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Australian Institute of Criminology

CRIME & JUSTICE RESEARCH 2022

ONLINE SEXUAL EXPLOITATION OF CHILDREN

Edited by Michael Phelan APM

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About the editor

Michael Phelan was appointed Chief Executive Officer of the Australian Criminal Intelligence Commission (ACIC) and Director of the Australian Institute of Criminology (AIC) on 13 November 2017.

As Chief Executive Officer of the ACIC, Mr Phelan is responsible for management and administration of the agency's intelligence operations and specialist capabilities, and for ensuring delivery of national policing information systems and services to partners. As Director of the AIC, Mr Phelan is responsible for leading Australia's national research and knowledge centre on crime and justice.

Mr Phelan has had an extensive career in law enforcement, beginning in 1985, when he was first appointed to the Australian Federal Police (AFP). Throughout his career, he has worked in a variety of fields, including community policing, narcotics and serious fraud.

In 1998, Mr Phelan was appointed Chief Executive Officer of the AFP Association for two years, before taking up a position as the AFP's Senior Liaison Officer in Manila, Philippines. In 2002, he was promoted to the Senior Executive Service in the AFP's Brisbane office.

Mr Phelan was appointed Director of the Australian High Tech Crime Centre in 2004, and was promoted to Assistant Commissioner later that year, undertaking the role of National Manager Border and International Network. In September 2007, Mr Phelan was appointed the Chief Police Officer for the Australian Capital Territory.

In 2010, he was promoted to Deputy Commissioner. Across multiple roles at this level, Mr Phelan had oversight of the AFP's High Tech Crime, Forensics, Intelligence, Serious and Organised Crime, Counter Terrorism and Protection Operations portfolios.

Mr Phelan has previously held positions on the boards of the Australian Crime Commission, CrimTrac and the Australia New Zealand Policing Advisory Agency. Mr Phelan also served as a member of the ACT Law Reform Advisory Council and the Australian National Advisory Council on Alcohol and Other Drugs.

In 2008, Mr Phelan was awarded the Australian Police Medal. He also holds a Degree in Commerce, an Honours Degree in Law and Masters in Business Administration.

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Introduction

The Australian Institute of Criminology (AIC) has a long history of conducting research on the online exploitation of children—the first such study dates back over 25 years. In response to the rapid growth of this crime in recent years, the AIC has invested significant research effort in better understanding online child sexual exploitation and identifying ways to reduce the problem. Supported by funding from the *Proceeds of Crime Act 2002*, the AIC launched the Child Sexual Abuse Material Reduction Research Program in 2018. This program funded eight multidisciplinary academic teams to research innovative approaches to reducing the production, distribution, storage and consumption of child sexual abuse material (CSAM). Many of those studies are reported in this book. These projects were followed by a more in-depth body of research focusing on the live streaming of child sexual abuse, which had not been covered by the earlier program.

This book reports on 15 studies completed and published by the AIC since January 2019. These broadly fall into three categories. Chapters 1 to 6 analyse several aspects of online sexual exploitation of children and shed light on issues that demand further attention. Chapters 7 to 11 explore approaches that might be taken to tackle the problem. Finally, chapters 12 to 15 examine the nature of live streaming of child sexual abuse.

Based on a systematic review of the available literature, chapter 1 examines the crime commission processes involved in producing and distributing CSAM. It describes the typical profile of victims and offenders and demonstrates the important role played by peer-to-peer networks, the darknet and encryption more generally in the proliferation of CSAM. As an extension of this work, chapter 2 uses a crime script methodology to unpack the way in which CSAM offending occurs on the darknet, highlighting three key stages: (1) crime set-up, (2) crime completion and (3) crime continuation. Chapter 3 examines self-produced CSAM, focusing on the language offenders use to persuade children to produce images and videos that are then widely circulated online. This research identifies the variety of tactics used in online chat, outlining 72 discrete linguistic tactics grouped into eight themes. Chapter 4 focuses on a particular group of perpetrators—the children's parents and parental figures, who account for a significant proportion of CSAM producers. In particular, it describes the roles played by biological mothers, biological fathers, stepfathers, foster fathers and mothers' partners.

Chapters 5 and 6 are slightly different to the preceding four, in that they address the prevalence of child sexual abuse more generally, although they also highlight the extent to which offending occurs online. Chapter 5 reports the results of a rapid evidence assessment of the available literature on the extent of reoffending by child sexual offenders. It shows that non-contact (typically online) offenders are characterised by lower levels of recidivism, based on official sanctions, than contact offenders. Escalation in offending is also low, with between one and eight percent of non-contact offenders escalating to contact offending. Chapter 6 examines the results of an empirical study of recidivism among child sexual offenders in New South Wales. It shows that seven percent committed another sexual offence within 10 years, and recidivism ranged from six percent for child sexual assault offenders to nine percent for CSAM offenders.

Where approaches to addressing the online sexual exploitation of children are concerned, chapter 7 provides an overview of the literature, identifying five cyber strategies to reduce the problem. These include peer-to-peer network monitoring, automated CSAM detection tools, web crawlers that can identify CSAM sites, pop-up warning messages, and facial recognition. Focusing more specifically on criminal justice responses to CSAM offending, however, identified little robust evidence of effective interventions. A systematic review of the available literature, reported in chapter 8, identifies a number of effective police interventions. Specialist cybercrime task forces and departments tend to result in a higher number of CSAM investigations and arrests, while specialist training for officers also seems to increase CSAM investigations. In addition, the tactical use of polygraphs can lead child sexual abuse suspects with no prior sexual offending history to admit to having committed such offences. Other criminal justice measures include providing a budget for expert consultation in CSAM prosecutions.

Chapter 9 describes the development of a new group-work program for CSAM offenders and explains why general sex offender treatment programs are not suitable for CSAM offenders. The next stage of this project will involve trialling the program with small groups of offenders.

Chapters 10 and 11 explore technological solutions to online child sexual exploitation. Chapter 10 describes the development of a new software tool that matches faces and voices across CSAM videos to help police investigations. Chapter 11 provides the results of an experiment to test whether pop-up messages are effective in discouraging people from accessing CSAM-related websites. It demonstrates that warning messages can significantly reduce people's willingness to click through to view such material.

The AIC's work on live streaming of child sexual abuse has focused on understanding the problem to identify points of intervention. Chapter 12 describes an analysis of financial transactions data provided by AUSTRAC. It outlines the typical profile of an Australian live streaming offender, along with the patterns of transactions, demonstrating that the amounts paid and the frequency of live streaming sessions increase over time. With the same data, chapter 13 uses machine learning to create a statistical model showing the key factors that differentiate the most prolific live streaming offenders from other offenders. Chapters 14 and 15 examine the negotiations that take place online between live streaming offenders and facilitators and describe the different relationships that exist between them.

Taken together, this significant body of research provides new insights into the contemporary nature of the online sexual exploitation of children. More importantly, it identifies effective approaches to preventing and detecting this crime and offers points of intervention that may help to reduce harm to children. This typifies the AIC's capacity to produce applied research, fulfilling its mandate to reduce crime and promote justice by undertaking, funding and disseminating crime and justice research.

Michael Phelan APM
Director
Australian Institute of Criminology

Online sexual exploitation of children

1. Crime commission processes in child sexual abuse material production and distribution: A systematic review

Jesse Cale, Thomas Holt, Benoit Leclerc, Sara Singh and Jacqueline Drew

Introduction

Recent years have seen increasing public and government concern about the production and distribution of child sexual abuse material (CSAM). CSAM is generally defined as material that depicts a child, or a representation of a child, in a sexual or offensive context, or as the subject of torture, cruelty or abuse (see, for example, *Criminal Code Act 1995* (Cth), sch 2, s 473.1). This material poses increasingly serious challenges to law enforcement agencies. Furthermore, a recent major report on CSAM production and distribution has identified a trend toward more egregious sexual content over time (Seto et al. 2018).

One of the difficulties in disrupting the production and distribution of CSAM lies in the technological developments that have facilitated these crimes. The proliferation of online platforms, such as internet chat rooms and social media websites, have provided offenders with more avenues for accessing and grooming victims (Wortley & Smallbone 2012). Anonymous peer-to-peer (P2P) file sharing networks and cloud storage allow offenders to distribute CSAM online with minimal risk of detection (Wortley & Smallbone 2012).

These developments have placed substantial pressures on law enforcement to develop new methods of detecting, investigating and preventing the production and distribution of CSAM. However, this depends on a detailed understanding of the decisions and processes involved in CSAM offending. Offender decision-making from a criminological perspective is based on the premise that crimes occur when potential offenders perceive that the benefits of committing a crime outweigh the costs (ie rational choice perspective; Clarke & Cornish 1985; Cornish & Clarke 2017; Leclerc & Wortley 2014). Therefore, criminal behaviour emerges from a rational decision-making process where situational-specific factors such as offender motivation, the risk of detection, the amount of effort required to successfully commit the crime, and the potential rewards influence the likelihood of offending (Clarke 1997; Cornish & Clarke 2017).

This decision-making framework provides a means of understanding the process behind the commission of different types of crime—including, in the current context, CSAM production and distribution. Empirical research exploring specific aspects of the production and distribution of CSAM has increased in the past decade. To date, however, no studies have consolidated this evidence to provide a baseline overview of what is known about different aspects of offending processes used by CSAM offenders. The aim of the current study was to address this gap by conducting a systematic review of the empirical literature on crime commission processes involved in CSAM production and distribution. The key research question guiding the review is: what is currently known in the empirical literature regarding the production and distribution of CSAM?

Methods

Search strategy

A search of relevant academic databases was conducted between 1 March and 3 April 2019 by a member of the research team. Table 1 lists the search terms used. Searched databases included:

- Informit (Australian Public Affairs Full Text, Australian Public Affairs Information Services, Australian Criminology Database, Australian Family & Society Abstracts, Health & Society Database, Humanities & Social Sciences Collection);
- ProQuest (ERIC, National Criminal Justice References Services Abstracts, PAIS Index, Policy File Index, ProQuest Central);
- Ovid (MEDLINE, PsycInfo, Social Work Abstracts);
- EBSCO (Criminal Justice Abstracts, Family Studies Abstracts, Family and Society Studies Abstracts, Violence & Abuse Abstracts, Women's Studies International);
- Web of Science (Web of Science Core Collection); and
- Google Scholar.

Table 1: Search terms

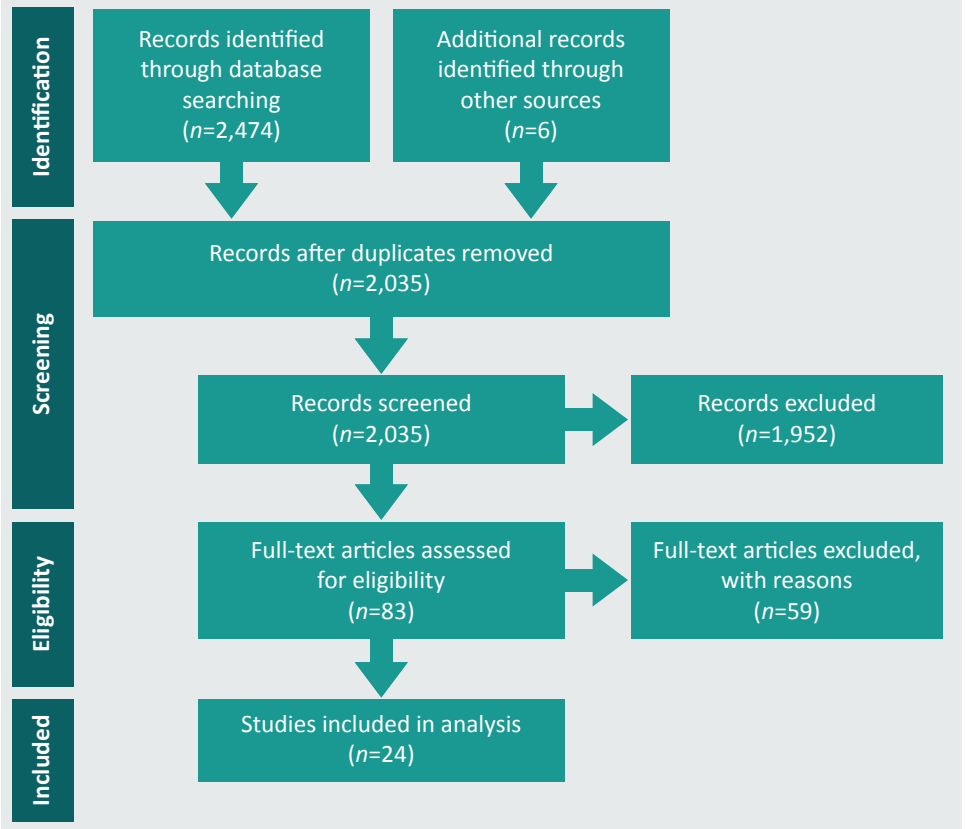
Concept 1	Concept 2
Search 1	
child exploitation material	
Search 2	
child pornography child abuse material child sexual abuse material	crime script* creat* produc* distribut* disseminat* detect*
Search 3	
image* photo* child pornography child abuse material child sexual abuse material child exploitation material picture* video*	online NEAR/5 grooming sexual NEAR/5 grooming internet NEAR/5 grooming

Note: Search 3 was an independent search to locate literature on CSAM in the context of grooming. It was not possible to run this search through all the listed databases as doing so returned too many results, making the search unmanageable. Therefore, search 3 was only run through four selected databases: ProQuest, Ovid, EBSCO and Web of Science

Inclusion and exclusion criteria, and analytic method

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher et al. 2009) Statement guided the selection of studies included in the current review. The initial search produced 2,474 results (Figure 1). An additional six publications were located through other sources—one through citation chaining, five by members of the research team. This brought the total number of records identified to 2,480. Of these, 445 were duplicates and excluded. The 2,035 remaining publications were screened to determine their relevance to the research question. This led to the exclusion of 1,952 publications.

Figure 1: PRISMA flow diagram



The full texts of the remaining 83 publications were further screened for inclusion. Books, book chapters, grey-literature reports, articles in the Australian Institute of Criminology's peer reviewed *Trends & issues* series, and articles in peer-reviewed journals that were published in or after 2010, and that emphasized either the production or distribution of CSAM, were included. Publications were excluded if they focused only on CSAM possession, did not differentiate between CSAM production/distribution and other sexual offences, or were focused on 'sexting' between minors. Non-English language publications, as well as publications where the full text could not be accessed, were excluded. The application of these criteria excluded 59 articles, bringing the total number of publications included in the final review to 24. A thematic analysis identified key themes related to the research question.

Results

Twenty-four studies directly addressed the research question. A summary of the key findings of each of the 24 publications is presented in Table A1 in the *Appendix*.

The analysis revealed a number of themes relating to CSAM. These included offender characteristics, victim characteristics and victim–offender relationships, characteristics of CSAM production and distribution, and the technologies used to distribute CSAM online.

Offender characteristics

Several studies highlighted demographic, psychological and social characteristics of CSAM producers, distributors and producers/distributors (eg Clevenger, Navarro & Jasinski 2016; Seigfried-Spellar 2014; Sheehan & Sullivan 2010; Wolak, Finkelhor, Mitchell & Jones 2011). Wolak, Finkelhor, Mitchell and Jones (2011) descriptively analysed 319 arrests for internet-related CSAM production. Perpetrators were typically white men in early adulthood, in employment. Clevenger, Navarro and Jasinski (2016) found that CSAM producers (as distinct from CSAM distributors) were usually aged in their 30s and often had drug and alcohol problems as well as histories of sexual and violent offences.

Sheehan and Sullivan (2010) examined four in-depth case studies and identified common backgrounds among CSAM producers that included early childhood sexual contact, being sexually victimised as a child, viewing pornography from an early age, and social isolation. They also described cognitive distortions among these individuals that helped them overcome psychological and emotional barriers to CSAM offending. Seigfried-Spellar (2014) found that individuals who exchanged CSAM over the internet more actively networked online and tended to be more extroverted than individuals who only searched for and viewed internet CSAM. However, in two studies analysing CSAM possession cases, over one-third of individuals who had been arrested for CSAM possession had also engaged in the distribution of CSAM (Wolak, Finkelhor & Mitchell 2011; Wolak, Finkelhor, Mitchell & Jones 2011).

There are also overlaps between offenders who produce and/or distribute CSAM and those who engage in contact (sexual) offending (Bickart et al. 2019; Bissias et al. 2016; Bouhours & Broadhurst 2011; Gewirtz-Meydan et al. 2018; Krone & Smith 2017; Krone et al. 2017; McManus et al. 2015; Shelton et al. 2016; Wolak, Finkelhor, Mitchell & Jones 2011). McManus and colleagues (2015) found that CSAM offenders (ie producers, distributors, and distributors/possessors) who had previously committed a sexual offence against a child were over seven times more likely to have produced CSAM than those with no previous history of contact sexual offences. Krone and Smith (2017) and Krone et al. (2017) found that the production or provision of CSAM, and being an administrator of a CSAM network, were also associated with contact sexual offending.

For some offenders, contact sexual abuse represents a necessary part of the CSAM production process (see Bickart et al. 2019; Gewirtz-Meydan et al. 2018; Krone & Smith 2017; Krone et al. 2017; McManus et al. 2015; Sheehan & Sullivan 2010). However, some producers of CSAM do so strictly online through the use of webcams, and thus do not themselves perpetrate contact sexual abuse (McManus et al. 2015). Nonetheless, a majority of victims (93%) in the study by Gewirtz-Meydan et al. (2018) reported that they experienced sexual molestation as part of the CSAM production process. Bickart et al. (2019) found that in some cases involving female perpetrators there was no direct physical contact with the victim (eg recording of CSAM-related images and videos), whereas in others contact sex offences occurred.

Victim characteristics and victim–offender relationships

Gender is a key factor related to the likelihood of CSAM victimisation (de Santisteban & Gámez-Guadix 2018; Wolak, Finkelhor, Mitchell & Jones 2011). For example, Wolak, Finkelhor, Mitchell and Jones (2011) found a majority of victims were female children and adolescents. Sheehan and Sullivan (2010) reported that ease of access to a victim, along with the perception that the victim was vulnerable, influenced offenders in selecting specific CSAM victims.

The production of CSAM most often occurs in a context where the victim is known to the offender (Bickart et al. 2019; Gewirtz-Meydan et al. 2018; Prat et al. 2014; Sheehan & Sullivan 2010; Shelton et al. 2016; Wolak, Finkelhor, Mitchell & Jones 2011). Gewirtz-Meydan and colleagues (2018) found that in more than half (52%) of cases analysed the offender was a family member of the victim, and in 41 percent of cases the offender was an acquaintance. The same study found perpetrators of female victims were more likely family members whereas perpetrators of male victims were more likely to be acquaintances. In the study by Wolak, Finkelhor, Mitchell and Jones (2011) in only about one-fifth of cases the victim and offender met online, and in less than five percent of cases the perpetrator was a stranger.

In a study of female online CSAM offenders by Bickart et al. (2019), close to three-quarters (71%) of the 70 CSAM production cases analysed involved a victim who was the offender's child, and over three-quarters involved a male co-offender (77%). Prat and colleagues' (2014) qualitative examination of two case studies of female sex offenders showed their engagement in child sexual abuse, including CSAM production, was motivated by a desire to appease their partners and keep them sexually satisfied.

