



Journal of Sexual Aggression

An international, interdisciplinary forum for research, theory and practice

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/tjsa20

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To cite this article: Gabrielle Gane, Paul Watters, Richard Wortley & Jeremy Prichard (24 Oct 2024): Blurring the lines: the vague boundary between mainstream and deviant internet pornography tags for at-risk viewers, Journal of Sexual Aggression, DOI: [10.1080/13552600.2024.2410352](https://doi.org/10.1080/13552600.2024.2410352)

To link to this article: <https://doi.org/10.1080/13552600.2024.2410352>



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Published online: 24 Oct 2024.



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Blurring the lines: the vague boundary between mainstream and deviant internet pornography tags for at-risk viewers

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ABSTRACT

Illegal material is increasingly appearing on popular mainstream websites. Many commentators worry about the impact of such material on adolescents' psycho-sexual development and the potential for some legal pornography to act as a gateway to child sexual exploitation material for users of any age. In this study, we collected publicly available data from a popular legal pornography website to assess the risk of adolescent exposure to content that may hinder healthy psycho-sexual development. We analysed over 27 million customer searches involving 149 video tags from this site. Five international experts on the effects of pornography rated the tags, categorising them into five overlapping genres: mainstream, incestuous, underage, aggressive and non-consensual. They also assessed the potential risk each genre posed. Our analysis found a significant positive correlation between the harm ratings and the frequency of tags used as search terms. Additionally, eleven of the twelve tags with the highest mean risk scores involved potential underage and/or incestuous content. This study highlights a concerning relationship between the harm ratings of various pornographic genres and their popularity as search terms. While exploratory, these results emphasise the need for regulatory measures to address the presence of harmful material on mainstream websites.

PRACTICE IMPACT STATEMENT

The study has practical implications for the regulation of potentially harmful pornography by legal pornography sites. The sites should (a) control the use of tags and how new tags are developed in order to prevent content creators from advertising potentially illegal material, (b) vet all content before it is uploaded for public consumption, and (c) implement screening systems to retrospectively find and eradicate all illegal or harmful content already in their collection.

ARTICLE HISTORY

Received 14 March 2023
Revised 20 September 2024
Accepted 23 September 2024

KEYWORDS

Pornography; pornography websites; pornography regulation; CSEM; adolescent sexual development; pathways to CSEM

Introduction

The rise of technology and social media has generated a new landscape in which traditional means of healthy identity and sexual exploration are being redefined, and with it, public attitudes and definitions of obscenity and sexuality (Carrotte et al., 2020; Hall, 2014; Harris, 2014). Prior to the

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Internet, pornography was distributed via DVDs, videos, cinemas, and hard copy magazines. With the rapid development of technology, accessing pornography on the Internet has become a global norm (Carrotte et al., 2020; Hall, 2014; Keene, 2021; Potenza, 2018; Smahel & Subrahmanyam, 2014). Over recent decades, online pornography has become a ubiquitous medium for sexual expression, entertainment, and exploration (Hall, 2014). For example, the world's largest pornographic website, Pornhub, reported receiving 115 million website visits per day in 2019 (Pornhub Insights, 2019). Daily traffic increased by 24.4% in 2020 due to the worldwide Coronavirus pandemic (Pornhub Insights, 2020). The growth in pornography use has occurred because, in comparison to more traditional forms of pornography, the Internet offers immediate and unrestricted access to an array of sexual information and genres of pornography, with little or no cost, and provides a perceived sense of anonymity as well as a degree of real anonymity (Boonmann et al., 2014; Cooper, 1998; Donevan et al., 2022; Hall, 2014; Potenza, 2018; Smahel & Subrahmanyam, 2014). While daily traffic has increased, there is no evidence to solely attribute this to a rise in adolescent porn site use (Bóthe et al., 2022).

The technologies of the pre-Internet era, (e.g. DVDs and magazines), assisted many domestic governments to regulate the content of pornography that legal companies sought to put to market. This system enabled countries to exclude certain content, for example: sexual violence; "sexually assaultive language"; content which "purposefully demean anyone" for the purpose of entertaining viewers; and certain sex acts, like fisting, and those involving urination (Office of Parliamentary Counsel, 2012). The regulatory model of the pre-Internet era is essentially sidestepped by the transnational business models of today's online (legal) pornography industry. This means that self-regulation is more important than ever. Among other things, self-regulation requires that pornography companies scrutinise videos that are uploaded for profit by "content creators", who range in sophistication from novice cinematographers through to high-end production teams working with famous adult entertainers. Pornhub (2021), as an example, has implemented a range of self-regulation measures. In the 2021 reporting period, Pornhub blocked or removed 20,666 videos depicting non-consensual content; 50 videos for hate speech; 983 showing bestiality or animal mistreatment; 3,770 that included human blood, faeces, or vomit; 6,520 depicting incest; and 1,183 which contained content that posed a serious risk of physical harm to a person, or which depicted activities with a corpse, including necrophilia. Additionally, Pornhub (2021) reported 11,626 child sexual exploitation material (CSEM) videos to the National Centre for Missing and Exploited Children.

