

Harmful Online Exposure, Peer Reinforcement and Perceived Cyberdelinquency among Secondary School Adolescents in Ghana

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DOI: <https://doi.org/10.47772/IJRISS.2026.100900078>

Received: 07 September 2026; Accepted: 12 September 2026; Published: 30 September 2026

ABSTRACT

Harmful online content is encountered within peer environments in which attention, approval and encouragement may shape how students interpret online conduct. This article examines associations between harmful online exposure, perceived online peer reinforcement and perceived peer cyberdelinquency using aggregate results from a cross-sectional survey of 384 secondary school students in Ghana. Exposure and reinforcement were represented by six-item agreement scales, and perceived peer misconduct by an eight-item scale. The reported total exposure–misconduct coefficient was 0.563 (95% confidence interval [0.461, 0.665]); the coefficient conditional on reinforcement was 0.279 (95% confidence interval [0.179, 0.379]). The reported indirect association through reinforcement was 0.284 (95% bootstrap confidence interval [0.203, 0.373]; 5,000 resamples). The outcome concerns perceptions of misconduct among students generally rather than respondents' own perpetration or verified offending. The results are consistent with a perceived peer environment in which harmful exposure and social endorsement occur together. Interpretation remains exploratory because of the cross-sectional design, overlapping item content, lack of covariate adjustment and inconsistencies in the source model summaries. The findings support further investigation of peer responses within school digital-citizenship and safeguarding research, including longitudinal designs with independently validated measures.

Keywords: Harmful Online Exposure; Peer Reinforcement; Perceived Peer Cyberdelinquency; Adolescents; Ghana; Cross-Sectional Associations

INTRODUCTION

Online harm among adolescents often involves an audience. An insulting message can be ignored, challenged, endorsed or redistributed. Each response changes the social context in which the original act is understood. An account based only on encountering harmful material therefore leaves an important question unanswered: does exposure coincide with a perceived environment in which peers reward that material? This distinction matters for research because seeing misconduct and receiving encouragement to participate in it are different experiences. It also matters for prevention because reducing opportunities to encounter a message and changing the response to that message require different actions.

Research on adolescent peer relationships provides a basis for examining these processes together. Nesi et al. (2018) identify peer status and influence as domains that can be transformed by social media. Patel and Quan-Haase (2024) place digital media within an ecological account of cyberbullying. The present study applies a narrower question to these broad perspectives: whether perceived reinforcement occupies an intermediate statistical position between reported exposure to harmful online content and perceptions of peer

misconduct. The proposed relationship is ecological in its object of inquiry, but the available measures operate at the level of individual respondents' perceptions.

Ghana is a relevant setting for examining this distinction. Kyei-Arthur et al. (2024) have investigated children's internet access, use and supervision in the country. Their study establishes the relevance of studying access alongside the social conditions of use; its estimates are not used as benchmarks for the present sample because the populations and measures differ. The current investigation focuses specifically on secondary school students' accounts of their digital peer environments. It does not assume that findings from a selected school sample describe all Ghanaian adolescents.

The term cyberdelinquency needs a clearly stated referent. In the parent questionnaire, seven outcome items concern harmful acts by students generally, while an eighth concerns the effect of online misconduct on school relationships. The questionnaire does not ask respondents how often they personally committed those acts. We therefore use perceived peer cyberdelinquency to denote perceptions of misconduct within the student environment. The term does not establish criminality, behavioural prevalence or individual involvement. This distinction is necessary both for valid interpretation and to avoid labelling adolescents as offenders on the basis of observations about their peers.

The study addresses two questions. First, how are harmful online exposure, perceived peer reinforcement and perceived peer misconduct associated in the reported survey? Second, does the specified cross-sectional model contain a positive indirect association through reinforcement? The contribution lies in distinguishing exposure to harmful content from the social responses surrounding it, while examining how the meaning of the questionnaire items limits the conclusions that can be drawn.

