



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Child Abuse & Neglect

journal homepage: www.elsevier.com/locate/chiabuneg

Neglect, online invasive exploitation, and childhood sexual abuse in Hong Kong: Breaking the links

Clifton R. Emery^a, Paul W.C. Wong^a, Virgil Haden-Pawlowski^b, Cayla Pui^b, Grace Wong^b, Steve Kwok^a, Amy Yinan Liu^c, Alhassan Abdullah^{d,*}^a Department of Social Work and Social Administration, The University of Hong Kong, Hong Kong^b Save the Children Hong Kong, Hong Kong^c Sandra Rosenbaum School of Social Work, University of Wisconsin-Madison, United States^d College of Education, Psychology and Social Work, Flinders University, Australia

ARTICLE INFO

Keywords:

Unwanted online sexual experiences
Invasive exploitation
Childhood sexual abuse
Neglect

ABSTRACT

Background: Childhood sexual abuse (CSA) is a form of maltreatment that involves a child in sexual activity that she or he cannot fully comprehend or is unable to give informed consent to. The empirical link between child neglect and contact child sexual abuse is well established but little research examines mediators that explain this link.

Objective: This study tests online risk behaviors and unwanted sexual experiences online as sequential mediators of the neglect – CSA relationship.

Participant and setting: The study uses a representative cross-sectional sample of 1097 Hong Kong adolescents.

Methods: Preacher and Hayes' (2008) non-parametric bootstrap approach was used to test three mediation hypotheses.

Results: Baseline logistic regression models showed neglected children had 11.2 times higher odds of reporting contact CSA ($p < .001$). Similarly, neglect was associated with 3.5 times higher odds of more online risk behavior ($p < .001$), which in turn was associated with 2.7 times higher odds of more online invasive exploitation ($p < .001$). Online invasive exploitation was associated with 2.7 times higher odds of reporting offline contact CSA ($p < .001$). The study found online risk behaviors to be a significant mediator of the relationship between neglect and online invasive exploitation (unwanted online sexual experiences). Online invasive exploitation, in turn, mediated the relationship between online risk behaviors and offline contact CSA.

Conclusion: The findings highlight the importance of intervening against neglect as it appears to play a vital role in the etiology of contact CSA in Hong Kong.

1. Introduction

Concern about online child sexual abuse (CSA) has increased substantially given recent developments in information technology, and particularly since the onset of the Covid-19 pandemic (cf. Augusti et al., 2021). Online CSA warrants attention in its own right and

* Corresponding author at: College of Education, Psychology and Social Work, Flinders University, Sturt Road, Bedford Park 5042, Adelaide, South Australia, Australia.

E-mail addresses: cemery@hku.hk (C.R. Emery), paulw@hku.hk (P.W.C. Wong), Cayla.Pui@savethechildren.org (C. Pui), Grace.Wong@savethechildren.org (G. Wong), alhassan.abdullah@flinders.edu.au (A. Abdullah).

<https://doi.org/10.1016/j.chiabu.2023.106591>

Received 29 May 2023; Received in revised form 25 November 2023; Accepted 30 November 2023

Available online 20 December 2023

0145-2134/© 2023 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

because it is the principle means by which perpetrators groom children for offline contact CSA (Shannon, 2007). Sexual abuse victimization is associated with later cyberbullying victimization (Noll et al., 2022), as well as both intimate partner violence (IPV) and suicidal ideation in adulthood (Chan, 2011; Chan et al., 2011). Neglect occurs when caregivers fail to provide a child with physical and emotional care required for life, health, and growth (Finkelhor et al., 2005). Although existing research documents links between parental neglect and online and offline CSA (Black et al., 2001; Finkelhor et al., 1997), no research examines whether children's online risk behaviors mediate the relationship between parental neglect and online CSA. Similarly, although links between online risk behaviors and online CSA (Jonsson et al., 2019), and between online CSA and offline CSA are well established (Shannon, 2007), no research examines whether online risk behaviors lead to offline CSA via the mediating pathway of online CSA. This mixed methods study examines these relationships for the first time in a study of online and offline CSA conducted on a sample of 1094 Hong Kong secondary students collected during the covid-19 pandemic. Following Emery (2017), CSA is conceptualized as one form of a more general type of victimization called invasive exploitation.

1.1. Child sexual abuse as invasive exploitation

Invasive exploitation occurs when “a person's private self or body is used to gratify or benefit another without consent” (Emery, 2017). CSA is arguably the quintessential and most intuitive form of invasive exploitation. However, in their 3-dimensional model Emery et al. (2023) push theorization of sexual abuse away from empiricist approaches to conceptualization that allow researchers to see connections to forced feeding, organ trafficking, colonization, slavery, and all forms of invasive medical procedures when carried out to benefit medical staff and institutions rather than patients. Consistent with the 3-D model, Emery et al. (2023) recently found a positive interaction between invasiveness and exploitativeness of child maltreatment experience in predicting suicidal ideation, even when total score (including for sexual abuse) on the child trauma checklist was controlled. Emery et al. (2023) argue conceptualizing CSA as invasive exploitation also pushes back against narratives that stigmatize victims of CSA by sensationalizing their victimization as a kind of sexual aberration. Accordingly, in this paper we discuss online sexual abuse as online invasive exploitation (IE). However, in order to keep matters clear for readers we continue to discuss offline contact child sexual abuse as CSA. We hope over-emphasis on the sexual aspect of victimization will be replaced by discussion that bears a closer resemblance to victims' subjective experience of victimization as the IE concept develops.

1.2. Breaking the passive victim myth: neglect as a pathway to children's online risk behaviors

“Any child is vulnerable to seduction by any adult but troubled children from dysfunctional families targeted by adults who are authority figures seem to be at even greater risk” (Lanning, 2005; 57, quoted in Martellozzo, 2012). The empirical link between parental neglect and contact CSA is well-established in the research literature (Black et al., 2001; De Vries & Goggin, 2020; Hildyard & Wolfe, 2002; Wilcox et al., 2004). Martellozzo (2012)'s discussion raises the targeting of more vulnerable children is consistent with an instrumental (and hence exploitative) approach to sexual gratification by perpetrators as an important and relevant empirical fact for prevention. However, a singular focus on exploitation of the vulnerability of neglected children by perpetrators risks ignoring the agency of neglected children. The neglect of children's agency may, in turn, result in researchers, policy makers, and clinicians turning a blind eye to important pathways to CSA victimization.

Hildyard and Wolfe (2002) note that neglected children may be more likely to seek out others to fulfill needs for nurture and protection. Although the research literature documents this fact it seldom conveys the desperation with which victims of neglect may actively search for emotional validation (cf. Rowny, 2018). Moreover, the research literature fails to note that neglected children socialized in cultures or communities that idealize romantic love as a quasi-religious higher state of human existence (and hence a solution to all problems) may be particularly prone to seeking emotional nurturance and protection in romantic relationships (see Pan, 2015). Social media are ubiquitous, addictive, and subject to the disinhibition effect (Martellozzo, 2012; Suler, 2004). For these reasons social media may seem like a relatively safe environment to neglected children engaged in such a search.

The Global Kids Online (GKO) study is a multi-country study supported by UNICEF. The GKO identifies the following among key risk behaviors that lead to online victimization: a) adding people to my friends or contacts who I have never met face to face, b) pretending to be a different person online from who I really am, c) sending personal information to someone that I have not met in real life, and d) sending a photo or video of myself to someone I have never met face to face as online (Logar et al., 2016). Such risk behaviors are linked to online victimization (Jonsson et al., 2019; Martellozzo, 2012; 54). Hence, we hypothesize online risk behaviors may mediate the relationship between neglect and online invasive exploitation (H1).

1.3. From risk to online invasive exploitation, and from online invasive exploitation to offline CSA

Links between online invasive exploitation and offline contact CSA are well-documented (Ainsaar & Loof, 2010; Shannon, 2007), as are links between risk behaviors and invasive exploitation (Jonsson et al., 2019; Martellozzo, 2012; 54). Once in communication with a perpetrator, children may be groomed via blackmail, gifts, or other incentives, resulting in online victimization (Martellozzo, 2012; 125). Although not all perpetrators conform to it (cf. Martellozzo, 2012; 122–123).¹ O'Connell (2003; 44) argues for a 5-phase

¹ Martellozzo's (2012; 122–125) research suggests some online perpetrators favor a very rapid shift from friendship forming to propositions of sexual activity.

grooming process covering (1) friendship-forming, to (2) relationship-forming, followed by (3) risk assessment, (4) exclusivity, and (5) sexual activity. All of these methods for manipulating victims may put children engaged in high risk online behaviors at increased risk for victimization by online invasive exploitation. This leads us to hypothesize that online invasive exploitation mediates the relationship between online risk behaviors and offline contact CSA (H2). However, O'Connell (2003)'s 5-phase grooming process may be particularly important to understand the vulnerability of neglected children to perpetrators who plan to use online invasive exploitation as a starting point for offline contact CSA. To the extent that they can tap into neglected children's deep-seated needs for protection and nurture (Crouch & Milner, 1993), perpetrators may succeed in luring children into sexual activity online and into offline meetings. Although our literature review found no studies of online risk behaviors as a mediator of the neglect-online IE relationship, Bramsen et al. (2013) found that earlier victimization was associated with increased risk behaviors, which mediated the relationship between victimization in childhood and victimization in adolescence. This logic leads to our sequential mediation hypothesis: the link between parental neglect and offline contact CSA is mediated first by online risk behaviors and then by online invasive exploitation (H3).