CSAM production also occurs in the context of online sexual solicitation and grooming by complete strangers (DeHart et al. 2017; de Santisteban et al. 2018; de Santisteban & Gámez-Gaudix 2018; Krone et al. 2017; Schulz et al. 2016; Quayle et al. 2014; Whittle, Hamilton-Giachritsis & Beech 2015; Wolak & Finkelhor 2013; Wolak, Finkelhor & Mitchell 2011). In a Spanish study, de Santisteban and Gámez-Guadix (2018) found that 6.5 percent of adolescent students reported that they had received requests from adults online for sexual depictions of themselves, and 1.1 percent of adolescents stated they had provided such material. In a study of 137 individuals who had been identified as having engaged in the online sexual solicitation of a minor, half (49.4%) reported receiving sexual photos from a minor (Schulz et al. 2016).

In the study by de Santisteban and Gámez-Guadix (2018), older female adolescents were significantly more likely than other adolescents to receive online requests for sexual images or videos. Just over 1.5 times as many girls as boys reported receiving such requests from adults (15.6% of girls vs 9.3% of boys), but almost equal proportions of boys and girls reported actual sexual interactions with adults online (8.2% of girls and 7.4% of boys). There were few overall differences in factors associated with receiving sexual solicitations from adults online and subsequently engaging in sexual interactions with adults online, but there was potentially a unique pattern of internet use that may be associated with both. They also showed that the exchange of CSAM is also a central part of the grooming process for contact sex offenders. The sharing process is thought to engender a bond with the victim, demonstrating that there is nothing inherently wrong or unnatural about sexual acts, and potentially providing material with which to blackmail the victim if they do not cooperate.

Offence characteristics

CSAM production occurs in a variety of contexts such as intrafamilial relationships, as well as online grooming and solicitation (see Wolak, Finkelhor, Mitchell & Jones 2011). The most common producer tactics identified by Wolak, Finkelhor, Mitchell and Jones (2011) involved coercion and pressure or using romance or a friendship to persuade the victim. In roughly one-quarter to one-fifth of cases, producers used alcohol or drugs to gain victim compliance or covert methods such as hidden cameras in change rooms. Only a minority of cases (less than 6%) involved the threat or actual use of violence.

Another context that has been identified as a site for CSAM production is child sex trafficking. Reid (2016) showed that sex traffickers not only engaged in the prostitution of minors but also actively created sexually explicit photos of them. In some cases, traffickers were sharing these photos on the internet or using them to blackmail the victims, as part of the overall crime commission process associated with sex trafficking. In effect, CSAM production can be used as a tool to gain control over victims to facilitate other forms of child sexual exploitation (eg prostitution). In short, not all offenders who produce CSAM do so for the purpose of selling the images.

Women's involvement in CSAM production may be characterised by different risk factors from male perpetrators, such as relationship dynamics where the woman's male partner is engaging in CSAM production and coercing her to participate, or where she is a willing co-offender (Bickart et al. 2019; Prat et al. 2014). Male perpetrators, on the other hand, have reported motivations including sexual arousal, gaining power over victims, facilitating social relationships with other offenders, and increasing their self-esteem (Sheehan & Sullivan 2010). It is often part of a broader grooming process associated with contact sexual offences. Not all offenders who produce CSAM engage in its distribution; for some, the production of CSAM is purely for personal use (Sheehan & Sullivan 2010; Wolak, Finkelhor & Mitchell 2011). Unfortunately, more specific information pertaining to CSAM distribution specifically was not uncovered in this review.

Technologies used in the online distribution of CSAM

Webpages are a key platform through which CSAM is hosted and distributed. Westlake and Bouchard (2016) identified 10 CSAM related networks comprising 4,831,050 websites by following hyperlinks on known sites. Despite the seemingly obvious risks associated with hosting CSAM on webpages, many websites with such material do not even attempt to avoid detection by masking the content or purpose (Westlake, Bouchard & Girodat 2017).

Another online platform for CSAM distribution is P2P networks (Bissias et al. 2016; Bouhours & Broadhurst 2011; Krone et al. 2017; Wolak, Finkelhor & Mitchell 2011). Bissias et al. (2016) analysed five P2P networks and estimated that in December 2014 there were around 840,000 peers sharing CSAM worldwide, with approximately three out of 10,000 internet users engaged in the distribution of CSAM across these networks. While there is evidence of international distribution of CSAM over P2P networks, much of the content may often be shared locally; Bouhours and Broadhurst (2011) found the ethnicity of CSAM victims and perpetrators often reflected the perpetrator's country of origin.

Discussion and conclusion

There is a crucial overlap between child sexual abuse and CSAM production. While the latter necessarily requires the former, the opposite is not true, and this is an important point for several reasons. There are similar individual and historical risk factors for child sexual abuse and CSAM production and distribution. Different patterns of male and female involvement in CSAM production also mirror, to some extent, gender differences in the modus operandi and motivations of male and female offenders of child sexual abuse (see, for example, Beech et al. 2009). Finally, the average age of perpetrators of CSAM production and distribution approximates the average age of adult perpetrators of child sexual abuse (mid-adulthood; Lussier & Cale 2013). However, there are also unique risk factors that may drive CSAM production aside from individual motivations specific to the abuse (sexual pleasure, power etc). Other motivations for CSAM production include profit; material can be produced with ease, without having to get involved with sex trafficking networks and organised crime, and without ever leaving the home.

It is possible that a majority of CSAM material involves victims and perpetrators who are known to one another, and often are related. Here, the production of CSAM may be motivated by a desire to consume the produced material, to share it with other offenders and gain status in offender circles, or to profit monetarily. In cases where victims and offenders are acquainted, access to victims and compliance strategies typically involve deceit and manipulation rather than violence.

In contexts where the victims and offenders are not known to one another, offenders may target children they perceive to be vulnerable in online contexts (see also Leclerc & Cale 2015). Some seek online sexual encounters or materials, others attempt in-person meetings, some use the internet specifically to meet children for the purpose of CSAM production, and others seek to purchase CSAM for their own consumption (see, for example, DeHart et al. 2017). CSAM production is perpetrated in a variety of contexts. The material is produced and distributed for commercial or non-commercial purposes and, in some cases, social purposes. Subsequently, distribution may be active or passive; the former, which arguably is the primary focus of current laws and policies, applies to those individuals who intentionally distribute material to others for some of the reasons discussed above. The latter, however, may occur when someone uses a P2P network to download CSAM content without realising that their files can be accessed by others in the network.

This necessitates unique prevention and disruption strategies because there are likely different risk factors for different CSAM production and distribution contexts. Holt, Blevins and Burkert (2010) point out that technological advancements have made it easier for offenders to go undetected, resulting in a lack of 'capable guardians' in the online context. While the results of the current review were focused on websites and P2P networks as the key sites of distribution, it is worth noting that there are many other contexts where CSAM is being shared. Other emerging technologies are changing the landscape of CSAM production and distribution (eg virtual reality, the darknet, live streaming; see Maxim et al. 2016). CSAM distribution as an offence type is ever-changing and the technology used is evolving constantly. This study was a systematic review of published academic studies, and thus revealed a gap in research that focuses on new methods of CSAM distribution that have been reported by police and media. For example, these include distribution methods such as cloud storage, messaging apps (eg Facebook Messenger, WhatsApp) and social media platforms (Burn 2018); CSAM has even been identified on bitcoin's blockchain (Gibbs 2018).

As technological innovation continues to shape the production and distribution of CSAM, law enforcement organisations are increasingly limited in their ability to intervene (Broadhurst 2019; Bursztein et al. 2019). The rise of Tor and the darknet has given perpetrators a level of anonymity that makes investigations difficult. In addition, some law enforcement methods used to work around encryption and identify offenders may violate their legal protections (Broadhurst 2019).

As encrypted communication applications such as Signal and Telegram become more popular, the challenges facing investigators dealing with CSAM cases may only increase (Broadhurst 2019). Thus, new research must focus on emerging methods of CSAM distribution and how offenders operate using these technologies.

One way to bolster prevention and intervention efforts is through crime scripting. This involves breaking down CSAM production and distribution step-by-step to systematically identify different processes through which offenders perpetrate these crimes (see Cornish 1994; Leclerc 2016, 2017). Fortin, Paquette and Dupont (2018) recently scripted the pathways from consumption of adult pornography, to consumption of CSAM, to CSAM distribution, to child luring, and eventually to child sexual abuse and CSAM production. In effect, scripts highlight heterogeneous pathways to different aspects of CSAM offending. This exercise generates two key outcomes:

- step-by-step accounts of the crime commission process related to CSAM to further our understanding of how offenders operate; and
- a framework for thinking of and applying detection, investigation and prevention strategies to disrupt these crimes.

Crime scripting boosts the capabilities of experts, online investigators and law enforcement by given them a simple framework that breaks down complex processes and stimulates thinking for crime prevention, which can lead to a reduction in CSAM.

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Table A1: Summaries of studies included

Study	Country[a]	Sampling	Relevant findings
Bickart et al. (2019)	USA	▪ Purposive sample ▪ 98 women serving a federal sentence for online CSAM	▪ 71% (*n*=70) engaged in CSAM production (32% non-contact and 40% contact) ▪ 71% of CSAM production cases involved a victim who was the offender's biological or adopted child, 77% involved a male co-offender
Bissias et al. (2016)	Multi-country	▪ Purposive sample ▪ 5 P2P networks (BitTorrent, eDonkey, Ares Galaxy, Gnutella and Gnutella2) ▪ 17,576 arrests for P2P CSAM	▪ An estimated 840,000 individuals shared CSAM on identified networks in 2011, growing to 1.3 million in 2014. ▪ 3 out of 10,000 internet users were estimated to be sharing CSAM on these networks. ▪ Popularity of each network differed between countries. ▪ Approximately 9.5% of individuals arrested for possession of P2P CSAM had engaged in offline contact sexual offending.
Bouhours & Broadhurst (2011)	Multi-country: Australia, Italy, New Zealand and USA	▪ Purposive sample ▪ 103 individuals arrested for downloading/ exchanging CSAM on P2P networks. Individuals were identified from a Virtual Global Taskforce database	▪ Popularity of each P2P network differed across countries. ▪ 60% were involved in distribution or trade of CSAM, 18.4% of these individuals also engaged in CSAM production.
Clevenger, Navarro & Jasinski (2016)	USA	▪ Nationally representative sample ▪ 755 arrest cases (99% male) for online CSAM or sex offences from Wave 2 of the National Juvenile Online Victimization (N-JOV) study	▪ CSAM producers and distributors were more likely than sexual exploitation of a minor offenders to be 30–39 years old, or above 50 years old, to have direct access to a minor and to have low self-control. ▪ They were also more likely than CSAM possessors to have displayed these same low self-control behaviours.

Table A1: Summaries of studies included (cont.)			
Study	**Country[a]**	**Sampling**	**Relevant findings**
de Santisteban et al. (2018)	Spain	▪ Purposive sample ▪ 12 male offenders convicted of online grooming who had committed contact sex offences against the victim(s)	▪ Solicitation and/or exchange of sexual photos was part of the online grooming process. ▪ Some offenders requested and/or exchanged sexual photos with the victim to get them more involved in a relationship with them. ▪ Receipt/exchange of photos was a goal of the grooming process.
de Santisteban and Gámez-Guadix (2018)	Spain	▪ Cluster sample ▪ 2,731 adolescents 12–15 years old (48.3% male; 50.6% female)	▪ 6.5% of respondents reported that an adult had requested sexual pictures or videos of them online, 1.1% stated they had sent photos or videos. ▪ Female respondents were significantly more likely to receive such requests than male respondents (10.0% vs 2.8%). Prevalence of such requests also increased with age. ▪ 2.6% were asked by an adult to engage in cybersex.
DeHart et al. (2017)	USA	▪ Convenience sample ▪ 200 CSAM offenders' online communications with undercover investigators	▪ Four groups of CSAM offenders identified: (1) cybersex-only offenders, (2) offenders who engaged in cybersex and also attempted to schedule a meeting, (3) offenders who only engaged in scheduling, and (4) buyers of child sex. ▪ Differences in the proportion of offenders who sought explicit photos of victims were found, with the second group having the highest proportion of such offenders (48%).

Table A1: Summaries of studies included (cont.)			
Study	**Country[a]**	**Sampling**	**Relevant findings**
Gewirtz-Meydan et al. (2018)	USA	▪ Convenience sample ▪ 133 adult survivors of CSAM production (33% male; 64% female; 2% transgender)	▪ Majority of survivors (83%) were 12 years old or younger when their victimisation began. ▪ For 52% of survivors, the offender was a family member, for 41% the offender was an acquaintance. ▪ Only 1% had met the offender online. ▪ Male survivors were more likely to report acquaintance offenders, female survivors were more likely to report familial offenders. ▪ 93% reported that sexual molestation was part of CSAM production. ▪ In 74% of cases, the offending had gone on for over a year. ▪ 48% stated that the illegal images were given to or shared with other persons.
Krone & Smith (2017)	Australia	▪ Convenience sample ▪ 152 subjects of AFP investigations of online child sex offences	▪ Engaging in the provision of CSAM, having an index offence conviction for CSAM production, having a history of CSAM production charges, and having a CSAM offending networking role were associated with contact offending
Krone et al. (2017)	Australia	▪ Convenience sample ▪ 152 subjects of AFP investigations of online CSAM related offences	▪ 86.8% of CSAM was produced in a domestic environment. 50.0% was produced in a public place, 44.1% in a commercial or professional studio environment. ▪ Majority of offenders did not use secure online communications. Those who did used web-based or internet service provider email services, and anonymisers.

Table A1: Summaries of studies included (cont.)			
Study	**Country[a]**	**Sampling**	**Relevant findings**
McManus et al. (2015)	UK	▪ Stratified opportunistic sample ▪ 244 males convicted of CSAM offences	▪ Individuals with prior CSAM conviction and child sexual abuse conviction (dual offenders) were more likely to have produced CSAM than non-contact CSAM offenders. ▪ Production by dual offenders was more likely to involve 'hands-on production'. ▪ Production by non-contact offenders was more likely to involve use of a webcam. ▪ No significant group difference in CSAM distribution was found.
Prat et al. (2014)	Canada	▪ 2 forensic psychiatric case reports of female child sex offenders. Both cases involved CSAM offending.	▪ One case involved CSAM production by a wife and husband. Victim was a girl the couple regularly looked after. ▪ One case involved a woman who possessed CSAM and who also sexually abused her children. Husband was a co-offender. ▪ Authors argue women's offending was motivated by a desire to do what their spouses wanted and to keep them sexually satisfied.
Quayle et al. (2014)	Multi-country: Italy and UK	▪ Purposive sample ▪ 14 male online grooming offenders	▪ Qualitative results revealed that CSAM was part of the online grooming process. Offenders reported exchanging photos with victims and leveraging their online relationship to solicit photos from them or to get victims to appear on webcam. ▪ Some offenders also stated that the victim had produced the images of themselves of their own accord.

Table A1: Summaries of studies included (cont.)

Study	Country[a]	Sampling	Relevant findings
Reid (2016)	USA	▪ Purposive sample ▪ 43 cases involving the sex trafficking of a female minor by a non-relative, and 10 social service providers	▪ Results showed that sex traffickers were not only prostituting victims but were also creating CSAM images of them. ▪ In some cases, the images were shared on the internet without the minor's consent, and there was also evidence that traffickers used the images to blackmail minors.
Schulz et al. (2016)	Multi-country: Germany, Finland and Sweden	▪ Convenience sample ▪ 2,828 internet users (49.3% men, 50.7% women)	▪ 4.8% of respondents reported that they had engaged in the online sexual solicitation of a minor. Of these, 49.4% reported receiving sexual photos as an outcome of solicitation, and 26.6% stated that cybersex had occurred. ▪ Neither victims' gender nor the way in which respondents were recruited into the study (ie recruited via websites with paedophilic content vs recruited via general websites) significantly affected the likelihood of either of these outcomes occurring.
Seigfried-Spellar (2014)	Multi-country: USA, UK, Australia and Canada	▪ Convenience sample ▪ 273 internet users (142 male, 125 female)	▪ 16 out of 273 internet users had consumed CSAM ▪ Exchangers of internet CSAM scored significantly higher on extroversion than searchers/viewers. ▪ Significant positive correlation between seriousness of CSAM offending and conscientiousness.

Table A1: Summaries of studies included (cont.)

Study	Country[a]	Sampling	Relevant findings
Sheehan & Sullivan (2010)	UK	▪ Convenience sample ▪ 4 men convicted of manufacturing CSAM	▪ 2 of the 4 interviewees had produced CSAM of their child/ children. ▪ 1 produced CSAM of the child of a friend. ▪ 1 produced CSAM of children unknown to him. ▪ Risk factors for offending included: early childhood sexual contact, experiencing childhood sexual victimisation, social isolation, accessing pornography at an early age, experiencing cognitive distortions, overcoming emotional barriers to offending, and having sexual fantasies of children from a young age. ▪ Ease of access to victim, and a perception that the victim was vulnerable, influenced victim selection. ▪ Manipulation techniques were used to gain access to victims and to make victims feel responsible for their victimisation. ▪ Interviewees also engaged in other forms of sexual offending. ▪ Motivations for producing CSAM included: sexual arousal, gaining power and control over victims and other offenders, facilitating social relationships with other offenders, and increasing self-esteem. ▪ Not all shared their content.

Table A1: Summaries of studies included (cont.)

Study	Country[a]	Sampling	Relevant findings
Shelton et al. (2016)	USA	▪ Convenience sample ▪ 251 online CSAM cases (100% male)	▪ 10% (*n*=26) had engaged in CSAM production. 25 of these individuals had also committed a contact offence. ▪ The victim–offender relationship in 54% of production cases was familial. 29% were acquaintances, and 21% had met online.
Westlake & Bouchard (2016)	Multi-country	▪ Snowball sample ▪ 10 CSAM-related networks comprising 4,831,050 websites (hyperlinks from seed CSAM-related websites were followed to identify other related websites)	▪ Two large CSAM networks and several smaller networks were identified. ▪ The majority of communities were focused on boys as opposed to girls and had non-explicit as opposed to explicit sexual material, with images as their main distribution medium. ▪ Community characteristics were not affected by seed websites' characteristics.
Westlake, Bouchard & Girodat (2017)	Multi-country	▪ Snowball sample ▪ 634 websites connected through hyperlinks to a CSAM website	▪ Manual observation of the websites successfully identified 31 of the 33 websites with CSAM images, suggesting that most CSAM-related websites did not make much effort to mask their content and purpose. This did not appear to affect the survival of websites with CSAM images over 14 months. ▪ The most common mediums of CSAM were images and videos, with the latter either being directly hosted on websites, or embedded on them.

Table A1: Summaries of studies included (cont.)

