullying and improved adolescent well-being [31]. At a broader structural level, clearer regulatory frameworks and platform accountability mechanisms have been discussed as necessary components of comprehensive protection against harmful online content [32].

Psychological distress manifested as difficulties with eating, sleeping, or concentrating due to fear of violence was also associated with higher social media engagement and a greater proportion of females. Survey-based evidence similarly indicates that adolescents exposed to violent online content frequently report reduced perceived safety and behavioural

avoidance, underscoring the emotional consequences of repeated exposure to threatening media environments. Interventions aimed at strengthening emotional resilience, promoting balanced digital habits, and fostering supportive peer and family networks may therefore help mitigate these adverse outcomes [33]. Approaches grounded in mindfulness and cognitive-behavioural techniques have shown potential for reducing emotional reactivity to online stressors while enhancing self-esteem, empathy, and coping capacity among adolescents [34].

Finally, the consistent gender associations observed across outcomes suggest that adolescent responses to online violence are gender-differentiated. Higher proportions of females within groups were associated with greater concern, distress, and reported perpetration, potentially reflecting gendered patterns of social media engagement, emotional processing, and exposure to appearance-related or relational pressures in digital environments. Prior research has linked social media use particularly visual and comparison-oriented content to body-image concerns and disordered eating among young women, supporting the plausibility of heightened emotional vulnerability in this group.

A key strength of this study is the use of a large, population-based survey combined with symbolic data analysis methods that allow inference when individual-level microdata are unavailable. However, several limitations should be acknowledged. The analysis is based on a small number of aggregated age–gender groups, which may limit statistical precision and the reliability of clustered standard errors. In addition, the cross-sectional design precludes causal inference, and associations may reflect bidirectional or contextual influences. Findings should therefore be interpreted as exploratory population-level relationships rather than definitive causal effects.

5. Conclusion

Exposure to violent content in social media environments is associated with adverse behavioural and psychological outcomes among adolescents, particularly when combined with high platform engagement. While social media use alone does not appear uniformly harmful, its interaction with violent content exposure is consistently linked to greater perpetration, fear of victimization, and psychological distress, with notable gender differences. These findings underscore the public-health relevance of online violence exposure and support the need for integrated prevention strategies that combine digital literacy education, family and school engagement, emotional-resilience interventions, and strengthened platform governance. Future research using longitudinal and individual-level data is needed to clarify causal pathways and inform more targeted policy responses.

Abbreviations

YEF Youth Endowment Fund

SDA Symbolic Data Analysis

Author Contributions

Ayshe Yaylal: Conceptualization, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

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