1.4. Context: Pandemic Era Hong Kong

Previous research suggests nearly 1 child out of every 4 in Hong Kong suffers from parental neglect (Lo et al., 2019). Authoritarian style parenting increases risk for all forms of maltreatment in Hong Kong, including neglect (ibid). Neglect in Hong Kong is also associated with single-parenthood, receipt of social assistance, maternal depression, poor family cohesion, maternal drug use, poor parent-child interactions, and poverty (Lo et al., 2017). Flat rental is extremely expensive in Hong Kong, leading many flat owners to subdivide flats into tiny spaces in order to rent to low-income families and resulting in many safety and health risks (Dwan et al., 2013). In the context of poverty and lack of space, neglect is sometimes fatal as children playing on roofs multi-story buildings or other unsafe environments fall from a height (cf. Dunn, 2021). In the middle classes, stringent employer demands to work long hours cause many households to rely extensively on domestic helpers (He & Wu, 2019). In some cases, over-reliance on untrained helpers for childcare may also put children at risk for neglect (Hui, 2019). Among many forms of neglect, insufficient monitoring and emotional neglect may put children at increased risk for online invasive exploitation and contact CSA (Genuis et al., 1991; Kotchick et al., 2001), as well as fatalities from accidents (Dunn, 2021).

In Hong Kong the vagaries of the Covid-19 pandemic exacerbated these problems as children were alternately required to attend school in person and then online. Although children were required to stay home and attend classes online, many parents in essential services did not have work from home options. Anecdotally, local NGOs describe the pandemic as a multi-faceted disaster for poor families in Hong Kong as the combination of lockdown requirements and poverty left parents more than usually unable to monitor and care for their children.

Fig. 1 shows the three study hypotheses which are restated below. Hypothesized mediation relationships are indicated by the arrows M1, M2, and M3. Hypothetical direct effects are indicated by arrows A, B, and C. For reader convenience the same letter indicators are referenced again in superscripts adjacent to coefficients in the mediation analysis section of Table 2.

Hypothesis 1. Adolescent online risk behaviors will mediate the relationship between neglect and online invasive exploitation (indirect effect shown as M1 on Fig. 1).

Hypothesis 2. Online invasive exploitation will mediate the relationship between adolescent online risk behaviors and offline contact CSA (indirect effect shown as M2 on Fig. 1).

Hypothesis 3. Adolescent online risk behaviors and online invasive exploitation will sequentially mediate the relationship between neglect and offline contact CSA (indirect effect shown as M3 on Fig. 1).

These hypotheses were also explored qualitatively through focus group interviews with a sample of the children using the Global Kids Online (GKO) templates (Byrne et al., 2016). The interviews sought to provide detailed insight and explanation about the hypotheses and to consolidate evidence from the quantitative data. Detailed accounts provided by the children regarding their perception of children's involvement in online activities will enable the researchers to validate the quantitative results and explain potential null findings.

1.5. The current study

The current study is an analysis of data collected for Save the Children Hong Kong. Frequency data on neglect and CSA are published in the original report (Authors, 2021), but the prevalence estimates for online invasive exploitation and all inferential analyses presented are unpublished and unique to this paper. The study is the first to use the GKO format whilst including measures of offline child abuse and neglect. It is the first study to examine the links between neglect and contact CSA in pandemic-era Hong Kong. It is also the first study to deploy the concept of online invasive exploitation. Because of potential confounds, the models control for adolescent age and gender, household size and whether the family owns the home, and mother and father employment status. The models control for count of online IE items participants refused to answer in order to control for biases from non-disclosure. Models control for other correlates that include ever having had contact with a stranger online, how often parents sit beside the adolescent whilst s/he is online, difficulty communicating with parents, and whether the adolescent is frequently online at a friend's house or whilst en route to other places (Chisholm, 2006; Global Kids Online, 2019). Ever having contact with a stranger on the net, difficulty talking with parents, and frequently online whilst at a friend's or going somewhere else were judged to be risk factors likely to be

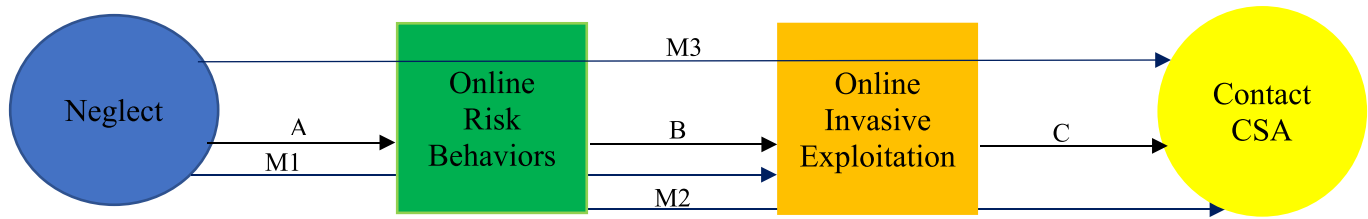


Figure 1. Double Mediation Model from Neglect to Contact Child Sexual Abuse

correlated with the risk behaviors scale and victimization, and hence requiring control, in addition to demographic characteristics. Parental monitoring whilst online was judged as a potential protective factor that could correlate with both risk behaviors and victimization.

2. Methods

2.1. Participants & procedure

2.1.1. Qualitative

Focus groups followed questions and guidelines on the Global Kids Online (GKO) templates (Byrne et al., 2016). The templates asked extensively about adolescent's online use patterns and experiences and how these related to life in school and offline. Using the template enabled the researchers to focus on the main issues within the survey and to explore in-depth participants' perceptions relating to the consequences of children's involvement in the online space. However, focus group interviewers did not directly ask children about any personal victimization experiences. The aim was to obtain one focus group for every other school recruited into the study. Focus group interviews were conducted with a convenience sample of 11 adolescents (total) in five groups of 2–3 participants each. Focus groups began with ice-breakers and had the goal of empowering children to recognize their own expertise. Topics included online skills and practices, risks, well-being, and resilience. The wrap-up included a summary of points discussed, thanking the children, asking how they felt during the interview, and whether they had questions or points to add.

2.1.2. Quantitative

In Hong Kong, schools receiving support from the government (aided schools) serve 80 % of Hong Kong's school children. The research team obtained a complete list of all aided schools in Hong Kong. Using multi-stage probability proportional to size (PPS) cluster sampling, eight aided secondary schools in Hong Kong were randomly selected for the study. Six of the schools agreed to participate resulting in a participation rate of 75 %. Classes were randomly selected among lower secondary students (grades 7–9). However, because of the chaos caused by the pandemic, one school dropped out before data collection was complete. As data collection was hindered by the pandemic, data was collected at an additional 5 schools using convenience sampling. This resulted in a random sample of 560 adolescents and a convenience sample of 537 adolescents. Prevalence estimates are based on the random sample only, and differences between random and convenience samples are compared in the results section. All team members involved with data collection were required to complete a one day training developed by the PI to increase knowledge of survey sampling, interviewing skills, refusal conversion skills, the questionnaire, informed consent, and to improve sensitivity to issues of child maltreatment and intimate partner violence. The team was required to pass a written exam and certification interview. The survey was translated into Chinese, back-translated into English to check for accuracy, and conducted online. Save the Children Hong Kong provided in-school presentations and assemblies to incentivize school participation in the study. Small coupons (roughly \$2.50 USD in value) were offered to students to participate, and participants were also entered in a lottery for which the prize was Apple airpods. Participants were recruited offline, after which the data were collected via online survey, to which participants were provided a link. In order to guard against random responding, a simple math question was inserted into the questionnaire ("2 X 4 = ?"). Correct answers were provided by 97 % of the sample. Participants with incorrect responses were excluded from the analyses. The questionnaire was translated from English into the traditional characters commonly used in Hong Kong Chinese (i.e. Cantonese) and back-translated into English to check for accuracy. Of the 1094 observations, roughly half (558) were collected at a random sample of schools whilst half (536) were from a convenience sample of schools. This allows the study to calculate potential bias of convenience samples on prevalence estimates. The random sample is used to provide population prevalence estimates. Data were collected between March 2020 and December 2021.

2.1.3. Ethics

IRB approval was granted by the University of XXX (name anonymized for peer review). Written informed consent was required from parents and informed assent from adolescents for both quantitative and qualitative studies. The informed consent procedure informed parents and adolescents that participation was voluntary, confidential, anonymous, and could be withdrawn at any time. One of the study authors is a licensed clinical psychologist who functioned as a resource in case any participants experienced significant emotional distress. His support in this respect proved unnecessary however as distress was not reported by the participants or the interviewer. The interviewer responsible for conducting the focus groups and collecting the quantitative data was required to undergo a one-day training about collection of data pertaining to child victimization. The training was designed and delivered by the first author and included sections on study recruitment, qualitative interviewing, sensitivity training for violence against children, human subjects' protection and informed consent, demonstrations, and role play. The training also included protocols for handling emotional distress and potential breaches of confidentiality in the interview setting. The interviewer was required to pass a written exam and a certification interview before data collection began.