Study	Country[a]	Sampling	Relevant findings
Whittle, Hamilton-Giachritsis & Beech (2015)	UK	▪ Convenience sample ▪ 3 offender–victim dyads from 3 online grooming cases	▪ Offenders and victims had differing perceptions about whether the solicitation of sexual photos/videos had taken place and, if so, who had initiated it. ▪ In one example, one offender reported that no such solicitation had taken place, while the victim reported that the offender had initiated it. ▪ In another example, the offender stated that no such solicitation had taken place while the victim stated that she had initiated it. ▪ In the last dyad, the victim reported that the offender had initiated the solicitation, while the offender stated that they had both initiated it.
Wolak & Finkelhor (2013)	USA	▪ Stratified national sample ▪ Arrests for internet-related sex crimes in 2009 that involved online sexual communications (143 cases involving offenders who met their victims online (online meeting offenders), 139 cases involving offenders who knew victims in-person before offence (know-in-person online offenders)). Data were drawn from the N-JOV study.	▪ 47% of online meeting offenders and 58% of know-in-person online offenders had engaged in CSAM production. Many of these cases appear to involve situations where the offender had requested sexual images from the victims (47% of online meeting offenders and 50% of know-in-person online offenders).

Table A1: Summaries of studies included (cont.)

Study	Country[a]	Sampling	Relevant findings
Wolak, Finkelhor, Mitchell & Jones (2011)	USA	▪ Nationally representative sample ▪ 319 arrests for CSAM production—122 from Wave 1 (July 2000–June 2001), 197 from Wave 2 (2006). Data were drawn from the N-JOV study.	▪ Offender was typically known to the victim (approx one-third of the time), or a face-to-face acquaintance (approx one-third of the time). ▪ Approx one-quarter of cases involved an offender the victim had met online. ▪ In about 5% of cases the offender was a stranger or pimp. ▪ Most cases also involved contact sex offending. ▪ Tactics used by offenders included the use or threat of violence, coercion, or pressure, the use of romance or friendship, giving the victim substances, covertly producing CSAM, providing victims with money or other items, and blackmailing victims with produced CSAM images. ▪ Approx one-quarter had distributed the CSAM they produced. ▪ Most victims were girls aged 6–17 years. ▪ Most offenders were male, aged 26 years or over, white, employed full-time, and in possession of other CSAM they had not produced.
Wolak, Finkelhor & Mitchell (2011)	USA	▪ Nationally representative sample ▪ 5,385 arrests for internet-related CSAM possession (429 from 2000–2001, 605 from 2006). Data were drawn from the N-JOV study.	▪ 33% of CSAM possessors from 2000–2001 and 39% from 2006 had distributed CSAM. ▪ 31% from 2000–2001 and 38% from 2006 had distributed CSAM over the internet. ▪ 93% of CSAM possessors in 2006 who used P2P networks were CSAM distributors.

a: Studies were classified as 'multi-country' if they drew on samples from more than one country, or if they involved an analysis of online webpages/networks that could be accessed across multiple countries

Note: AFP=Australian Federal Police; CSAM =child sexual abuse material; N-JOV=National Juvenile Online Victimization; P2P=peer-to-peer

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2. Child sexual abuse material on the darknet: A script analysis of how offenders operate

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Introduction

Child sexual abuse material (CSAM, also referred to as child exploitation material) is the contemporary term used to describe child pornography (Bissias et al. 2016; Krone et al. 2017). The development of online technologies in recent decades has facilitated the distribution and consumption of CSAM over the internet (Brown & Bricknell 2018; Holt et al. 2020; Westlake 2020). While it is difficult to determine the true scope of online CSAM given the challenges associated with detecting such content, research suggests that online CSAM is ever-present on all portions of the internet (Westlake 2020). For example, in Bissias et al.'s (2016) study of five peer-to-peer (P2P) networks, the authors estimated that in one month approximately three out of every 10,000 internet users around the world distributed CSAM over these networks. More recently, the Internet Watch Foundation (2018) reported that between 1996 and 2018 it had removed over 400,000 webpages depicting child sexual abuse, with 105,047 of those webpages identified in 2018 alone.

The prevalence of online CSAM poses a threat to the health and wellbeing of both victims and broader society. The negative psychological impacts that child sexual abuse can have on victim–survivors have been documented (eg Bedi et al. 2011; Guha et al. 2019; Kendler et al. 2000; Turner et al. 2017). These include post-traumatic stress disorder (Bedi et al. 2011; Turner et al. 2017), depression (Bedi et al. 2011; Kendler et al. 2000; Turner et al. 2017), anxiety (Kendler et al. 2000; Turner et al. 2017), suicidal thoughts (Bedi et al. 2011; Turner et al. 2017) and substance use disorders (Kendler et al. 2000). In the context of online CSAM, the harms associated with the abuse can be exacerbated by the enduring nature of the material. As Gewirtz-Meydan et al.'s (2018) study of CSAM survivors found, the knowledge that images of them may still be circulating on the internet can cause adult survivors further distress as they fear that individuals will recognise them or think that they voluntarily engaged in the production of this material.

Moreover, the literature has highlighted the limitations of current techniques of disrupting online CSAM production and distribution. Not only do many law enforcement agencies lack the human capacity, resources and technologies under certain circumstances needed to keep up with online CSAM offenders (Franqueira et al. 2018; Holt et al. 2020), there is also evidence that CSAM investigators may experience adverse psychological outcomes (eg secondary traumatic stress, burnout) due to the nature of these investigations (Burruss, Holt & Wall-Parker 2018; Perez et al. 2010; Seigfried-Spellar 2018). All of this points to the need to generate knowledge that will enable the development of more efficient and effective methods of preventing and disrupting online CSAM production and distribution.

Despite the social and psychological harms associated with online CSAM, there is a dearth of literature examining specific crime commission processes that offenders undertake in creating and distributing such content (Westlake 2020). As a growing body of literature demonstrates, developing knowledge about crime commission processes can inform crime prevention initiatives, as they allow for a deeper understanding of how situational and environmental factors can influence opportunities for offending, offender decision-making and methods of offending (eg Chiu, Leclerc & Townsley 2011; Chiu & Leclerc 2016; Cornish 1994; Leclerc, Wortley & Smallbone 2011). This has the potential to enhance law enforcement techniques for investigating, detecting and preventing online CSAM production and distribution. As such, this study aims to undertake the first empirical crime script analysis to uncover the steps taken by offenders who engage in online CSAM on the darknet.

Online CSAM production and distribution

Before the advent of the internet, CSAM tended to be produced by individuals with direct physical access to victims and distributed in hardcopy formats such as magazines, physical films and photographs (Jenkins 2001; Wortley & Smallbone 2012). The rise of the internet has transformed the way in which CSAM is produced and distributed, providing a virtual platform through which offenders gain access to victims and circulate and share content anonymously and to larger audiences (Jenkins 2001).

Today, offenders have access to technologies such as digital cameras, webcams and smartphones that enable them to create CSAM and upload the material to the internet at little cost and with little effort (see Wortley & Smallbone 2012). Additionally, there is evidence that the growth of virtual spaces has facilitated new methods of CSAM production. For example, offenders may engage with minors online and ask them to supply indecent/sexual images or videos of themselves (de Santisteban & Gámez-Guadix 2018; DeHart et al. 2017; Schulz et al. 2016). Therefore, offenders no longer need to be in close physical proximity to victims in order to commit an offence, but only require online access (eg internet chat rooms, email, social networking platforms) to communicate with minors. To this extent, the internet has removed many of the barriers to accessing victims and producing CSAM that offenders traditionally faced.

Similarly, the offline distribution of CSAM has now largely been superseded by a range of online distribution methods (Jenkins 2001; Westlake 2020). A recent Internet Watch Foundation (2018) report indicated that most webpages hosting CSAM were image-hosting websites (82%), followed by cyberlockers (file-hosting sites, 5%), and banner sites (4%). Other types of webpages that were identified as hosting such material included blogs, websites, forums, search providers, image boards, video channels, and social networking sites (Internet Watch Foundation 2018). As these findings show, offenders can now exploit a variety of online platforms to distribute CSAM (Westlake 2020).

When discussing the online distribution of CSAM, it is important to distinguish between distribution that occurs via the clear web and that which takes place on the darknet. Each distribution site gives offenders different methods of evading detection and reflects varying levels of offender sophistication. The clear web refers to the portion of the internet that is indexed by search engines and easily accessible to members of the public (Martin et al. 2020; Weimann 2016). The darknet is the segment of the internet that is hidden from the general public. Individuals typically use dedicated browsers such as The Onion Router (Tor) or I2P to access it (Martin et al. 2020; Weimann 2016). These software tools operate by randomly routing users' internet protocol (IP) traffic through other users' IP addresses, effectively reducing the risk that an individual's online behaviours can be identified. Thus, offenders perceive this as an environment where the risk of detection is low and therefore operate with greater impunity (Haasz 2016; Weimann 2016; Westlake 2020).

Crime script analysis

The ways in which the darknet has changed the landscape of CSAM production and distribution warrants the development and application of a novel framework to increase the capabilities of law enforcement to investigate, detect and prevent this phenomenon (Cale et al. 2021). In this context, new knowledge about how offenders operate is critical. Crime script analysis represents one method of understanding how offenders proceed with their crime, which can generate insights into how they can be stopped (Cornish 1994). A crime script breaks down crime commission processes into a series of steps. Once a crime script has been mapped, each step of the script provides a potential intervention point to disrupt crime (Cornish 1994; Leclerc 2014). In addition, identifying more steps generates more intervention points, and therefore stopping crime is more likely.

Crime script analysis draws on the rational choice perspective, which conceptualises offending as purposive and calculated—arising in situations where offenders perceive that the benefits associated with committing a crime outweigh the potential risks and costs involved (Cornish & Clarke 1986; Leclerc & Wortley 2014). Rational choice perspectives are closely linked with situational crime prevention, which aims to reduce offending opportunities by altering the environment so that potential offenders assess the risks of offending are greater than the benefits (Cornish & Clarke 1986, 2003). Crime scripting can inform situational crime prevention—the step-by-step breakdown of a crime commission process allows for the identification of points of intervention where preventive approaches can be implemented to disrupt offending online or offline (eg Brayley, Cockbain & Laycock 2011; Chiu & Leclerc 2016; Chiu, Leclerc & Townsley 2011; Hutchings & Holt 2015; Leclerc, Wortley & Smallbone 2011).

Scripting online CSAM production and distribution

Despite the potential benefits of scripting online CSAM production and distribution processes, there has been a lack of empirical research focusing on developing such scripts. Fortin and colleagues' (2018) work on online child sexual exploitation used a script approach to examine the literature on the topic. In that study, the authors outlined how motivated CSAM offenders may start out by consuming adult pornography before transitioning to online CSAM when they learn that they can access such content over the internet. From there, offenders may escalate their involvement with online CSAM, engaging in its distribution, and may eventually produce such material and commit contact child sexual abuse offences (Fortin, Paquette & Dupont 2018).

The review by Fortin, Paquette and Dupont (2018) provides evidence on how context-specific factors can facilitate online CSAM distribution and production and the need to look at the different actions taken by offenders. However, as the study reviewed the literature rather than using empirical data collected for generating scripts, a critical need for crime script analysis of how offenders operate when distributing and producing online CSAM remains. This study sought to address this gap by conducting interviews with online investigators working in the field of CSAM.

Aim

The ultimate objective of this project is to boost the capabilities of online investigators to investigate, detect and prevent the production and distribution of CSAM in an efficient and practical way. One way to achieve this goal is to use crime scripting, which is a powerful evidence-based method to address crime problems because it offers a systematic, simple and practical template to map out solutions. Consistent with the aims of the Australian police agencies to fight CSAM, we seek to pursue the protection of children and vulnerable persons from CSAM through the novel approach of crime scripting. In this study, we present the three phases of the crime script for producing and distributing CSAM on the darknet. Finally, we highlight the benefits of this approach for investigation, detection and prevention purposes. To our knowledge, no empirical study has examined CSAM crime scripts from the perspective of online investigators operating on the darknet—arguably the most accurate and reliable data source with which to construct crime scripts in this context.

Method

Sample

Australian policing jurisdictions were invited to participate in a project funded by the Australian Institute of Criminology to examine how offenders operate to distribute and produce CSAM online. We recruited 11 online investigators from Queensland Police Service, five from South Australia Police, four from the Australian Federal Police and nine from the Western Australia Police Force (*n*=29). A total of six interviews were retained for this study as these interviews involved law enforcement officers who specifically conducted online investigations into CSAM on the darknet—the phenomenon scripted in this study. Other online investigators operated on the clear web and were thus not included in the current study.

The average length of time investigators working on the darknet had been employed by the police at the time of the study was 15.66 years. In terms of experience, these investigators had been working on CSAM for an average of 4.83 years and had previously worked in the field of sexual assault for 2.83 years on average. These investigators had worked on other types of crime online for three months on average as well. The average age of investigators was 41.66 years. Four investigators were male and two were female.

Procedure

University ethical approval and approval from each of the research committees from the relevant jurisdictions was obtained. Each police jurisdiction was first approached through a contact person (eg team leader of online operatives) who assisted with the recruitment phase of the project. Then, after approaching potential participants, the contact person provided us with a list of online investigators who agreed to participate in the project. The voluntary nature and independence of the research as well as the confidentiality of individual responses were communicated to participants and informed consent was obtained. No potential participants refused to participate in the project.

Data collection and analytical strategy

The most valuable, accurate and direct source of data to construct crime scripts of online CSAM is arguably online investigators themselves, as they can provide rich data on how offenders operate based on their experience and knowledge in this field. Before proceeding with the interviews, crime script analysis was first explained to the investigators and two examples of scripts were provided to ensure clarity of the framework.

Thereafter, each investigator was asked to describe the script adopted by offenders based on their experiences. The interviewer took detailed notes and, importantly, made a sketch of the script based on the data provided by the investigator. The interview did not progress in a linear fashion. During the interview, the interviewer guided the investigator to draw out the steps of the script from their perspective and the details of how each of those steps is executed. At multiple points during the interview, the interviewer summarised the information provided by the investigator to validate and ensure the accuracy of the script. The final product consisted of a sketch of the script involving three phases provided by the investigator and accompanying notes explaining the details of the script. These interviews were completed by the first author assisted on one occasion by a team member.

Following data collection, the scripts provided by investigators were entered into an Excel database which was used to generate the final script that best explains CSAM on the darknet. In other words, a 'mini-script' was created for each investigator as an initial guide before the final crime script was generated (see also Chiu & Leclerc 2016; Chiu, Leclerc & Townsley 2011). Using an Excel spreadsheet assisted us in organising the knowledge but also identifying offending patterns in the data, thus maximising our understanding of the script adopted by offenders.

Each interview was important as it permitted us to: (1) confirm and validate the data provided for scripting during other interviews, and (2) reconstruct the entire script by capturing each step of the script revealed during interviews. This process ensured that the final script as accurately as possible reflects how offenders operate (see also Chiu & Leclerc 2016; Chiu, Leclerc & Townsley 2011). For the purposes of this study, the script has been broken down into three phases.

Results

Crime script of CSAM offenders operating on the darknet

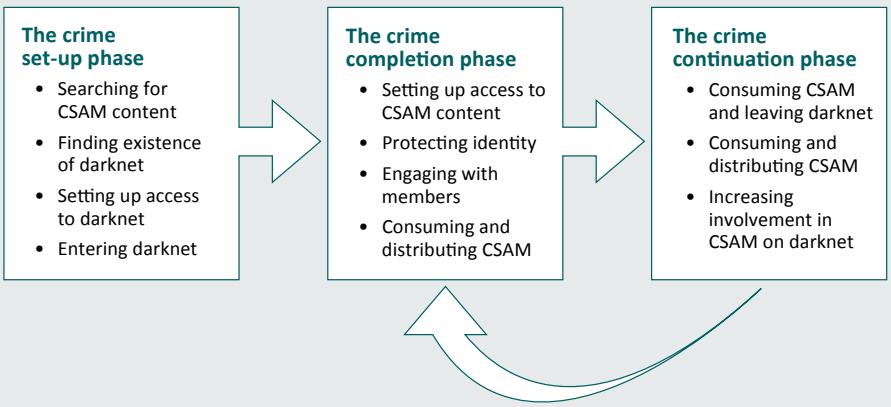
Figure 1 presents the crime script phases of how offenders operate on the darknet. The steps of the script have been grouped in three phases: (1) the crime set-up phase, (2) the crime completion phase, and (3) the crime continuation phase.

The crime set-up phase

Before accessing and operating on the darknet, CSAM offenders can have a wide range of motives for their offending behaviours including sexual gratification, the desire to explore sexuality with children, and/or validating their sexual interests. Many offenders are also seeking to interact with other individuals who share their interests, which supports their own interests in sexual activities with children (Holt, Blevins & Burkert 2010; Jenkins 2001; O'Halloran & Quayle 2010). Some offenders will also seek information on how to sexually abuse and manipulate children for this purpose (Holt, Blevins & Burkert 2010; Jenkins 2001; O'Halloran & Quayle 2010).

The crime set-up phase involves several steps. Before the first step of the crime set-up phase, there are several preconditions required for offenders to proceed. One precondition for CSAM offenders operating on the darknet is access to the internet and the ability to navigate the clear web in the first place. Rarely do offenders enter the darknet without first navigating the clear web (see Copeland, Wallin & Holt 2020; Martin et al. 2020). Once offenders with a certain propensity for CSAM are present on the clear web, they will simply search for CSAM by visiting adult pornographic websites, or searching for keywords via Google, as an example (Westlake 2020). Additionally, some learn about CSAM through discussion boards or forums on related topics (Jenkins 2001; Westlake 2020).

Figure 1: Crime script of CSAM offenders operating on the darknet



The crime set-up phase continues with offenders setting up their access to the darknet. Offenders will learn about the existence of the darknet before setting up their access. They may either stumble across information by accident or hear about it when searching for CSAM. Offenders may also learn about Tor through family, friends or websites such as Reddit and YouTube. Next, offenders will search for information about how to enter the darknet.

The crime completion phase

Once an individual has identified websites and forums that contain CSAM, they will then take the necessary steps to access these materials and set up their access to CSAM on the darknet. In some cases, individuals must create an account with a username and password to gain access to the site's protected content, as with other cybercriminal communities (eg Hutchings & Holt 2015). For many offenders, there is also a step during which they will protect their identity. Often, this will happen in response to recommendations made by other members of the community (see also Holt, Blevins & Burkert 2010). Next, offenders will engage with other members of the community, in much the same way as on regular social media platforms (eg making comments, using likes, sending private messages, posting links), which will provide a network critical for engaging in CSAM (Krone & Smith 2017), and lead them to consume and distribute CSAM based on their preferences.

The crime continuation phase

Offenders will then generally proceed in one of the following three ways: (1) consume CSAM and leave the darknet, (2) consume and distribute CSAM, or (3) increase their involvement in CSAM on the darknet. The first way simply involves offenders who will typically consume CSAM but leave the darknet for various reasons, which may include the difficulty of navigating the darknet or a lack of interest in interacting with other offenders on the darknet. The second possibility involves offenders who will repeat the above process and engage more actively in consuming and distributing CSAM on the darknet. For these offenders, the crime completion phase of the script is repeated over time as they find a platform to express themselves and engage with other offenders who have the same sexual interests. The third way involves offenders who will increase their activity on the darknet and participate in communities of certain groups of offenders and eventually gain a higher status in those communities (see also Fortin, Paquette & Dupont 2018). They will also maintain their CSAM contribution (eg by distributing) and look to join other community boards.