CONCEPTUAL FRAMEWORK AND OPERATIONAL DEFINITIONS

Harmful Online Exposure

Harmful online exposure is operationalised as agreement with six statements about insulting or humiliating comments, embarrassing pictures or messages, student arguments, fake accounts or impersonation, harmful material shared in student groups, and online behaviours considered unacceptable at school. These domains primarily concern peer aggression, humiliation and identity misuse. They do not constitute a comprehensive inventory of pornography, extremist material, substance-related content, scams or other online risks. The broad final two items leave some content unspecified; they are interpreted as perceptions of the surrounding online environment rather than evidence of particular forms of criminal exposure.

The response format measures agreement, not the frequency or duration of exposure. Although the first item uses the word often, its response categories do not establish a numerical frequency or a defined recall period. Consequently, the scale cannot support estimates of how many harmful messages students encountered, how frequently they encountered each content type, or how long they spent online. General internet-use frequency appears elsewhere in the parent questionnaire and should not be substituted for frequency of harmful-content exposure.

Perceived Online Peer Reinforcement

Peer reinforcement is operationalised as agreement with six statements covering visible reactions to harmful content, perceived encouragement of repetition, attention seeking, bystander silence, perceived acceptability and encouragement to post or forward material. The construct therefore combines perceived rewards, injunctive norms and beliefs about the social significance of peer responses. These are related dimensions, but the available scale does not provide separate validated subscales for them.

Modelling means observing another person's conduct; approval concerns perceived endorsement; encouragement involves pressure or invitations to act; and perceived norms concern beliefs about what others accept. Exposure items partly capture opportunities to observe conduct, whereas the reinforcement items concern responses to it. However, a like, a comment or silence does not invariably signify approval.

Such reactions can reflect irony, uncertainty, fear of retaliation or attention without endorsement. The reported composite cannot determine which interpretation applied in a particular interaction, and no separate behavioural reinforcement process is directly observed.

Perceived Peer Cyberdelinquency

The outcome covers perceived insulting or embarrassing conduct, fake-account misuse, non-consensual sharing of private material, rumours, unauthorised account access, threatening or excluding others, and forwarding harmful material. Seven items refer to some students; the eighth concerns consequences for school relationships. The score is therefore a mixed perception measure of peer misconduct and its relational consequences. It is neither a self-report perpetration scale nor a measure of attitudes towards committing an offence. This definition governs interpretation throughout the article.

The Proposed Relationships and Competing Explanations

The conceptual framework proposes that encountering harmful material may coincide with perceptions that peers reward or tolerate it, and that both may be associated with perceiving misconduct as common. Nesi et al. (2018) explain how social media can transform peer status and influence, while Patel and Quan-Haase (2024) locate online harm within interconnected digital and social environments. These perspectives support examining content exposure and audience response together. They do not establish the temporal sequence assumed by the present statistical model.

In the fitted specification, exposure is X, reinforcement is M and perceived peer misconduct is Y. The X-to-M coefficient and the M-to-Y coefficient conditional on X define the reported indirect association; the X-to-Y coefficient conditional on M describes the remaining association. This ordering is an analytical assumption. Reverse ordering is plausible: students who already perceive more misconduct may notice more harmful content and interpret peer reactions as approving. Selection into similar peer groups and shared conditions at home or school could also influence all three measures.

The framework distinguishes a substantive explanation from a measurement explanation. The former concerns social endorsement within peer interactions; the latter concerns a common negative appraisal expressed through overlapping questionnaire items. Some reinforcement items already suggest that approval encourages harmful behaviour, while exposure and outcome items refer to similar acts. Their covariance may therefore partly reflect wording and respondents' general beliefs. Clear construct boundaries and tests against closely related measures are necessary before treating the composites as distinct mechanisms (Clark & Watson, 2019; Flake & Fried, 2020).

METHOD

Study Design and Data Source

This article reports quantitative associations from Afriyie's (2026) doctoral study of digital social ecologies in Ghanaian secondary schools. The parent study used an explanatory sequential mixed-methods framework. The present report concerns its cross-sectional questionnaire findings and does not use the qualitative component to infer temporal ordering. Numerical estimates are drawn from the thesis's results tables; participant-level data and original model output were unavailable for re-estimation.

The questionnaire, data-screening results and measurement-quality findings in the thesis provide the basis for the measures and scoring account below. Procedures described prospectively in the thesis are identified as protocol requirements. Ethical clearance was obtained, as stated in the ethics section.