However, this level of self-regulation appears to be lacking in other parts of the sector. Whether other legal sites contain the types of material blocked by Pornhub is not clear, as there are no agreed industry standards. However, various scholars have documented that popular and openly available pornography commonly emphasise aggression, male dominance, and the submission and objectification of women (Guggisberg, 2020; Keene, 2021; Owens et al., 2012; Peter & Valkenburg, 2010a; Vera-Gray et al., 2021), sometimes with overtly racist themes (West, 2022; see further Mayall & Russell, 1993). Such themes are not only presented in visual pornographic content but are also presented qualitatively in the titles of videos (Vera-Gray et al., 2021), and "tags", which are short descriptors of video content (Mazières et al., 2014). Moreover, online pornography is not neatly segregated into "mainstream" and "deviant" silos. To adapt Coopersmith's (2006) terminology, legal "white" pornography is frequently intermingled with: "grey" material, which is legal in some countries but not others (Prichard & Spiranovic, 2014); and illicit "black" content – notably CSEM and adult sexual abuse material, including torture, rape, and bestiality. The conspicuous encroachment of grey and black material onto popular mainstream websites was first empirically demonstrated in studies of filesharing networks (Hurley et al., 2013; Prichard et al., 2011, 2013; Wolak et al., 2014). But the most spectacular recent illustration of intermingling has been the availability of CSEM on Pornhub, which garnered international media attention and is the focus of a class-lawsuit initiated against Pornhub by, among others, American child abuse survivors (Iati, 2021). Relatedly, Pornhub (2021) recently reported that approximately 175,000 searches for CSEM occur on its UK platform each month. It's also worth noting that CSEM offending tends to show an increase over time in

severity of acts being portrayed, concurrent with a gradual decrease in the subject's age (Fortin & Proulx, 2019).

To be clear, we are not arguing that pornography is harmful to all viewers (see Malamuth, 2018, for a review); indeed, there are some who argue that they may be benefits for adolescents viewing certain types or genres (Andrie et al., 2021), and there can be large individual differences in responses or interests (Seigfried-Spellar, 2019). Despite the volume and accessibility of pornography in the Internet age, as well as the graphic nature of some content, evidence for the effects of pornography on sexual aggression in the general population have been mixed and contentious (Ferguson & Hartley, 2022; Hall, 2014; Keene, 2021; Kingston et al., 2008; Potenza, 2018). For example, Ferguson and Hartley (2022) conducted a meta-analysis involving 59 studies on the association between pornography and sexual aggression. They found a weak association between sexual aggression and violent pornography and no association between non-violent pornography and sexual aggression. Most consumers perceive pornography as a positive product (e.g. Rissel et al., 2017). However, a minority evidently consider that their use of pornography is problematic in some way, with an increasing number of consumers wanting assistance for self-perceived problematic pornography use (Sniewski & Farvid, 2019). Whilst the majority of the of the general population may not develop significant pornography-related negative health concerns, a growing body of research suggests that a subset of individuals may be more at-risk for developing problems (Cooper et al., 1999; Fernandez & Griffiths, 2021; Potenza, 2018; Stark et al., 2018). These include a sense of disempowerment through dysregulated viewing habits (Sniewski et al., 2018), an increased strain on relationships with intimate partners (Crosby & Twohig, 2016), and reduced work performance and productivity (Crosby & Twohig, 2016). In particular, at-risk groups include young viewers of pornography (Boonmann et al., 2014; Potenza, 2018; Seigfried-Spellar & Rogers, 2013; Smahel & Subrahmanyam, 2014), and adults at risk of progressing to more deviant and illegal forms of pornography, such as CSEM (Knack et al., 2020; Morgan & Lambie, 2019; Peters et al., 2014; Seigfried-Spellar & Rogers, 2013). We describe these two risk groups below.

Risk group 1: Adolescents and pornography

The Internet has become an integral and prioritised part of adolescent life – with more than 90% of adolescents from varying countries using the Internet every day (Roy, 2020). It is, thus, no surprise that adolescents view pornography for sexual entertainment (Harris, 2014; Newman & Newman, 2020; Peter & Valkenburg, 2010a; Smahel & Subrahmanyam, 2014; Smetana, 2017). In fact, exposure to explicit sexual content has become a standard part of adolescents' developmental trajectory, with an estimated 43% accessing pornography on a weekly basis (Farré et al., 2020; Harris, 2014; Owens et al., 2012; Peter & Valkenburg, 2010a; Roy, 2020; Smahel & Subrahmanyam, 2014).

However, there is a concern that youth exposed to deviant or violent pornographic content online may be more likely to accept and adopt such displayed sexually aggressive behaviours offline (Boonmann et al., 2014; Flood & Hamilton, 2003; Smahel & Subrahmanyam, 2014; Svedin et al., 2011). This has implications for healthy psychosexual and social-emotional development amongst young pornography viewers, as the aggressive behaviour displayed in mainstream Internet pornography may place them at risk to develop negative or unrealistic sexual norms, attitudes, and behaviours about sexuality or relationships, blurring the line between what constitutes as sexual pleasure and sexual harm (Binnie & Reavey, 2020; Donevan et al., 2022; Harris, 2014; Owens et al., 2012; Smahel & Subrahmanyam, 2014; Vera-Gray et al., 2021).

A study investigating sexual attitudes and expectations amongst Dutch adolescents suggests that with more frequent exposure to explicit sexual content online, there is an increased belief that pornography is reflective of mainstream behaviour and attitudes and that it contains applicable information to the real world (Peter & Valkenburg, 2010b). However, adolescents who frequently view pornography tend to view all genres of pornography more frequently as well, notably deviant forms such as violent pornography or CSEM (Svedin et al., 2011). Such adolescents may increasingly

feel desensitised to mainstream pornography and instead want to seek out more stimulating, explicit content (Brahma & Brahma, 2017; Hall, 2014; Svedin et al., 2011). It has been suggested that the younger the age of onset for pornography use, the greater the risk for progressing to more deviant forms of pornography, such as bestiality or CSEM (Seigfried-Spellar & Rogers, 2013). This is concerning, as frequent exposure to aggressive content further place youth at a higher risk of normalising or even desiring sexually aggressive, exploitative, and violent behaviours over time (Boonmann et al., 2014; Flood & Hamilton, 2003; Guggisberg, 2020; Hall, 2014; Kingston et al., 2008; Landripet et al., 2019).