Prior to the section of the questionnaire containing neglect, contact CSA, and online invasive exploitation items, participants were asked whether they understood what is meant by privacy, and were asked whether they were able to answer the questionnaire in private. Participants who could not do so in private were asked to complete the questionnaire later. Hong Kong does not yet have a mandated reporting law for child maltreatment. The online survey was programmed to provide pop-up boxes when participants endorsed maltreatment items like neglect, invasive exploitation, or contact CSA. Participants who endorsed these items were provided with information guiding them to hotlines and organizations that can provide help. No adverse experiences were reported by participants as a result of survey or focus group participation.

2.2. Measures

2.2.1. Offline contact CSA and neglect

Offline contact CSA and neglect were both measured using adolescent report on the Juvenile Victimization Questionnaire (JVQ) (Finkelhor et al., 2005). Offline contact CSA was coded as 1 if the adolescent indicated at least one of the following items had happened before: (1) 'Did a grown-up touch your private parts when you didn't want it or make you touch their private parts? Or did a grown-up force you to have sex?' (2) 'Did anyone TRY to force you to have sex, that is, sexual intercourse of any kind, even if it didn't happen?', and (3) 'Did you do sexual things with anyone 18 or older, even things you both wanted?' (Finkelhor et al., 2005). When an adolescent answered never for all three of these items contact CSA was coded as zero. Neglect was coded as zero unless an adolescent answered yes to the following item: 'When someone is neglected, it means that the grown-ups in their life didn't take care of them the way they should. They might not get them enough food, take them to a doctor when they are sick, or make sure they have a place to stay. Were you neglected?' (Finkelhor et al., 2005).

2.2.2. Online invasive exploitation (IE)

A five item subset of the more severe items from the GKO measure for unwanted online sexual experiences (Byrne et al., 2016) was used as a measure of online IE. The scale was introduced with the question: 'In the past year, have any of these ever happened to you on the internet?' The items were, in the past year: (1) 'I have been asked for sexual information about myself (what my body looks like without clothes or sexual things I have done) when I did not want to answer such questions,' (2) 'I have been asked to talk about sexual acts with someone on the internet when I did not want to' (3) 'I have been asked by someone on the internet to do something sexual when I did not want to,' (4) 'I have been asked on the internet for a photo or video showing my private parts when I did not want to,' and (5) 'I have done something sexual on the internet when I did not want to.' Possible responses were no, yes, and prefer not to answer. Prefer not to answer was treated as 'no' except when all 5 items were prefer not to answer, in which case the scale was set to missing. This is a conservative approach compared to Authors (2021), for which prefer not to answer was treated as 'yes' based on the relationships seen with risk and other forms of victimization. Items were summed to create a scale ranging from 0 to 5. Cronbach's alpha is not appropriate to assess reliability for dichotomous items; hence Kuder-Richardson formula 20 was used: the KR-20 coefficient was .81 indicating good reliability.

2.2.3. Online IE exposure

Three less invasive items from the GKO unwanted online sexual experiences scale (Byrne et al., 2016) were used to create a minor IE scale called online IE exposure. These three items were in the past year: (1) 'I was sent a message that I did not want with ads or links to x-rated websites,' (2) 'I opened a message or link in a message that showed pictures of naked people or people having sex that I did not want,' and (3) 'I have seen or received a sexual message, image, or video about someone else that I did not want.' The crucial distinction between the minor online IE exposure and online IE is that exposure involves other people but online IE involves the adolescent's direct interaction with the perpetrator. Reliability for these three items was acceptable as the KR-20 coefficient was .77. The three items were summed into a scale ranging from zero to three.

2.2.4. Non-disclosure

Each of the 8 GKO unwanted online sexual experiences items used to create online IE exposure and online IE provided adolescents with the option to respond with 'prefer not to answer.' Because both estimates and statistical inferences may be biased by reluctance to disclose victimization, the 'prefer not to say' responses for all 8 items were summed into a scale for each participant and controlled for in the analyses. A participant who did not refuse any of the items had a score zero; a participant who refused all 8 items had a score of 8. The scale had high reliability (KR-20 coefficient was .95). In theory, this approach creates potential problems with multicollinearity with online IE exposure and online IE (a high inverse correlation might be expected). Empirically this proved not to be a problem. The correlation with online IE was ($r = 0.03$, $p = .33$) positive, low, and non-significant. The correlation with online IE exposure was positive and significant ($r = 0.09$, $p = .003$) but not large. Since participants who prefer not to respond to items may be more likely to have experienced that type of victimization, controlling for this non-disclosure is a means of reducing bias in the models. Indeed, some research on sensitive topics deliberately and separately measures preference for non-disclosure so that it can be controlled in models as well as studied separately (cf. Emery et al., 2015).

2.2.5. Online risk behaviors

Following the GKO, online risk behaviors were measured by the items 'in the past year how often have you done the following things (1) added a person to my friends or contacts who I have never met face to face, (2) sent personal information to someone I have not met in real life, (3) sent a photo or video of myself to someone I have never met face to face, and (4) pretended to be a different person online from who I really am (Logar et al., 2016). To these was added a fifth item (5) I looked for new friends on the internet. Possible responses were (1) never, (2) hardly ever, (3) at least every month, (4) at least every week, (5) every day or almost every day, (6) several times each day (7) prefer not to say. Items answered with 7 were coded as missing. Reliability was acceptable; Cronbach's alpha was 0.75. The mean of the 5 items was calculated for each participant (so that participants with some missing items remained comparable to participants who responded to all items) in order to create the scale. Online risk behaviors are distinguished from IE exposure and online IE in a critical distinction. For both exposure and online IE, participants were first briefed that the questions pertained to unwanted online sexual experiences. No such explanation preceded the risk behaviors. Hence, the biggest distinction is that exposure and online IE are both involuntary and unwanted by the participant. Some risk behaviors may be involuntary, but many

may be presumed to be voluntary.

2.2.6. Control variables

The models run control for multiple other risk and protective factors for online IE. These include whether the child has ever had contact with someone online that they don't know in real life, how often parents sit beside the adolescent when s/he is online (never, hardly ever, sometimes, often or very often), how easy it is to talk to the parent about things that upset the adolescent (very easy, fairly easy, fairly difficult, very difficult), how often the adolescent is online at a friend's house, and how often the adolescent is online whilst en route to somewhere else (never, hardly ever, at least every month, at least every week, daily or almost daily, several times each day, or almost all the time).

2.2.7. Demographic characteristics

Analyses also controlled for the adolescent's gender, age, whether the mother and father were unemployed, whether the family owns the residence, and the number of people who live in the household.

2.3. Analytic Issues

Qualitative focus group transcripts were analyzed by three researchers; one of whom coded in Chinese, the other in English, and one performed thematic analysis of the codes. The two coders (one in Chinese, one in English) familiarized themselves with the transcripts and performed initial coding independently. Initial codes generated were discussed among the two coders, and the last author validated minor disagreements. The initial codes were imported into NVivo 17 and analyzed following the reflexive thematic analysis process by [Braun and Clarke \(2019\)](#). The thematic analysis was performed by the last author and validated by the two coders who were involved in the initial coding. The triangulated coding process enhanced the validity of the transcribed data and the focal codes (codes agreed on). Quantitative data were analyzed in *Stata16*. Population weights were calculated using Hong Kong census data on the size of the district from which each of the randomly selected schools was drawn and used to calculate population prevalence estimates. The models presented in [Table 2](#) used regression when risk behaviors was the outcome and ordinal logistic or logistic regression as appropriate for IE exposure, online IE, and contact CSA. All models (including models used to estimate indirect mediation effects discussed below) adjusted for clustering of standard errors within schools.

However, mediation models used ordinal logistic or logistic regression (i.e. ordinal logistic regression was used to predict risk behaviors rather than linear regression) as appropriate. [Preacher and Hayes' \(2008\)](#) non-parametric bootstrap approach was used to test the mediation hypotheses. All bootstraps resampled the cases with replacement in 1000 repetitions. For hypotheses 1 and 2, indirect effects were calculated via the product of the coefficient for the mediator (online risk behaviors or online IE) and the independent variable (neglect or online risk behaviors). Sequential mediation in [hypothesis 3](#) was calculated by the product of the two indirect effects. Confidence intervals of 99 % were calculated for the bootstrapped results. In their Monte Carlo simulation study [Liu et al. \(2015\)](#) note that applying the [Preacher and Hayes \(2008\)](#) approach to mediation with ordinal logistic regression results in less precision of estimates, poorer performance on statistical tests, and an underestimation of the standard error in comparison with logistic regression. However, they found that as the number of categories increased to 5 ordinal logistic regression was an acceptable alternative. As all of the ordinal variables involved in the mediation analyses had 5 or more levels we judged mediation with ordinal logistic regression to be reasonable. We judged this approach to be more acceptable than estimating multiple mediation models across fundamentally different types of model (i.e. estimating indirect effects from a combination of linear and logistic regression models), for which we found no documentation. A model for online IE exposure is shown in [Table 2](#) but it was not included in the mediation analyses.

