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Developmental Trajectories and Outcomes of Online Child Sexual Abuse: A Systematic Review of Longitudinal Studies

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Abstract

Background. OCSA includes adult grooming or solicitation and peer electronic sexual coercion. Due to its negative consequences, it has become a public mental health concern. While prevalence is well established, the developmental timing of onset, predictors, and outcomes can only be clarified through longitudinal studies. **Objective.** This review synthesizes longitudinal evidence on online child sexual abuse (OCSA) in minors, with an emphasis on developmental timing, prospective risk and protective factors, and downstream outcomes. Methods. A systematic review was conducted according to the PRISMA 2020 guidelines. Eligible studies enrolled participants under 18 years of age at baseline, used a longitudinal design, and examined OCSA. Twelve studies were identified through database searches (2000-2025) and citation chasing, all of which were published from 2013 onwards. Discussion. The narrative synthesis identified that the risk for OCSA was concentrated in mid-adolescence. Peer electronic coercion rose through early-mid adolescence and plateaued around the age of 16-17. The cumulative onset reached approximately one in three by age 18. The predictors included depressive symptoms, maltreatment, adverse childhood experiences, and risky digital behaviors. Protective parental monitoring buffered escalation, especially in early adolescence. In terms of consequences, adult solicitation predicted poorer quality of life and emotional distress, whereas peer coercion increased depression and delinquency. Bidirectional feedback loops emerged between adolescent sexting and adult solicitation. A school-based trial demonstrated that even brief prevention efforts can reduce the risk of OCSA. Conclusion. Longitudinal evidence suggests that OCSA follows an age-graded developmental pattern and is associated with potentially modifiable risk and protective factors. Prevention should focus on mid-adolescent hazard windows, minority-sensitive support, family-based monitoring, and digital safety education. The proposed Developmental-Online-Trajectories of Sexual abuse (DOTS) framework integrates these findings to guide future research, practice, and prevention.

Key Words: Online Child Sexual Abuse ▪ Grooming ▪ Electronic Sexual Coercion ▪ Adolescence.

Introduction

Digital technologies have reshaped the way young people connect with each other. Social and romantic interactions are now often tied to phones and platforms rather than to face-to-face contexts (1, 2). Adolescents spend long hours on messaging apps, social networks, gaming, or streaming, where many of them share pictures and videos every day (3-5). Some of these exchanges remain archived, others vanish instantly in stories, and algorithms silently decide who appears in their feeds (6, 7). In practice, private and semi-public online spaces often blur together. A chat may move across several apps, and images can be reshared or modified without consent (8). Child sexual abuse, as it has traditionally been studied, has involved the manipulation or coercion of minors for sexual purposes in offline contexts (9). Today, these harms also take on digital forms (10). Abuse may start online through grooming or sexual solicitation, involve pressure to share sexual images, or online contact can act as a gateway to an in-person meeting (11, 12). There are important differences between online and offline sexual victimization and related adverse experiences, including typical

perpetrator-victim dynamics, contexts of contact, and offense characteristics (13-16). However, they frequently co-occur and reinforce one another, so research and practice increasingly consider them together when assessing risk and impact (11, 12, 17-19). Online child sexual abuse (OCSA) is usually defined as the sexual exploitation, contact, or coercion of a minor through digital means, whether it remains online or later shifts offline (20-25). It primarily concerns situations in which adults or older adolescents target a minor for sexual purposes, in ways that meet legal thresholds for criminal behavior such as grooming, sexual extortion, or the production and distribution of child sexual abuse material (CSAM) (14, 20-26). The literature most commonly distinguishes two forms: (1) adult online grooming and sexual solicitation, which involve adult-child interactions, and (2) peer-perpetrated electronic sexual coercion, typically occurring within dating or romantic contexts (27-31). Thus, clear conceptual boundaries are essential, especially for distinguishing criminal or abusive adult-child interactions from other, sometimes normative, forms of sexual communication among peers. This review uses the 4C framework of content, contact, conduct, and contract (32) as a guide to sort these categories. OCSA should be separated from consensual sexting or general sexual exposure online, which can be linked to abuse but are not considered abuse alone (33, 34). Consensual peer sexting refers to voluntary, mutual exchanges of sexual messages or self-generated images between minors who perceive themselves as similar in age, power, and knowledge, and which may carry psychosocial risks but are not forms of abuse or criminal conduct (2, 33-35). In contrast, OCSA involves deception, coercion, pressure, or blackmail, or adult solicitation, possession, or dissemination of sexual content involving minors (14, 20, 24-26). Non-consensual intimate image (NCII) sharing and sexual extortion, including grooming, coercion, and threats to disseminate self-generated images unless a child complies, are forms of OCSA that are increasingly recognized in legal and policy responses (22, 23, 26, 35-38). At a global level, the problem of OCSA is a major cause for concern. In 2023 alone, over 36 million suspected OCSA cases were reported to hotlines (38). Reports have noted not only growth but also diversification, such as financial sexual extortion and AI-generated material (e.g., deepfake pornography) (38-40). A recent systematic review and meta-analysis estimated a past-year prevalence of 8.1%, with subtypes ranging from 3.5% for sexual extortion to 12.6% for non-consensual taking, sharing, or exposure to sexually explicit content (41). Routine activity theory (42, 43) provides a way to explain these dynamics. The risk is higher when adolescents encounter motivated offenders (e.g., when they befriend strangers), when guardianship is weak (low parental mediation), and when targets appear suitable (self-disclosure, risky self-presentation) (44). Moreover, it is also important to consider the developmental lens. Adolescence is marked by strong reward sensitivity, new social goals, and developing self-control (45-50). Taken together, these characteristics can make fast-paced digital interactions harder to manage, and resisting peer or adult pressure often requires considerable effort (27, 29). Research has linked several factors to a higher risk, such as being in mid to late adolescence, lower well-being, heavy Internet use, previous victimization, and risky self-presentation, including eroticized images (27, 51, 52). These vulnerabilities align with evidence that OCSA is associated with depression, anxiety, shame, reduced quality of life, and relational difficulties (12, 17, 18, 28, 53). In addition, sexual and gender minority youth show a higher prevalence of OCSA, partly due to prior adversity, bullying, and discrimination (8, 19). These insights clarify some patterns of onset and escalation. However, longitudinal research on adolescent OCSA remains scarce. Much of the literature is cross-sectional, terminology is inconsistent, and the geographic coverage is narrow.

Rationale for the Review

This review adopts a developmental perspective and synthesizes longitudinal research on OCSA in minors. Eligible studies examined adult online sexual solicitation or grooming, peer electronic

sexual coercion, online-initiated offline contact, and/or prospective outcomes and risk behaviors linked to OCSA. Consistent with recent terminology guidance, we included only studies addressing clearly abusive or exploitative online sexual interactions. Research on consensual peer sexting or general sexual exposure was retained only when it was explicitly tested as part of a pathway to OCSA. A longitudinal synthesis is warranted for three reasons. First, only longitudinal designs can resolve the temporal ordering of OCSA (29, 53, 54). Second, the literature has moved beyond single-wave prevalence to include survival, growth-curve, and cross-lagged models that can test bidirectionality (e.g., sexting and solicitation) and within-person change (33). Third, emerging intervention evidence suggests that trajectories can be altered through school-based prevention programs (55).

Thus, the main aim of this review is to synthesize longitudinal evidence on OCSA across childhood and adolescence, with an emphasis on temporal ordering and developmental timing.

Method

Based on a critical reading of the literature, five exploratory research problems were formulated to guide this synthesis. The first concerns the timing of OCSA onset, its persistence, and trajectory development across follow-up assessments. The second addresses prospective predictors of OCSA across individual, family, peer/school, and digital domains. The third focuses on prospective associations between OCSA and mental health, relational, academic, and risk outcomes, accounting for baseline adjustment. The fourth examines temporal ordering and potential bidirectionality between OCSA and co-occurring risks and behaviors, including offline victimization and risky online practices such as sexting, pornography use, and electronic harassment, across measurement waves. The fifth concerns heterogeneity in these patterns across key sociodemographic characteristics and OCSA subtypes. The aim is to integrate what longitudinal designs can reveal about timing and mechanism so that prevention and intervention can be directed to the right windows and targets.