Participants and Sampling

The source reports 400 questionnaires distributed and 392 returned, a return rate of 98.0%. Eight returned questionnaires were excluded for substantial missing responses or incomplete sections, leaving 384 analysed

questionnaires (96.0% of those distributed). The source reports 196 male and 188 female respondents, 252 respondents from public schools and 132 from private schools. The reported locality categories were urban (174), peri-urban (126) and rural (84).

The protocol specified multistage recruitment through selected schools. The available aggregate records do not identify the completed sampling frame, school count, recruitment dates or selection probabilities. Population weighting and adjustment for school clustering were therefore outside the scope of this report. The sample is not treated as nationally representative.

Appendix G of the thesis lists questionnaire age options of 12–14 years, 15–17 years and 18 years and above. The results chapter uses different boundaries, which cannot be reconciled from aggregate counts. Age frequencies and age-specific analyses are consequently not reported. The open-ended category also prevents a precise upper age limit or an assumption that every participant was a minor.

Measures and Score Interpretation

All three scales used five response categories: 1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree and 5 = strongly agree. Higher scores represent stronger endorsement of each scale’s statements. The exact items from the parent questionnaire are reproduced in Appendix A so readers can inspect content coverage and overlap. The source reports composite scale means. Section 4.4.1 reports item-level missingness of 0.0%–1.8% in the retained sample, with no retained questionnaire missing more than 5.0% of all items. Minor omissions were handled using available valid responses within each construct. The source reports checks of the permitted response range and no out-of-range values. The minimum number of valid responses required for an individual scale score is not specified.

Table 1 summarises the reported descriptive statistics and internal consistency coefficients. The measures were developed for the parent study. Its Section 4.4.4 reports an exploratory factor analysis of the full five-construct questionnaire: Kaiser–Meyer–Olkin sampling adequacy = 0.86; Bartlett’s test, $\chi^2(496) = 4826.37$, $p < .001$; and a five-factor solution explaining 64.7% of the total variance. Reported item loadings ranged from 0.58 to 0.84, with no cross-loading reported as requiring item removal.

The reported factor analysis provides preliminary evidence of internal structure. The full loading matrix and extraction and rotation specifications were unavailable, limiting assessment of construct separation. External validation, age-appropriate cognitive testing and measurement invariance across age or gender are not established. Cronbach’s alpha describes internal consistency. The outcome’s relational-impact item warrants separate examination in further validation work.

Table 1 Reported scale characteristics

Measure	Items	Mean	SD	α
Harmful online exposure	6	3.48	0.72	.78
Perceived peer reinforcement	6	3.06	0.79	.86
Perceived peer cyberdelinquency	8	2.58	0.83	.88

Note. N = 384 in the parent results. SD = standard deviation; α = Cronbach’s alpha. Values are reproduced from Afriye (2026), not recalculated. Agreement-scale means do not estimate behavioural prevalence.

Statistical Analysis and Confounding

The parent study reports ordinary least-squares regression paths and an indirect association estimated with 5,000 bootstrap resamples. Exposure was specified as X, reinforcement as M and perceived peer misconduct as Y. The indirect coefficient is the product of the X-to-M coefficient and the M-to-Y coefficient conditional

on X. The direct coefficient describes the X-to-Y association conditional on M. This specification describes an association pattern; it does not establish temporal ordering or causal mediation (Maxwell & Cole, 2007).

The reported paths do not adjust for demographic, family, school or internet-use covariates. Potential confounders include parental monitoring, socioeconomic circumstances, digital literacy, school climate, prior misconduct, personality characteristics, time online and type of internet use. Family digital supervision and school climate appear in the parent questionnaire, but the available mediation tables do not establish that these variables were included in the model. Their presence in the questionnaire cannot be treated as evidence of statistical control.

Table 2 presents unstandardised coefficients, standard errors and 95% confidence intervals. The intervals for the total, direct and indirect associations are reproduced from the thesis. For the exposure–reinforcement and conditional reinforcement–misconduct paths, approximate two-sided 95% normal intervals were calculated from the rounded reported coefficients and standard errors as $B \pm 1.96 \times SE$. These derived intervals are identified separately from the source bootstrap intervals. They assume approximate normality and do not account for school clustering or verify the original model. No participant-level models were refitted.