Risk group 2: Pathways to CSEM

There has been a growing concern about the production, distribution, and consumption of deviant sexual content, such as CSEM, on the Internet (Beech et al., 2008; Neutze et al., 2011; Price et al., 2015; Svedin et al., 2011). Accessing CSEM is a criminal offence in many countries and is defined as a form of child sexual exploitation. It is now understood that the onset of CSEM offending often occurs among individuals who have no previous sexual interest in children (Babchishin et al., 2015; Beech et al., 2008; Fortin & Proulx, 2019; Knack et al., 2020; Merdian et al., 2018; Morgan & Lambie, 2019; Lanning, 2010; Ly et al., 2018; Perkins & Wefers, 2018; Quayle, 2012; Quayle & Taylor, 2003; Seto & Ahmed, 2014). As noted earlier, there are cases whereby illegal CSEM has been found on otherwise legal pornography sites (Iati, 2021), but there is also concern that certain genres of legal pornography may be a pathway to CSEM for some offenders. Teen categories of pornography, often labelled as “barely legal”, do not involve the sexual exploitation of children as such but seek to eroticize the adult actor as a minor (Peters et al., 2014; Prichard et al., 2022; Quayle, 2020). Barely legal pornography has been referred to as “pseudo-child pornography” (Dines, 2009, p. 124). Techniques employed to present the actress as a minor include using actresses with small physiques, having her assume child-like behaviours (e.g. shyness, giggling), having sexual-inexperienced themes (e.g. “innocent”, “virgin”, storylines involving stepfathers or babysitters), faking vaginal bleeding, employing youthful dialogue (e.g. “good girl”), using child-oriented costumes (e.g. school clothes, wearing pigtails), and emphasising the dominance of the male actors (Peters et al., 2014).

Adults who have been convicted of, are in treatment for, or have had a history of accessing CSEM describe that they initially started watching mainstream adult pornography and progressed from such legal material due to pop-up advertisements, considerable exposure, boredom, or simply due to the knowledge that the vastness of the Internet made such extreme content available and accessible (Knack et al., 2020; Morgan & Lambie, 2019; Seigfried-Spellar & Rogers, 2013; Wortley et al., 2024). They often described that they would start viewing sexual stimuli on lower levels of the deviancy spectrum (e.g. spanking) and gradually progress up to more extreme, illegal sexual content (Knack et al., 2020).

Self-reported accounts are vulnerable to self-serving bias and need to be treated with a degree of caution. Nonetheless, there is increasing evidence of a habituation and desensitisation effect of pornography over time, where viewers become less sexually stimulated by mainstream sexual themes and decide to seek out novel, more deviant or violent sexual content to achieve the same levels of arousal (Knack et al., 2020; Landripet et al., 2019; Seigfried-Spellar & Rogers, 2013). In this way, it has been proposed that such viewers build a “tolerance” towards lower levels of sexual content on the deviancy scale, being less emotionally impacted by aggressive or demeaning sexual acts and being drawn to more extreme or illicit violent material over time (Knack et al., 2020). Recurring exposure to deviant Internet pornography such as CSEM can gradually progress to the normalisation and acceptance of such illegal behaviours, and may lead to the formation of adverse attitudes, beliefs, and expectations (Kingston et al., 2008; Landripet et al., 2019).

The current study

The two groups described above face specific risks which need to be better understood for potential policy responses to be considered by regulators. The present study aims to contribute to the

emerging body of quantitative and empirical research on pornography content and the risk that some genres may pose (Pathmendra et al., 2023). However, researching potentially graphic pornography entails certain psychological, ethical and legal risks to the researchers. Direct analysis of pornographic videos, images, audio and text is problematic. To overcome this problem, the current study involves the analysis of available metadata. The fact that every item has associated metadata is a benefit to researchers, as both the data and metadata are typically linked together with a specific Uniform Resource Locator (URL). Using a big data approach, these items and metadata can be crawled, scraped, and analysed to assist research.

We are specifically interested in the video tags associated with the pornography content. When a content creator uploads their own pornographic video, they can attach a list of video tags, synonymous to keywords or categories, to their file to define and describe the content within the video. This also makes it easier for viewers to search for specific themes of their desire. For example, tags may describe the practices displayed in the video, characteristics of the actors, or filming techniques used (Mazières et al., 2014). This is a bottom-up system, as each manually created tag allows videos to be sorted into a variety and combination of categories for viewers to browse. These are also the same predetermined list of categories available for viewers to browse (Mazières et al., 2014). The meaning of tags can greatly vary depending on the geographical and cultural context of the content creator and viewer, providing the latter with a wide range of accessible pornography dimensions. Mazières et al. (2014) analysed a large network of tags on two popular mainstream pornography websites and discovered that the substantial collection of tags connects numerous pathways between blurry categories of pornography, rather than dividing scripts from each other. To our knowledge, there are no studies that have further explored such blurry categories that arise from tags in order to investigate the potential risk that these widely accessible dimensions have on at-risk viewers.

We set out an exploratory approach to (1) conceptually map video tags from one popular mainstream pornography into different themes or “dimensions” of pornography and (2) to explore the potential risk that such tags and dimensions may have on the healthy psychosexual development of at-risk viewers. We will do this by firstly undertaking a top-level “audit” of one publicly available popular pornography website to scrape the video tags created and uploaded by content creators (i.e. a bottom-up system). Secondly, we ask a panel of professional experts in the field of sexual offending to categorise the tags into broader genres of pornography and to rate the extent to which each tag is likely to link to potentially harming pornography. The outcomes of this work are to develop and validate a conceptual mapping which could be used to develop policy in relation to at-risk groups and their access to categories of concern.