Pregibon's linktest was used to test each model for non-linearity but no significant non-linearity was detected. Diagnostics for multicollinearity were run on linear probability models for all models in the data. As all of the variance inflation factors (VIFs) were less than 2 it was concluded that multicollinearity was not a substantial threat to statistical inference. Because the Chinese version of the final contact CSA item was judged to principally connote offline physical sexual activity (with people over 18 years old), but remained interpretable as pertaining to online sexual activity, sensitivity analyses were run coding contact CSA with and without using this item. This change removed three cases from the analysis (one girl and two boys). There were only two substantive changes in the results of the analyses conducted based on this change. First, the coefficient for ever neglected remained significant in the final model in [Table 3](#). Second, the coefficient for ever have contact with a stranger on the net ceased to be significant in the final model in [Table 3](#). Results of mediation analyses were unaffected. Because we are hesitant to risk further underestimation of contact CSA prevalence, the results are shown with the sexual activity with people over age 18 in the analyses. However, we note the differences in the limitations section. Results of the sensitivity analysis are available upon request.

3. Results

3.1. Quantitative study

3.1.1. Bivariate statistics

[Table 1](#) provides the tetrachoric (for dichotomous variables) and polychoric (for ordinal variables) correlation matrix for IE exposure, online invasive exploitation, contact CSA, and the control variables. The items were highly correlated and for the sake of brevity, stars are used to indicate statistical significance at the $p < .05$, $p < .01$, and $p < .001$ level (without Bonferroni corrections). The

Table 1
Tetra/Polychoric correlations for IE exposure, online invasive exploitation, contact CSA & controls.

	Exp1	Exp2	Exp3	IE1	IE2	IE3	IE4	IE5	CSA1	CSA2	CSA3	Stranger	Beside	NoTalk	FrdHouse
Exp 2	0.82***														
Exp 3	0.68***	0.86***													
IE 1	0.44***	0.66***	0.62***												
IE 2	0.55***	0.68***	0.58***	0.91***											
IE 3	0.54***	0.68***	0.61***	0.91***	1.00***										
IE 4	0.52***	0.58***	0.53***	0.84***	0.90***	0.92***									
IE 5	0.27	0.43*	0.47*	1.00***	0.86***	0.95***	1.00***								
CSA 1	0.43***	0.50***	0.49***	0.63***	0.73***	0.78***	0.64***	0.74***							
CSA 2	-0.04	0.15	0.19	0.39*	0.66***	0.44	0.50*	0.72**	0.87***						
CSA 3	0.12	0.19	0.23	0.65***	0.69***	0.77***	0.65***	0.74**	0.89***	0.87***					
Stranger	0.28***	0.34***	0.27***	0.41***	0.40***	0.39*	0.41***	0.38*	0.40***	0.20	0.42**				
Beside	-0.09*	-0.04	-0.02	-0.13	-0.07	-0.15	-0.10	-0.35	0.06	-0.05	0.16	-0.08			
No Talk	0.01	-0.00	0.02	0.02	0.07	0.18	0.06	-0.02	0.01	-0.21	0.04	-0.03	-0.07		
Frd House	0.05	0.08	0.08	0.03	-0.07	0.07	0.02	0.33*	-0.09	-0.12	-0.18	0.16***	0.00	0.01	
Going SW	0.16***	0.16***	0.19***	0.15*	0.16	0.26*	0.19*	0.37*	0.13	-0.07	-0.17	0.22***	0.04	-0.02	0.58***
Female	0.22***	0.14*	0.14*	0.05	0.15	0.19	0.46**	0.06	0.10	0.03	-0.18	0.13*	0.04	-0.09*	0.07
Age	0.11**	0.17***	0.16***	0.08	0.08	-0.01	0.04	0.22	-0.03	0.10	-0.02	0.08	-0.09**	0.05	0.06
Ownhome	0.12*	0.00	0.04	0.06	-0.11	-0.24	-0.22	-0.04	0.06	-0.13	-0.13	0.00	0.08	-0.11*	0.02
Refusals	0.39***	0.35***	0.32***	0.26***	0.21***	0.14	-0.12	-0.02	0.28**	0.34***	0.44***	0.16	0.12***	0.04	0.01
HH Size	0.04	0.01	-0.01	-0.08	-0.08	-0.00	-0.13	-0.20	-0.12	0.02	-0.08	-0.11**	-0.01	-0.05	0.01
D. Unemp	-0.01	0.04	0.08	0.10	0.02	-0.00	0.03	0.15	-0.05	-0.03	0.24	0.01	-0.05	0.15**	0.02
M. Unemp	-0.15**	-0.04	0.00	-0.05	-0.00	0.05	0.17	0.20	0.09	0.15	0.22	-0.07	0.03	-0.07	-0.14**

	Going SW	Female	Age	Ownhome	Refusals	HH Size	D. Unempl
Female	0.12**						
Age	0.11**	-0.09*					
Ownhome	0.02	-0.04	-0.05				
Refusals	0.07	-0.24***	0.10	0.02			
HH Size	-0.01	0.09*	-0.12**	0.12*	-0.14**		
D. Unemp	0.07	-0.14	0.23***	-0.14	-0.01	-0.25***	
M. Unemp	-0.08	-0.05	-0.04	-0.07	0.02	-0.12*	0.16*

correlations are in the expected direction, with the exception of the relationship between the first exposure item and the second contact CSA item, which is negative but non-significant and close to zero. Within measure correlations were high; the lowest IE exposure correlation is between the first and third items ($r = 0.68, p < .001$), the lowest online IE correlation is between items one and four ($r = 0.84, p < .001$), the lowest contact CSA correlation is $r = 0.87$ ($p < .001$). There are no situations in which an item has a higher correlation with an item outside of its measure than its highest correlation within the measure. Factor analyses (not shown) were conducted on the polychoric item correlation matrices for IE exposure, online IE, and contact CSA. The IE exposure model was saturated after one factor and the loadings for all three items are over 0.8. The online IE model was saturated after two factors, however, the eigenvalue for the second factor was 0.006 and the remaining values were negative. A screeplot showed a sharp elbow after the first factor. Loadings on the first factor were all over 0.9. The offline CSA model was saturated with one factor and all of the loadings were over 0.9.

3.1.2. Descriptive statistics

Prevalence estimates for Hong Kong are provided in Table 2. Two of the prevalence estimates (for contact CSA and neglect) can be seen in Emery (2021). The remaining prevalence estimates for online invasive exploitation, online IE exposure, and risk behaviors are unique to this paper as we have used the more conservative scoring method noted in the methods section. We estimate that 3.8 % of lower secondary Hong Kong girls and 1.6 % of lower secondary Hong Kong boys have been victimized by offline contact child sexual abuse. 10.1 % of girls and 8.8 % of boys had experienced neglect. Levels of invasive exploitation online were high. 3.1 % of girls and 4.2 % of boys were asked for sexual information about themselves, 3.6 % of girls and 2.2 % of boys were asked to talk about sex acts, 0.8 % of girls and 0.7 % of boys were asked to do something sexual, 2.1 % of girls and 0.4 % of boys were asked for a sexual photo or video of themselves. The percentage of girls asked to do something sexual was significantly higher than for boys. 0.3 % of girls and 0 % of boys in the random sample had done something sexual online against their will (this is an indicator for virtual contact CSA). However, this pattern was reversed in the convenience sample, where 0.8 % of boys and 0.4 % of girls had done something sexual online against their will. For boys, 9.2 % had experienced at least one act of online invasive exploitation in the past year, this number was 7.5 % for girls but the difference was not significant.

Table 2

Sample descriptive statistics: boys, girls, random sample, convenience sample (total N = 1094).