Design and Search Strategy

This systematic review was guided by a pre-specified protocol that fixed the research questions, eligibility rules, and coding plan before screening. The review followed the PRISMA 2020 reporting guidelines, and the search was tailored to the field's fragmented terminology while remaining intentionally strict regarding study design (longitudinal only). The time window spanned January 2000 to August 2025, capturing both the pre-smartphone and smartphone eras. Core psychology, biomedical, and social science databases were searched, and this was supplemented by targeted additional sources (Google Scholar citation chasing and reference lists) to minimize the risk of missing relevant studies scattered across disciplines. Searches were limited to English-language publications only.

Inclusion and Exclusion Criteria

Studies were eligible if they (a) enrolled participants younger than 18 at baseline or reported adolescent-specific results separately, (b) used a longitudinal design with at least one prospective estimate (predictors of later OCSA, or OCSA of later outcomes), and (c) measured an OCSA construct aligned with this review's definition (adult grooming/solicitation, peer electronic sexual coercion, or clearly delineated NCII dissemination/sexual extortion/live-streaming/CSAM involving minors). Both antecedent (individual, family, peer/school, and digital factors predicting later OCSA) and outcome (OCSA predicting later mental health, relational/academic functioning, revictimization, or health risk outcomes) models were included. One-wave surveys, repeated cross-sections without within-person follow-up, purely qualitative research, measurement-only articles lacking longitudinal analyses, and samples in which adolescent data could not be isolated from adults (e.g., mixed-age panels without adolescent-specific estimates) were excluded from the scope.

Furthermore, studies that focused solely on non-coercive sexting or general sexual exposure were excluded, unless they were explicitly tested as part of the OCSA pathway.

Search Strategy

Because OCSA terms differ across disciplines, a combined controlled vocabulary was used for the search. The core string was: "online sexual" OR grooming OR solicitation OR sextort* OR "electronic sexual coerc*" OR "coercive sext*" OR "non-consensual intimate image*" OR NCII OR "cyber sexual abuse"* AND (adolescen* OR youth OR teen* OR child*) AND (longitudin* OR cohort OR prospective OR "follow-up" OR "cross-lag*" OR survival OR "growth curve"). The primary databases searched were PubMed/MEDLINE, APA PsycINFO, Web of Science Core Collection, ScienceDirect, ERIC, ProQuest, PsycARTICLES, PsycEXTRA, and Ovid MEDLINE. Furthermore, Google Scholar was searched with a 2000-2025 custom range, and forward/backward citation chasing was performed for all included articles. A PRISMA flowchart (Figure 1) documents the protocol used to conduct the current review.

Data Extraction and Analyses

A structured extraction template was piloted and refined, after which each study was coded for full citation, country, sample characteristics and age range, number of waves and inter-wave intervals, perpetrator type/abuse form (adult grooming/solicitation vs. peer electronic sexual coercion, with notes on NCII dissemination/sexual extortion and online-to-offline bridges), OCSA measurement, analytic approach (e.g., cross-lagged panel, latent growth, survival/Cox, mixed-effects, randomized trial models), antecedents/predictors and outcomes, and effect sizes with confidence intervals and covariate adjustments. To avoid double-counting, each study that used the same cohort was linked to the relevant research question it

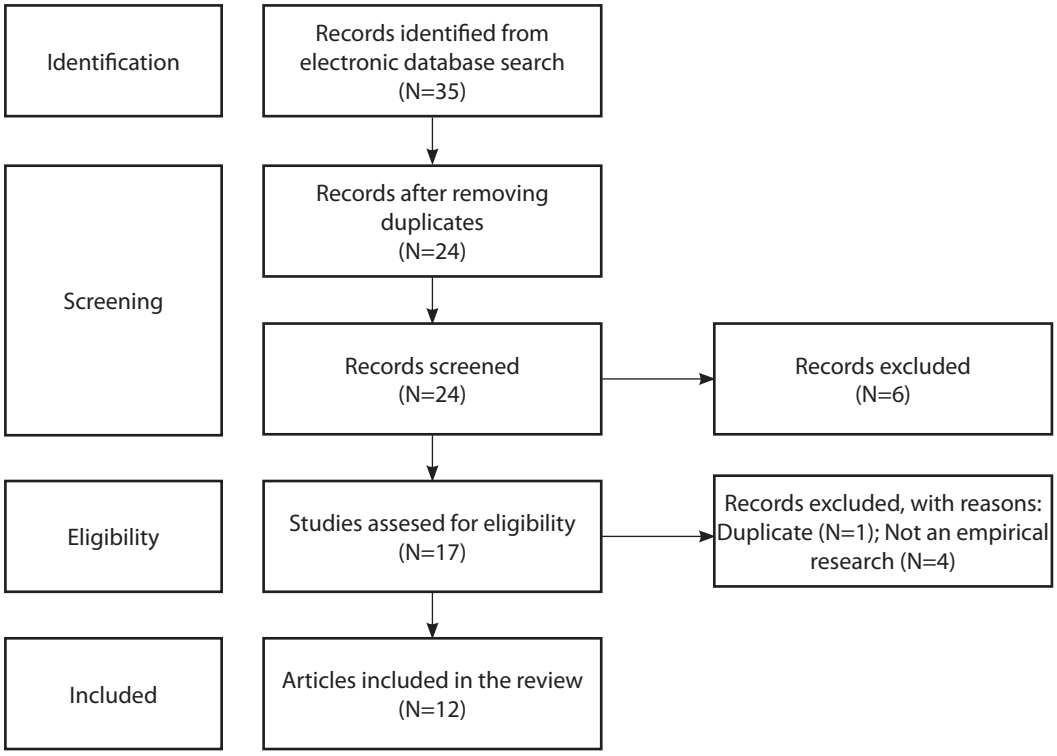


Figure 1. Flowchart of the article selection process based on the PRISMA guidelines (2020).

answered (e.g., onset/trajectories vs. mental-health outcomes). The risk of bias was assessed using the JBI Checklist for Cohort Studies (56), and the Cochrane RoB 2 tool was used to evaluate biases in randomized trials (57). All assessments were conducted by a single reviewer, guided by the official manuals and piloting of the tools to ensure consistency. Risk of bias ratings informed the interpretation of the evidence but were not used as exclusion criteria. These assessments were then used to inform the interpretation instead of excluding papers post-hoc. Owing to the considerable variation in conceptualization, measurements, and follow-up intervals, a meta-analysis was considered inappropriate. Instead, a structured narrative synthesis was carried out according to the SWiM guidelines (58).

Results

Study Selection

The search identified 11 records from databases (PubMed/MEDLINE = 3; PsycINFO = 3; Web of Science = 3; ScienceDirect = 2) and 2 from other sources (Google Scholar via citation chasing). After deduplication, 13 unique records were screened by title and abstract, after which one was excluded for focusing solely on non-coercive sexting without an OCSA pathway. Full texts were sought and assessed for all 12 articles, and all 12 met the eligibility criteria and were included in the synthesis (Table 1). No eligible longitudinal studies published before 2013 were identified. The final sample, therefore, reflects research conducted between 2013 and 2025.

Study Characteristics

The corpus comprised 12 longitudinal studies of minors, including those from Spain (17, 27, 28, 33, 55), the United States (8, 11, 12, 29, 53, 54), and Taiwan (59). Across these studies, the age range extended from late childhood to late adolescence (approximately 10–18 years). All included studies were published after 2013, despite the broader search window from 2000 onward. The designs included 2 to 4 wave panels (with a typical lag of 12 months), latent growth and survival models, one naturalistic cohort with objective web-trace data (8), and one school-based RCT with 3- and 6-month follow-ups (55).

Incidence and Developmental Course

Across peer-focused cohorts, electronic sexual coercion rose from early to mid-adolescence and then plateaued around ages 16-17 (latent growth; 29). In event-time analyses, the cumulative incidence of coerced peer sexting reached approximately 1 in 5 by age 15 and 1 in 3 by age 18, with the steepest increase in risk between the ages of 14 and 16 (54). For adult-initiated online sexual solicitation, a three-wave Spanish school cohort of 12- to 15-year-olds documented both new onsets and persistence of online sexual solicitation and sexualized interactions with unknown adults over a single school year (28). A separate two-wave Spanish cohort with a one-year interval found that grooming victimization remained stable for a subgroup of adolescents (17).