Materials and method

IRB approval for this study was sought from University College London, and an exemption was granted on 1st March 2022, as the study involved data in the public domain and was classified as low risk.

Website scraping

One of the most popular global mainstream pornography websites was scraped for video tags that allow viewers to search for pornographic categories of their preference. The website was chosen randomly from one of the top 5 global pornography websites by total visitors (Morichetta et al., 2019), to be representative of the typical pornographic content being viewed by most users. Visual inspection of the top 5 websites revealed a high level of similarity in layout, content and themes. At the time of data collection, popularity among the top 5 was confirmed by using SimilarWeb, a tool which measures the total amount of traffic received by websites globally. The website typically receives

in excess of 703 million visits per month, with 10.92 pages viewed per visit, and an average duration of 10 minutes and 24 s (similarweb, 2021).

Tags are labels that briefly describe video content and are assigned by the video producers when they upload the video to the website. The number of times each tag was selected by users was also scraped. It is important to note that while any one video is likely to have multiple tags, each selection is an independent event. Thus, the selection frequency data measure the type of pornography the user was seeking, irrespective of whether a video that was ultimately viewed might also have been listed under other tags. No individual, personal data from users were collected and at no point were the pornographic videos viewed by the researchers.

Expert raters

We sought expert ratings of the video tags. Five domain experts known to the authors were approached by email and agreed to take part in the study. All experts had more than 15 years of relevant professional and/or research experience in the sexual offending field. Between them, they had expertise in the causes and treatment of sexual offending in adolescents and adults, sexual offending in the online environment, categorising and analysing child sexual abuse material, and the impact of indecent images on psycho-sexual development and contact sexual offending. The raters came from the UK, Ireland and Australia; three of the raters were female and two were male. Informed consent was obtained from all expert raters and confidentiality was assured. Raters were informed that they could drop out at any stage of the study if they felt uncomfortable or had any concerns about the content of the research.

The rating tasks

The expert raters were asked to complete two tasks.

Task 1: Categorising the tags

Based on research by Vera-Gray et al. (2021), we identified five broad categories of pornographic content:

- **Mainstream:** defined as the most common representations of sexual activity under political and societal norms of gender, sexuality, and commerce.
- **Underage:** defined as content with an emphasis on the youthfulness of actors or content that evokes an underage impression, while the actors themselves may not actually be underage.
- **Incestual:** defined as content with an emphasis on sexual activity between family members, while the actors themselves may not actually be related.
- **Non-consensual:** defined as content with an emphasis on or provides an impression that the creation or distribution of sexual activity is unwanted or has not been agreed to by one or more of the individuals involved, whilst the actors themselves may have consented.
- **Aggressive:** defined as content with an emphasis on any sexually violent behaviours that are physical, verbal, threatening, coercive or psychological in nature.

Raters were asked to allocate each of the tags to one or more of the above categories. If raters believed that a tag belonged to numerous categories, they were directed to rank order their preference. For instance, if they thought that a tag was most likely to be in the "Underage" dimension as well as somewhat likely to be in "Incestual", then they should allocate "1" to "Underage" and "2" to "Incestual".

Task 2: Rating the tags

Raters were asked to assign a “Potential Risk to Healthy Psycho-sexual Development Score” (or “potential risk score”, PRS) to each tag on a scale of 1–10, where:

1 = No risk to healthy psycho-sexual development

5 = Moderate risk to healthy psycho-sexual development

10 = High risk to healthy psycho-sexual development

A 10-point Likert scale was provided on the side of each tag for raters to mark their response. The tags tell us what users were seeking, not necessarily what the videos might contain. For both tasks, in our instructions to raters we acknowledged that they may not know the precise nature and content of the material to be found under each tag, and that there will also be variation within each tag. We advised raters that their responses should be based on what the text labels suggest the content will cover and the potential for users to access material that poses a risk to healthy psycho-sexual development. Finally, we provided an open-ended section at the end of the survey for any comments, questions, or queries the raters wanted to add. Note that the PRS is intended as a measure of potential harm, we are not suggesting that all risks inevitably lead to harm. We also recognise the dangers in subjective evaluations of risk, which is why we selected a group of experts, and instituted inter-rater reliability measures, as described in the following section.

Inter-rater reliability

Inter-rater reliability examines the variability between two or more raters who assess or rate the same group of targets (Koo & Li, 2016; Shou et al., 2022; Usry et al., 2018). To measure the inter-rater reliability of the PRS responses between the panel of experts, we obtained an intra-class correlation coefficient (ICC). This type of inter-rater reliability was chosen as it is the recommended index for when three or more raters evaluate all available targets (Shou et al., 2022). Specifically, the model used was ICC (3,5), where 3 indicates a two-way mixed design (each target was rated by the same expert raters, who were the only experts of interest), and 5 indicates that reliability is calculated on the mean ratings of 5 raters.

The dataset was analysed using IBM SPSS Statistics Version 27 (IBM Corp., 2020). Using Koo and Li’s (2016) general inter-rater reliability ICC guidelines, ICC scores reported less than .50 are characterised as “poor,” between .50 and .75 are characterised as “moderate”, between .75 and .90 are characterised as “good”, and scores above .90 are characterised as “excellent”, based on the 95% confidence interval of the ICC estimate.