Discussion

Crime scripting CSAM on the darknet

This study provides, to our knowledge, the first empirical crime script of how CSAM offenders operate on the darknet. The script is characterised by three phases. Offenders have to set up their access to the darknet prior to consuming and distributing CSAM. Commonly, before offending on the darknet, CSAM offenders spend some time consuming this material on the clear web, distributing and sexually exploiting young people online, which constitutes another script. In addition, some offenders will return to the clear web after offending on the darknet. This phase is critically important as these offenders are arguably more vulnerable to detection outside the boundaries of the darknet—that is, on the clear web. This offers intervention points for detection after CSAM has been produced for distribution on the darknet (Holt, Blevins & Burkert 2010; Westlake 2020).

This script, like others, is not perfectly linear. Some offenders may not follow all the steps contained in each phase of the script in the order depicted in Figure 1. Some of the steps in phase 1, such as setting up access to CSAM and protecting identity, may overlap or occur simultaneously as offenders learn about and interact with the darknet. This is not a challenge for stopping offenders. As long as we recognise the existence of those steps, they can be used for investigation and detection purposes. Moreover, how certain steps are executed by offenders may evolve over time, especially those related to the use of data and technologies, but our knowledge of how offenders operate may also evolve. This requires organisations involved in fighting cybercrime to make their culture more receptive to data and to set up a systematic process to collect and use data efficiently (Hutchings & Holt 2015; Leclerc & Cale 2020). If we keep track of and record how offenders commit their crimes over time, we can develop additional crime script steps to create new intervention points, which will reveal other ways to disrupt crime. The script can be adapted according to how offenders' methods evolve over time (Leclerc 2014).

Boosting law enforcement capacity to detect, investigate and prevent CSAM on the darknet

A logical step for future research is to examine the process step-by-step rather than each phase of the crime script, which would uncover all the actions undertaken by offenders and thereby boost the capacity of online investigators, or any individuals or institutions working to prevent this crime. The steps offenders take to set up their access to the darknet and CSAM give us critical information on how offenders are using information technology skills for their crimes. It is imperative that police organisations keep investigators up to date with evolving technologies through training to facilitate their work online. Once the steps in each phase of the script have been examined, it will be possible to think of and use those steps as potential intervention points. Similarly, the data circulated and shared on the darknet between offenders on how they produce CSAM could be collected in a systematic fashion to enhance the current script and then re-used for training purposes. In fact, many of the script steps represent promising data points that can be leveraged by the police (see also Lee & Holt 2020).

The crime script outlined here can serve educational functions and be used as part of a development program to rapidly upskill new and upcoming online investigators on how CSAM offenders operate specifically. As indicated by Marcum and her colleagues (2011, 2010), specialised training on CSAM is critical to combat this phenomenon, especially in a context where human and financial resources are limited. These studies suggested that specialised training in cybercrime significantly increased CSAM arrests in 2007 but not in 2008. It is critical to note that the cybercrime training evaluated in these studies did not focus on CSAM activities or processes specifically. In fact, no information was available as to the training content (whether and how CSAM was covered), training length or the qualifications of the individuals administering the training, which only reinforces the need to design targeted training programs on CSAM processes to enhance investigators' capacity to address this phenomenon. Knowledge of CSAM processes could also be disseminated among online investigators operating in different jurisdictions nationally and internationally, regardless of their experience. Moreover, scripting can be used to identify historic failure points of investigations, allowing police to improve their online operations and/or make a stronger case to higher management about the complexity and priority of CSAM investigations and the need to increase the resources deployed to address this crime. Finally, crime scripting can set an international benchmark on how to understand and approach the CSAM problem.

Conclusion

The challenge we are facing as a society is that CSAM will not dissipate regardless of the tools employed by the public and private entities who police the internet (Lee & Holt 2020; Westlake 2020). The statistics on the prevalence of CSAM are alarming and are likely to increase as the internet becomes accessible to more and more people. In addition, CSAM arguably generates more child sexual abuse than ever before as many offenders are finding a relatively safe space to express their interests. Moreover, without diminishing the negative psychological impacts that CSAM has on victims (eg Bedi et al. 2011), online investigators working in the CSAM field may also experience negative consequences somewhat similar to those observed among victims (Burruss, Holt & Wall-Parker 2018; Perez et al. 2010). In other words, CSAM leads to negative consequences for societal wellbeing globally.

Crime script analysis assists in better understanding, investigating, detecting and preventing crimes. Scripting is a practical method to develop concrete ways of addressing this problem—and is easy to apply to real cases. It fits well with the work led by the Australian Federal Police, who recently established the Australian Centre to Counter Child Exploitation.

There are several steps that can be taken from here. First, in addition to the points above, the ways CSAM offenders operate on the clear web can also be mapped using crime scripts. This would not only provide a framework to address CSAM on the clear web but also make better sense of the whole CSAM process, which often involves both the clear web and the darknet. Second, there is a need for crime scripts to be used by police agencies in collaboration with others involved in cybercrime investigations who may come across evidence of CSAM (eg those in the banking industry). Third, and related to the previous point, online investigators are dedicated to combatting CSAM despite the many challenges they face during their work, such as lack of time and insufficient staff. There is a need to be more responsible as a society and to facilitate their work by ensuring and protecting their wellbeing, providing them with more resources (human, financial, technological) and creating channels for the transfer of knowledge and expertise among them.

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3. Online child sexual offenders' language use in real-time chats

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The development of effective criminal justice responses to online sexual offending against children requires a good understanding of how these crimes occur. In this study, we examined the offending process through the lens of typed communication between offenders and child victims within web-based and instant messaging conversations ('chat logs'). Our aim was to better understand how offenders engage victims through written dialogue and how they attempt to elicit children's compliance with sexual requests.

From an intervention and prevention perspective, understanding the content and style of offender dialogue in chat logs could assist in several ways. First, it provides psychologists with an ecologically valid, generic snapshot of offenders' drives and cognitions immediately prior to and during offending, as opposed to relying on offender self-reports about their behaviour and strategies. Second, a comprehensive understanding of dialogue tactics assists software developers in working out what words or phrases should be used in broadscale message scanning designed to identify offenders. Third, understanding offenders' verbal tactics and requests assists covert law enforcement officers who play the role of children to anticipate the types of requests and dialogue they will confront, so they can plan useful responses.

To date, little prior research has analysed online sex offenders' discourse tactics in chat logs. As such, theories or frameworks describing online offender communication are unrefined and there is ambiguity around the online grooming construct (Bennett & O'Donohue 2014). Researchers in online offending have tended to conceptualise and interpret their work against frameworks originally developed to explain offline (contact) offending. One frequently cited example is the grooming subset of O'Connell's (2003) typology of 'cybersexploitation' (Aitken, Gaskell & Hodkinson 2018; Bennett & O'Donohue 2014; Black et al. 2015). This subset proposes five sequential stages that precede sexual abuse: friendship forming, relationship forming, risk assessment, exclusivity, and sexual act (ie the 'innocuous' introduction of sexual themes to develop trust). However, online grooming researchers that have relied on the model have not always found the five stages present (Williams, Elliott & Beech 2013) and some have reported a cyclical rather than sequential pattern (Lorenzo-Dus & Kinzel 2019; but see also Chiang & Grant 2017).

The problem with continued reliance on O'Connell's (2003) model is that online technology (as a forum for sexual gratification) has evolved over the past two decades, potentially changing offenders' expectations and ways of engaging with victims (Wager et al. 2018). While grooming has remained integral to contact offending that occurs within a known relationship, it may not feature at all in online sexual offending against children (Kloess, Hamilton-Giachritsis & Beech 2019). Indeed, it is possible to request or transmit sexual exploitation material without building a relationship with a victim at all (Henshaw, Darjee & Clough 2020). To guide the field further, researchers need to take a broad conceptual approach to online chat log analysis. A bottom-up perspective (as opposed to 'retrofitting' data interpretations to pre-existing models of offending) is warranted, while acknowledging the rapid way in which online technology can allow offenders to operate. Further, research needs to acknowledge changes in legislation over time such that language use in itself, such as requesting an image, can constitute a sexual offence, provided the person requesting the image believes they are talking to a child (see, for example, *Criminal Code Act 1899* (Qld), s 218B; *Criminal Law Consolidation Act 1935* (SA), ss 63A, 63B).

Research sample and methodology

We analysed the chat logs of 38 convicted child sexual offenders who had accessed victims through various social media sites for sexually exploitative purposes (Griffith University ethics approval Ref no: 2019/132). Three research questions guided our investigation: First, what verbal tactics or strategies did the offenders employ in their dialogue when engaging with children? Second, how were these verbal tactics sequenced within the individual chats? Third, were there any distinct patterns of tactic use within the cohort of individual offenders?

Sample of chats

The chat logs (*n*=38) were provided by two Australian police organisations and included offenders aged between 18 and 65 (*M*=30.57, *SD*=8.96) who were convicted of child grooming and sexual procurement of a child under 16 years of age. Each chat formed part of a police brief of evidence that led to the offenders' convictions. They were created between March 2017 and September 2019, and the duration of each chat (beginning to end) varied from one day to 174 days (*M*=41.11, *SD*=47.39, median=16 days). Offenders were located across Australia, the United States, United Kingdom, Europe and Asia.

All chat logs were in English and involved an offender corresponding with a single child victim after making a random friend request through a social media site (eg Facebook), social network post (eg Locanto) or group chat room (eg Kik). Each chat consisted of a group of discrete messages between the offender and victim, and the number of independent communication sessions ranged from one to 17. Sixteen offenders (42%) indicated a desire to make face-to-face contact. Child victims were 36 girls aged between 13 and 15 years (*M*=13.69, *SD*=0.58) and two boys aged 13 and 14 years. All offenders were aware of the child's age and gender from the exchange (it was typical for them to request this information).

Move analysis

When deciding the method of discourse analysis to use in this study, we scanned and debated the various approaches used in previous research. One approach—thematic analysis—classifies broad patterns in the text (themes) in accordance with their underlying meanings (eg Aitken, Gaskell & Hodkinson 2018; Kloess, Hamilton-Giachritsis & Beech 2019; Williams, Elliott & Beech 2013). An example of a theme might be 'emotional connection', which could be defined as dialogue that attempts to foster a close emotional bond with a victim (Aitken, Gaskell & Hodkinson 2018). Another approach includes the classification of individual words (eg 'boyfriend', 'erection') or phrases such as 'would you touch yourself?' (Black et al. 2015; Lorenzo-Dus & Kinzel 2019). All of the above-mentioned units of analysis have been used in past research to shed some light on the communicative function of language within grooming and sexual exploitation. For example, we have learned that offenders often, through their choice of words, reframe sexual assault as 'romance' and as 'beneficial to the victim' (see Lorenzo-Dus & Kinzel 2019: 4). These units of analysis, however, do not address offender dialogue as a *tactical manoeuvre* within an ongoing interchange between an offender and victim. We were particularly interested in the cognitive or functional elements of the offenders' messages within a sequence of dialogue crafted by each offender to gratify his sexual desires (Bhatia 1993).

Another form of analysis we observed, more suitable for our purpose, is 'move analysis' (Swales 2011). This method was used by Chiang and Grant (2019, 2017) to understand the communicative functions associated with the grooming process. A 'move' is a segment of text that after initial analysis is deemed to perform a single communicative function (eg 'defining the relationship'). Each move comprises lower-level strategies or steps (ie tactics). For ease of presentation, moves can be presented in colour-coded 'move maps', providing visual, sequential representations of the rhetorical exchanges (ie linguistic framework) between offenders and their victims, and variations in the order and frequency of the moves (see Chiang 2018).

Move analysis provides an ideal foundation for driving new conceptualisations of online offending because outcomes must be based on what emerges from the data rather than relying solely on comparing the findings to a pre-existing framework. For example, while Chiang and Grant (2017) found some overlap with O'Connell's (2003) grooming model using transcripts from perverted-justice.com, new findings were revealed even with their small datasets. Of particular note was the high frequency of sexually abusive behaviour in transcripts specifically selected to illustrate grooming. In their later study, Chiang and Grant (2019) reviewed 20 transcripts from genuine victims of a single offender and found two previously unreported behaviours—namely, overt persuasion and extortion. We suspect that the new findings may have emerged from the more sophisticated methodological approach, and that adopting this approach with a larger, more representative sample would greatly advance our understanding of the phenomenon.

Data coding

Our analysis followed a modified version of the 10 steps outlined by Biber, Connor and Upton (2007). The first two authors individually read a random sample of five transcripts and then collaborated to determine the purpose of the chats and function of segments of text. The unanimous agreement was that the rhetorical purpose of each offender's behaviour was persuasion, and this in turn shaped our interpretation of chat log text. A random sample of 10 new chats were then reviewed to develop a list of offender intentions (hereby referred to as 'tactics'). Seventy-two separate tactics were identified, with unanimous agreement on definitions achieved after four iterations. The full set of chat logs were then coded by the second author. The coding manual, containing all the tactics and definitions, is available on request.

Next, individual tactics were grouped according to the similarities or patterns that emerged, resulting in eight overarching moves in the offenders' behaviour. These moves are listed in the first column of Table 1. The same table also provides exemplars of tactics associated with each move.

Due to our prescribed manuscript word limit, we do not list all 72 tactics but rather a reconfigured (condensed) version of 38 tactics created for the purpose of an analysis reported later in this chapter.

Results

Prevalence of moves and tactics

Table 1 lists the offender 'moves' in descending order of prevalence across the 38 transcripts, with the prevalence of each tactic given in the second column. The tactic 'Indicates need for sexual activity' was most prevalent (35% of all moves). Tactics in this category were highly explicit (in some instances tending towards sexual aggression—for example, making reference to having anal sex with a child) and extended beyond grooming into the realm of sexually abusive behaviour. There appeared to be acute interest in the children's virginity.

The next most prevalent move was 'Manages resistance' (*n*=490). This move often co-occurred with 'Indicates need for sexual activity' such that it directly preceded (11%, *n*=53) or followed (56%, *n*=273) exchanges focused on sexual activity. The apparent function of these messages was to mitigate the intensity of a request (eg preceding a sexual request with flattery or an apology) or to appease a victim who had responded negatively to a request in an attempt to keep them engaged. These moves showed that offenders were engaging in a form of self-monitoring, recognising when the limits of boundary pressing had been exceeded.

Table 1 also lists the tactics associated with each move, along with examples of each tactic. Tactics were defined as either grooming behaviours or sexual exploitation/abuse, with half (19/38) meeting the latter criteria.

Table 1: Offender moves and tactics in order of prevalence

Move	*n* (%)	Tactics	Example
Indicates need for sexual activity	1,135 (35)	Hooks sexual reference into exchange (G)	My hobbies are travel, movies … and sex
		Implies need for sexual gratification (S)	Getting horny just looking at your picture
		Requests sexual act (S)	Can you hold my dick when we meet?
		Offers to engage in sexual act (S)	I would be gentle if we have sex
		Refers to engaging in own sexual act (S)	I'm watching porn and stroking my cock
		Refers to victim-only sexual act (S)	Rub yourself and tell me how it feels
		Refers to child's potential enjoyment in sexual activity (S)	You will really enjoy it .. you'll get horny as hell
		Refers to future sexual activity (S)	We can have sex for hours when we meet
Manages resistance	490 (15)	Checks child is OK (S)	Are we still good?
		Apologises, retracts statement, shows empathy (G)	Yeah sorry just curious; I understand. It's a big step to take
		Exerts pressures on victim to comply with sexual request (S)	You just have to tell me. Are we having sex when we meet? Yes or no
		Promises future relationship with child (S)	We could date as boyfriend and girlfriend
Establishes victim attributes	377 (12)	Asks child's age (G)	When did you turn 14?
		Checks child is alone (G)	Are your parents in the house?
		Asks if child has masturbated or been aroused (G)	Do you like to rub yourself and get turned on?
		Asks about child's genitalia and sexual attributes (G)	Do you have hair down there? What size are your breasts?
		Asks if child is a virgin (G)	Random question … have you had sex?
		Asks about child's clothing (G)	What colour panties are you wearing?
		Asks if child has interacted with a penis (G)	Have you ever touched a guy's dick?
		Asks about sexual activity with others (G)	Ever had your pussy eaten?
		Asks if child is OK dating older men (G)	Are you OK with me being older?
		Asks about child's sexual interests (G)	What would you like to do if I were there?

Table 1: Offender moves and tactics in order of prevalence

Move	*n* (%)	Tactics	Example
Defines relationship	326 (10)	Knowledge of/familiarity with offender (G)	I thought I knew you when you came up
		Refers to victim as sexually attractive (G)	Any picture of you would be sexy
		Uses non-sexual terms of affection (G)	You got it hunny
		Asks if victim is sexually attracted to him (G)	What do you think about me?
Acknowledges wrongdoing	254 (8)	Seeks victim's consent or expresses concerns about consequences (G)	You have to be in charge of saying what you want to try, ok?
		Indicates awareness of age differences or that victim is below age of consent (G)	Because I'm over 18 and you are under 14, its illegal
Transmits sexual materials	252 (8)	Requests image with clothes on (S)	Send me a pic. Anything.
		Requests image with clothes off (S)	I want to see what you look like naked.
		Sends image with clothes on (S)	That's me (on left) with my mates.
		Sends image with clothes off (S)	Big aren't I? [after image sent]
		Sends other sexual content (S)	Want to try this? [after video sent]
Seeks contact	230 (7)	Requests alternative electronic contact (S)	Can I call and teach you?
		Seeks a meeting in person (S)	I need to meet you in person
Asserts offender attributes	171 (5)	Mentions offender age (G)	Hello I'm 27 male from US
		Promotes sexual abilities and genitalia (S)	Yeah that's my big dick little miss
		States sexual preferences (S)	Tiny and tight is good

Note: G=Grooming; S=Sexual exploitation/abuse. Examples have been modified to enhance their meaning in isolation from the surrounding text

The move map

Figure 1 provides a visual representation of the sequencing of moves for 15 randomly selected chat logs out of the 38. Each of these bars, read from left to right, represents an offender's entire interaction with the child from the beginning until the end of contact. Moves (which incorporate the various tactics) are colour-coded and breaks in contact are denoted by a black line. Each move map is read as an individual case. For example, the first case, on line one, shows the offender had six exchanges with the victim while the last reveals a single exchange. In both instances, the 'Need for sexual activity' move (represented by the colour red) was introduced early and constituted a considerable proportion of the exchange.

The sequence of moves shown in these move maps also demonstrates that the chats were dynamic in nature. Engagement in sexual activity—played out in the 'Need for sexual activity' move—was quite rapid for some chats and there were constant shifts between moves. Even when offenders began their exchanges with efforts to gather information about their victim or define their relationship, chats quickly shifted to sexualised moves, and other exchanges were seemingly used to support or maintain access to or involvement in this move.