Prospective Antecedents

Risk accrued across developmental, psychosocial, and digital domains. Baseline depressive symptoms prospectively predicted subsequent adult-initiated sexualized encounters with minors (27). A history of maltreatment and early online risk behaviors predicted online sexual solicitations and encounters with individuals initially encountered online (11). In survival analyses, pornography use, electronic harassment, greater engagement in dating behaviors, and adverse childhood experiences (ACEs) predicted an earlier onset and increased risk of coerced sexting (54). In Taiwan's national cohort, gaming, exposure to pornography, engagement in broader risky Internet behaviors, depression, and involvement in cyberbullying (as victims and/or perpetrators) were predictors of victimization (59). Conversely, the use of chat rooms, exposure to pornography, engagement in risky Internet

Table 1. Research Articles Included in the Systematic Review

Article	Method	Participants	Age range	Country	Main purpose
de Santisteban, Gámez-Guadix (2018)	2-wave school panel; cross-lagged paths over 1 year	Secondary-school adolescents	12-14 (M=13.11; SD=0.79)	Spain	Do internalizing symptoms forecast later adult-initiated online sexual solicitations/sexualized interactions?
Gámez-Guadix, Mateos-Pérez (2019)	2-wave school panel; cross-lagged models	Early adolescents	12-14	Spain	Test reciprocity between adolescent sexting and adult online sexual solicitation.
Ortega-Barón et al. (2022)	3-wave cohort across a school year (13 months)	School-based sample	12-15	Spain	Track onsets/persistence of adult solicitation/sexualized interactions and examine adjustment.
Gámez-Guadix et al. (2023)	2-wave cohort over 1 year	Adolescents	12-14 (M = 13.34; SD = 0.87)	Spain	Examine the stability of grooming victimization and emotional adjustment; test equity moderators.
Noll et al. (2013)	Prospective cohort; logistic regression	Maltreated girls and community comparison	14-17	USA	Do maltreatment and online behaviors forecast solicitations and online-to-offline meetings?
Noll et al. (2022)	Naturalistic cohort with objective web-trace data; ~2-year follow-up	Adolescent girls	12-16	USA	Identify high-risk digital behavior profiles and test whether they forecast later victimization.
Thulin (2022)	4-wave latent growth modeling (annual)	School-based cohort	13-18	USA	Map developmental trajectories of peer electronic sexual coercion and test protective factors.
Thulin et al. (2023)	Discrete-time survival/ Cox models across four years	School-based cohort	13-18	USA	Pinpoint age at onset and accelerators for coerced sexting.
Thulin et al. (2024)	4-wave random-intercept panel models	School-based cohort	12-18	USA	Test within-person effects of peer electronic sexual coercion on later functioning.
Calvete, Orue, Gámez-Guadix (2022)	School-based RCT with 3- and 6-month follow-ups	Adolescents	11-17	Spain	Evaluate a brief program to prevent online grooming.
Maas, Bray, Noll (2019)	Prospective cohort; latent class → outcomes over 1 year	Adolescent girls	14-17	USA	Do online-inclusive sexual experience profiles predict later offline harms?
Chang et al. (2016)	2-wave national school cohort; logistic/path models (1 year)	10th-11th graders (large national sample)	15-17	Taiwan	Identify predictors of unwanted online sexual solicitation (victimization and perpetration).

Perpetrator type / Abuse form	Waves / Lag	Predictors / Antecedents	Effect metric	Results
Adults soliciting/grooming minors online (sexualized interactions)	2 waves; 12 months	Depressive symptoms (T1)	β (cross-lagged)	Higher depressive symptoms at baseline predicted greater adult-initiated sexualized interactions one year later; reverse path ns after controls.
Adults soliciting minors online; adolescent sexting tracked as linked behavior	2 waves; 12 months	Sexting (T1) and solicitation (T1)	β (cross-lagged)	Bidirectional links: baseline sexting predicted later adult solicitation, and baseline solicitation predicted later sexting.
Adults unknown to the adolescent; online sexual solicitation/sexualized interactions	3 waves; 5 months (T1-T2), 8 months (T2-T3), 13 months total	Victimization pattern (early vs none)	aOR / β	Early/persistent victimization predicted lower health-related quality of life at follow-up.
Adults grooming minors online (repeated episodes)	2 waves; 12 months	Sexual minority status; parental education (moderators)	β / group contrasts	Stable grooming predicted higher depression/anxiety and shame/guilt; stability more likely among sexual-minority youth and those with lower parental education.
Online contacts (adult age not always specified); solicitations and offline meetings with someone first met online	2 waves; 12-16 months	Maltreatment; online risks at T1	aOR (logistic)	Maltreatment predicted solicitations and offline meetings; online-risk behaviors independently predicted offline meetings.
Unspecified online actors; online sexual solicitations/cybervictimization	2 waves (naturalistic); 24 months	High-risk digital behavior profiles (objective)	OR / β	High-risk objective profiles prospectively predicted later online sexual solicitations and cybervictimization.
Peers/dating partners; electronic sexual coercion (pressure, quid-pro-quo, threats)	4 waves; 12-month interval (annual)	Age (time-varying); parental monitoring; ACEs	Growth β (latent growth)	Coercion increased through mid-adolescence, plateaued ~16-17; higher parental monitoring buffered growth.
Peers/dating partners; coerced sexting	4 years (survival models); 12-month interval (annual)	Pornography use; e-harassment; dating behaviors; ACEs	HR (Cox)	Pornography use, electronic harassment, dating behaviors, and ACEs accelerated onset; risk concentrated in mid-adolescence.
Peers/dating partners; electronic sexual coercion	4 waves; 12-month interval (annual)	Coercion at time t	β (panel / RI-CLPM)	Electronic coercion at time t predicted subsequent increases in depression and delinquency (t+1), net of in-person dating violence.
Adults soliciting minors online; the outcome is sexualized interactions with adults when solicited	3 waves; Pre, 3-, 6-month follow-up	Intervention vs control	β / d (mixed models)	Intervention reduced sexualized interactions at 3-6 months and improved grooming knowledge versus controls.
Mixed online exposures (class includes online sexual risk; perpetrator age not disaggregated)	2 waves; 12 months	Class membership (T1)	OR / β	Online-inclusive class predicted later sexual assault and HIV-risk behaviors, with stronger effects among maltreated youth.
Victimization by online others (age not always specified); adolescent-perpetrated solicitation also measured	2 waves; 12 months	Gaming; pornography exposure; Internet risk; depression; cyberbullying	aOR / β	Victimization predicted by gaming, pornography exposure, risky Internet behavior, depression, and cyberbullying; perpetration predicted by chat-room use, pornography, risky behavior, cyberbullying, and offline sexual harassment.

behaviors, cyberbullying, and offline sexual harassment were predictors of perpetration (59). An observational study utilizing objective browser traces found high-risk digital behavior profiles that anticipated subsequent online sexual solicitations and cyber-victimization (8). On the protective side, higher parental monitoring was associated with a flatter growth in peer electronic sexual coercion, especially earlier in adolescence (29).

Outcomes Following OCSA

Prospective outcome models converged on mental health and functioning costs. Persistent or early adult solicitation and sexualized interactions predicted a lower health-related quality of life (HRQoL) at follow-up (28). The stability of grooming over a year forecasted higher depression, anxiety, shame, and guilt (17). Within-person panel models showed that peer electronic sexual coercion at baseline predicted increases in depressive symptoms and delinquency at follow-up, even after accounting for in-person dating violence (53). In a cohort linking online experience classes to later offline harm, an online-inclusive risk class predicted subsequent sexual assault and HIV risk behaviors, with stronger effects among maltreated youth (12).

Bidirectional and Cyclical Processes

Evidence for reciprocity is clearest for adolescent sexting and adult solicitation, with each predicting increases in the other over one year once baselines were controlled (cross-lagged panel; 33). The same study also found a feedback loop between sexting and cyberbullying victimization, suggesting that cycles of digital risk extend beyond sexual content and into broader online victimization. Another cross-lagged panel study modeled depressive symptoms and online sexual victimization reciprocally; however, the effects were strongest from symptoms to later victimization, with little support for the reverse once controls were applied (27). Within-person models of peer electronic sexual coercion likewise indicated directional rather than reciprocal processes, with coercion forecasting later depression and delinquency but not vice versa (53). Taken together, reciprocal pathways have been demonstrated for sexting and solicitation, and to a lesser extent for depression and victimization, while other longitudinal cohorts have primarily tested unidirectional risks.