Variable	Hong Kong prevalence estimates <i>n</i> = 558 or Mean	Gender contrast ¹ in prevalence (random sample only)		Random/convenience sample contrast	
		<i>N</i> = 253 Girls	<i>N</i> = 276 Boys	<i>N</i> = 558 Random	<i>N</i> = 536 Convenience
Any Contact CSA	2.6 %	3.8 %	1.6 %	3.4 %	2.9 %
Ever Neglected	9.0 %	10.1 %	8.8 %	10.4 %	11.9 %
Online Invasive Exploitation (IE)	0.08	0.10	0.07	0.10	0.12
Asked for sexual information about self	3.3 %	3.1 %	4.2 %	4.0 %	4.3 %
Asked to talk about sex acts	2.8 %	3.6 %	2.2 %	3.4 %	3.1 %
Asked to do something sexual	0.7 %	0.8 %	0.7 %	1.0 %	1.4 %
Asked for photo with private parts	1.5 %	2.1 %*	0.4 %	1.6 %	2.6 %
Did something sexual	0.2 %	0.3 %	0.0 %	0.4 %	0.8 %
Online IE Exposure	0.68	0.70	0.70	0.70*	0.86
Got X-rated Ads in message	35.0 %	37.3 %	31.2 %	36.3 %	41.5 %
Opened link showing sex acts	17.6 %	16.8 %	20.6 %	18.3 %**	25.3 %
Saw sexual message/image/video	17.1 %	16.7 %	19.6 %	17.1 %	20.7 %
Online Risk Behaviors (Monthly)	1.66	1.67	1.64	1.70	1.66
Looked for new friends on the net	34.2 %	37.0 %	32.5 %	32.0 %	26.5 %
Sent personal info to a stranger	3.5 %	3.2 %	3.0 %	4.5 %	3.4 %
Added a stranger to my contacts	11.4 %	12.9 %	8.4 %	11.8 %	12.8 %
Pretended to be someone else	17.2 %	13.9 %	21.1 %	17.4 %	16.9 %
Sent photo/video to stranger 4.3 %	4.3 %	5.2 %	2.9 %	5.5 %	5.6 %
Ever contact with a stranger	43.7 %	48.1 %*	38.8 %	45.7 %	42.1 %
Parents sit with me sometimes when I'm online	31.1 %	31.3 %	27.4 %	30.7 %	34.7 %
Fairly difficult to talk to parents	47.7 %	44.0 %*	55.7 %	48.3 %	51.0 %
Daily online at friend's house	50.8 %	52.1 %	45.3 %	47.2 %	45.7 %
Daily online going somewhere	59.2 %	59.5 %	57.1 %	58.9 %	60.0 %
Female	43.7 %	–	–	48.0 %***	80.5 %
Age	13.71	13.73	13.69	13.77***	13.50
Parents own the home	22.3 %	22.6 %	23.4 %	18.8 %**	27.4 %
Count of refusal of IE items (non-disclosure indicator)	0.36	0.16**	0.47	0.43	0.45
Household size	2.88	2.94	2.86	2.81	2.84
Dad unemployed	9.4 %	5.2 %	15.8 %	9.9 %	7.0 %
Mom unemployed	24.4 %	25.5 %	21.4 %	25.7 %*	31.0 %

¹ Stars indicate significant differences on Z or t-tests. * $p < .05$, ** $p < .01$, *** $p < .001$.

The (less invasive) IE exposure prevalence was even higher. More than 1 in 3 girls (37.3 %) and 31.2 % of boys had received a message with X-rated ads. 16.8 % of girls and one in five boys (20.6 %) had opened a link showing sex acts that they did not want. Among girls, 16.7 % had seen a sexual message, image, or video they did not want; for boys this was 19.6 %. Census projections suggest there were 932,000 children aged 0–14 living in Hong Kong in 2022. Worked out at the population level these numbers suggest 24,000 of these children have been or will be subjected to offline contact sexual abuse, 83,000 have been or will be neglected, and 77,000 have experienced or will experience online invasive exploitation. The proportion of children affected by at least one of these problems (neglect, online IE or contact CSA) is large. The weighted population estimate from the random sample is 16.5 %, or 153,000 children. 13.3 % of Hong Kong children will experience exactly one type, 2.4 % of Hong Kong children will experience two of these types of victimization, and 0.8 % will experience all three.

Online risk behavior prevalence estimates are provided for engaging in the behavior on a monthly or more frequent basis in Table 2. In Hong Kong 37 % of girls and 32.5 % of boys look for new friends on the internet on a monthly basis or more frequently. A somewhat smaller proportion of Hong Kong adolescents sent personal information to someone they only knew from online (3.2 % of girls and 3 % of boys) monthly or more frequently. More adolescents added someone they only knew from online to their contacts (12.9 % of girls and 8.4 % of boys). Pretending to be someone you are not on a monthly or more frequent basis was more common for boys (21.1 %) than for girls (13.9 %) but the sample size may not have been large enough to make this difference statistically significant. The difference between boys and girls in the convenience sample was not as large or in the same direction. Sending personal videos or photographs to strangers on the net was less common with one in twenty girls (5.2 %) and 2.9 % of boys doing this on a monthly or more frequent basis. Although it was not included in the risk behavior scale (as it is a dichotomous item) having contact with a stranger online was common. Nearly half of girls (48.1 %) had contact with a stranger at least once. This was significantly more common among

Table 3
Regression & logistic regression: contact childhood sexual abuse, online invasive exploitation, risk behaviors, & neglect.¹

Variable	Online risk behaviors (regression, n = 918) B (SE B)	Online IE exposure (ordinal logit, n = 899) OR (95 % CI)	Online IE (ordinal logit, n = 894) OR (95 % CI)	Any contact CSA (logit, n = 894) OR (95 % CI)
Online invasive exploitation (IE)				2.00** (1.32, 3.04)
Online IE exposure			2.84*** (2.00, 4.04)	1.32 (0.91, 1.92)
Online risk behaviors		1.44* (1.05, 1.98)	2.35*** (1.74, 3.18)	1.50* (1.10, 2.04)
Ever neglected	0.32* (0.10)	1.80* (1.08, 3.01)	2.02 (0.99, 4.12)	4.79 (0.86, 26.6)
Ever contact with stranger on the net	0.48*** (0.05)	1.47* (1.03, 2.09)	1.39 (0.99, 1.95)	2.57* (1.02, 6.50)
Parents stay beside me when online	-0.01 (0.02)	0.95 (0.80, 1.12)	0.82* (0.67, 0.99)	1.18 (0.69, 2.02)
Difficult to talk to my parents	-0.04 (0.03)	1.09 (0.97, 1.24)	1.11 (0.81, 1.52)	0.56 (0.32, 1.01)
Often online at friend's house	0.01 (0.01)	0.96 (0.90, 1.03)	0.87 (0.74, 1.02)	0.92 (0.78, 1.09)
Often online going somewhere	0.03** (0.01)	1.14*** (1.07, 1.22)	1.16* (1.03, 1.31)	1.02 (0.72, 1.45)
IE refusal count (non-disclosure)	0.08*** (0.01)	1.16*** (1.07, 1.26)	0.84 (0.48, 1.46)	0.96 (0.46, 2.04)
Dad unemployed	0.14 (0.09)	1.02 (0.66, 1.57)	0.92 (0.28, 3.00)	1.01 (0.26, 3.86)
Mom unemployed	0.03 (0.06)	0.81 (0.57, 1.16)	1.20 (0.65, 2.23)	1.63 (0.53, 5.04)
Household size	-0.01 (0.02)	1.08 (0.95, 1.24)	0.88 (0.68, 1.15)	1.04 (0.49, 2.22)
Family owns home	-0.03 (0.05)	1.30 (0.82, 2.04)	1.14 (0.48, 2.27)	1.13 (0.47, 2.69)
Female	-0.01 (0.04)	1.71* (1.08, 2.70)	1.10 (0.53, 2.31)	0.91 (0.32, 2.57)
Age	0.02 (0.02)	1.23* (1.04, 1.44)	0.91 (0.71, 1.18)	1.03 (0.61, 1.72)
(Pseudo) R ²	0.25	0.05	0.23	0.30

Mediation analysis	Baseline ²	Direct ³	Bootstrap 95 % confidence interval ⁴	Indirect ⁵	Bootstrap 99 % confidence interval
Ever Neglected → Contact CSA	11.18***	8.41***			
Ever Neglected → Risk Behaviors	3.51***	2.38*** ^A	0.52–1.29		
Risk Behaviors → Online IE	2.66***	2.45*** ^B	0.41–1.47		
Neglect → Risk → Online IE				.84 ^{M1}	0.08–1.97
Online IE → Contact CSA	2.74***	2.00** ^C	0.25–1.53		
Risk → Online IE → Contact CSA				.72 ^{M2}	0.19–1.73
Neglect → Risk → Online IE → CSA				.63 ^{M3}	0.02–2.67

¹Standard errors corrected for clustering by school. * p < .05, ** p < .01, *** p < .001.

²Child age and gender controls only. All effect sizes shown are odds-ratios from logits or ordered logits, depending on outcome variable.

³Controlling for child age, gender, ever neglected, ever contact with a stranger online, parents stay beside me online, difficult to talk with parents, often online at a friend's house, often online going somewhere, IE refusal count (non-disclosure), household size, home ownership, and mother and father unemployment.

⁴Confidence intervals and indirect effects shown at coefficient level not odds-ratio level (i.e. coefficients are not exponentiated).

⁵Letters. The letters A, B, and C, correspond to associations estimating direct effects. M1, M2, and M3 correspond to estimates of indirect effects.

girls than among boys (38.8 %).

Almost one in three adolescents (31.3 % of girls and 27.4 % of boys) reported that their parents sometimes sat next to them while they were online. Significantly more boys (55.7 %) than girls (44 %) reported that it was fairly or more difficult to talk to their parents when something was upsetting them. Just over half of girls (52.1 %) and just under half of boys (45.3 %) reported being online at a friend's house daily or more often. Being online daily whilst going from one place to another was also very common; 59.5 % of girls and 57.1 % of boys had this habit. The average age was nearly 14 and more than 1 in every 5 children came from a family that owned its own home. About one in every 4 mothers and 1 in every 10 fathers was unemployed. The average household was smaller than 3 people, and boys had significantly higher average refusal counts for online IE items (0.47 for boys versus 0.16 for girls). This finding suggests the study may systematically underestimate sexual victimization of boys.