The thesis's model-fit summaries are inconsistent with its displayed standardised coefficients. A reconciled R^2 or F statistic cannot be established from the available tables. These fit statistics and the standardised coefficients are therefore omitted from the results table. The retained coefficients remain source-reported estimates, and their interpretation is exploratory. Omitting the inconsistent fit summaries does not constitute statistical re-estimation or resolve the underlying discrepancy.

Ethical Approval Consent and Safeguarding

Ethical clearance for the study was obtained from the relevant institutional ethics committee. The study protocol required parental or guardian consent and student assent for minors, voluntary participation, and the right to skip questions or withdraw without academic or disciplinary disadvantage. Education-authority and school permission were required in addition to individual consent.

The protocol specified questionnaires without names, student identifiers, phone numbers or social-media account details, and excluded passwords, private messages and identifiable screenshots. It required secure storage, separation of consent forms from responses and restricted access to research records. Teachers were not to inspect individual responses. Distress support and referral for disclosures of serious harm were specified, with participants informed of the limits to confidentiality. These provisions describe the documented protocol; a completed consent implementation account, including arrangements for participants aged 18 years and above, was not available in the source materials. No identifiable participant material is presented in this article.

RESULTS

Descriptive Pattern

The mean harmful-exposure score exceeded the mean reinforcement score, while the perceived-misconduct mean was lower than both. These descriptive differences should not be read as differences in the prevalence of three behaviours. The measures have different item content, and agreement scores do not provide occurrence rates.

Regression Coefficients and Indirect Association

Harmful online exposure was positively associated with perceived reinforcement ($B = 0.600$, $SE = 0.047$; approximate 95% CI [0.508, 0.692]). The reported total exposure–misconduct coefficient was 0.563 (95% bootstrap CI [0.461, 0.665]). In the model containing both exposure and reinforcement, the exposure coefficient was 0.279 (95% bootstrap CI [0.179, 0.379]), while the reinforcement coefficient was 0.473 (SE

= 0.051; approximate 95% CI [0.373, 0.573]). These conditional associations account for the other focal predictor only.

Table 2 Regression coefficients and indirect association

Path or association	B	SE	95% CI	Interval basis	p
Exposure to reinforcement	0.600	0.047	0.508–0.692	Normal approx.	<.001
Exposure to misconduct	0.563	0.052	0.461–0.665	Bootstrap	<.001
Total association					
Exposure to misconduct	0.279	0.051	0.179–0.379	Bootstrap	<.001
Conditional reinforcement on					
Reinforcement to misconduct	0.473	0.051	0.373–0.573	Normal approx.	<.001
Conditional on exposure					
Exposure to misconduct	0.284	0.043	0.203–0.373	Bootstrap	—
Indirect via reinforcement					

Note. N = 384. B = unstandardised coefficient; SE = standard error; CI = confidence interval. Coefficients, SEs and p values come from thesis Tables 14–15. Normal approximation intervals were calculated as $B \pm 1.96 \times SE$ from rounded source values. The other intervals are labelled bootstrap intervals in the thesis (5,000 resamples); the indirect SE is a bootstrap SE. The dash denotes an unreported p value. No demographic, family or school covariates were included. The source model-fit discrepancy remains unresolved.

The reported indirect association was 0.284 (bootstrap SE = 0.043; 95% bootstrap CI [0.203, 0.373]). The component coefficients produce $0.600 \times 0.473 = 0.2838$, consistent with the rounded indirect estimate, and the direct and indirect estimates sum to the total coefficient ($0.279 + 0.284 = 0.563$). These checks establish arithmetic agreement among these entries.

The reported indirect interval excludes zero and is consistent with a positive indirect association under the specified model. Exposure retains a positive association with perceived misconduct after inclusion of reinforcement. These results do not establish that reinforcement transmits a causal effect, particularly given simultaneous measurement, possible reverse ordering and unmeasured confounding.