Heterogeneity and Moderators

Several studies have tested the moderators of risk and persistence. Stable grooming victimization was more common among sexual minority adolescents and those with lower parental education, and stability was associated with greater emotional harm (17). Parental monitoring reduced the increase in peer coercion, exhibiting the most significant protective impact during early adolescence (29). ACEs hastened the initiation of coercive sexting (54), whereas maltreatment exacerbated the associations between online-inclusive profiles and subsequent sexual assault/HIV risk (12). Formal tests by sex/gender, disability, and area were infrequent, and when conducted, the patterns typically corresponded with the overall effects.

Period and Platform-Affordance Signals

Direct comparisons of pre-smartphone and post-smartphone cohorts or explicit tests of platform affordances in relation to OCSA were largely absent. Most studies inferred exposure from behaviors that reflected underlying affordances, for example, high-volume messaging, use of pornography, participation in chat rooms, or engagement in broader risky digital routines (54, 59). These measures capture adolescent engagement with features such as anonymity, accessibility, or constant connectivity; however, they do not isolate the affordances themselves. A notable exception was a naturalistic cohort study that combined objective web-trace data with follow-up interviews and demonstrated that high-risk browsing profiles forecasted later online sexual solicitations and victimization (8). Overall, the available evidence supports a link between everyday digital routines and subsequent

OCSA risk, although it remains unclear which specific design features, including ephemerality, persistence, or algorithmic amplification, are the most influential.

Prevention Signals

One randomized trial in the set provided preliminary evidence of a preventive impact. Namely, a brief school-based prevention program reduced sexualized interactions with adults when solicited at 3-6 months and improved grooming knowledge relative to controls (55), indicating that near-term modification of risk is possible.

Risk of Bias Overview

Across the observational cohorts, the risk of bias was clustered in the confounding and follow-up domains. Thus, most studies used validated self-reports and appropriate longitudinal models (low risk for measurement/analysis); however, covariate adjustment was often limited, and attrition handling was variably detailed, yielding overall "some concerns" ratings. The randomized trial was overall low risk, with "some concerns" for missing outcome data and selective reporting, given the self-reported outcomes and incomplete pre-registration details. A brief summary is provided in Supplementary Table 1, with item-level JBI and RoB 2 in Supplementary Tables 2-3.

Discussion

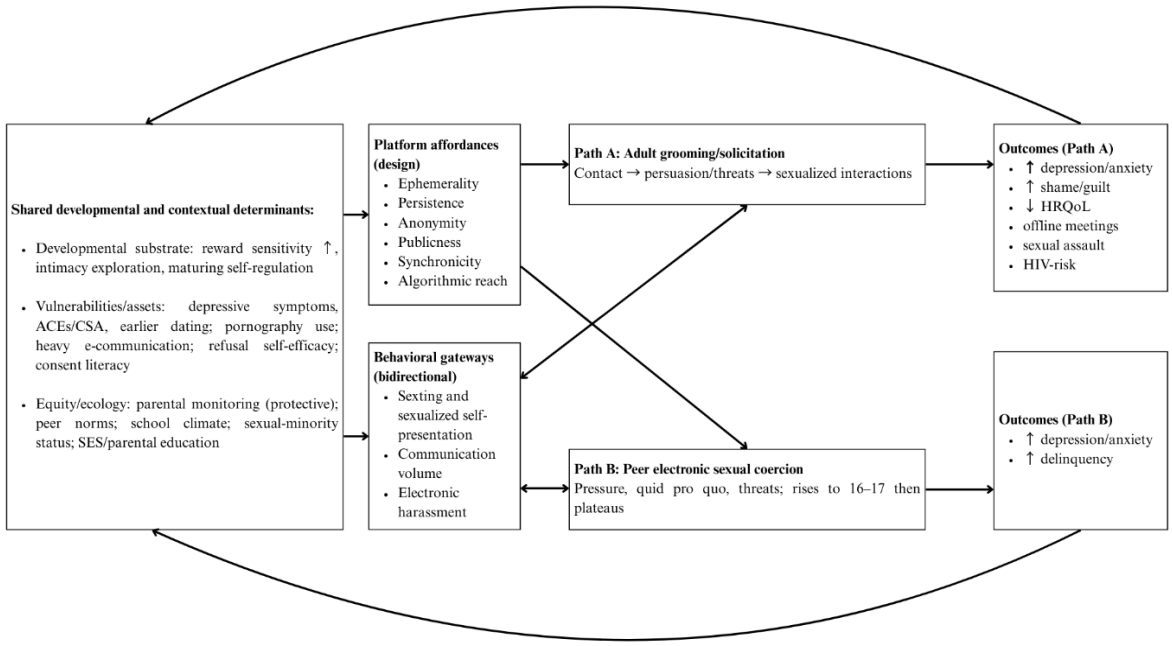
This review brings together longitudinal evidence on OCSA across childhood and adolescence. It traces when risks intensify, who is most vulnerable, and how harms unfold over time. To organize these findings in a coherent way, the Discussion draws on the proposed Developmental-Online-Trajectories of Sexual abuse (DOTS) model, a framework that groups developmental, digital, and outcome pathways.

The DOTS Model: Developmental-Online-Trajectories of Sexual Abuse

The proposed DOTS (Developmental-Online-Trajectories of Sexual abuse) conceptual model (Figure 2) offers a practical way to organize heterogeneous longitudinal findings without making strong causal claims. The model arranges evidence along four linked elements. It distinguishes shared determinants that shape vulnerability before an incident occurs, proximal digital processes that structure opportunity and leverage in everyday online life, two partially distinct trajectories that involve adult grooming and peer electronic sexual coercion, and downstream outcomes that can feed back into later risk. The purpose of this model is to provide a common vocabulary that allows studies using different measures and designs to be compared more directly while keeping the interpretation tied to longitudinal ordering rather than speculation.

Shared Developmental and Contextual Determinants

Middle adolescence appears to be a hazardous window in which reward sensitivity and social goal pursuit outpace still-maturing self-regulation, which is consistent with prior studies (46, 60). These age-graded hazards align with developmental accounts that emphasize rising social-reward sensitivity and intensifying peer orientation across mid-adolescence, which can heighten responsiveness to online social cues (48, 61). Furthermore, the evidence from this review is consistent with prior research showing that adolescents who report more internalizing symptoms are more likely to report unwanted online sexual solicitation or harassment, with effects especially pronounced among girls (62, 63, 64). In addition, high-risk youth show greater odds of receiving sexual solicitation and engaging in riskier contact behaviors (65, 66). Simultaneously, parental mediation is associated with lower exposure to sexual



Determinants (developmental factors, vulnerabilities/assets, equity/ecology) feed into platform affordances and behavioral gateways. These processes lead to two trajectories: Path A (adult grooming/solicitation) and Path B (peer electronic sexual coercion), culminating in adverse outcomes (mental health, HRQoL, and offline/relational harms). Dashed arcs indicate feedback loops from outcomes back to determinants. Arrows denote prospective associations, not causation; ACEs = Adverse childhood experiences; CSA = Child sexual abuse; HRQoL = Health-related quality of life; NCII = Non-consensual intimate images.

Figure 2. Proposed "DOTS: Developmental-Online-Trajectories of Sexual abuse" conceptual model.

risks and reduced harm when risks occur (5, 67). Finally, sexual and gender minority adolescents report markedly higher rates of online sexual harassment than their heterosexual peers, along with substantial distress (68). Together, these determinants interact with the design features of digital platforms, shaping how adolescents encounter and engage with specific online gateways that can open or constrain risk pathways.