Figure 1: Move map of chat logs (random sample of 15 cases only)

Cluster profiles

We conducted further analysis to determine whether there were distinct offender subgroups in terms of tactic use. This analysis required a reduction in the number of tactics, which was done by combining similar tactics—for example, all comments made by offenders boasting about sexual prowess or genital size were recoded into the single tactic of 'sexual self-promotion'. The final pool consisted of 38 tactics, which are listed in column 3 of Table 1.

Cluster analysis, a method of data reduction, was then conducted (using hierarchical agglomerative variable clustering with furthest-neighbour linkage and Euclidean distance). The clustering of variables at each stage of the data reduction was first inspected to identify large increases in coefficients between each step. Next, the cluster profiles were examined for meaningful cluster differences to determine the simplest cluster solution. A three-cluster solution was both simple and interpretable, offering the clearest explanation for distinguishing between patterns in the dialogue used by offenders to manipulate victim behaviour.

To determine how the clusters differed with respect to the tactics, we explored how the pattern of dialogue was expressed as a function of cluster membership. A one-way between groups analysis of variance (ANOVA) was conducted using the 38 recoded tactics as independent variables and cluster membership as the dependent variable. The ANOVA revealed significant differences between the three groups with moderate to very large effect sizes for 24 of the 38 tactics (63%; eg from $F(2,35)=78.23$, $p<0.001$, $\eta^2=0.82$ for 'Requests sexual act' to $F(2,35)=3.83$, $p=0.03$, $\eta^2=0.18$ for 'Hooks sexual reference into exchange'). Given the lack of homogeneity of variance on half the recoded tactics, Blanca et al.'s (2018) procedure was followed to ensure robustness of the *F*-test to control for potential Type I errors. Once established, post hoc analyses were applied to find the source of between-group differences. This information, together with a qualitative analysis of individual cases within each cluster (performed by the second author), was used to develop the cluster profiles. The cluster profiles are described as follows.

Cluster 1—Impetuous (n=20)

These offenders, representing the largest group, engaged in 'hit and run' style behaviour. They spent the least amount of time online (*M*=2.85 communication sessions, *SD*=2.23; range=1–3 sessions). Their concern was *immediate* gratification of sexual needs, with sexual references and requests for images being introduced early—sometimes at the first point of contact. These offenders boasted about their sexual prowess, had little interest in meeting offline, and showed little concern for the legal consequences of their behaviour.

Cluster 2—Opportunistic (n=13)

These offenders, who spent the medium amount of time online (*M*=7.23 sessions, *SD*=4.29; range=2–15), displayed similar tactics to the other clusters. However, their behaviour seemed less overbearing and they appeared to have fewer preconceptions about how the relationship should progress. For example, if the relationship did not escalate beyond the initial sexual dialogue, these offenders seemed content to move on. The nature of the exchanges suggested they were more isolated and lacking in social skills than the other cluster profiles. Manipulative behaviours included low-level bribery, petulance, use of empathy to establish trust, promises not to disclose images transmitted by the victim, and passive-aggressive dialogue ('Oh well, if you don't want to, I'll go'). These offenders seemed just as focused on their own masturbatory and sexual practices as on the child's sexual interests and behaviour. They made more requests to meet offline than Cluster 1 offenders (although there was minimal planning), and they showed some concern for the legal consequences of their behaviour.

Cluster 3—Devious (n=5)

These offenders appeared fixated on the idea of having an underage sexual partner, and they had clear expectations about their victims (eg a young virgin willing to engage in particular fantasies). They spent the most amount of time online (*M*=13.40 sessions, *SD*=2.70; range=10–17). Offenders in this cluster used more intense descriptions of sexual engagement with the child, including offers to teach masturbation. The chat logs often included long commentaries of both imaginary (future) and contemporaneous sexual encounters. The offenders became aggressive when their needs were not met, but this aggression was interspersed with empathy, apologies and concern about the child's reactions. These offenders insisted on secrecy, made sophisticated plans to meet and were more acutely aware of the legal consequences of their behaviour.

Discussion

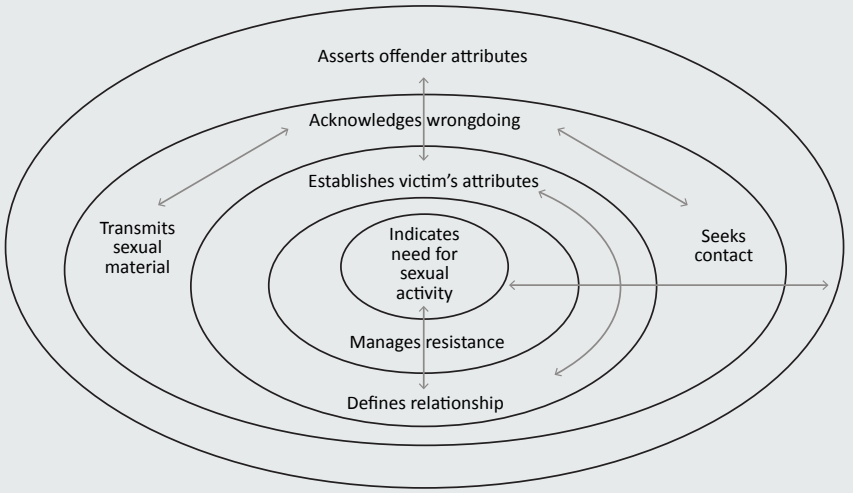
This study, which used move analysis and a large contemporaneous sample of chat logs to better understand how sexual offenders engage child victims online, revealed findings that are both similar to and distinct from those of previous research. One salient finding was the heavy emphasis on highly sexualised acts that would be classified as abuse, as opposed to grooming (eg friendship building). Although there was also evidence of grooming tactics similar in content to those discussed in prior literature (eg defining the relationship with the victim in affectionate terms, gathering information about the child's prior sexual experiences and assessing risk; Aitken, Gaskell & Hodkinson 2018; Black et al. 2015; Chiang & Grant 2017), the tactics relating explicitly to sexual activity were used most frequently throughout the chat logs (at least twice as often as any other tactic, including individual grooming tactics). The sexual content of the offenders' dialogue was frequently aggressive, describing violations that included oral and anal sex and submission to the offender as an authority figure. It is the intensity and centrality of abusive content in our offender–victim exchanges that distinguishes the dialogue from that described in prior work (but see also Kloess, Hamilton-Giachritsis & Beech 2019).

Further, this study found that offender tactic use was intermittent, without a clear structure or progression of steps. This finding differs from that of prior research, where themes or categories have been confined to progressive stages in each exchange. O'Connell's (2003) model, for example, proposes that offenders progress in a linear fashion from grooming to sexual exploitation. Subsequent researchers (who failed to replicate the linear model) proposed that offenders' strategies progress in a more cyclic fashion (Lorenzo-Dus & Kinzel 2019; Williams, Elliott & Beech 2013). In contrast, the progression of tactics in our chat logs is best described as haphazard. Many offenders showed rapid engagement in sexual content, reflecting an immediate need for gratification, with frequent shifts between tactics and no clear pattern or evidence of planning.

The shifting of tactics was due, albeit in part, to the use of a move which co-occurred (in close proximity) to the sexual content: 'Manages resistance'. When victims did not engage with extremely explicit or perverse requests, offenders displayed signs of self-monitoring. The offenders recognised that boundaries had been exceeded, leading them to retract statements, apologise, or promise not to disclose any images transmitted by the victim. If appeasement failed to elicit compliance, pressure became more overt (eg the offender threatened to break off contact or post any previously obtained images of the victim on a public website). At other times, sexual requests were preceded by the offender acknowledging that requests were 'wrong', which sometimes led victims to experience guilt and to revert to participating in sexual exchanges. This pattern of tactics was not predictable, as shown in the move maps. In other words, managing resistance sometimes preceded and sometimes followed sexual content, and was sometimes interspersed with other tactics associated with seeking contact or asserting offender attributes.

Rather than stages, we conceive the online child sexual offending process to be more of a gravitational pull towards sexual activity. We illustrate this process in Figure 2, borrowing the idea from the socio-ecological approach of Bronfenbrenner (1979), where shifts occur across system elements based on whether they are more or less involved with the individual. Specifically, Figure 2 indicates 'Need for sexual activity' is the core motivation at the centre of the model's concentric circles. The remaining seven moves are placed according to their prevalence, as represented by their distance from the centre. The further away from the move 'Indicates need for sexual activity', the less important that move is overall. This new model retains the interplay between moves (the doubled-headed arrows) to illustrate the dynamic nature of shifts between moves.

Figure 2: Dynamic interplay of moves used in chat logs



There are several implications arising from our findings. First, the findings highlight an important distinction between online and offline offending, where grooming in an online environment constitutes a smaller component of the offender–victim interchange (see also Kloess, Hamilton-Giachritsis & Beech 2019). Indeed, from a theoretical perspective, our findings challenge models that see grooming as central to online discourse and imply a need to move away from using O'Connell's (2003) model as a framework to interpret and compare results based on discourse analysis of online chat logs.

Second, our findings have implications for methods of detecting offending behaviour through broadscale message scanning. They suggest that, rather than searching for isolated words or phrases, it may be more effective if scanning systems target the close association between (a) explicit sexual content and (b) phrases or words designed to assuage victim distress or reluctance. Third, our findings suggest that people who work in covert operations (pretending to be the child) should anticipate requests for explicit sexual acts at any time during the interaction and be equipped with a range of useful and admissible responses. Conceptualising chat logs as merely a series of eight interchangeable overarching moves enables a more analytical focus on the content and minimises cognitive load on the person pretending to be the child, thereby reducing burnout. This analytical focus, combined with the knowledge that sexually explicit content can occur early on in an interaction (so that officers are not caught off guard), could reduce the risk of harm associated with exposure to child sexual exploitation material (Powell et al. 2014). Figures 1 and 2 may help with that.

A final contribution of our study is that it confirmed distinct offender subgroups. This was the first time a cluster analysis had been conducted on 'moves', and three patterns were revealed. The Impetuous pattern involved immediate gratification, greater exchange of sexually explicit images and little concern with the consequences. The offenders labelled as Opportunistic focused more on desensitising, normalising and manipulating behaviours. Those labelled as Devious were more sexually aggressive and fixated on specific attributes of the child. Caution needs to be exercised in drawing generalisations given the limited sample size and uneven groups, but nonetheless, if these clusters are found to be robust, they would be helpful from a range of perspectives.

Any fine-tuned characterisation of offending patterns enables personalisation of treatment and guides more reliable prognosis of the risk of harm the offender poses to others. From a rehabilitation perspective, for example, Cluster 3 (Devious) would be of greatest concern to psychologists. This group was the most manipulative and aggressive, and their messages showed high levels of sexual deviancy, sexual preoccupation and distorted cognitions. Such characteristics have been found to be associated with the highest levels of recidivism among offline offenders (Mann, Hanson & Thornton 2010; Mann et al. 2007). Knowing the actual discourse-related tactics used by online sexual offenders provides insights needed to challenge offender distortions about how online interactions unfold. Cognitive distortions serve to diffuse responsibility for harm (eg 'I just wanted to teach her about her body', 'I said it was illegal, but she sent an image anyway', 'I didn't know she was underage'), which is why disputing and correcting such misconceptions is key to promoting offender accountability and self-awareness.

Differences to prior research

We speculated about why our study revealed new findings not previously reported. First, our sample of chat logs is quite distinct from those used in prior work in both its size and the way in which offenders accessed their victims. Our sample of 38 offenders accessed children through individual social networking sites. When the number of offenders has been reported in prior work, it has typically been small (eg 5 to 8 offenders; Aitken, Gaskell & Hodkinson 2018; Chiang & Grant 2017; Grosskopf 2010; Kloess, Hamilton-Giachritsis & Beech 2019; Kloess et al. 2017; Williams, Elliott & Beech 2013). Further, considerable prior research has relied on transcripts obtained from perverted-justice.com, where offenders unknowingly engaged with trained adult volunteers who posed as children in regional chat rooms (but see also Chiang & Grant 2019; Kloess, Hamilton-Giachritsis & Beech 2019; Kloess et al. 2017). Such chat rooms—where children interact with like-minded peers—were popular in the 1990s and early 2000s but are rarely used now. The sample of chats in the prior research would not have had the same level of diversity as ours nor been reflective of the current era, where instant messaging and online live chatting (with built-in cameras) is entrenched in the mainstream culture of children and adults.

Second, our sample relied on a method of analysis that allowed us to (a) consider the discrete elements of each offender's dialogue and (b) use these to develop offender moves and associated tactics designed to influence victim behaviour. Unlike the broad themes that emerged from other forms of discourse analysis, these moves were sequenced to determine the flow of interactions, and the associated tactics were used to specify offender subgroups who engaged in different patterns of online behaviour. The next step for researchers is to try to replicate these findings across samples and determine whether the coding method was driving the differences or whether the current outcomes were a function of the offender chat logs to which we had access (Open Science Collaboration 2015; Schneevogt, Chiang & Grant 2018).

Conclusion

Online sexual exploitation of children was depicted in this study as having a central focus on offenders' sexual gratification. Offenders' requests for sexual activity often occurred early in the communication exchange, with frequent shifts in discourse strategy to elicit compliance, as opposed to the gradual methods of 'seduction' observed with offline offending (Ospina, Harstall & Dennett 2010). New theory development is clearly needed to explain the aetiology and progression of online sexual offending against children, as distinct from offline offending. This will be facilitated by using large and diverse contemporaneous samples of offender chat logs, analyses that consider offender dialogue as a tool to influence children's behaviour, and acknowledgement of the potential for distinct offender subgroups.

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4. Production and distribution of child sexual abuse material by parental figures

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Introduction

Despite law reform and eradication efforts, child sexual abuse material (CSAM) is widely available online and its prevalence and severity appears to be increasing (eg Keller & Dance 2019; Seto et al. 2018). In this report, CSAM refers to 'sexually abusive images of children that are typically disseminated via the internet' (Brown & Bricknell 2018: 1). Over the last two decades, notifications of CSAM to US authorities have increased by an average of 50 percent each year (Bursztein et al. 2019). In 2017–18, reports of child sexual exploitation to the Australian Federal Police were 50 percent higher than the previous year, reaching almost 15,000 (Australian Federal Police 2018).

The identification of child victims in CSAM is a major challenge for law enforcement, with the majority of victims remaining unknown to authorities (ECPAT International & Interpol 2018). Over time, CSAM production has trended towards more egregious abuse associated with younger child victims (Seto et al. 2018). New strategies and approaches are necessary to prevent CSAM offending and improve the identification of victims.

Research suggests that a significant proportion of CSAM is produced and distributed by parents who victimise their children (Canadian Centre for Child Protection (CCCP) 2017). An online convenience sample of 150 adult survivors of CSAM found that, of those abused by a single perpetrator, 42 percent identified their biological or adoptive father or stepfather as the offender; and of those abused by multiple perpetrators 67 percent identified their biological or adoptive parents or step-parents as the primary perpetrators (CCCP 2017). A second online convenience sample of 133 adult survivors of CSAM found that 52 percent of perpetrators were family members (Gewirtz-Meydan et al. 2018). These findings are consistent with qualitative research with adult survivors in Australia and overseas which has consistently identified parents as CSAM perpetrators (Itzin 2001; Salter 2013a). Content analysis of CSAM images and videos suggests that over two-thirds were manufactured in a home setting (CCCP 2016), and that the most highly traded CSAM images online involved the abuse of prepubescent girls by their fathers (Seto et al. 2018). The impact on victims is significant, including complex traumatic and dissociative disorders, suicidal ideation, shame, and fear associated with the ongoing circulation of the abuse material (CCCP 2017; Salter 2013a).

Parental production poses a major challenge to the prevention and detection of CSAM. Within the home environment, situational factors such as access to vulnerable children and opportunities for offending can lead to serious abuse and exploitation with comparatively little risk of detection for the offender/s (Seto 2019). Parental offenders exert greater control and have greater access to their victims than extra-familial or online offenders. Sexual exploitation in the family often begins at a younger age, and involves more serious and frequent offending for a longer duration, compared to extra-familial abuse (Salter 2013b). The shame and mental health impacts of CSAM victimisation are reported to be a major barrier to disclosure, with child victims frequently refusing to describe their abuse to therapists or police (CCCP 2017; Gewirtz-Meydan et al. 2018). The challenges of detecting, substantiating and prosecuting intra-familial sexual abuse result in a lack of information about incest offenders, who are under-represented in forensic samples and studies (Goodman-Delahunty 2014). Existing sex offender typologies and risk assessments are focused largely on extra-familial offenders who abuse multiple children, rather than intra-familial offenders who subject their own children to intensive abuse (Goodman-Delahunty 2014).

As a result, there is a lack of evidence and guidance for policymakers, practitioners and law enforcement in this crucial area. There is a need for targeted research into the circumstances, patterns and dynamics of CSAM production perpetrated by parental figures in order to inform strategies to prevent and detect offending parents. There is also a need to further document the impact of parental CSAM offending on victims in Australia. While parents are often positioned as partners in online safety education and abuse prevention, this study highlights the significant role played by parents in CSAM production.

Aims and method

This study aimed to identify the characteristics of CSAM production cases perpetrated by parental figures, and to develop interdisciplinary policy and practice recommendations to increase the ability of law enforcement and other agencies to detect offenders. Accordingly, the research team developed a database of 82 cases in which Australian parents or parental figures were charged with CSAM offences against their children, as reported in media or legal databases, from 2009 to 2019. In June 2019, we began a search of media reported cases of CSAM production and distribution perpetrated by the child's parents. The search was conducted on Factiva, which is an online database of global news and business information produced by Dow Jones and Reuters. We searched Factiva for all Australian newspaper reports that included the terms 'father', 'mother' and 'child pornography' between 2009 and 2019. All results were read to determine their relevance to the project, yielding 54 cases that involved a parental figure or carer (eg mother, father, step-parent, parent's partner or foster parent) who produced CSAM of children who were in their care.

Following the Factiva search, we searched the Australasian Legal Information Institute (AustLII) database for legal documentation, such as sentencing judgments, pertaining to CSAM cases perpetrated by parental figures from 2009 to 2019. AustLII is operated jointly by the law faculties at UNSW Sydney and the University of Technology, Sydney. Its content is publicly available legal information. Its primary source information includes legislation and decisions of courts and tribunals. Using the terms 'mother', 'father', 'incest', 'produce child pornography', 'producing child pornography' and 'producing child exploitation material', the AustLII search yielded 34 cases that involved a parental figure or carer who produced CSAM of their biological children, stepchildren and/or their partner's children. The terms 'incest' and the addition of 'produce' or 'producing' to 'child pornography' were included in the AustLII search as these terms were commonly used in sentencing judgments.

All Factiva and AustLII cases were entered into a database that recorded key case characteristics, including:

- the relationship of the perpetrator to the victim (ie biological parent, step-parent, parent's partner, foster parent/carer);
- demographics of perpetrator and victim;
- number of perpetrators and victims;
- duration of abuse;
- mode by which the abuse was detected;
- characteristics of the abusive acts;
- whether the abuse images were distributed;
- known psychological impacts on victims;
- previous involvement with police or community services; and
- the use of alcohol and other drugs in the abuse.