The last two columns of [Table 2](#) show unweighted proportions and means for the random and convenience samples. This comparison allows the reader to estimate the extent to which relying on convenience samples of Hong Kong may bias estimates. The convenience sample had significantly higher unemployment rates for mothers but (non-significant) lower unemployment rates for fathers. Home ownership in the convenience sample was significantly more likely (27.4 % versus 18.8 %); the convenience sample was also more female as the sample included girls only school. Adolescents in the convenience sample were significantly more likely to report online IE exposure, which was driven by the fact that one in four (25.3 %) had opened a link showing sex acts. The demographic differences suggest the convenience sample comes from a higher socio-economic background than the random sample. Using convenience samples may result in biased estimates of the prevalence of less invasive online IE exposure.

3.1.3. Inferential models

[Table 3](#) shows regression, logistic regression, and ordinal logistic regression for models of interest. For ordinal and binary logistic regression models odds ratios are shown instead of coefficients. Neglect ($B = 0.32$) and ever having contact with a stranger on the net ($B = 0.58$) had large, significant, positive coefficients. How often adolescents went online whilst en route to somewhere else, and IE refusal count (non-disclosure) were also all significantly and positively associated with online risk behaviors. The model explained 25 % of the variance in online risk behaviors.

Each increase in risk behaviors was associated with 1.44 times higher odds of an increase in online IE exposure. Neglect was associated with online IE exposure when risk behaviors were controlled; being neglected was associated with 1.8 times higher odds of an increase online IE exposure. More often being online whilst en route to somewhere else, non-disclosure, ever having had contact with a stranger on the net, being female, and being older were also associated with increased odds of (more) online IE exposure (see [Table 2](#) column 2). Pseudo r-squared for the model was 5 %.

Online risk behaviors were significantly associated with higher odds (2.35 times higher odds) of more severe online IE. More online IE exposure was associated with 2.84 times higher odds of more online IE but having parents stay beside the adolescent whilst on the net was associated with (0.82 times) lower odds of more severe online IE. Going online whilst en route to somewhere else increasingly often was associated with nearly 1.2 times higher odds of more severe online IE. Counterintuitively, a family's home ownership was associated with higher odds of more severe IE. This may reflect greater access to the net and to devices. Pseudo r-squared for the model was 23 %.

Each increase in online invasive exploitation was associated with 2 times higher odds of offline contact CSA. Online risk behaviors were associated with 1.5 times higher odds of offline contact CSA. Controlling for risk behaviors, online IE, and online IE exposure, neglect was not significant but the odds ratio was large (4.79). In addition, neglect was significantly associated with offline contact CSA in the sensitivity analysis ($OR = 5.10, p = .044$). Ever having contact with a stranger on the net was associated with 2.57 times higher odds of offline contact CSA (however this was not significant in the sensitivity analysis). Pseudo r-squared was 30 %.

3.1.4. Mediation

The lower section of [Table 3](#) shows the results from mediation analyses. The letters in superscript next to direct and indirect effects correspond to the same letters on [Fig. 1](#). The first column shows odds ratios from baseline models with age and gender controls only. At baseline, neglect is associated with 11.2 times higher odds of contact CSA. Direct effects are estimated with the controls detailed in footnote four. The reader can see that even in the controlled model neglect is associated with 8.4 times higher odds of offline contact CSA. All direct effects depicted in [Fig. 1](#) (A, B, and C) were highly significant with odds ratios greater than or equal to two. The indirect effects corresponding to M1, M2, and M3 were all positive. The non-parametric bootstrap confidence intervals show the three indirect effects are significant with 99 % confidence.

3.2. Focus groups

Analysis of the transcripts yielded 6 themes about online life: (1) unpleasant experiences online, (2) vigilance about sharing personal information, (3) help seeking, (4) attitudes, (5) making friends, and (6) suggestions for schools. To keep within the scope, this paper focuses on the first 3 themes. One participant complained about inappropriate ads that are embedded in videos she watches "Sometimes there will be more than ten ad breaks in a twenty-minute video." "All of the ads have inappropriate content...like there could be a naked woman in the ad with her breasts bouncing." This experience negatively affected her emotionally, particularly because her privacy was sometimes violated. When the "inappropriate advertisements suddenly started to play...it was very loud and everyone could hear. I felt very embarrassed." Participants were aware of the risk of sharing personal information online. With respect to sharing photos on social media, one stated "If it's not asked for by a teacher it won't be necessary." There were, however, contradictions in these narratives. One participant initially stated that everyone they chatted with online were people they knew in real

life. However, later, when asked, the same participant replied “both” to a question about whether particular interlocutors were known from real life or only from online. More than one participant displayed such contradictions. A female participant said she talked to “friends I met in [online] games” and that these were people from “all around the world.” Participants said they were less likely to go to adults for help because “they are even less familiar with the internet than I am.” Reassuringly, one participant said she would go to her parents or teachers for help because her friends are “still minors.” However, several other participants said they would not ask anyone for help if something bad happened online: “They will ask too many questions. It’s so annoying. There is a generation gap.”

The focus group interviews also shed light on the relationship between neglect, risk behaviors, and online victimization. In some of the focus groups participants correctly identified that online victimization could happen because “people trust the strangers online too much.” When asked what makes people trust strangers online so much, one participant replied: “Maybe because they don’t have friends in real life? Or maybe because their family doesn’t show enough care and love to them, so that they feel lonely and want to know people online.” Another participant replied “the victims are usually at home alone, and don’t have people around them. They believe those online chat apps can help them have a better life, because they want people to keep them company.” When asked for solutions these adolescents suggested “more warmth from the family” and that schools should specifically create opportunities for kids to make friends with classmates. Although they identified communicating with strangers online as a risk, many of the qualitative participants admitted to doing this sometimes. For some participants the initial reason for communicating with strangers online was related to playing the online game. However, some participants also identified player to player chat channels as a venue for risk: “I have also seen people looking for teenage girls there...they seem to want to make them their girlfriends, sort of...Some...conversations include some erotic content.” Other participants described that positive experiences involved meeting people from other countries and improving their communication skills in English and Chinese. Most of the focus group participants thought of internet safety as a technical skill that they could learn on their own or from friends better than from adults. At the same time, it is clear that some parents are very worried and trying to make their adolescent children aware of online risks.

Participant: “My mom told me to be very cautious when using the internet, and never send out something personal like a photo to strangers.”

Interviewer: “Did she explain why you should be so cautious?”

Participant: “Because she worried that people online might blackmail me using the nude photos. I cannot hold up under stress and would end up committing suicide. My mom said this.” Some participants reported difficulties with X-rated advertisements when they changed their online age to be very young (7 or 8).

4. Discussion

This study aimed to unpack the relationship between neglect and contact CSA by examining three mediation hypotheses. All three hypotheses were supported by the data. To our knowledge, this was the first study to examine sequential mediation of the relationship between neglect and contact CSA by online risk behaviors and online IE, although previous research documents many of these links (cf. Finkelhor et al., 1997). The findings suggest that the relationship between neglect and online IE is mediated by online risk behaviors, the relationship between online risk behaviors and contact CSA is mediated by online IE. Further, the findings are consistent with the hypothesis that the relationship between neglect and contact CSA is sequentially mediated by online risk behaviors and online IE. In the baseline models children who reported having been neglected had 11 times higher odds of reporting contact CSA. This large increase in risk is consistent with previous research on neglect and CSA (Black et al., 2001; Finkelhor et al., 1997). Evidence on the second mediation pathway suggests online IE may mediate the relationship between online risk behaviors and offline contact CSA. Online grooming is a major means used by perpetrators to carry out offline contact CSA (Shannon, 2007). The study extends Bramsen et al. (2013)’s earlier finding that earlier victimization may increase risk behaviors which then increase later victimization; neglect may also precipitate such risk behaviors. Neglect may increase later risk for online IE and contact CSA because neglected children are more likely than others to seek out others to fulfill needs for protection and nurture (Hildyard & Wolfe, 2002), resulting in higher levels of online risk behaviors. Although some research on online IE suggests some perpetrators move very quickly to a perpetration stage (cf. Martellozzo, 2012; 122–123), our findings on mediation of the neglect-online IE relationship by online risk behaviors, as well as our qualitative findings, are more consistent with the idea that children experiencing neglect may be actively seeking nurture, support, and love, (Hildyard & Wolfe, 2002) and consequently actively increasing their risk for online IE. The fact that risk behaviors mediate the relationship between neglect and online IE raises questions about why risk behaviors increase and what such children may be looking for online. Further research is needed to unpack this. Such children may be especially vulnerable to perpetrators employing the 5-phase grooming process described by O’Connell (2003; 44). It is important to note that these risk behaviors may seem like adaptive responses to neglect to the children employing them. It is inadequate to conceptualize these children as simply passively vulnerable to online invasive exploitation.