Proximal Digital Processes: Platform Affordances and Behavioral Gateways

Sexting and sexualized self-presentation, high-volume online communication (especially with unfamiliar contacts), and electronic harassment operate as behavioral gateways that increase exposure to and normalize sexualized exchanges. The DOTS model separates platform features from the behaviors that bring young people into contact with risk because current evidence is uneven across these domains. Event-level affordances, such as ephemerality, publicness, persistence, anonymity, unsolicited contact, and the ease of forwarding or screenshotting, are theoretically central, but adolescent panels included in this review seldom measure them directly. Previous research has shown that publicness, persistence, anonymity, and low-friction contact widen exposure. Namely, EU Kids Online documents substantial sexual-message prevalence, and both the 4Cs framework and OECD guidance frame these as structural rather than purely individual risks (5, 32, 69). Moreover, earlier studies indicate that how teens use social media (e.g., in ways that are harmful to their health or that they feel they have to do) may be more important than how often they use it (61, 70). Research on platform affordances clarifies the mechanisms that may exacerbate vulnerability. Thus, features such as persistent streams, network

visibility, and low-friction messaging can heighten social comparison, exposure, and interaction with potentially harmful others (71).

The literature on behavioral gateways indicates that early offline sexual abuse is a particularly robust predictor of future OCSA, partly due to risky online behavior (19). Heavy communication and contacting strangers are associated with unwanted and more aggressive online sexual solicitations, as well as offline meetings (11, 72). Electronic harassment within dating contexts co-occurs with other forms of coercion and shows temporal coupling with in-person abuse, underscoring its gateway role (73, 74). An Australian survey linked image pressure and non-consensual forwarding to being female, online bullying, and prior sexual encounters (75). Therefore, OCSA is rarely an isolated incident but rather a component of the broader context of technology-facilitated sexual abuse (35, 76, 77). These interacting processes crystallize into two distinct trajectories of online child sexual abuse.

Two Trajectories That Can Bridge Online and Offline Contexts

In the DOTS framework, Path A captures adult grooming or solicitation. Adults, typically unknown to adolescents, initiate or escalate sexualized online contact. This pattern is linked to communication with strangers, high-contact platform use, and markers of psychosocial vulnerability (13, 65). Earlier evidence shows that such encounters are not rare and are associated with distress and poorer health-related quality of life (18, 28). Moreover, population surveys map sizable lifetime exposure to online grooming among youth and young adults, underscoring the public health relevance of this route (5, 14). Path B refers to peer electronic sexual coercion, which often involves known partners (14, 26). It is characterized by pressure, threats, or manipulation by same-age partners to obtain sexual images or interactions, often embedded in dating dynamics and broader cyber-dating abuse (2, 30, 31). Both trajectories can extend into youth's offline lives (15, 78, 79). The findings of this review are supported by previous research, which indicates different risk profiles for adult-perpetrated versus peer-perpetrated abuse (16, 78). In addition, these distinctive paths ultimately converge to a range of adverse health-related outcomes.

Downstream Outcomes

In the longitudinal corpus reviewed in this study, OCSA was followed by worsening mental health and functioning across both paths in the DOTS framework. Importantly, online risk is not hermetically sealed from offline harm. Adolescents who have experienced offline sexual abuse or maltreatment show elevated risk for online sexual solicitation and related victimization outcomes, and these harms often co-occur across settings (18, 19, 72). Beyond the longitudinal evidence reviewed here, international research and review studies report similar negative effects, with sexual extortion and image-based sexual abuse associated with increased depression, anxiety, and social or academic problems among youth (76, 80, 81). In addition, recent studies on youth sexual extortion indicate that it is highly prevalent and harmful to mental health, showing that sexual exploitation through technology is an increasing risk for youth (35, 36, 37). This aligns with previous findings linking image-based sexual abuse before age 18 to self-injury, suicide attempts, and drug overdose in childhood/adolescence (81). Furthermore, cross-sectional studies align with these findings, documenting worse psychological health among adolescents victimized online by offenders met on the Internet (18) and elevated distress associated with unwanted online sexual solicitation (64). In the DOTS model, these results are positioned on the right side of both paths to illustrate their convergence. The model also features feedback loops that show how cycles could occur. A negative mental state or relationship difficulties can make it harder to cope and may lead people to spend more time in higher-risk online areas, which can perpetuate the cycle in subsequent waves.

Limitations, Implications, and Recommendations for Future Research

Several limitations warrant caution when interpreting these findings. Studies are geographically concentrated (Spain, the United States, and East Asia), limiting generalizability to regions with different digital infrastructures and sex-education policies. Although the database search covered the period from 2000 to 2025, all eligible longitudinal studies were published from 2013 onwards. As a result, the conclusions primarily reflect OCSA in the contemporary, smartphone-dominated digital ecology rather than earlier internet eras. OCSA measures vary, and outcomes are often self-reported. Furthermore, attrition typical of school panels risks selective retention. Formal tests of period effects (pre- and post-smartphone cohorts) and platform affordances are scarce. Most evidence infers features from behaviors. Taken together, the findings should be interpreted with appropriate caution. Because this synthesis draws on observational longitudinal studies that vary in measurement precision, follow-up spacing, attrition, and adjustment for confounding, the inferences remain provisional rather than definitive estimates of risk, timing, or impact within a contemporary, smartphone-dominated digital ecology. Accordingly, the main patterns require further verification through replication in independent cohorts and triangulation across measurement approaches, ideally using more harmonized OCSA operationalizations and corroborating data sources beyond self-report (e.g., diary methods and objective digital trace indicators where feasible), alongside designs that more directly test competing developmental and causal explanations. Therefore, results from studies with stronger adjustment for confounding and lower attrition were afforded greater evidential weight, whereas findings from cohorts with higher dropout or weaker measurement strategies were treated more cautiously. This approach aligns with the current guidance, which recommends that risk of bias assessments be used to shape interpretation rather than to exclude studies after the fact (82). On this basis, three priorities follow from the DOTS model. First, perpetrator-specific measurements, including perceived power differences and relationship context. Second, research should specifically assess whether interactions occurred in ephemeral channels, anonymous spaces, public feeds, or permanent archives, and whether forwarding or screenshotting was used as leverage. Thus, research designs should combine survey, diary, and objective trace data to provide a more comprehensive methodological approach. Third, developmental resolution. Onset patterns suggest that shorter lags and age-based survival models may be particularly informative around transition points such as first smartphone access, first romantic relationships, and school transitions, especially when paired with within-person methods that separate stable between-person risk from within-person change (53). For practice and prevention, the longitudinal evidence supports targeting early secondary school and mid-adolescent hazard windows. Interventions may focus on refusal skills, emotion regulation under social pressure, and bystander responses, alongside parental guidance that emphasizes supportive, collaborative monitoring rather than purely restrictive control (29). At the program level, a brief school-based prevention reduced sexualized interactions with adults when solicited (55), demonstrating near-term prevention potential. Furthermore, active or restrictive media mediation is associated with lower odds of early adolescent sexting, reinforcing the role of family strategies in potentially risky online behavior (83). Parental mediation may also buffer downstream mental health impacts of online victimization, weakening longitudinal links between cyberbullying and later depression or self-harm (84). For youth with ACEs or histories of maltreatment, professional care might include digital safety planning that prepares them for the switch from online to offline spaces (11). Pediatric appointments could be useful for initiating a short conversation about youth digital routines in addition to regular topics. In addition to identifying groups at ongoing risk, such as sexual minority youth and those from resource-limited families, screening should focus on risk indicators that

consistently predict future exposure. Moreover, protective family processes should be implemented through an encouraging approach, including collaborative monitoring and transparent norms regarding privacy and consent (11, 17, 27, 29). Preventive advice about common ways that adults and peers try to coerce can be helpful, as well as practicing saying no and normalizing seeking help if an interaction feels forced. It is also beneficial to communicate a safety plan that includes information on how to report, block, and what to do if an image has been shared, including possible sexual extortion threats.

Conclusion

Longitudinal evidence indicates that OCSA increases and escalates primarily in mid-adolescence, is prospectively predicted by prior adversity and specific digital routines, and is followed by deterioration in mental health and behavioral outcomes. Adolescents with ACEs, sexual minority status, or lower parental education appear more likely to show earlier onset or greater persistence, whereas parental monitoring is consistently protective, particularly in early adolescence. Evidence for reciprocal links is strongest for the feedback loop between sexting and adult solicitation. Formal tests of platform-level affordances and period effects are limited, highlighting a measurement gap rather than a lack of association. The DOTS model synthesizes these strands into a developmental map with two perpetrator pathways, identifiable windows of onset and escalation, and interruptible feedback loops. The field now has the outlines of when and where to intervene. The next step is to pair higher-resolution measurements with multilayered prevention at home, school, pediatricians' offices, and on the platforms where youth spend significant amounts of their social lives.