The Factiva and AustLII cases were then compared to identify any cases duplicated in the two datasets.

The Factiva cases contained limited information compared to the AustLII cases, which complicated attempts to identify duplicate cases. However, drawing on available information about the cases (eg the year of the reported incident, demographic details such as the gender and age of perpetrators and victims, and geographical locations), six cases were matched between the two datasets, reducing the number of cases found through Factiva to 48. This left a total of 82 cases (48 from Factiva and 34 from AustLII). Of the 48 Factiva cases, the accused was reported to have pled guilty or been convicted/sentenced in 39 cases (81%). In the remaining nine cases (19%), the accused was recorded as being charged.

All Australian states and territories except for the Northern Territory were represented in the 82 cases—Australian Capital Territory (3), New South Wales (15), Queensland (14), South Australia (9), Tasmania (3), Victoria (31), Western Australia (6) and non-Australian territory (1). The relevant non-Australian case was being heard in a US court regarding an Australian male couple, where one of the men was the victim's father through surrogacy.

Analysis of the data involved extracting frequency statistics for key case characteristics. These findings were written up in a preliminary report and shared with the research team, who collaborated in drawing out the specific challenges to policy and practice across child protection, law enforcement and public policy. Findings were discussed through online group and one-to-one meetings and via email using a multiple case study analysis (Yin 2009), integrating existing research literature, interdisciplinary professional expertise and the findings of the database analysis.

Limitations

The methodology of the study has a number of limitations. It is well recognised that cases of child sexual abuse detected by authorities are not representative of child sexual abuse cases as a whole, since the majority of child sexual offences are not reported and prosecuted (Bromfield & Higgins 2004). Hence, it is likely that the cases gathered in this study represent a narrow selection of CSAM cases perpetrated by parental figures.

The study is based on data gleaned from media articles and legal documents, and hence is limited to the information adduced in court processes and recorded by journalists or judges. Additionally, given child sexual offences are under-reported and inadequately detected, and that the cases included in the study involve perpetrators who were identified and apprehended, this sample may be skewed towards perpetrators who are more reckless, less careful and less technologically competent than undetected perpetrators. The most strategic and technologically savvy offenders are the least likely to be detected and prosecuted. In familial abuse cases, it is challenging to assess and document the full extent of offending (Pratley & Goodman-Delahunty 2011). For these reasons, the criminal record of a parental offender might not accurately record their perpetration history.

Criminal trials prioritise certain types of information over others. For instance, relevant information such as a family's prior contact with child protection services was frequently unavailable, since it was not discussed in the trial. Apparent biases were evident in the kinds of cases that were reported in the media or available in AustLII. For instance, all identified cases involving solo offending by biological mothers were found in media reports, whereas no such cases were found in AustLII. This difference might indicate a preference for sensationalist or unusual stories about female perpetrators in the media or inattention to solo female perpetration cases in AustLII. Therefore, findings from this study should be understood as preliminary and the basis for further research and examination.

Overview of the cases

Perpetrators

Over three-quarters of identified CSAM cases perpetrated by parental figures (64/82, 78%) involved single perpetrators, while the remaining cases (18/82, 22%) involved multiple perpetrators. A male perpetrator was involved in 90 percent (74/82) of the cases—72 percent (59/82) of cases involved a single male perpetrator, 10 percent (8/82) involved a single female perpetrator, and 18 percent (15/82) included male and female perpetrators.

Most offenders were the biological parents of the victims, followed by step-parents or a parent's partner (see Table 1). However, when differentiated by gender, all female perpetrators were the biological mother of the child victim/s (*n*=23), while over half of male offenders were the biological father of the child (43/74, 58%, including two surrogate fathers), 30/74 (41%) of the cases were perpetrated by a stepfather, a parent's partner or a foster father. There was one case where the male perpetrator was a friend or associate of the victim's biological mother.

Table 1: Perpetrator's relationship to victim

	Biological parent	Biological parent (surrogate)	Foster parent	Parent's friends/ associates	Parent's partner	Step-parent
Media	37	1	2	3	6	11
AustLII	21	1	0	1	4	11
Total	**58**	**2**	**2**	**4**	**10**	**22**

Note: Some of the 82 cases involved more than one victim. In some of these cases, the relationship between each victim and the perpetrator was different (eg one victim could be the perpetrator's biological daughter, and another could be the stepdaughter). Only cases that involved a victim's parent, step-parent, foster parent or a parent's partner are included in this study

The age of perpetrators ranged from early adulthood to 60s. In cases where the perpetrator's age was identified, most perpetrators were in their 30s and 40s (see Table 2).

Table 2: Perpetrators by age group

	18–29	30–39	40–49	50–59	60–69	Unknown
Media	6	18	20	8	1	13
AustLII	5	12	11	3	0	10
Total	**11**	**30**	**31**	**11**	**1**	**23**

Note: Some of the 82 cases involved more than one perpetrator

Victims

Of these 82 cases, two-thirds (55/82, 67%) involved a single victim, and eight in 10 cases (69/82, 84%) involved the perpetrator's daughter/stepdaughter/partner's daughter (see Figure 1). The perpetrator's son/stepson/partner's son was the victim in one-fifth of cases (17/82, 21%; see Figure 1). In cases where the age of the victims were reported (72/82, 88%), the majority of victims were aged between zero and 14 years old—33 victims were aged between zero and four years old, 25 were aged between five and nine years old, 32 victims were aged between 10 and 14 years, and six victims were between 15 and 17 years old (see Table 3).

Figure 1: Victims by gender

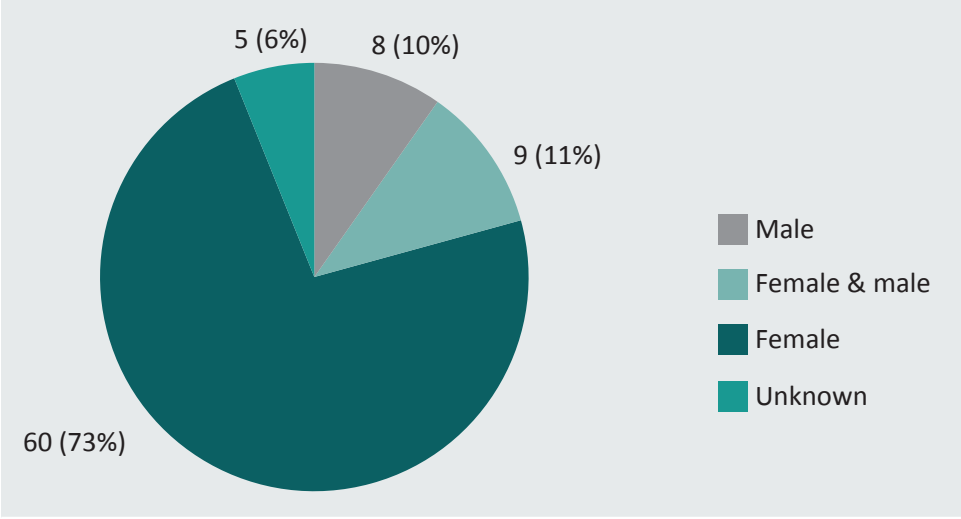

Table 3: Victims by age group

	0–4	5–9	10–14	15–17	Unknown
Media	18	14	20	1	8
AustLII	15	11	12	5	4
Total	**33**	**25**	**32**	**6**	**12**

Note: Some of the 82 cases involved more than one victim

Duration of abuse

The duration of abuse was reported for 55 of the 82 cases. In almost half of these cases (26/55, 47%) the abuse lasted for one year or less (see Table 4). Only 10 cases involved offending of over five years duration.

Table 4: Duration of abuse

	6 months or less	1 year or less	2 years or less	3 years or less	4 years or less	5 years or less	10 years or less	10+ years	Unknown
Media	9	4	3	3	0	1	8	0	20
AustLII	7	6	5	1	4	2	1	1	7
Total	**16**	**10**	**8**	**4**	**4**	**3**	**9**	**1**	**27**

Detection

Fifty-eight cases contained information about the manner in which CSAM production or distribution by a parental figure was detected. Among these cases, the most common method of detection was via police investigation (31/58, 53%). However, case information did not detail the reason for the police investigations. Disclosure was noted in one in five cases (12/58, 21%) including where the victim disclosed the abuse to a non-offending parent, to a teacher at school or to a friend, or when a sibling disclosed the abuse to the non-offending parent.

In 11 of these 58 cases (19%) the CSAM was discovered outside of a police investigation. The perpetrator's partner discovered the CSAM in four of these 11 cases. In the remaining seven cases, the offending was detected by members of the community (eg when the perpetrator left his mobile telephone containing CSAM behind in an office; see Table 5).

Table 5: How abuse was detected

	Disclosure	Discovered by partner	Discovered by another person	Perp. admission	Police investigation	Third-party report	Unrelated police investigation	Unknown
Media	5	1	2	1	12	3	7	19
AustLII	7	3	5	1	11	2	1	5
Total	**12**	**4**	**7**	**2**	**23**	**5**	**8**	**24**

Note: In some of the 82 cases multiple ways of detection were identified

Distribution

While all cases included CSAM production charges, distribution or sharing was also found to have occurred in just under half of the cases (37/82, 45%; see Table 6). This finding might reflect the fact that some offenders produced CSAM for personal use without intending to share it with others. In some cases, distribution might have occurred but this was denied by the offender or there was insufficient evidence to bring charges in the same court case. In most of the cases, it was clear from the available documentation that the distributed material depicted the offender's child. However, in cases where there were production and distribution charges, it cannot be assumed that the production charges were linked to the distribution charges.

Table 6: CSAM offences

	Produced	Possessed	Distributed/shared
Media	48	19	29
AustLII	34	8	8
Total	**82**	**27**	**37**

Note: In some of the 82 cases, multiple forms of CSAM offences were identified

Types of abuse

CSAM production and distribution perpetrated by a parental figure is a crime that is very likely to occur in the context of other forms of child abuse and maltreatment. In about four in five CSAM production cases (66/82, 79%), other forms of abuse were identified. As might be expected, CSAM production was accompanied by sexual abuse in 61/66 (92%) of these cases, followed by grooming/coercive behaviours towards the child (13/66, 20%; see Table 7). Physical and emotional abuse was also reported in a minority of cases.

Table 7: Types of abuse

	Sexual	Physical	Emotional	Grooming/ coercion	Unknown
Media	33	1	1	8	12
AustLII	28	5	1	5	4
Total	**61**	**6**	**2**	**13**	**16**

Note: In some of the 82 cases, multiple forms of abuse were identified

Prior contact with welfare services

There was no reference to prior involvement by child protection or welfare services in the majority of cases. However, this does not mean there was no previous intervention. It might be that prior service involvement was not reported. In four cases there was reference to prior involvement by community or welfare services. In these cases, biological parents (2), a biological father (1) and a stepfather (1) were identified as the perpetrators. There were only two cases in which the police had been previously involved, and both cases involved the victim's stepfather. In both cases, the victims had disclosed sexual abuse perpetrated by their stepfathers. However, the matters were not put before the court as one stepfather 'denied the crimes and was never charged', and in the other case 'a brief of evidence was not proceeded with through court due to issues surrounding the alleged victims'.

Overview of perpetrators

Biological father

The biological father of the victim was identified as the perpetrator or one of the perpetrators of CSAM production and/or distribution in 43/82 cases (52%). Of these 43 cases, only 20 cases (47%) were identified as involving both the production and distribution/sharing of CSAM, while the other 23 cases (53%) involved only the production of CSAM. The ages of these perpetrators ranged from mid-20s to late 50s. Almost two-thirds of cases (28/43, 65%) perpetrated by the biological father involved a single victim, and the single victim was their daughter in 75 percent of these cases (21/28). Of the 15 cases where there was more than one victim, slightly under half (7/15, 47%) also involved the perpetrator's son. Of the 43 cases, five of the identified perpetrators were convicted of or being tried for sexual offences not related to the present cases. In 16/43 (37%) cases, the perpetrators were reported to have a psychiatric condition or formal diagnosis.

Table 8: Example involving a biological father	
Perpetrator	▪ male (aged mid- to late 30s) ▪ no history/past conviction of sexual offences ▪ biological father of the victims
Victims	▪ younger 2 of 3 siblings ▪ daughter—abuse started when 8 years old ▪ son—abused when 12 years old
Duration	▪ daughter—last 4.5 years ▪ son—one occasion
Abuse type	▪ CSAM production ▪ sexual abuse
Detection	▪ eldest sibling disclosed to mother
Details	The perpetrator sexually abused his daughter (youngest child) and son (youngest son). The children's parents were separated and their mother was living in another state. The perpetrator was the sole parent of the children. There were three children but only two were identified as being abused. The man abused his son on one occasion (when he was 12) but abused his daughter over about 4.5 years (from age 8–12). Production of CSAM involved the daughter only. Sexual abuse with daughter involved force. The offending ended when the eldest son disclosed to the children's mother that their father was 'showering and sleeping' with his sister. Mother took children away and (presumably) reported the perpetrator to the police. He was subsequently arrested.

Biological mother

There were 23/82 cases (28%) where the victim's biological mother was reported to have been involved. Of these 23 cases, there were eight cases (35%) where the biological mother was the sole perpetrator, and the other 15 (65%) cases were perpetrated by her with a co-offender. These co-offenders included the victim's biological father or stepfather, and the biological mother's partner or friends/associates. None of the biological mothers had been convicted or tried for previous sexual offences. In most of the eight cases where the victim's biological mother was identified as the sole perpetrator of CSAM production and distribution, it was reported that the mothers produced the materials for the benefit of men online or men they knew. There was limited information about the perpetrator and victim in these cases. The ages of the perpetrators, reported in five cases, ranged from 18 to late 40s. None of the biological mothers had a criminal record and only one was reported to have had a psychiatric condition or formal diagnosis.

Table 9: Example involving a biological mother	
Perpetrator	▪ female (46 years old) ▪ no history/past conviction of sexual offences ▪ biological mother of the victim
Victims	▪ daughter—abuse started when 13 years old
Duration	▪ 1 year
Abuse type	▪ CSAM production ▪ sexual abuse
Detection	▪ unrelated police investigation
Details	A woman pleaded guilty to charges of sexually assaulting her daughter. These charges were of indecent dealing, making an indecent recording, sexually penetrating a child, encouraging a child to engage in sexual behaviour, and supplying child pornography. It was reported that police uncovered the abuse after officers searched a man's computer and found a video showing him having sex with the woman and abusing her teenage daughter.

Stepfather, foster father or mother's partner

There were 34/82 (41%) cases in which the victim's stepfather (22/34, 65%), foster father (2/34, 6%), or the partner of the victim's mother (10/34, 29%) was reported to be the sole offender or co-offender of CSAM production and/or distribution and other forms of abuse. Of these 34 cases, almost two-thirds (22/34, 65%) involved a single perpetrator, and a similar proportion involved a single victim (24/34, 71%). In almost all cases (33/34, 97%), the single victim, or one of the victims, was female. Compared to the percentage of biological fathers who both produced and distributed/shared CSAM (47%), a smaller percentage of non-biological fathers/father figures (10/34, 29%) were identified as having both produced and distributed or shared CSAM. Of the 34 cases, six of the identified perpetrators were convicted of or being tried for sexual offences not related to the present cases.

Table 10: Example involving the partner of the victims' mother	
Perpetrator	▪ male (mid-50s when committing offences) ▪ prior history/conviction of sexual offences (sexual penetration of a child under 16 years of age)
Victims	▪ 2 girls (aged 13 and 15 at time of offences)
Duration	▪ 20 months
Abuse type	▪ CSAM production ▪ sexual abuse
Detection	▪ unknown
Details	The perpetrator sexually assaulted victim 1 on several occasions when she was travelling in his car, in her bedroom and in the lounge room. On other occasions, the perpetrator photographed both victims when they were naked. After the photographs were taken, both victims saw their photographs on the perpetrator's computer.

Multiple perpetrators

Of the 18 cases where there were multiple perpetrators (18/82, 22%), all involved at least one biological parent, and five cases involved both biological parents. The other perpetrators identified in these cases were a parent's partner, friends or associates of a parental figure, strangers (in cases where the victim was prostituted by a parental figure for financial gain), and relatives of a parental figure. Four cases involved strangers or people unrelated to the victims. It is interesting to note that in 8/82 cases (10%) the perpetrators were reported to have given the victims alcohol and/or other substances (eg sleeping pills), and three of these cases occurred when there were multiple perpetrators.

Table 11: Example involving multiple perpetrators

Perpetrators	▪ multiple—male (mid-40s), female (early 30s), 2 other males (late 30s and early 40s) ▪ male (mid 40s) was found to have sexually abused one of the co-offenders when younger ▪ two perpetrators were biological parents of the victim, and the other two were the nephews of the father
Victims	▪ female (aged 9 years old when abuse started)
Duration	▪ 2 years
Abuse type	▪ CSAM production ▪ sexual abuse
Detection	▪ disclosure (by mother after ending relationship)
Details	Four people were involved in abusing a girl from when she was 9 years old. Two of the four perpetrators were the girl's biological parents. The other two were the nephews of the father. At first, only the parents were involved in the sexual abuse. However, within six months one nephew was introduced into the abuse. The other nephew was introduced approximately six months later. It was reported that the abuse was planned by the father. He instigated the abuse and invited and organised the attendance of his two adult nephews, who subsequently, but separately, joined him in abusing his daughter. After the mother ended her relationship with the father, she reported the abuse to the police.

Impacts on victims and non-offending family members

There were 34/82 cases (41%) in which the effects of CSAM production and/or distribution as well as other forms of abuse were identified or commented on by the judge, or recorded in a victim impact statement.

Following are some examples to highlight issues and effects that were identified from the cases. The issues and effects were presented by the victims and others who were directly affected (eg the non-offending relatives such as the victim's mother).

Table 12: Impacts on victims and non-offending family members	
Effects	**Examples**
Self-blame/guilt	▪ A sentencing judgment described the victim as having 'spent years feeling ashamed and blaming herself for the abuse and beatings and for being disowned by her mother'. ▪ A sentencing judgment noted that '[a]part from the direct impact of the offences, she suffers ongoing guilt due to her perception that it is she who has ruined her mother's and brother's lives by speaking out about the abuse [perpetrated by her father]'.
Psychological harm	▪ A sentencing judgment noted 'that the victim is suffering both low self-esteem and depressive symptoms, was highly likely to be related to the abuse from which she suffered'. ▪ The impact on the victim was described by the judge as 'the pain, guilt and turmoil she has experienced as a result of the offender's criminal conduct', and that 'sexual abuse of children of tender years will inevitably give rise to long term adverse psychological consequences.'
Grief	▪ Relatives of the victims said they 'live with an indelible sadness', and that 'grief controls every facet of our lives'. ▪ The mother of one victim noted in her victim impact statement: 'I feel immense sadness and grief for the fact my children will have no relationship with their father, but there is nothing I can do about it.'
Loss	▪ A sentencing judgment noted that the 'victim tells of great confusion these crimes have caused, and the loss to the victim of so much that other children and teenagers enjoy. She speaks of her utter isolation as she has now no parent and no-one to turn to'. ▪ One victim was noted to have said, 'I feel angry, upset, disgusted, confused, sad, feel like I've lost my childhood and I lost my mum'.
Conflicted emotions/ ambivalence	▪ One judge commented that the victim was a 'hopelessly conflicted child'. ▪ A sentencing judgment noted that the victim 'spoke of her ambivalence, and confusion about the nature of her feelings'. ▪ A sentencing judgment said the victim had 'indicated that testifying against her own parents was likely be the most difficult and defining choice she will ever have to make in her life'.