DISCUSSION

The reported pattern is consistent with a perceived peer environment in which exposure to harmful material accompanies an expectation of social approval. The analytical value of the result is that it directs attention to what audiences do with harmful content. An adolescent may encounter an insulting message, see classmates reward it and infer that similar conduct is socially acceptable. The current measures capture parts of that perceived configuration. They do not observe an adolescent moving through those stages.

Interpreting a Perception Measure

A first implication concerns the unit of explanation. The analysis is often most naturally described in terms of individual behaviour because a student completes the questionnaire. Yet the items largely concern the surrounding peer ecology. Respondents can meaningfully differ in their perceptions of the same school or group, and their reports can identify concerns that merit further investigation. Those reports should not be converted into labels of personal delinquency. A high score could represent attentive observation, concern about classmates, participation in harmful groups, or a combination of these possibilities.

A second implication concerns the interpretation of reinforcement. The statistically intermediate variable is not a direct count of likes, reposts or supportive comments. Several items already contain causal language about approval encouraging repetition. Students who agree with those propositions may also agree that online misconduct is common, creating covariance between two interpretations of peer life. Future measurement should separate observed audience reactions, perceived approval, personal expectations of reward and subsequent behaviour. Each component could then be tested without embedding the proposed explanation inside the mediator items.

Bystander responses also need contextual interpretation. Machackova (2020) shows why individual, social and situational factors matter when analysing reactions to online aggression. The present composite places laughter, attention, silence and encouragement within one score, but these responses may have different meanings and consequences. A student who remains silent through fear is not equivalent to a student who actively encourages redistribution. Future analysis should distinguish these responses instead of assuming that every visible or absent reaction reinforces harm.

Confounding and the Limits of the Proposed Sequence

Parental supervision may affect access to risky peer spaces and the interpretation of online conduct. School climate may influence both willingness to report misconduct and perceptions that peers tolerate it. Prior involvement in conflict may influence group selection, harmful-content exposure and the salience of approving reactions. Socioeconomic circumstances, digital literacy and patterns of internet use could further shape these relationships. Because the reported model does not adjust for these conditions, it cannot establish that the focal associations are independent of them.

Adjustment alone would not establish direction in a single-wave survey. Longitudinal research reviewed by Marciano et al. (2020) examines relationships across time; the present analysis does not observe whether exposure precedes reinforcement or whether either precedes misconduct. The interpretation is therefore restricted to contemporaneous associations among perceptions. Alternative model directions, shared response tendencies and peer-group selection remain plausible explanations. The reported indirect coefficient should not be translated into a percentage of adolescent wrongdoing caused by peer approval.

Implications for Ghanaian Schools and Families

The findings make peer responses a reasonable candidate for school-based inquiry. Classroom discussion could distinguish encountering a harmful post, endorsing it, forwarding it and seeking help. Guidance and counselling activities could examine how students interpret humour, humiliation, popularity and bystander silence. These proposals follow from the conceptual interpretation; the survey does not demonstrate that any particular programme changes behaviour.

Practical prevention should consider the safety of students who challenge a peer group. Reporting routes need to be accessible and credible, and participation in research should remain separate from school discipline. Students should not have to reproduce private messages or identify classmates publicly to obtain support. Parent-school engagement can address supportive supervision and communication alongside online restrictions. Kyeyi-Arthur et al. (2024) provide Ghanaian evidence relevant to internet access and supervision, but their sample and measures differ from those in the present report.

Intervention evidence provides grounds for evaluation rather than direct transfer of conclusions. Polanin et al. (2022) synthesise studies of programmes targeting cyberbullying perpetration and victimisation; that evidence does not validate the present mediation pathway or establish its effectiveness in Ghana. A local evaluation should distinguish peer norms, behaviourally defined incidents, victimisation, help seeking and unintended consequences. Reduced perceived misconduct could reflect less harm, but could also reflect changes in awareness or willingness to report.

Limitations and Priorities for Further Research

The principal limitations are the cross-sectional design, common-respondent measurement, content overlap and absence of covariate adjustment. Neither observation of peer conduct nor belief that it occurs establishes personal perpetration. Agreement responses do not supply exposure frequencies, recall periods or validated thresholds. The outcome combines misconduct perceptions with one relational-consequence item. The reported exploratory factor analysis offers preliminary structural evidence, but its summary does not establish discriminant validity or age-group equivalence. Statistical significance does not correct these measurement limitations.