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References

1. Nesi J, Choukas-Bradley S, Prinstein MJ. Transformation of Adolescent Peer Relations in the Social Media Context: Part 1-A Theoretical Framework and Application to Dyadic Peer Relationships. Clin Child Fam Psychol Rev. 2018;21(3):267-94. doi: 10.1007/s10567-018-0261-x.
2. Van Ouytsel J, Lu Y, Ponnet K, Walrave M, Temple JR. Longitudinal associations between sexting, cyberbullying, and bullying among adolescents: Cross-lagged panel analysis. J Adolesc. 2019;73:36-41. doi: 10.1016/j.adolescence.2019.03.008. Epub 2019 Apr 5.
3. Buljan Flander G, Selak Bagarić E, Prijatelj K, Čagalj Farkas M. Analysis of current trends in use of social networks among first and third grade students of secondary schools in Croatia [Ispitivanje aktualnih trendova u korištenju društvenim mrežama kod učenika prvog i trećeg razreda srednjih škola u Hrvatskoj]. Kriminologija i socijalna integracija. 2020;28(2):277-94. doi: 10.31299/ksi.28.2.6.
4. Ofcom. Children and parents: Media use and attitudes report 2025. London: Ofcom; 2025. [cited 2025 Sep 11]. Available from: https://www.ofcom.org.uk/media-use-and-attitudes/media-habits-children/children-and-parents-media-use-and-attitudes-report-2025.
5. Smahel D, Machackova H, Mascheroni G, Dedkova L, Staksrud E, Ólafsson K, et al. EU Kids Online 2020: Survey results from 19 countries. London: EU Kids Online, London School of Economics and Political Science; 2020. doi: 10.21953/lse.47fdeqj01ofo.
6. Bainotti L, Caliandro A, Gandini A. From archive cultures to ephemeral content, and back: Studying Instagram Stories with digital methods. New Media Soc. 2020;23(12):3656-76. doi:10.1177/1461444820960071.
7. Taylor SH, Brisini KS. Parenting the TikTok algorithm: An algorithm awareness-as-process approach to online risks and opportunities. Comput Human Behav. 2023;150:107975. doi: 10.1016/j.chb.2023.107975.
8. Noll JG, Haag AC, Shenk CE, Wright MF, Barnes JE, Kohram M, et al. An observational study of Internet behaviours for adolescent females following sexual abuse. Nat Hum Behav. 2022;6(1):74-87. doi: 10.1038/s41562-021-01187-5.
9. Barth J, Bermetz L, Heim E, Trelle S, Tonia T. The current prevalence of child sexual abuse worldwide: A systematic review and meta-analysis. Int J Public Health. 2013;58(3):469-83. doi: 10.1007/s00038-012-0426-1.
10. Ybarra ML, Mitchell KJ. How risky are social networking sites? A comparison of places online where youth sexual solicitation and harassment occurs. Pediatrics. 2008;121(2):e350-7. doi: 10.1542/peds.2007-0693.

11. Noll JG, Shenk CE, Barnes JE, Haralson KJ. Association of maltreatment with high-risk internet behaviors and offline encounters. Pediatrics. 2013;131(2):e510-7. doi: 10.1542/peds.2012-1281.
12. Maas MK, Bray BC, Noll JG. Online sexual experiences predict subsequent sexual health and victimization outcomes among female adolescents: A latent class analysis. J Youth Adolesc. 2019;48(5):837-49. doi: 10.1007/s10964-019-00995-3.
13. Whittle H, Hamilton-Giachritsis C, Beech A, Collings G. A review of online groom-ing: Characteristics and concerns. Aggress Violent Behav. 2013;18(1):62-70. doi: 10.1016/j.avb.2012.09.003.
14. Finkelhor D, Turner H, Colburn D. Prevalence of online sexual offenses against chil-dren in the US. JAMA Netw Open. 2022;5(10):e2234471. doi: 10.1001/jamanetworkopen.2022.34471.
15. Wolak J, Finkelhor D, Mitchell KJ, Ybarra ML. Online "predators" and their victims: Myths, realities, and implications for prevention and treatment. Am Psychol. 2008;63(2):111-28. doi: 10.1037/0003-066X.63.2.111.
16. Schaathun IL, Nenseth IR, Rognmo K, Hafstad GS. Factors differentiating risk of sexual abuse victimization by adults and peers among adolescents. Child Abuse Negl. 2024;151:106707. doi: 10.1016/j.chiabu.2024.106707.
17. Gámez-Guadix M, Mateos-Pérez E, Alcázar MA, Martínez-Bacaicoa J, Wachs S. Stability of the online grooming victimization of minors: Prevalence and association with shame, guilt, and mental health outcomes over one year. J Adolesc. 2023;95(8):1715-24. doi: 10.1002/jad.12240.
18. Jonsson LS, Fredlund C, Priebe G, Wadsby M, Svedin CG. Online sexual abuse of adolescents by a perpetrator met online: A cross-sectional study. Child Adolesc Psy-chiatry Ment Health. 2019;13:32. doi: 10.1186/s13034-019-0292-1.
19. Turner HA, Finkelhor D, Colburn D. Predictors of online child sexual abuse in a US national sample. J Interpers Violence. 2023;38(11-12):7780-803. doi: 10.1177/08862605221149090.
20. ECPAT International. Terminology guidelines for the protection of children from sexual exploitation and sexual abuse. 2nd ed. 2025. [cited 2025 Sep 5]. Available from: https://ecpat.org/wp-content/uploads/2025/04/Second-Edition-Terminology-Guidelines-final.pdf.
21. INHOPE. INHOPE Annual Report 2021. 2021. [cited 2025 Sep 5]. Available from: https://stopline.bee-secure.lu/wp-content/uploads/2022/08/inhope-annual-report-2021.pdf.
22. Henry N, Flynn A, Powell A. Image-based sexual abuse: Victims and perpetrators. Trends Issues Crime Crim Justice. 2019;(572):1-20. doi: 10.52922/ti09975.
23. Powell A, Scott AJ, Flynn A, Henry N. Image-based sexual abuse: An international study of victims and perpetrators-A summary report. Melbourne: RMIT University; 2020. [cited 2025 Sep 6]. Available from: https://researchmgt.monash.edu/ws/portalfiles/portal/319918063/Image-BasedSexualAbuseReport_170220_WEB_2.pdf.
24. UNICEF. Ending online child sexual exploitation and abuse. New York: UNICEF; 2021. [cited 2025 Sep 7]. Available from: https://www.unicef.org/documents/ending-online-child-sexual-exploitation-and-abuse.
25. Quayle E. Online child sexual exploitation and abuse. In: Brown JM, Horvath MAH, editors. The Cambridge Handbook of Forensic Psychology. Cambridge: Cambridge University Press; 2021. p. 333-51. doi: 10.1017/9781108848916.018.
26. Patchin JW, Hinduja S. Sextortion among adolescents: Results from a national survey of US youth. Sex Abuse. 2020;32(1):30-54. doi: 10.1177/1079063218800469.
27. de Santisteban P, Gámez-Guadix M. Longitudinal and reciprocal relationships of depression among minors with online sexual solicitations and interactions with adults. Cyberpsychol Behav Soc Netw. 2018;21(6):355-60. doi: 10.1089/cyber.2017.0641.
28. Ortega-Barón J, Machimbarrena JM, Calvete E, Orue I, Pereda N, González-Cabrera J. Epidemiology of online sexual solicitation and interaction of minors with adults: A longitudinal study. Child Abuse Negl. 2022;131:105759. doi: 10.1016/j.chiabu.2022.105759.
29. Thulin EJ. Electronic dating violence in adolescence: Trajectories, implications for depressive symptoms and delinquency, and identifying events and behaviors that are most predictive of EDV engagement [dissertation]. Ann Arbor (MI): University of Michigan; 2022. doi: 10.7302/4663.
30. Kernsmith PD, Victor B, Smith-Darden JP. Online, offline, and over the line: Coercive sexting among adolescent dating partners. Youth Soc. 2018;50(2):1075-93. doi: 10.1177/0044118X18764040.
31. Zweig JM, Lachman P, Yahner J, Dank M. Correlates of cyber dating abuse among teens. J Youth Adolesc. 2014;43(8):1306-21. doi: 10.1007/s10964-013-0047-x.
32. Livingstone S, Stoilova M. The 4Cs: Classifying online risk to children. Hamburg: Leibniz-Institut für Medienforschung | Hans-Bredow-Institut (HBI); 2021. (CO:RE Short Report Series on Key Topics). doi: 10.21241/ssoar.71817.
33. Gámez-Guadix M, Mateos-Pérez E. Longitudinal and reciprocal relationships between sexting, online sexual solicitations, and cyberbullying among minors. Comput Human Behav. 2019;94:70-6. doi: 10.1016/j.chb.2019.01.003.
34. Yang SJ, Stewart R, Lee JY, Kim JM, Kim SW, Shin IS, et al. Prevalence and correlates of problematic internet experiences and computer-using time: A two-year longitudinal study in Korean school children. Psychiatry Investig. 2014;11(1):24-31. doi: 10.4306/pi.2014.11.1.24.
35. Patchin JW, Hinduja S. Addressing youth sexting through rational legislation and education. J Adolesc Health. 2024;75(4):530-2. doi: 10.1016/j.jadohealth.2024.07.001.