Table 12: Impacts on victims and non-offending family members (cont.)	
Effects	**Examples**
Mistrust/betrayal	▪ One judge commented that the victim 'feels totally betrayed by the defendant. She does not want to see him or his family again'. ▪ A sentencing judgment noted that the victims 'have had the natural trust that should exist between a mother and her children, and between sister and brother, tainted (if not destroyed). Indeed, the [perpetrator]'s conduct was calculated to effect the destruction of the family bonds'.
Fear	▪ One judge commented that the 'fear, the ingrained fear in fact, of this particular situation that you exposed them to while you sat in that dock and watched them called liars in the position of a stepfather is almost incomprehensible to me'.
Trauma	▪ One judge commented that the 'offending had a severe impact on the victim who continued to suffer serious trauma.' ▪ A sentencing judgment noted that the victim 'described her inability to complete her university studies, and every time she hears the sound of a camera shutter, it brings back memories of posing naked for [the perpetrator] and [the perpetrator] secretly photographing her sunbaking in the back garden'.
Projected effects/ vulnerability	▪ One judge commented that while the victim 'was too young to understand what was happening', the abuse 'had made him vulnerable to being groomed for sexual activity'. ▪ One judge commented, 'your daughter might be oblivious to what happened at the moment, but one day she will come of an age and be seriously disturbed to know what her own father did'.

Summary and conclusions

This study provides a picture of CSAM production and distribution by parents or parental figures of the victims. The findings indicate that CSAM production and distribution perpetrated by parental figures is a form of abuse mainly perpetrated by a single individual (78%) on a single victim (67%). Consistent with other research findings (eg Seto et al. 2018), it is a gendered form of abuse with men as offenders in 90 percent of cases, and girls as victims in 84 percent. In this context, the victim's biological father (52%) or stepfather (41%) was most likely to be the offender. In cases where the victim's age was identified, the victims in the study were very young, with over 60 percent younger than nine, and one-third between 10 and 14. This is broadly consistent with the age distribution of children depicted in CSAM (CCCP 2016). Unsurprisingly, sexual abuse featured in almost all of the cases (92%). In this context, the identified impacts on victims and non-offending others are consistent with those experienced by people who have experienced familial child sexual abuse. While our findings indicate that production of CSAM is not always associated with distribution (in 45% of the cases), this could reflect the evidence available for prosecution rather than the true extent of distribution.

The findings of the study suggest CSAM offending perpetrated by parental figures poses significant challenges to child protection and investigation. While victims of parental abuse are the least likely group to disclose abuse (Goodman-Brown et al. 2003), CSAM victimisation is an additional barrier to disclosure since it is often accompanied by compounded shame, self-blame and confusion (CCCP 2017). These factors were evident among the victims in this study, including trauma, self-blame and conflicted feelings about the perpetrator/s. The duration of recorded abuse in this study was usually under one year, while self-report studies with familial CSAM survivors typically indicate abuse of longer duration (CCCP 2017; Salter 2013a). This difference may be attributable to the challenges of disclosure, evidence-gathering and prosecution in familial sexual offending, where offenders are charged only for those offences that can be substantiated. The difficulties of disclosure and evidence gathering are exacerbated in cases where the child was very young, where the child was unaware their abuse was recorded, and where offenders used alcohol or other drugs to sedate or confuse the child—all of which occurred in some cases in this study.

Familial child sex offenders are poorly accommodated within existing forensic typologies and instruments based on samples of extra-familial offenders (Goodman-Delahunty 2014). In this study, familial offenders abused prepubescent children while also maintaining romantic and sexual relationships with adults. This pattern of abuse does not accord with longstanding forensic typologies that categorise 'preferential' offenders as extra-familial abusers and position incest offenders as 'situational' offenders whose abuse is triggered by stressors in their environment (see Robertiello & Terry 2007). The findings of this study also do not align well with current CSAM offender typology research. In this scholarship, categories of 'online' and 'contact' offending, and production and distribution offences, are inconsistently defined and operationalised. However, in the typology literature, CSAM offenders are considered more likely than contact offenders to be single and disinterested in adult relationships (Henshaw, Ogloff & Clough 2017).

Three profiles of CSAM offenders emerged from this study. The first was the male offender who forms adult relationships and has children of his own to exploit. The second was the male offender who forms a relationship with a woman and exploits her children or seeks to obtain children by some other means (eg the surrogacy cases). It can be inferred from the young age of victims in this study and other evidence of premeditation (such as the administration of alcohol or drugs and participation in online/offline abuse networks) that some biological or de facto fathers and stepfathers formed adult romantic relationships with the intention of producing or procuring children for exploitation. Such a pattern accords with victim descriptions of incest offenders as highly premeditated in their abuse and exploitation of their children (eg Salter 2013a, 2013b). These offenders may recruit women into the abuse of her children, or the abuse might take place without the mother's knowledge. The third profile was a biological mother who produces CSAM of her children at the behest of men she knows in person or online; however, available information was unclear about the circumstances under which CSAM was produced (eg whether it was done voluntarily, under duress or from a desire to please). Further research is necessary to explore these core subgroups of intra-familial sex offenders in more depth.

Online offending and CSAM introduce complex new dimensions to intra-familial sexual victimisation. Extensive reference was made throughout the documented cases to the impact on children of CSAM offending perpetrated by parental figures. It is therefore notable that there is no specialist policy or service response for Australian CSAM victims such as targeted mental health care or redress and restitution frameworks. The lack of a national approach or framework is in contrast to the United States, where identified CSAM victims (or their appointed caregivers or representatives) can opt to be notified when an individual is charged with accessing their abuse images, and there is a statutory restitution framework (Binford et al. 2015). There is a clear need for further research into the victim experience and impacts of parental CSAM offending to inform the development of evidence-based responses and support.

The study has a number of implications for policy and practice. The study foregrounds the intersection of technology with intra-familial abuse and the difficulties of detecting and disclosing CSAM offending. This finding indicates that all frontline law enforcement personnel would benefit from training on the intersection of technology with familial sexual abuse, and indicators of technology-facilitated offending including grooming behaviours. Such training should cover the sensitive and effective conduct of initial welfare interviews with children where intra-familial or online offending is suspected or reported. Where a father is known to have accessed CSAM, his family should be offered referral to specialist support services, not only for the wellbeing of the non-offending partner but to ensure a supportive environment for children, who may later disclose contact offending.

As Australia and other jurisdictions scale up efforts to prevent child sexual abuse before it occurs, and to intervene as early as possible in abuse cases, the findings of this study highlight technology-facilitated familial abuse as a key area of concern that should be addressed in primary prevention and early intervention efforts. Sexual abuse and online safety education programs should include sensitive messages to children about image-making by family members and relatives, and where and how to seek help to disclose. Community education programs should be developed targeted at women who are repartnering and at risk of being groomed by offenders seeking to abuse their children. These programs should explain how offenders seek to groom women and the signs of a groomed child, and should be targeted through dating apps or social media marketing. Community messaging should be developed aimed at women who become aware that their partner is accessing CSAM, encouraging them to contact appropriate support services or phone lines to discuss their concerns. Telephone counsellors should receive training on how to support and advise women whose partners are accessing CSAM. The findings of this study further confirm existing evidence of the immediate and long-term impacts of CSAM offending by parental figures and the necessity of specialist victim support.

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5. Patterns and predictors of reoffending among child sexual offenders: A rapid evidence assessment

Christopher Dowling, Hayley Boxall, Kamarah Pooley, Cameron Long and Christie Franks

There is a vast body of literature examining reoffending among child sexual offenders, including a number of systematic reviews and meta-analyses (Hanson & Bussière 1998; Hanson & Morton-Bourgon 2005; McCann & Lussier 2008; McPhail, Hermann & Nunes 2013; Seto, Hanson & Babchishin 2011; Seto & Lalumière 2010). This reflects the academic, clinical and policy interest in how often, and under what circumstances, child sexual offenders go on to commit further sexual offences after contact with the criminal justice system, and in the effectiveness of treatment and intervention measures.

Sexual offences against children have historically been characterised as compulsive and pathological behaviours driven by ingrained deviant sexual interests. Implied in this view is the assumption that child sexual offenders will sexually reoffend unless they are removed from the community or treated. However, research has shown that child sexual offenders and other offender groups have similar levels of antisocial traits (eg impulsivity, recklessness, aggression, lack of empathy; Lussier & Mathesius 2018; Seto & Lalumière 2010). Relatedly, prior reviews report substantially lower rates of sexual reoffending than non-sexual reoffending among child sex offenders; this suggests that, for many, child sexual offending is but one component of a broader pattern of criminal behaviour (Hanson & Bussière 1998; Hanson & Morton-Bourgon 2005; McCann & Lussier 2008).

Importantly, these reviews have also examined the psychological and behavioural predictors of reoffending among child sexual offenders. In general, psychological markers of both antisociality and sexual deviance (ie sexual preferences for children, an abnormal preoccupation with sex) are associated with an increased risk of sexual reoffending. Other markers, many of which likely reflect these two core risk factors, include histories of sexual and non-sexual offending, sexual offences against non-related or unknown (ie extra-familial) children, and greater diversity in sexual offences (eg offences with and without physical contact, offences against male and female children, offences against children and adults).

In terms of demographic factors, age has emerged as one of the most important predictors of reoffending, with younger and juvenile offenders being more likely to sexually (and non-sexually) reoffend. While this may be underpinned by burgeoning deviant sexual interests, research suggests that, in most cases, it reflects a combination of pubertally-intensified sexual preoccupations; similar pubertal increases in impulsivity, recklessness and aggression; and increased opportunities for contact with children by virtue of their youth (eg Martinson & Ryan 2010). Critically, in contrast to the widely accepted age–crime curve, which shows that general offending tends to peak around 17 to 20 years of age, researchers have noted a bi-modal age distribution for child sexual offending, with separate peaks in adolescence and mid-adulthood (Smallbone, Marshall & Wortley 2008). Additionally, studies have shown that juveniles have higher rates of sexual reoffending but rarely go on to sexually reoffend as adults (eg Caldwell 2002). Previous studies have also drawn attention to the different treatment needs of these two offender groups (eg Veneziano & Veneziano 2002). Taken together, these findings highlight the importance of distinguishing between adult and juvenile child sexual offenders when examining risk profiles and rates of reoffending.

Despite research highlighting the variation in risk profiles and reoffending rates among child sexual offenders, the pathological view, which assumes a high likelihood of sexual reoffending, continues to underpin a number of criminal justice and treatment measures, including indeterminate sentencing regimes, sexual offender specific treatment programs and post-sentence community management schemes (eg sexual offender registers, community orders). Indeed, Bartels and colleagues (2019) have noted a recent 'net-widening' trend in the sentencing and post-sentence management of sexual offenders across Australia, whereby such schemes are being applied more indiscriminately to a wider range of offenders and offences. An updated review of reoffending research on child sexual offenders is therefore timely, and important for informing the scale and tailoring of these measures. Relatedly, an understanding of the characteristics associated with an increased likelihood of reoffending can aid in targeting these measures at higher risk child sexual offenders.

Finally, an updated review is also well placed to incorporate the growing number of studies examining sexual offenders in the online environment, most notably those who produce, distribute or use child sexual abuse material (CSAM), but also those who use this environment to solicit and 'groom' children for sexual contact. Research on these emerging populations has only recently increased to a point where the review and synthesis of findings is possible (see Babchishin, Hanson & VanZuylen 2015; Babchishin et al. 2018; Brown & Bricknell 2019; Garrington et al. 2018).

Methodology

A rapid evidence assessment was conducted to address the following questions:

- What proportion of child sexual offenders have a prior history of general and sexual offending?
- How prevalent is general and sexual reoffending among child sexual offenders?
- What is the nature of general and sexual reoffending among child sexual offenders?
- What factors are associated with an increased risk of general and sexual reoffending among child sexual offenders?
- Are there any differences between juvenile and adult sex offenders in their likelihood of reoffending and reoffending risk profile?

Search strategy

Rapid evidence assessments are systematic reviews of research undertaken in an accelerated manner within a restrictive time frame (ie four weeks to six months; Booth, Sutton & Papaioannou 2016). English language studies were included if they were peer reviewed, published between January 2010 and March 2020, and conducted in Australia, New Zealand, Canada, Europe (including the UK) or the United States.

Included studies report on contact (fondling/touching, masturbation, and penetrative sex) and non-contact (voyeurism and exhibitionism; procurement; and the possession, distribution and/or production of CSAM) sexual offences committed against children by adult or juvenile offenders who were subsequently processed through the criminal justice system. To account for variation in ages by study and jurisdiction, studies must have examined individuals who offended sexually against a person under 18 years of age (or viewed sexually explicit material depicting persons under 18 years of age). Adult offenders were 18 years or over at their index sexual offences.

Studies must have retrospectively and/or prospectively followed offenders for any period of time after contact with some element of the criminal justice system for their index child sexual offences, and included at least one quantitative measure of general and/or sexual reoffending. General offending was broadly defined as including any criminal offence, including both non-sexual and sexual offences. Importantly, sexual reoffending was not limited to further sexual offences against children, but included all crimes of a sexual nature, including those against adults. Data on offences recorded by the criminal justice system are typically used to examine reoffending. These datasets classify offences based on legal definitions and codes that combine most sexual offences against children and adults, preventing the analysis of sexual reoffending against children specifically. The exception to this is CSAM offences, which are often recorded separately from other sexual offences, and as a result a number of studies do examine rates of CSAM reoffending. However, for the purposes of this study, rates of CSAM reoffending provide an incomplete, and potentially misleading, picture of sexual reoffending against children, and for this reason discussion is limited to sexual reoffending broadly.

Prior offending was defined as at least one instance of contact with the criminal justice system for sexual or general offending before contact for the index child sexual offence. Only recorded offending was examined, although offences could have progressed to any stage of the criminal justice system (report, arrest, charge, conviction or incarceration). Validation studies of risk assessment tools, systematic reviews and meta-analyses were also included.

Studies were excluded if they:

- only measured reoffending as a treatment or intervention effect (ie no reoffending rates were presented);
- examined non-criminal problematic sexual behaviours; or
- did not differentiate between child and adult sexual offending.

The decision was made to exclude studies that involved the direct evaluation or assessment of treatment programs targeted at child sexual offenders because of concerns that they would introduce bias into the sample and skew the results. For example, offenders who participate in treatment programs may be less likely to reoffend because of the impact of the intervention, and because of other factors related to their involvement in treatment in the first place. Because this study aggregates the findings from studies involving both treatment and non-treatment populations, the overall figures may not be representative of either cohort.

Staff from the Australian Institute of Criminology's JV Barry Library searched 15 databases: the JV Barry Library catalogue; Campbell Collaboration, Cochrane Library, CINCH, Criminal Justice Abstracts, eBooks, E-Journals, Google Scholar, Informit, National Criminal Justice Reference Service Abstracts, OpenDissertations, ProQuest, Psychology and Behavioral Sciences Collection, SocINDEX, and Violence and Abuse Abstracts. Searches were conducted using the following search terms:

- Target: child* AND
- Index offence: (sex offen* OR sexual offen* OR sex abus* OR sexual abu* OR exploit* OR porn* OR molest*) OR p?edophil* AND
- Reoffence: recidiv* OR reoffend* OR repeat* OR history* OR prior OR trajector*

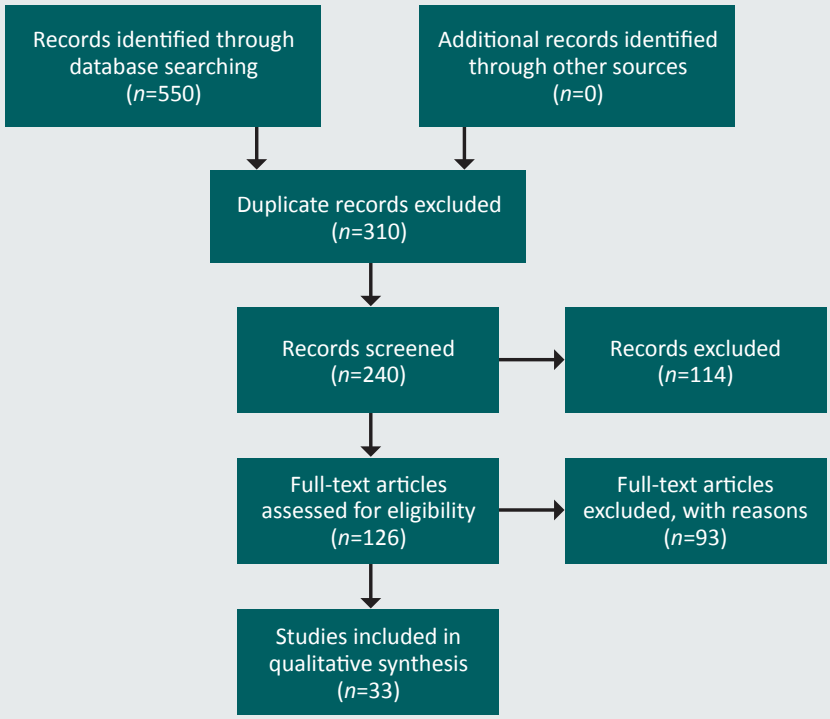
Search terms were identified and refined through a series of initial scoping searches undertaken by the researchers. In particular, these searches identified that the inclusion of generic terms such as 'juvenile', 'minor' and 'under-age' resulted in a large number of results that did not focus on child sexual offending as a subcategory of crime. As such, the victim-related search terms were limited to 'child' and 'children'.

Study selection and analysis

A total of 550 studies were initially identified for further screening (Figure 1). Duplicates (*n*=310) were removed. The researchers reviewed the abstracts of the remaining sources (*n*=240), and full-text copies of 126 studies were sourced. A further 93 studies were excluded after secondary screening, leaving 33 studies for inclusion in the review. These 33 studies are indicated by an asterisk in the references.

Many of the studies included in the review provide information about more than one sample of child sexual offenders. For example, in a number of studies the authors compared the reoffending rates of different child sexual offenders, classified by the nature of their index offence or criminal histories. As such, two units of analysis are used in this report—studies, and samples of child sexual offenders. Across the 33 studies, there were 55 samples of child sexual offenders.

Figure 1: Search results



Limitations

Despite facilitating a systematic and transparent review of research on a given topic, rapid evidence assessments do not provide the same exhaustive depth or detail as a full systematic review (Ganann, Ciliska & Thomas 2010). The limitations of reviewing studies that analyse recorded offence data—namely the omission of offences that do not come to police attention or result in the laying of charges, prosecution, conviction or imprisonment—should also be acknowledged (Blackley & Bartels 2018; Cossins 2011). Finally, there is likely some slight variation in the definition of key terms across studies, including, most notably, the age distinction between adults and juveniles, producing some overlap between groups of offenders.