Results

Categorisation of tags

A total of 149 tags were identified. The total number of times tags were selected was 27,918,985, with an average of 187,375.7 per tag. The expert raters were asked to carefully review and allocate tags to the categories of mainstream, underage, incestual, non-consensual, and aggressive. Raters were asked to ensure that they had a clear understanding of the content associated with each tag. Raters were also asked to base their decision on the primary theme or most prominent aspect of the content associated with the tag. If raters were uncertain about the content associated with a specific tag, they were asked to mark as “Uncertain.” If tags were marked as “Uncertain” by at least two experts, they were excluded from further analysis. Four tags (BBW, Indian web series, ASMR and Skank nilf) were excluded from further analysis because two experts indicated that they were uncertain about the associated content, leaving 145 tags.

Our original intention was to analyse all orders of preference nominated by the experts. Raters were asked to indicate their first preference for its category allocation; if they had additional preferences, they also noted these, but the focus was primarily on their first preference. Focusing only on first preferences better reflects the level of agreement among raters and provides a simpler way to represent the data as appropriate for an exploratory study. Where there was disagreement among experts on their first preference, this was taken to indicate an overlap between categories. For example, if some experts rated a tag as “mainstream” and the others rated it as “incestual”, we allocated it to a “mainstream/incestual” category. There was full agreement on a single category for 61% of the tags ($n = 88$); in 34% of cases raters assigned tags to two categories ($n = 49$); and in 5% of cases tags were assigned to three categories ($n = 8$). As shown in Table 1, this resulted in 13 categories and category combinations, with the mainstream category comprising the most tags. Looking just at the five primary categories (i.e. including multiple counts for overlaps), 128 tags were labelled mainstream, 26 aggressive, 23 underage, 18 incestual, and 15 non-consensual.

Potential risk ratings

Descriptive statistics and PRS correlations between the five expert raters are shown in Table 2. A robust level of internal consistency ($\alpha = .920$) was found between the five expert raters and their PRS allocations for the 145 tags. Results from the ICC statistical analysis based on absolute agreement show excellent inter-rater reliability across PRS obtained by the five expert raters; ICC (3,5) = .916, 95% CI [.892, .936], $p < .001$. Results indicate that there was a very strong level of agreement between all five expert raters when allocating a PRS for the 145 tags.

Table 1. Allocation of tags to categories by expert raters.

Category	Tags
Mainstream	African, Amateur, Amateur threesome, Anal sex, Arab / Arabian, Asian, Asian massage, Ass, Beach, Big ass, Big cock, Big dick, Big natural tits, Big tits, Blonde, Black hair, Blow job, Celebrity, Cosplay, Cougar, Creampie, Cum in mouth, Cum in pussy, Doctor, Doggystyle, Exotic, Feet, Female ejaculation, Fingering, Free porno, Gay porn, Hairy puss, Handjob, Heels, Interracial, Japanese, Japanese massage, Japanese mom, Japanese wife, Latina, Lesbian, Lingerie, Maid, Massage, Mature women, Monster cock, Movie, Muslim, My friend's hot mom, Oiled, Orgasm, Pinay, Porn, Punjabi, Pussy licking, REAL Amateur, Real homemade, Redhead, Sex toys, Shaved pussy, Shemale, Skinny, Stockings, Swingers, Thai, Tran sexual 123334, Toons, Vintage, Virtual reality, POV, Wife, Wife threesome, Workout
Underage	Asian teen, Teen anal
Incestual	Dad and daughter, Family, Family therapy, Hot step sister, Japanese family, Japanese mom and son, Mom and son, Mom fucks son, Real mom and son, Sister and brother, Stepmom and son
Non-consensual	Blackmail
Aggressive	Forcely fucked (sic)
Mainstream/Underage	18, Babysitter, Black girls, Chubby teen, College, Cumshot, Full movie, India / Indian girls, Indian teen, Japanese teen, Old and young, Petite, Sexy girls, Solo girls, Teen creampie, Teacher, Virgin, Young girl
Mainstream/Incestual	Aunt, Fuck me daddy
Mainstream/Non-consensual	Cam videos, Casting, Caught masturbating, Cheating, Compilation, Cuckold, Orgy, Real hidden camera, Voyeur
Mainstream/Aggressive	Ass gaping, BDSM, Bukkake, Cheating wife, Creampie gangbang, Deepthroat, Double penetration, Fisting / Fist-fucking, Gangbang, Hot milf, Hot mom, Japanese uncensored, Milf anal, Mature anal, Milf, Next, Rough, Wife gangbang
Underage/Incestual	Daughter, Step daughter
Mainstream/Underage/Non-consensual	Old man young girl
Mainstream/Incestual/Aggressive	Mother, Mommy, Mom anal
Mainstream/Non-consensual/Aggressive	Ass to mouth, Facial, Hardcore, Pissing
Not categorised	ASMR, BBW, Indian web series, Skank milf

Table 2. Descriptive statistics and PRS correlations among expert raters.