36. Ray A, Henry N. Sextortion: A scoping review. Trauma Violence Abuse. 2024;26(1):138-55. doi: 10.1177/15248380241277271.
37. Wolak J, Finkelhor D, Walsh W, Treitman L. Sextortion of minors: Characteristics and dynamics. J Adolesc Health. 2018;62(1):72-9. doi: 10.1016/j.jadohealth.2017.08.014.
38. WeProtect Global Alliance. Global Threat Assessment 2023: Assessing the scale and scope of child sexual abuse online. London: WeProtect; 2023. Available from: https://www.weprotect.org/wp-content/uploads/Global-Threat-Assessment-2023-English.pdf.
39. WeProtect Global Alliance. AI-produced child sexual abuse material: Insights from dark-web forum discussions. London: WeProtect; 2024.
40. Thorn; National Center for Missing & Exploited Children. Trends in financial sextortion: An investigation of sextortion reports in NCMEC CyberTipline data. San Francisco: Thorn; 2024. [cited 2025 Sep 7]. Available from: https://info.thorn.org/hubfs/Research/Thorn_TrendsInFinancialSextortion_June2024.pdf.
41. Fry D, Krzeczkowska A, Ren J, Lu M, Fang X; Into the Light Index Study Group. Prevalence estimates and nature of online child sexual exploitation and abuse: A systematic review and meta-analysis. Lancet Child Adolesc Health. 2025;9(3):184-93. doi: 10.1016/S2352-4642(24)00329-8.
42. Cohen LE, Felson M. Social change and crime rate trends: A routine activity approach. Am Sociol Rev. 1979;44(4):588-608. doi: 10.2307/2094589.
43. Holt TJ, Bossler AM. Examining the applicability of lifestyle-routine activities theory for cybercrime victimization. Deviant Behav. 2008;30(1):1-25. doi: 10.1080/01639620701876577.
44. Wachs S, Michelsen A, Wright MF, Gámez-Guadix M, Almendros C, Kwon Y, et al. A routine activity approach to understand cybergrooming victimization among adolescents from six countries. Cyberpsychol Behav Soc Netw. 2020;23(4):218-24. doi: 10.1089/cyber.2019.0426.
45. Blakemore SJ, Mills KL. Is adolescence a sensitive period for sociocultural pro-cessing. Annu Rev Psychol. 2014;65:187-207. doi: 10.1146/annurev-psych-010213-115202.
46. Casey BJ, Jones RM, Hare TA. The adolescent brain. Ann N Y Acad Sci. 2008;1124:111-26. doi: 10.1196/annals.1440.010.
47. Crone EA, Dahl RE. Understanding adolescence as a period of social-affective en-gagement and goal flexibility. Nat Rev Neurosci. 2012;13(9):636-50. doi: 10.1038/nrn3313.
48. Shulman EP, Smith AR, Silva K, Icenogle G, Duell N, Chein J, et al. The dual sys-tems model: Review, reappraisal, and reaffirmation. Dev Cogn Neurosci. 2016;17:103-17. doi: 10.1016/j.dcn.2015.12.010.
49. Somerville LH. The teenage brain: Sensitivity to social evaluation. Curr Dir Psychol Sci. 2013;22(2):121-7. doi: 10.1177/0963721413476512.
50. Steinberg L. A dual systems model of adolescent risk-taking. Dev Psychobiol. 2010;52(3):216-24. doi: 10.1002/dev.20445.
51. Schittenhelm C, Kops M, Moosburner M, Fischer SM, Wachs S. Cybergrooming vic-timization among young people: A systematic review of prevalence rates, risk factors, and outcomes. Adolesc Res Rev. 2025;10:169-200. doi: 10.1007/s40894-024-00248-w.
52. Schoeps K, Peris Hernández M, Garaigordobil M, Montoya-Castilla I. Risk factors for being a victim of online grooming in adolescents. Psicothema. 2020;32(1):15-23. doi: 10.7334/psicothema2019.179.
53. Thulin EJ, Kusunoki Y, Kernsmith PD, Smith-Darden JP, Grogan-Kaylor A, Zim-merman M, et al. Longitudinal effects of electronic dating violence on depressive symptoms and delinquent behaviors across adolescence. J Interpers Violence. 2024;39(11-12):2526-51. doi: 10.1177/08862605231221281.
54. Thulin EJ, Kernsmith P, Fleming PJ, Heinze JE, Temple J, Smith-Darden J. Coer-cive-sexting: Predicting adolescent initial exposure to electronic coercive sexual da-ting violence. Comput Human Behav. 2023;141:107641. doi: 10.1016/j.chb.2022.107641.
55. Calvete E, Orue I, Gámez-Guadix M. A preventive intervention to reduce risk of online grooming among adolescents. Psychosoc Interv. 2022;31(3):177-84. doi: 10.5093/pi2022a14.
56. Moola S, Munn Z, Tufanaru C, Aromataris E, Sears K, Sfetcu R, et al. Chapter 7: Sys-tematic reviews of etiology and risk. In: Aromataris E, Munn Z, editors. JBI Manual for Evidence Synthesis. Adelaide: JBI; 2020. doi: 10.46658/JBIMES-20-01.
57. Sterne JAC, Savović J, Page MJ, Elbers RG, Blencowe NS, Boutron I, et al. RoB 2: A revised tool for assessing risk of bias in randomised trials. BMJ. 2019;366:l4898. doi: 10.1136/bmj.l4898.
58. Campbell M, McKenzie JE, Sowden A, Katikireddi SV, Brennan SE, Ellis S, et al. Synthesis without meta-analysis (SWiM) in systematic reviews: Reporting guideline. BMJ. 2020;368:l6890. doi: 10.1136/bmj.l6890.
59. Chang FC, Chiu CH, Miao NF, Chen PH, Lee CM, Chiang JT. Predictors of unwanted exposure to online pornography and online sexual solicitation of youth. J Health Psy-chol. 2016;21(6):1107-18. doi: 10.1177/1359105314546775.
60. Braams BR, van Duijvenvoorde ACK, Peper JS, Crone EA. Longitudinal changes in adolescent risk-taking: A comprehensive study of neural responses to rewards, puber-tal development, and risk-taking behavior. J Neurosci. 2015;35(18):7226-38. doi: 10.1523/JNEUROSCI.4764-14.2015.
61. Odgers CL, Jensen MR. Annual Research Review: Adolescent mental health in the digital age—facts, fears, and future directions. J Child Psychol Psychiatry. 2020;61(3):336-48. doi: 10.1111/jcpp.13190.