The findings are consistent with a mediation pathway from neglect to online risk behaviors to online IE to offline contact CSA. There were, however, limitations in the measurement of neglect and offline contact CSA, as both of these were lifetime measurements. Annual prevalence of offline contact CSA would not be high enough to support a restriction to past year prevalence that remained statistically sensitive. Alternative explanations for the findings could involve, for example, a direct effect of neglect on contact CSA which then increases both online risk behaviors and hence online IE, or a situation in which online IE normalizes inappropriate sexual relationships, resulting in desensitization to offline red flags. Pathways to victimization are complex and any one pathway is only likely to explain a portion of the total victimization. However, we think that the mediation model as depicted is a likely version compared to the alternatives. The findings also provide a snapshot of Hong Kong during the covid-19 pandemic in 2020–2021. During that period, schools were following a somewhat chaotic set of directives to switch education from offline to online, and then back to offline again,

back online, and so on. Internet use and addiction is high in Hong Kong and East Asia generally, with addiction rates estimated between 17 % and 26 % in high school (Shek & Yu, 2016). Being required by the school to be present online, as well as lockdowns limiting much socialization to online contexts likely increased both internet addiction and risk for online IE in Hong Kong during the pandemic. A time-series analysis would allow us to examine relationships between the timing of lockdowns and peaks in online IE, but we save this for future research. Future research should also examine the sequential mediation pathway to contact CSA using longitudinal data and examine whether depression mediates the relationship between victimization from neglect and online risk behaviors (Littleton et al., 2014).

4.1. Implications

Simply assuming that children are passive victims may make clinical, school and policy interventions more likely to fail. The qualitative findings suggest Hong Kong adolescents are aware of online risks, yet still take them. Neglected adolescents may be aware that engaging with strangers online is high risk but may either discount the risk or believe, in desperation, that the potential gain is worth the risk as they actively try to improve their lives. Although the neglect to victimization pathway appears to be mediated by online risk behaviors, it is not reasonable to expect that eliminating the internet from the lives of adolescents is a realistic or healthy approach. The focus group data suggested that adolescents also use the internet for school and in order to learn about and explore the world. Rather, the findings suggest that it is vitally important to provide vulnerable children with safe alternatives. In the past, local governments have created safe community spaces for children to meet and play after school. Policies have ensured the safety of such community facilities by ensuring the technical specifications are safe and by ensuring that the interactions between children are monitored by a trained and responsible adult. To ensure safety, governments have policies that limit how many children can be monitored by a single adult.

One way to mitigate this problem may be to create analogous safe social meeting spaces online for children who have been identified as vulnerable and at high risk for invasive exploitation (for example children who are victims of neglect). Online chat rooms for vulnerable children could be opened during certain hours after school (perhaps between the hours of 3 pm and 8 pm) and actively monitored and supervised in real time by a trained adult. Just as in real life, such chat rooms would need to have numeric limits on the number of children present at any one time. Just as in real life, children could participate in games collectively, but under adult supervision. Provision of identifying personal information (phone numbers, social media ids) could be restricted but offline meetings could be enabled after some period of online acquaintanceship by coordinating with local community centers in real life. Initial in person meetings between vulnerable adolescents could be hence supervised in a safe space and children provided with emotional support and guidance about relationship boundaries, both in cyberspace and in real life. Online safety training for adolescents could also emphasize the ways in which safe relationship boundaries change and vary across different circumstances and contexts. Such trainings in schools, NGOs, and other organizations could aim to make adolescents more accurate judges of risk rather than adopting a simple ‘stranger danger’ warning approach which may be unpersuasive to children who are emotionally desperate. Professional emotional support from social workers, teachers, and adult mentors can mitigate, if not eliminate, the emotional poverty such children are seeking to escape from (cf. Emery & Yang, 2022). Of course, parent training to make parents more aware of the issue and of the importance of their physical presence, emotional warmth and support, as well as technological means to reduce their children’s risk, could help to improve the situation at the source. However, the idea of reductions in victimization by having supervised safe spaces for online socialization and gaming is consistent with predictions from both theories of informal social control (Emery et al., 2015; Sampson et al., 1997) and routine activity theory (Cohen & Felson, 1979).

As mediators, both online risk behaviors and online IE victimization offer points for intervention. One approach to dealing with this problem might be the development of AI to detect online IE early on apps and games frequented by children, allowing parents, schools and social workers to intervene to prevent escalation of the online IE before it becomes severe or perpetrators are able to arrange offline meetings, which is the most serious kind of online offense (Martellozzo, 2012; 127). The mediation findings are also consistent with a sequential chain; from neglect, to online risk behaviors, to online IE, to offline contact CSA (hypothesis 3). Efforts to break the links in this chain must understand that adolescents and vulnerable families actively attempt to deal with the problems they confront. Enlistment of parents and children into empowering active protection roles can occur when schools, clinicians, policy makers, and community leaders act to increase the capacity of communities, families, and children to ameliorate neglect and its sequelae. Future research should investigate whether deploying the invasive exploitation concept in this narrative may facilitate communication with parents and adolescents by reducing the stigma and histrionic social responses associated with “sexual” abuse without losing sight of its devastating consequences. Research is also needed to determine whether the IE concept may help to identify groups of children whose victimization remains marginalized or unaddressed because they are not easily classified as victims in the dominant categories of physical, sexual, and emotional abuse and neglect. For example, children who are blackmailed online regarding non-sexual but stigmatized secrets like having a mental illness might confront a similar constellation of emotions as children blackmailed online about sexual activities. Both types of blackmail might be conceptualized as online invasive exploitation.

4.2. Limitations

The data collected for this study are cross-sectional; hence causal inferences cannot be drawn. Although analyses controlled for non-disclosure, 11.8 % of the sample refused to answer one or more of the online IE items. Hence, it is almost certain that the findings underestimate the true level of victimization. Boys had significantly higher levels of non-disclosure than girls so under-reporting and underestimation of the prevalence of victimization may be more serious for boys. Strictly speaking, the results are generalizable only to

students in lower secondary aided schools in Hong Kong. Students in government, international, or SEN schools may have different victimization and risk profiles. The number of contact CSA cases in the data prevented the study from making use of only current year data as statistical power would be weak. Using even any contact CSA as the final outcome reinforces the limitations that result from cross-sectional data, as information on when the victimization occurred in time is not available. These issues of temporal precedence further complicate the data's capacity to support the model and introduce the possibility of reverse-causality bias. The GKO measure of online IE likely underestimates the true prevalence because only 'unwanted' interactions are captured; victimization that children believed to be voluntary on their part would not be included. Further, some experiences reported as IE exposure might be more accurately classified as online IE. Alternate models in which contact CSA results in online IE and risk behaviors could also be plausibly supported by the data. Although evidence from the analyses is consistent with online risk behaviors and online IE playing important roles as mediators, the findings do not represent the only potential pathway to contact CSA. Further, in addition to online perpetrators moving to offline contact CSA, online IE may normalize inappropriate sexual relationships, resulting in more offline risk behaviors and desensitization of children to red flag boundary violations. Although the data set is large, lack of statistical power may still have resulted in some of the null findings. In particular, the model for offline CSA contained a large number of predictors given the sample prevalence, which may introduce conservative bias (biasing coefficients towards zero; Chen et al., 2016). Although it was not used for population prevalence estimates, roughly half of the data came from a convenience sample (although controlling for random versus convenience samples did not affect the models). The findings should be replicated with additional research in other contexts. When sensitivity analysis to remove online/offline ambiguity from the item on physical activity with someone over 18 was conducted, two boys and one girl classified as having contact CSA victimization experience were removed from the analysis. When this was done, the ever contact with a stranger on the net item ceased to be a significant predictor of contact CSA in the final model. More in-depth qualitative research like oral histories could also be used to shed more light on the issues raised in this paper. Future research on this topic should control for other forms of maltreatment.

5. Conclusion

It is established that children who are neglected are more likely to be victims of CSA (both offline and online). However, the link between neglect and CSA has not been systematically investigated empirically. As the first study to unpack the relationship between neglect and contact CSA by examining three mediation hypotheses, this study offers significant evidence to promote early intervention and primary prevention. Evidence on the serial mediation analysis suggests that to break this chain of abuse, significant efforts, in policy and practice, should be made towards preventing neglect as well as to curtail the negative consequences of online risk behaviors. For example, promoting supervised safe spaces for online socialization and gaming will be useful to prevent CSA and IE victimization, even among neglected children who are exposed to the internet. Online IE is a very serious form of victimization in and of itself. It is crucially important to develop prevention mechanisms that break the links earlier in the process.

Data availability

Data will be made available on request.

Acknowledgments

- 1) We gratefully acknowledge the support of Save the Children Hong Kong, which funded and on behalf of which this research was conducted.
- 2) The write up of this paper benefitted from a Sino-British fellowship at the School of Social and Political Science at the University of Edinburgh.