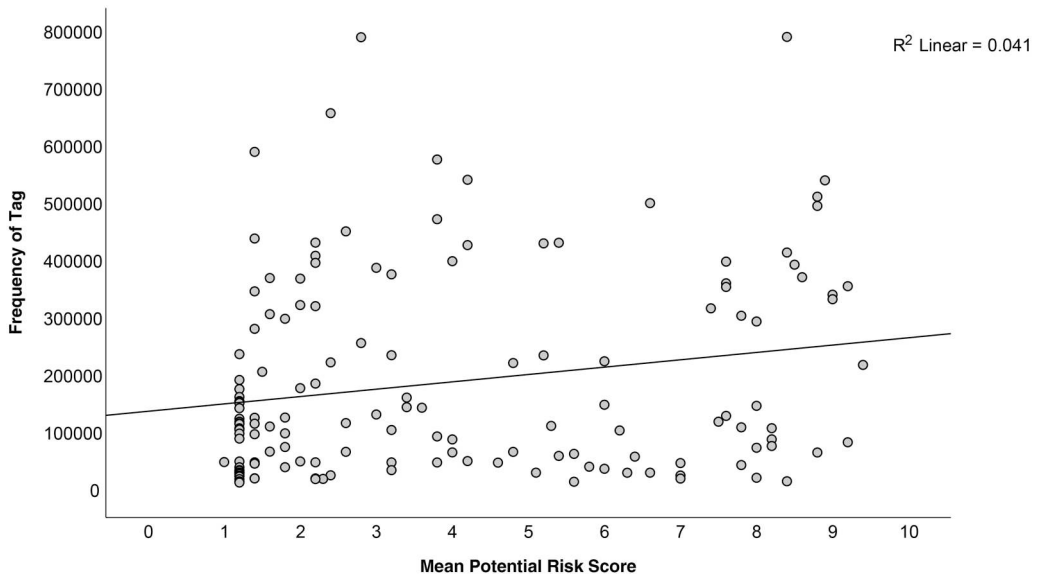
Expert Rater	M*	SD	1	2	3	4
1	4.5	3.6				
2	3.6	2.9	.70**			
3	3.5	2.7	.63**	.60**		
4	4.2	2.9	.68**	.73**	.70**	
5	4.0	3.6	.72**	.80**	.69**	.82**

*Range 1-10; ** $p < .001$

A simple linear regression analysis was conducted in order to assess whether the mean PRS predicted the frequency of selected tags (See [Figure 1](#)). The regression was statistically significant, $F(1, 143) = 6.092$, $p = .015$, $R^2 = .041$. The small R^2 , however, indicates that the strength of the association was low and not clinically significant.

Descriptive statistics for the twelve tags with the highest mean PRS are shown in [Table 3](#). Eleven of the tags involve potential underage and/or incestual content, while the remaining tag (“forcely fucked”) involves aggression. Four of the tags are also in the top twelve in terms of popularity, with “teen anal” ranked as having the highest search frequency.

[Figure 2](#) shows a Venn diagram that visually illustrates the overlaps among the 5 primary pornography categories, as described in [Table 1](#). For each of the 13 populated areas, the following data are

**Figure 1.** Linear regression of the frequency of selected pornography tags and the mean potential risk score.**Table 3.** The 12 tags with the highest mean potential risk score, showing search frequency and popularity rank.

Rank	Tag	Mean Risk Score	SD	Search Frequency	Popularity Rank
1	Mom fucks son	9.4	.89	221,826	50
2	Dad and daughter	9.2	.84	359,125	30
3	Forcely fucked	9.2	1.10	86,868	92
4	Old man young girl	9.0	1.22	344,307	33
5	Young girl	9.0	1.22	336,442	34
6	Real mom and son	8.9	.22	543,817	7
7	Japanese mom and son	8.8	.45	515,313	8
8	Mom and son	8.8	.45	499,213	10
9	Daughter	8.8	1.10	69,032	100
10	Sister and brother	8.6	1.51	374,813	26
11	Teen creampie	8.4	.50	396,671	23
12	Teen anal	8.4	.55	794,046	1

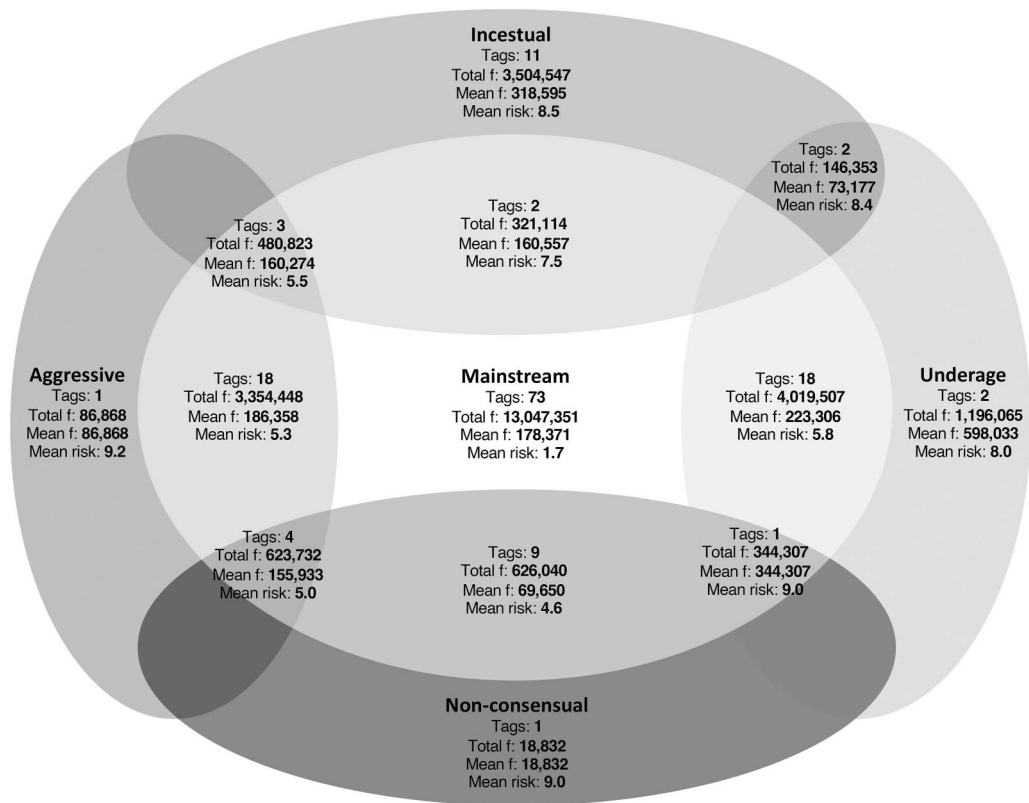


Figure 2. Venn diagram of pornography categories, showing the number of tags (Tags), number of times tags were selected (Total f), average number of selections per tag (Mean f), and average potential risk score (PRS) per tag (Mean risk).