62. Choi J, Seo M, Kim JW, Kim K. The relationship of risky online behaviors and ad-verse childhood experiences to online sexual victimization among Korean female adolescents. J Interpers Violence. 2023;38(3-4):3637-60. doi: 10.1177/08862605221109888.
63. Zetterström Dahlqvist H, Gillander Gådin K. Online sexual victimization in youth: Predictors and cross-sectional associations with depressive symptoms. Eur J Public Health. 2018;28(6):1018-23. doi: 10.1093/eurpub/cky102.
64. Ybarra ML, Leaf PJ, Diener-West M. Sex differences in youth-reported depressive symptomatology and unwanted Internet sexual solicitation. J Med Internet Res. 2004;6(1):e5. doi: 10.2196/jmir.6.1.e5.
65. Mitchell KJ, Finkelhor D, Wolak J. Risk factors for and impact of online sexual solic-itation of youth. JAMA. 2001;285(23):3011-4. doi: 10.1001/jama.285.23.3011.
66. Wells M, Mitchell KJ. How do high-risk youth use the internet? Characteristics and implications for prevention. Child Maltreat. 2008;13(3):227-34. doi: 10.1177/1077559507312962.
67. Livingstone S, Helsper E. Parental mediation of children's internet use. Journal of Broadcasting & Electronic Media. 2008;52(4):581-599. doi: 10.1080/08838150802437396.
68. Mitchell KJ, Ybarra ML, Korchmaros JD. Sexual harassment among adolescents of different sexual orientations and gender identities. Child Abuse Negl. 2014;38(2):280-95. doi: 10.1016/j.chiabu.2013.09.008.
69. OECD. Towards digital safety by design for children. OECD Digital Economy Pa-pers. 2024;(363). doi: 10.1787/c167b650-en.
70. Orben A. Teenagers, screens and social media: A narrative review of reviews and key studies. Soc Psychiatry Psychiatr Epidemiol. 2020;55(4):407-14. doi: 10.1007/s00127-019-01825-4.
71. Bayer JB, Triệu P, Ellison NB. Social media elements, ecologies, and effects. Annu Rev Psychol. 2020;71:471-97. doi: 10.1146/annurev-psych-010419-050944.
72. Mitchell KJ, Finkelhor D, Wolak J. Youth Internet users at risk for the most serious online sexual solicitations. Am J Prev Med. 2007;32(6):532-7. doi: 10.1016/j.amepre.2007.02.001.
73. Temple JR, Choi HJ, Brem M, Wolford-Clevenger C, Stuart GL, Peskin MF, et al. The temporal association between traditional and cyber dating abuse among adolescents. J Youth Adolesc. 2016;45(2):340-9. doi: 10.1007/s10964-015-0380-3.
74. Zweig JM, Dank M, Yahner J, Lachman P. The rate of cyber dating abuse among teens and how it relates to other forms of teen dating violence. J Youth Adolesc. 2013;42(7):1063-77. doi: 10.1007/s10964-013-9922-8.
75. Seto MC, Roche K, Nicholas M, Newton J. Predictors of online child sexual exploita-tion through image-sharing. Child Protection and Practice. 2024;2:100045. doi: 10.1016/j.chipro.2024.100045.
76. Henry N, Beard G. Image-based sexual abuse perpetration: A scoping review. Trau-ma Violence Abuse. 2024;25(5):3981-98. doi: 10.1177/15248380241266137.
77. Paradiso MN, Rollè L, Trombetta T. Image-based sexual abuse associated factors: A systematic review. J Fam Violence. 2023;39(5):931-48. doi: 10.1007/s10896-023-00557-z.
78. Chiu J, Quayle E. Understanding online grooming: An interpretative phenomenologi-cal analysis of adolescents' offline meetings with adult perpetrators. Child Abuse Negl. 2022;128:105600. doi: 10.1016/j.chiabu.2022.105600.
79. Wolak J, Mitchell KJ, Finkelhor D. Close online relationships in a national sample of adolescents. Adolescence. 2002;37(147):441-55. doi: 10.1006/jado.2002.0494.
80. Umbach R, Henry N, Beard G. Prevalence and impacts of image-based sexual abuse victimization: A multinational study. In: CHI '25: Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems. New York: ACM; 2025. p. 1-20. doi: 10.1145/3706598.3713545.
81. Mitchell KJ, Colburn D, Finkelhor D, Gewirtz-Meydan A, Turner HA, Jones LM. Links between image-based sexual abuse and mental health in childhood among young adult social media users. Child Abuse Negl. 2025;164:107471. doi: 10.1016/j.chiabu.2025.107471.
82. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. doi: 10.1136/bmj.n71.
83. Corcoran EM, Doty J, Wisniewski P, Gabrielli J. Youth sexting and associations with parental media mediation. Comput Human Behav. 2022;132:107125. doi: 10.1016/j.chb.2021.107125.
84. Wright MF. The moderating effect of parental mediation in the longitudinal associa-tions among cyberbullying, depression, and self-harm among Chinese and American adolescents. Front Psychol. 2024;15:1459249. doi: 10.3389/fpsyg.2024.1459249.

Appendix

Supplementary Table 1. Risk of Bias Summary by Domain for Included Studies (JBI for Cohort Studies)

Study	Selection of participants	Measurement of exposure	Confounding	Outcome measurement	Follow-up adequacy	Statistical analysis	Overall judgment
de Santisteban, Gámez-Guadix (2018)	Low	Low	Some concerns (limited covariates)	Low	Low (≈85% retention)	Low	Some concerns
Gámez-Guadix, Mateos-Pérez (2019)	Low	Low	Some concerns	Low	Low	Low	Some concerns
Ortega-Barón et al. (2022)	Low	Low	Some concerns	Low	Some concerns (attrition not fully addressed)	Low	Some concerns
Gámez-Guadix et al. (2023)	Low	Low	Some concerns	Low	Low	Low	Some concerns
Noll et al. (2013)	Low (prospective maltreated + comparison cohort)	Low	Some concerns (residual confounding likely)	Low	Some concerns (attrition reporting limited)	Low	Some concerns
Noll et al. (2022)	Low	Low (objective web-trace data)	Some concerns (residual confounding despite extensive covariate adjustment)	Low	Low	Low	Some concerns
Thulin (2022)	Low	Low	Some concerns	Low	Low	Low	Some concerns
Thulin et al. (2023)	Low	Low	Some concerns	Low	Low	Low	Some concerns
Thulin et al. (2024)	Low	Low	Some concerns	Low	Low	Low	Some concerns
Maas et al. (2019)	Low	Low	Some concerns (latent classes partly confounded by maltreatment)	Low	Some concerns (attrition)	Low	Some concerns
Chang et al. (2016)	Low (large national school sample)	Low	Some concerns (self-report depression only)	Low	Some concerns (attrition details limited)	Low	Some concerns

Supplementary Table 2. Item-Level JBI Risk of Bias Ratings for Cohort Studies (Q1-Q11)

Study	Q1*	Q2†	Q3‡	Q4§	Q5‖	Q6¶	Q7**	Q8††	Q9‡‡	Q10§§	Q11‖‖	Overall
de Santisteban, Gámez-Guadix (2018)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Some concerns
Gámez-Guadix, Mateos-Pérez (2019)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Unclear	Yes	Yes	Some concerns
Ortega-Barón et al. (2022)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Unclear	Unclear	Yes	Some concerns
Gámez-Guadix et al. (2023)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Some concerns
Noll et al. (2013)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Unclear	Unclear	Yes	Some concerns
Noll et al. (2022)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Some concerns
Thulin (2022)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Some concerns
Thulin et al. (2023)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Some concerns
Thulin et al. (2024)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Some concerns
Maas et al. (2019)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Unclear	Unclear	Yes	Some concerns
Chang et al. (2016)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Unclear	Unclear	Yes	Some concerns

*Similar groups & same population; †Exposure measured similarly across groups; ‡Exposure measured validly/reliably; §Confounders identified; ‖Strategies for confounding; ¶Outcome absent at baseline; **Outcome measured validly/reliably; ††Follow-up time sufficient; ‡‡Follow-up complete / reasons explored; §§Strategies for incomplete follow-up; ‖‖Appropriate statistical analysis.

Supplementary Table 3. RoB 2 Domain-Level Risk of Bias Ratings for the Randomized Trial

Study	D1 Randomization process	D2 Deviations from intended interventions	D3 Missing outcome data	D4 Measurement of the outcome	D5 Selection of the reported result	Overall
Calvete et al. (2022)	Low risk	Low risk	Some concerns	Low risk	Some concerns	Some concerns