References

- Ainsaar, M., & Loof, L. (2010). *Online behaviour related to child sexual abuse* (Literature report).
- Augusti, E. M., Sætre, S. S., & Hafstad, G. S. (2021). Violence and abuse experiences and associated risk factors during the COVID-19 outbreak in a population-based sample of Norwegian adolescents. *Child Abuse & Neglect*, 118, Article 105156.
- Black, D., Heyman, R., & Slep, A. (2001). Risk factors for child sexual abuse. *Aggression and Violent Behavior*, 6(2–3), 203–229.
- Bramsen, R. H., Lasgaard, M., Koss, M. P., Shevlin, M., Elklit, A., & Banner, J. (2013). Testing a multiple mediator model of the effect of childhood sexual abuse on adolescent sexual victimization. *American Journal of Orthopsychiatry*, 83(1), 47.
- Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4), 589–597.
- Byrne, J., Kardefelt-Winther, D., Livingstone, S., & Stoilova, M. (2016). *Global kids online research synthesis, 2015–2016*. UNICEF Office of Research-Innocenti and London School of Economics and Political Science. Retrieved 30-7-2019: www.globalkidsonline.net/synthesis.
- Chan, K. L. (2011). Association between childhood sexual abuse and adult sexual victimization in a representative sample in Hong Kong Chinese. *Child Abuse & Neglect*, 35(3), 220–229.
- Chan, K. L., Yan, E., Brownridge, D., Tiwari, A., & Fong, D. (2011). Child sexual abuse associated with dating partner violence and suicidal ideation in a representative household sample in Hong Kong. *Journal of Interpersonal Violence*, 26(9), 1763–1784.
- Chen, Q., Nian, H., Zhu, Y., Talbot, H. K., Griffin, M. R., & Harrell, F. E., Jr. (2016). Too many covariates and too few cases? - a comparative study. *Statistics in Medicine*, Nov 10;35(25), 4546–4558. <https://doi.org/10.1002/sim.7021> (Epub 2016 Jun 30. PMID: 27357163; PMCID: PMC5050102).
- Chisholm, J. F. (2006). Cyberspace violence against girls and adolescent females. *Annals of the New York Academy of Sciences*, 1087(1), 74–89.
- Cohen, L. E., & Felson, M. (1979). Social change and crime rate trends: A routine activity approach. *American Sociological Review*, 588–608.
- Crouch, J. L., & Milner, J. S. (1993). Effects of child neglect on children. *Criminal Justice and Behavior*, 20(1), 49–65.

- De Vries, I., & Goggin, K. E. (2020). The impact of childhood abuse on the commercial sexual exploitation of youth: A systematic review and meta-analysis. *Trauma, Violence & Abuse, 21*(5), 886–903.
- Dunn, L. (2021). Child fatality review panel fifth report. Retrieved 5-22-2023: [https://www.swd.gov.hk/storage/asset/section/2867/en/CFRP_Fifth_Report_\(Eng\).pdf](https://www.swd.gov.hk/storage/asset/section/2867/en/CFRP_Fifth_Report_(Eng).pdf).
- Dwan, D., Sawicki, M., & Wong, J. (2013). *Subdivided housing issues of Hong Kong: Causes and solutions*. Hong Kong Institute of Education.
- Emery, C. (2017). The challenge of construct fundamentalism: CSA as invasive exploitation? *Journal of Child & Adolescent Trauma, 10*(1), 87–93.
- Emery, C. (2021). *An exploratory study on understanding online risks and children's online behavior in Hong Kong. Final report for save the children Hong Kong*. Retrieved 5-22-23: <https://savethechildren.org.hk/wp-content/uploads/2022/04/An-Exploratory-Study-on-Understanding-Online-Risks-and-Children%E2%80%99s-Online....pdf>.
- Emery, C. R., Abdullah, A., Ho, R. T., & Islas-Madlo, S. (2023). Studying maltreatment through polyvictimization: a three-dimensional theoretical foundation. In C. Martin, V. Preedy, & V. Patel (Eds.), *Handbook of Anger, Aggression, and Violence*. Springer. https://doi.org/10.1007/978-3-031-31547-3_3.
- Emery, C. R., Wu, S., & Raghavan, R. (2015). The hutong effect: Informal social control and community psychology in Beijing. *Injury Prevention, 21*(2), 121–125.
- Emery, C. R., & Yang, H. (2022). Modeling the relationship between mentoring and depression symptoms among adolescent North Korean refugees. *Journal of School Psychology, 92*, 121–135.
- Finkelhor, D., Hamby, S., Ormrod, R., & Turner, H. (2005). The juvenile victimization questionnaire: Reliability, validity, and national norms. *Child Abuse & Neglect, 29*(4), 383–412.
- Finkelhor, D., Moore, D., Hamby, S. L., & Straus, M. A. (1997). Sexually abused children in a national survey of parents: Methodological issues. *Child Abuse & Neglect, 21*(1), 1–9.
- Genius, M., Thomlison, B., & Bagley, C. (1991). Male victims of child sexual abuse: A brief overview of pertinent findings. *Journal of Child & Youth Care, 1*–6. Global Kids Online. (2019). *Global kids online: Comparative Report*. UNICEF Office of Research – Innocenti.
- He, G., & Wu, X. (2019). Foreign domestic helpers hiring and women's labor supply in Hong Kong. *Chinese Sociological Review, 51*(4), 397–420.
- Hildyard, K. L., & Wolfe, D. A. (2002). Child neglect: Developmental issues and outcomes. *Child Abuse & Neglect, 26*(6–7), 679–695.
- Hui, C. (2019). Child fatality review panel fourth report. Retrieved 5-22-2023: https://www.swd.gov.hk/storage/asset/section/2867/en/CFRP_Fourth_Report_en_Nov2019.pdf.
- Jonsson, L. S., Fredlund, C., Priebe, G., Wadsby, M., & Svedin, C. G. (2019). Online sexual abuse of adolescents by a perpetrator met online: A cross-sectional study. *Child and Adolescent Psychiatry and Mental Health, 13*(1), 1–10.
- Kotchick, B. A., Shaffer, A., Miller, K. S., & Forehand, R. (2001). Adolescent sexual risk behavior: A multi-system perspective. *Clinical Psychology Review, 21*(4), 493–519.
- Lanning, K. (2005). Compliant child victims: Confronting an uncomfortable reality. In E. Quayle, & M. Taylor (Eds.), *Viewing child pornography on the internet* (pp. 49–60). Lyme Regis: Russell House Publishing.
- Littleton, H. L., Grills, A. E., & Drum, K. B. (2014). Predicting risky sexual behavior in emerging adulthood: Examination of a moderated mediation model among child sexual abuse and adult sexual assault victims. *Violence and Victims, 29*(6), 981–998.
- Liu, H., Zhang, Y., & Luo, F. (2015). Mediation analysis for ordinal outcome variables. In *Quantitative psychology research: The 78th annual meeting of the psychometric society* (pp. 429–450). Springer International Publishing.
- Lo, C. K., Tung, K. T., Chan, K. L., Yip, P. S., Lau, J. T., Wong, W. H., ... Ip, P. (2017). Risk factors for child physical abuse and neglect among Chinese young mothers. *Child Abuse & Neglect, 67*, 193–206.
- Lo, C. K. M., Ho, F. K., Wong, R. S., Tung, K. T. S., Tso, W. W. Y., Ho, M. S. P., ... Ip, P. (2019). Prevalence of child maltreatment and its association with parenting style: A population study in Hong Kong. *International Journal of Environmental Research and Public Health, Mar 29;16*(7), 1130. <https://doi.org/10.3390/ijerph16071130>. PMID: 30934827; PMCID: PMC6480629.
- Logar, S., Anzelm, D., Lazic, D., & Vujacic, V. (2016). *Global kids online Montenegro: Opportunities, risks and safety*.
- Martellozzo, E. (2012). *Online child sexual abuse: Grooming, policing and child protection in multi-media world*. Oxford, UK: Routledge.
- Noll, J. G., Haag, A. C., Shenk, C. E., Wright, M. F., Barnes, J. E., Kohram, M., ... Bonanno, G. A. (2022). An observational study of internet behaviours for adolescent females following sexual abuse. *Nature Human Behaviour, 6*(1), 74–87.
- O'Connell, R. (2003). From fixed to mobile internet: The morphing of criminal activity online. In M. Calder (Ed.), *Child sexual abuse and the internet: Tackling the new frontier*. Lyme Regis, Dorset: Russell House Publishing.
- Pan, L. (2015). *When True Love Came to China*. Hong Kong University Press.
- Preacher, K., & Hayes, A. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*(3), 879–891.
- Rowny, K. L. (2018). *Developmentally-anchored considerations for youth with a history of Foster Care: A clinical resource guide clarifying key elements of Mentalization and Mentalization-based treatment* (Doctoral dissertation). The Wright Institute.
- Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science, 277*(5328), 918–924.
- Shannon, D. (2007). *The online sexual solicitation of children by adults in Sweden*. Stockholm. <http://www.bra.se>.
- Shek, D. T., & Yu, L. (2016). Adolescent internet addiction in Hong Kong: Prevalence, change, and correlates. *Journal of Pediatric and Adolescent Gynecology, 29*(1), S22–S30.
- Suler, J. (2004). The online disinhibition effect. *Cyberpsychology & Behavior, 7*(3), 321–326.
- Wilcox, D. T., Richards, F., & O'Keefe, Z. C. (2004). Resilience and risk factors associated with experiencing childhood sexual abuse. *Child Abuse Review: Journal of the British Association for the Study and Prevention of Child Abuse and Neglect, 13*(5), 338–352.