shown: the number of tags included, the total number of times those tags were selected, the mean number of selections per tag, and the mean risk score per tag. As the Venn diagram shows, the mainstream category forms an inner hub around which the other four categories circle. Most overlaps, then, involve mainstream with each of the other four primary categories (either singly or combined). As we move from the centre to the periphery, the average PRS increases; that is, as might be predicted, the more mainstream the search term the less risky it is judged to be. As noted in Table 3, incestual and underage categories are particularly problematic.

Discussion

This study is one of many in recent decades that have examined the variety and seriousness of content available on legal pornography websites. Our interest lay in understanding the degree to which content might:

- Pose a risk to the healthy psycho-sexual development of adolescents; and
- Provide pathways to CSEM for users of any age.

We used scraping of publicly available data relating to video tags from the website of one large legal company. The 145 most popular tags – which collectively had received over 27 million hits – were viewed by independent raters, who then (a) categorised the tags according to Vera-Gray et al.’s (2021) taxonomy, and (b) assigned a score to indicate each tag’s likely threat to viewers’ healthy psycho-sexual development.

Because the raters did not check to see what types of pornography each tag led to, our data are based on the raters' subjective assessments. The experts based their judgements on what the uploader of the video decided best described the video content. However, we do not believe that this detracts from our findings. The expert raters were in much the same position as the website visitors as they searched for videos – they made assumptions about what sorts of video would be linked to each tag. The selection of a tag indicates what the viewer *thought* that they were going to find and, therefore, reflects both their sexual interests and their experience of previous searches. The five raters are experts in their field, who are well-acquainted with the meaning of pornographic terms and titles, and who completed their assessments independently and isolated from each other. Furthermore, our analyses were designed to highlight potential areas of ambiguity or disagreement in raters' views (e.g. as evidenced in the categorisation of certain tags as "mainstream" by some raters, and "incestual", "aggressive", "underage" or "non-consensual" by others). Additionally, since the tags were chosen by content creators to increase views of the videos they uploaded, it is fair to assume that the tags really did lead to the content described at some point in the video. For example, arguably few, if any, videos linked to the tag "fisting" would not have contained that sexual act. Erroneous or misleading tagging does not serve content creators' interests.

Adolescents' psychosexual development

The findings of this study indicate a potential risk posed to adolescents' healthy psychosocial development. On the pornography website we studied, it strongly appears that all users¹, including adolescents or children, would be presented with a broad spectrum of intermingled content – ranging from legal mainstream pornography to material that may include CSEM (e.g. "young girl"), or adult sexual abuse (e.g. "forcely fucked"). While the Venn diagram illustrated in [Figure 2](#) neatly categorises content according to common genres, no such categorisation exists for users on the website that we studied. On the contrary, a novice adolescent user (or adult for that matter) will be bombarded with an array of tag terms – many of which communicate little information about the nature of the connected content. This means that users may easily stumble across material they might not have sought. For example, the expert raters unanimously agreed that "anal sex" tag normally leads to "mainstream" content. But they disagreed as to whether: "mature anal" was "mainstream" or "aggressive"; and, "mom anal" was "mainstream", "incestual", or "aggressive". If experts with >15 years' experience of the pornography industry were not certain what sort of material lay behind certain tags, it seems unlikely that a novice adolescent user would. The relevance of this point is that by clicking on common tags, a new adolescent user is over time highly likely to be unintentionally exposed to material that is not mainstream, and which contains the sorts of deviant or violent pornographic content that has concerned scholars of youth-wellbeing for many years (Boonmann et al., 2014; Flood & Hamilton, 2003; Smahel & Subrahmanyam, 2014; Svedin et al., 2011). A recent nationally representative study of Australian youth aged between 15–20 found that 86% of males and 69% of females had been exposed to pornography (Crabbe et al., 2024), so the potential impact is quite high. Note, however, that this study did not study the actual consequences of exposure, nor the actual behaviour of adolescents who may have a number of different responses, such as quitting the browser if they encountered distressing or harmful content.

[Table 3](#) lists the 12 tags where the average of the expert raters' PSRs reached 8.4/10 or higher. The raters not only agreed that these tags led to material that posed a high risk to healthy psychosexual development; they also agreed that nine of the 12 tags (i.e. all bar tags 4, 5, and 11) were *not* mainstream. By this we mean that, for instance, "forcely fucked" (tag 3) and "daughter" (tag 9) were unanimously categorised as "aggressive" and "underage/incestual" respectively. The strong inference of this finding is that many of the tags in [Table 3](#) may lead to illegal material, such as CSEM or videos of adult rape.

Alarmingly, these tags were also very popular on the website. "Real mom and son", for example, which was categorised unanimously as "incestual", had received 543,817 hits – the seventh most

popular tag. Arguably the fêted “popularity” of such content dramatically increases the likelihood of exposure for adolescents because (a) it makes discovery easier and (b) it normalises the content and portrays it as acceptable and innocuous.