The aggregate source records impose additional limits. Incompatible age bands prevent a verified age distribution, while inconsistent model-fit summaries limit confidence in the regression findings. The derived normal intervals inherit the assumptions and possible errors of the reported standard errors. The source also lacks a minimum per-scale completion rule and sufficient sampling information to account for school clustering. These constraints restrict reproducibility and generalisability.

Further research should use cognitive interviews and independent validation to distinguish exposure, observed peer responses, perceived approval and personal behaviour. A longitudinal design with defined recall periods could measure exposure before subsequent peer responses and later conduct while accounting for prior levels of each variable. Prespecified covariate selection, transparent missing-data rules and appropriate treatment of school clustering would strengthen interpretation. Behaviourally defined content-frequency measures would also permit conclusions that the present agreement scales cannot support.

CONCLUSION

The reported survey findings identify a positive association between harmful online exposure and perceived peer misconduct, with perceived reinforcement statistically positioned between them. The contribution is to distinguish harmful content from the social responses surrounding it and to identify questions for prevention research in Ghanaian schools. The evidence concerns perceptions within the reported sample. Longitudinal evidence, stronger measurement validation and reproducible covariate-adjusted analysis are needed before causal or intervention-effectiveness claims can be made.

Data and Reporting Transparency

Data Availability

This article reproduces aggregate statistics from the unpublished doctoral research manuscript cited as Afriyie (2026). Participant-level data, the scoring codebook and original analysis syntax were not available for the present revision, and no public dataset is provided with it. The questionnaire items used to interpret the constructs are reproduced in Appendix A. Enquiries concerning the underlying study records may be directed to the corresponding author; access is not promised and would depend on the data custodian and applicable permissions.

Use of Generative Artificial Intelligence

ChatGPT (OpenAI) assisted with manuscript restructuring and language editing, the reviewer response, arithmetic checks and calculation of the two normal-approximation confidence intervals from reported

summary statistics. It did not collect data or fit new participant-level models. The authors retain responsibility for the accuracy of the study records, interpretations and final submission.

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Appendix a Questionnaire Items Underlying the Three Constructs

The background questionnaire listed age categories of 12–14 years, 15–17 years and 18 years and above. The present article does not report an age distribution because these boundaries differ from those used in the thesis’s results chapter.

The wording below is reproduced from Sections D, E and F of the parent questionnaire. Item codes are added for clarity. All items use 1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree and 5 = strongly agree. The parent instrument calls Section D Digital Exposure and Section F Cyberdelinquent Behaviour; the article uses the narrower interpretations explained in the text. Inclusion here identifies the documented wording and does not establish independent validation or confirm the exact field version administered.

Code	Questionnaire statement
D1	I often see insulting or humiliating comments online.
D2	I have seen students share embarrassing pictures or messages about others.

D3	I have been exposed to online arguments involving students.
D4	I have seen fake accounts or impersonation involving students.
D5	I have seen harmful content being shared in student online groups.
D6	Online spaces expose students to behaviours that may not be accepted at school.
E1	Students sometimes receive likes, laughter or comments after posting harmful content.
E2	Online approval from friends can encourage students to repeat harmful behaviour.
E3	Some students share harmful content because they want attention from peers.
E4	Students may remain silent when harmful online behaviour is popular in a group.
E5	Peer reactions online can make harmful behaviour look acceptable.
E6	Students sometimes encourage others to post or forward harmful content.
F1	Some students insult or embarrass others through online platforms.
F2	Some students create or use fake accounts to disturb others.
F3	Some students share private messages, pictures or screenshots without permission.
F4	Some students spread rumours about others online.
F5	Some students access other people's accounts without permission.
F6	Some students use digital platforms to threaten, mock or exclude others.
F7	Some students forward harmful content even when they know it may hurt someone.
F8	Online misconduct among students affects relationships in school.

Source: Afriyie (2026), Appendix G, Sections D–F. D = exposure; E = reinforcement; F = perceived peer misconduct. Section F asks about students generally and prohibits naming individuals.