Pathways to CSEM

There is little doubt that CSEM is also openly trafficked on the popular legal pornographic website that we studied (Iati, 2021). This is relevant in and of itself to the CSEM-pathways question because it supports the growing evidence that the opportunities to view CSEM are plentiful and require minimal effort from users of any age. Users of the website that we studied did not need (a) to leave the site they were on to find CSEM elsewhere, or (b) need to have any technical experience about the darknet, TOR and the like. In support of this argument, we point to the fact that, of the 145 most used tags on this site, 15 were unanimously categorised as being indicative of possible CSEM or “barely legal” content, i.e. “incestual” (11), “underage” (2), and “incestual/underage” (2) (see Figure 2). The tags had received over 5.65 million hits.

The data in Figure 2 are instructive for another reason. They support reports from some Internet users (including CSEM offenders) that it is possible over time to move from mainstream pornography into more deviant or “hardcore” material, and then into CSEM. Figure 2 pictorially depicts how gradual that pathway can be. The PRS in the “mainstream” category commences at a low average of 1.7/10. At the point “mainstream” overlaps with the other primary categories, the PRS rises to an average of 4.6–7.5/10. Once in the periphery the average PRSs range from 8.0–9.2/10. A fair conclusion to draw from these data is that the spectrum of material is so nuanced, and contains so many incremental steps, that any single progression along the spectrum may not present a sort of psychological threshold, or moral challenge. Arguably such a graduated pathway is more believable than common précised versions of the “pathways” narrative, which imply two main decisive leaps in the trajectory – i.e. from mainstream to deviant content, and then from deviant to CSEM. We are not suggesting that users whose pathway to CSEM is slow and gradual have been stripped of choice. In some respects, a gradual trajectory provides more time for users to reflect on their actions. But we do think these data add credibility to the overall explanation that men (and some women) who might never dreamed of viewing CSEM when they first started using legal pornography, did so through multiple decisions over time.

Implications for regulation

Adults’ use of pornography is a matter of personal choice in liberal democratic societies and has been so for many decades. Yet, it is also true that most societies have set legal boundaries on sexual content of one sort or another – with common goals being to restrict minors’ access to pornography, and to criminalise certain categories of material, including CSEM, for people of any age. This study has practical implications for the identification and regulation of potentially harmful pornography on legal pornography sites. These implications could include self-regulation and content vetting measures to ensure that videos do not contain illegal or harmful content, but also active approaches used by other media sectors, such as routine audits, content filtering, and reporting mechanisms for users to flag harmful or illegal content. Industry-wide, standardised harm ratings for content – particularly those related to underage and incestuous themes – scored higher in terms of potential risk to psycho-sexual development, suggesting that legal pornography websites should integrate risk-rating systems that help identify and limit the exposure of such content, especially to vulnerable viewers. Government policy could further strengthen this strategy by considering age verification and protective filters, with the former currently the subject of a national trial in Australia (Sakkal, 2024).

Problems underpinning age verification systems, and the broader regulation of sexual content in the Internet era are grimly complex and beyond the bailiwick of this paper. We cannot comment on

the practises used by other websites to regulate their content, but it seems to us that the pornography site that we studied could implement three strategies – and these may be applicable in other parts of the pornography sector. First, instead of permitting content creators generate tags, the website should control what tags exist and how new tags are developed. This step would prevent content creators to be able to advertise that their material contains CSEM (or other types of illegal material). Secondly, like Pornhub (2020), the company should vet all content before it is uploaded and made publicly available. Thirdly, screening systems should be implemented to retrospectively eradicate CSEM and other forms of illegal material from the site.

Limitations and further work

Based on the results, there was a very strong level of agreement between all five expert raters when allocating a PRS for the 145 tags. We checked whether the mean PRS predicted the frequency of selected tags. However, the small R^2 value indicates that the strength of the association was low. This limitation suggests that while the experts consistently rated the tags, the predictive power of these ratings for actual tag frequency is weak. This could imply that other factors not captured by the PRS are influencing tag frequency, or that the PRS itself may need further refinement to better capture the relevant predictive elements. Additionally, the study's reliance on expert ratings might have introduced subjective bias, and the sample size of tags may not be representative enough to generalise the findings broadly. Future research should consider incorporating additional predictive variables and potentially expanding the sample size to enhance the robustness and generalizability of the results.

Given the potential harms arising from exposure, an intriguing possibility would be to engage pornographic websites to enhance adolescent protection by shaping user activity to reduce risk, given some evidence that this is already happening (Rama et al., 2023). This approach would require cooperation and collaboration with pornographic website operators; a recent example is the collaboration between Pornhub, Stop It Now and the Internet Watch Foundation (IWF) to engage users searching for CSEM content with a chatbot (Scanlan et al., 2024). The chatbot saw a significant reduction in searches for CSEM content on Pornhub during the study. Further innovative approaches that combine tracking, personalisation and risk reduction are likely to see harm reduced for this vulnerable population.

To address the encroachment of harmful sexual material onto mainstream websites in Australia, several regulatory measures are recommended. These include implementing robust age verification systems, mandatory content filtering and monitoring, and enforcing legal accountability for non-compliant websites. Additionally, easy-to-use reporting mechanisms should be established, alongside public awareness campaigns to educate users about online risks. Collaboration with tech companies and regular audits are essential, as are support services for affected individuals and parental control features. These are consistent with the current executive action in Australia to trial some of these measures – such as age verification² – and complemented by the introduction of the Online Safety Act 2021, and the Basic Online Safety Expectations. Future research will monitor the effectiveness of these new measures.

Notes

1. Without having access to data from the website host, it is not possible to determine which content is being selectively presented to users based on their age. We have no evidence that certain content is being presented selectively, however, algorithmic bias is a well-known phenomenon, alongside targeted advertising supported by tracking cookies; put another way, the technology exists to profile, track and deliver targeted content to users.
2. <https://www.pm.gov.au/media/tackling-online-harms>

Disclosure statement

No potential conflict of interest was reported by the author(s).

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