Results

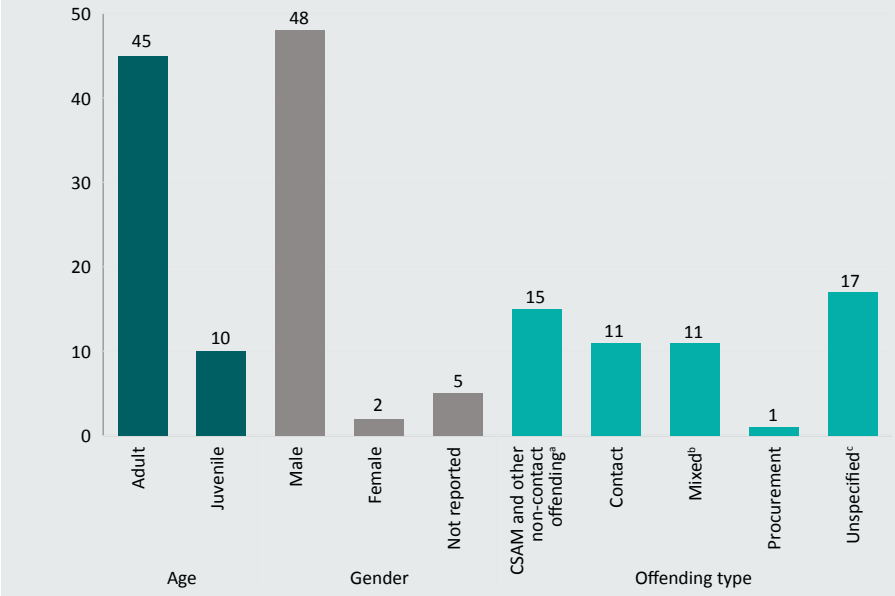
Study and sample characteristics

The majority of studies were conducted in Europe (36%) or North America (ie Canada or the United States; 42%). Six studies (18%) were conducted in Australia or New Zealand. Seventeen (52%) studies operationalised reoffending as any new conviction while 14 studies used a new report (6%), arrest (12%) or charge (24%). Only one study measured reoffending using incarceration data.

Most child sexual offender samples comprised adult (82%, *n*=45) male (96%, *n*=48) offenders (Figure 2). Based on their index offence or criminal offending histories, offenders had been detected for:

- CSAM and other non-contact offences (27%, *n*=15);
- contact offences (20%, *n*=11);
- mixed offences (both CSAM and other contact or non-contact offending; 20%, *n*=11);
- procurement offences (2%, *n*=1); and
- other unspecified sexual offences against children (31%, *n*=17).

Figure 2: Sample characteristics (*n*)



a: Mixed refers to the co-occurrence of CSAM and other forms of child sexual abuse (contact or non-contact)

b: The nature of offences committed by individuals in these samples were not specified. Rather, they were referred to globally as child sexual offenders

Source: Child sexual offender studies database [computer file]

Prevalence of prior offending

Nineteen studies reported on prior general offending among 33 samples of child sexual offenders (Table 1). The studies using prior conviction or incarceration data found that between 78 and 84 percent of adult offenders had a prior offence recorded (*n*=13 samples; Elliott et al. 2019; Howard, Barnett & Mann 2014; Jung et al. 2013; Krone et al. 2017; Laajasalo et al. 2020; Nadesu 2011; Turner et al. 2016). Among studies using report, arrest or charge data, prior offending ranged between 26 and 84 percent in all but two of the 15 samples of adult child sexual offenders (Bader, Welsh & Scalora 2010; Brouillette-Alarie & Proulx 2013; Eke, Helmus & Seto 2019; Eke, Seto & Williams 2011; Faust et al. 2015; Goodman-Delahunty & O'Brien 2014; Lussier, Deslauriers-Varin & Râtel 2010; Seto & Eke 2015; Soldino, Carbonell-Vayá & Seigfried-Spellar 2019).

A small number of studies examined prior offending among juvenile offenders, finding between 37 and 100 percent had prior convictions (*n*=2 samples; Stevens et al. 2013), and between six and 35 percent had prior reports/arrests/charges (*n*=3 samples; Aebi et al. 2014; Fanniff & Kolko 2012).

Sixteen studies reported on prior sexual offending among 25 samples of child sexual offenders. Rates of prior offending varied significantly, primarily due to differences in samples and observation periods. Between five and 37 percent of adult child sexual offenders had previously been convicted of a sexual offence (Craissati, Bierer & South 2011; Elliott et al. 2019; Jung et al. 2013; Krone et al. 2017; Laajasalo et al. 2020; Nadesu 2011; Turner et al. 2016). Meanwhile, five to 61 percent had previously been reported, arrested or charged with a sexual offence (Bader, Welsh & Scalora 2010; Brouillette-Alarie & Proulx 2013; Eke, Seto & Williams 2011; Goodman-Delahunty & O'Brien 2014; Lussier, Deslauriers-Varin & Râtel 2010; Soldino, Carbonell-Vayá & Seigfried-Spellar 2019).

In two studies, four samples of juvenile offenders were found to have very low rates of prior contact with the criminal justice system for sexual offending (0–3%; Aebi et al. 2014; Stevens et al. 2013).

Table 1: Summary of prior offending rates among juvenile and adult offenders, by prior offence type

	Juveniles		Adults	
	n	%	*n*	%
General				
Prior report/arrest/charge	3	6–35	15	2–84
Prior conviction/sentence	2	37–100	13	8–78
Overall	5	6–100	28	2–84
Sexual				
Prior report/arrest/charge	2	0	8	5–61
Prior conviction/sentence	2	0–3	12	5–37
Overall	4	0–3	21[a]	5–61

a: Includes one sample where the definition of prior offending was not provided

Source: Child sexual offender studies database [computer file]

Rates of reoffending

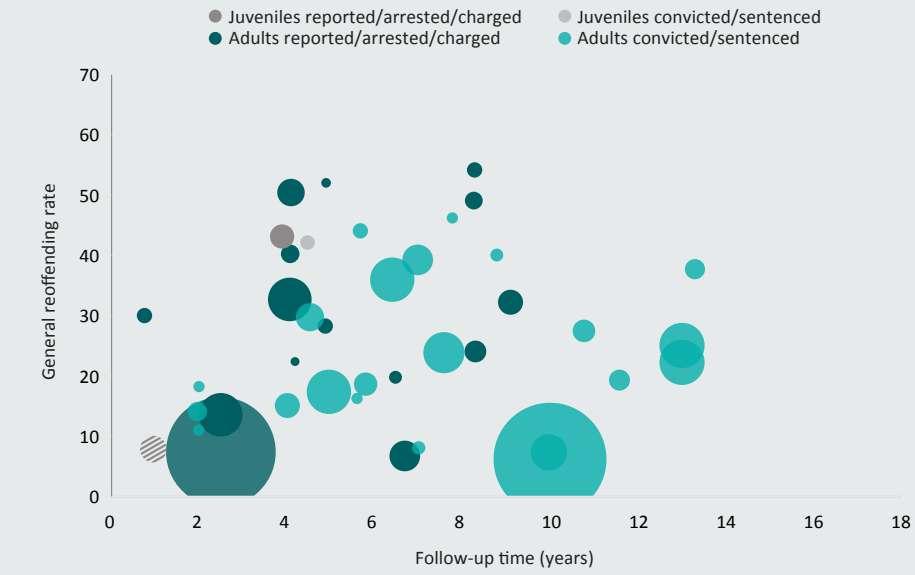
General reoffending

Twenty-four studies reported on general reoffending among 45 samples of child sexual offenders. Figure 3 displays rates of general reoffending (y-axis) by the time offenders were followed from the index offence (x-axis), population and reoffending measure (bubble colour), and sample size (bubble size; see also Table 2). The review found that:

- reoffending rates were between zero and 54 percent, with follow-up periods ranging from 10 to 160 months (follow-up periods missing for 3 samples);
- reoffending rates were lower than 20 percent for all but one of the samples that were followed for two years or less (*n*=5);
- reoffending rates were between 20 and 54 percent in most samples that were followed for periods of four years or more (*n*=34); and
- the cumulative likelihood of reoffending appeared to increase until around two to four years from the index offence, then stabilised, albeit with significant variation across samples.

The highest reoffending rates were observed in studies of adults that used rearrest/recharge measures.

Figure 3: Rates of general reoffending among child sexual offenders (%)



Note: Samples composed of offenders who were followed for different periods of time are plotted based on the mean or median follow-up time. Smallest sample: *n*=6. Largest sample: *n*=6,719. Sample size was unavailable for striped bubbles

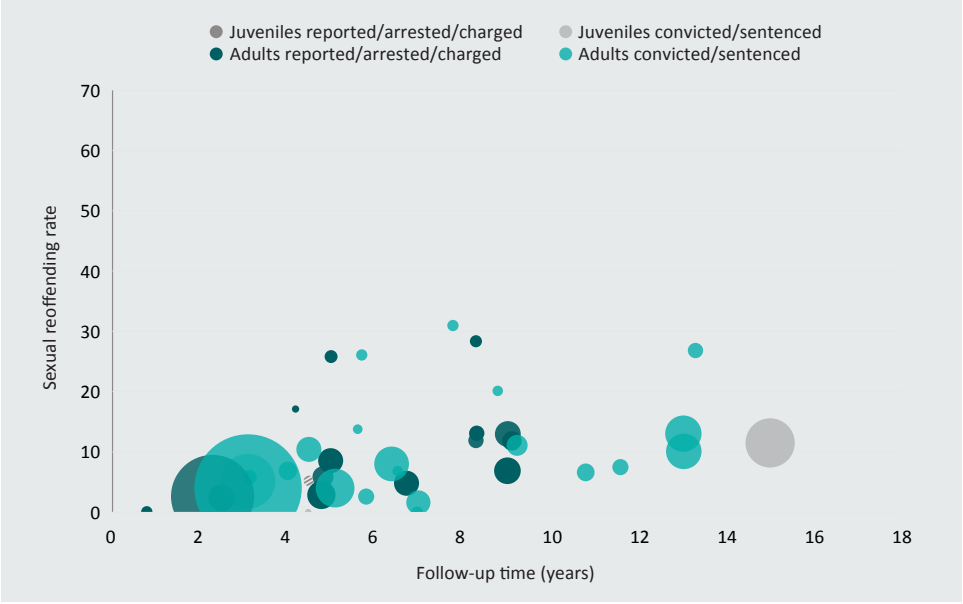
Source: Child sexual offender studies database [computer file]

Sexual reoffending

Figure 4 displays rates of sexual reoffending for 39 child sexual offender samples, as measured in 23 studies (see also Table 2). The review found that:

- reoffending rates were between zero and 31 percent, with follow-up times ranging between 10 and 160 months;
- most samples (*n*=33) recorded reoffending rates of 15 percent or less; and
- the cumulative likelihood of reoffending increased slightly about two to four years from index offence, then stabilised, again with significant variation across samples.

Figure 4: Rates of sexual reoffending among child sexual offenders (%)



Note: Samples composed of offenders who were followed for different periods of time are plotted based on the mean or median follow-up time. Smallest sample: *n*=6. Largest sample: *n*=4,249. Sample size was unavailable for striped bubbles

Source: Child sexual offender studies database [computer file]

Table 2: Summary of reoffending rates among juvenile and adult offenders, by reoffence type

	Juveniles				Adults			
	Report/ arrest/ charge		Conviction/ sentence		Report/ arrest/ charge		Conviction/ sentence	
	n	%	*n*	%	*n*	%	*n*	%
General								
2 years or less	4	8–21	3	19–21	35	6–54	4	11–18
4 years or more	2	0–42	2	0–42	7	8–30	16	8–46
Overall	7	0–43	5	0–42	27	7–54	21	6–46
Sexual								
2 years or less	1	0	–	–	35	0–31	1	3
4 years or more	3	0–31	3	0–11	4	0–3	16	0–31
Overall	4	0–11	3	0–11	29	0–11	19	0–31

Source: Child sexual offender studies database [computer file]

Characteristics of reoffending

Time to first reoffence

Seven studies reported on the average time to first reoffence, measured in months. Despite variations in study methodologies, sample sizes and definitions of reoffending, the findings were relatively consistent:

- time to first general reoffence was consistently shorter than time to first sexual reoffence among studies that measured both types of reoffending (Craissati, Bierer & South 2011; Elliott et al. 2019; Goodman-Delahunty & O'Brien 2014);
- time to first contact sexual offence was shorter than time to first non-contact sexual offence in those studies that measured both types of sexual reoffending (Elliott et al. 2019; Jung et al. 2013); and
- time to first general reoffence was shorter among offenders who had a prior history of offending when compared to 'first-time' offenders (Daly et al. 2013).

Transition from non-contact to contact offending

Ten studies reported on the transition to contact child sexual offending among 12 samples of non-contact offenders. Six of these samples demonstrated very low levels of escalation from non-contact to contact offending (less than one percent), finding that sexual reoffenders committed the same type of offence as their index offence (Goller et al. 2016; Howard, Barnett & Mann 2014; Krone et al. 2017; Seto, Hanson & Babchishin 2011; Soldino, Carbonell-Vayá & Seigfried-Spellar 2019). Among the other six samples, one to eight percent of non-contact offenders escalated to contact offending (Aebi et al. 2014; Black 2018; Eke, Seto & Williams 2011; Elliott et al. 2019).

Predictors of reoffending

Age

Seven studies reported on the relationship between the age of the offender and reoffending in adult and juvenile populations. Five studies found that offenders who were younger at the time of their first sexual offence were significantly more likely to reoffend generally and sexually (Eke, Seto & Williams 2011; Lussier, Deslauriers-Varin & Râtel 2010; Nadesu 2011; Nilsson et al. 2014; van der Put et al. 2012). Nilsson et al. (2014) further identified that age at first conviction was a strong predictor of non-sexual reoffending but only a modest predictor of sexual reoffending.

Two studies examined the relationship between age at index offence and reoffending in adult populations (Rettenberger et al. 2015; Seto & Eke 2015). Although both studies identified that younger adults were at higher risk of reoffending, they showed different relationships between age and reoffending, with Rettenberger and colleagues (2015) finding evidence of a curvilinear trend. Here, higher rates of sexual reoffending were observed in adults aged under 25 years and between 40 and 60 years. Rates were lower for adults aged 26 to 39 years and over 61 years (Rettenberger et al. 2015).

Indigenous status

Only two studies reported on the relationship between the Indigenous status of the offender and reoffending—one examining Indigenous Australians (Daly et al. 2013) and one examining New Zealand Maori (Nadesu 2011). Both found an increased likelihood of general reoffending among Indigenous offenders compared with non-Indigenous offenders, although Daly and colleagues (2013) noted that this association disappeared when prior offending was controlled for in their analysis.

Socio-economic status

Four studies reported on the relationship between the socio-economic status (SES) of offenders and reoffending. These studies found that child sexual offenders were more likely to commit general or contact sexual reoffences if they experienced relative socio-economic disadvantage, and this was consistent across different measures (Aebi et al. 2014; Daly et al. 2013; Krone et al. 2017). However, Daly et al. (2013) found that the relationship between SES and reoffending was moderated by prior offending (ie offenders from low SES backgrounds were only more likely to reoffend if they had histories of prior offending), while Aebi et al. (2014) identified that juvenile child sexual offenders were more likely to come from higher SES backgrounds than juvenile perpetrators of peer/adult sex offending.

Offence type

Twelve studies reported on the differences in reoffending among the various types of child sexual offenders. Findings were mixed in terms of whether CSAM and contact offenders differed in their rates of general and sexual reoffending. Three studies found no difference (Aebi et al. 2014; Jung et al. 2013; Lussier, Deslauriers-Varin & Râtel 2010), while two studies found that contact offenders were more likely to reoffend generally and sexually than CSAM offenders (Laajasalo et al. 2020; Seto & Eke 2015). These studies also found:

- mixed offenders were more likely to sexually reoffend than CSAM offenders (Eke, Helmus & Seto 2019; Elliott et al. 2019; Goller et al. 2016; Soldino, Carbonell-Vayá & Seigfried-Spellar 2019);
- producers of CSAM and those who participated in CSAM networks were more likely to sexually reoffend than other CSAM offenders (Krone et al. 2017);
- offenders who had a history of breaching their conditional release orders were more likely to generally and sexually reoffend than those who did not (Eke, Seto & Williams 2011; Seto & Eke 2015); and
- extra-familial contact offenders were more likely to reoffend generally and sexually than intra-familial contact offenders, but both were more likely to commit non-contact than contact reoffences (Nilsson et al. 2014; Turner et al. 2016).

Prior offending

Seventeen studies reported on the association between prior offending and reoffending. Most of the evidence suggests that prior offending increased the likelihood of general and sexual reoffending, even after controlling for other factors such as age, Indigenous status and SES (Bader, Welsh & Scalora 2010; Black 2018; Eke, Seto & Williams 2011, Eke, Helmus & Seto 2019; Elliott et al. 2019; Nadesu 2011; Rettenberger et al. 2015; Seto & Eke 2015; Stevens et al. 2013). However, some studies found that the relationship between prior offending and reoffending differed by type of reoffending. Daly and colleagues (2013) found that prior offending was correlated with general reoffending but not sexual reoffending, while Krone and colleagues (2017) found that prior offending was associated with contact reoffending but not non-contact reoffending. CSAM offenders were less likely to have a criminal history than contact and mixed offenders (Cohen 2018; Laajasalo et al. 2020; Soldino, Carbonell-Vayá & Seigfried-Spellar 2019). This may go some way to explaining why CSAM offenders are less likely than contact offenders to reoffend.

One study found evidence that CSAM offenders with a history of offending were more likely to commit contact reoffences than CSAM offenders with no history of offending (Seto, Hanson & Babchishin 2011).

Discussion

A review of the most recent evidence on child sexual offenders suggests that the cumulative likelihood of both general and sexual reoffending increases in the first few years after the index offence, then stabilises. However, sexual reoffending among child sexual offenders is rare compared with general reoffending. Across most studies, rates of sexual reoffending were 15 percent or less, and rates of general reoffending were between 20 and 54 percent. Additionally, many more child sexual offenders have histories of general than sexual offending. This is consistent with research showing that child sexual offences are often committed as part of broader patterns of offending, and are usually underpinned by more general antisocial inclinations as well as deviant sexual inclinations (Lussier & Mathesius 2018; Seto & Lalumière 2010). There is also little evidence of escalation in reoffending—neither adult nor juvenile offenders typically escalate from non-contact to contact child sexual offences.

A number of high-level implications for policy and practice can be drawn from these conclusions. Findings highlight the importance of concentrating responses to child sexual offending in the first few years after criminal justice system contact, when re-exposure to the original stressors or facilitators underpinning the behaviour, or exposure to new stressors resulting from criminal justice system contact, are most likely. Critically, findings also reinforce the utility of interventions addressing criminal and antisocial behaviour broadly, rather than just sexual offending specifically, for child sexual offenders. The low rates of sexual reoffending mean that targeted treatment, sentencing and post-sentence measures which use empirically supported risk factors to identify and prioritise high-risk offenders are likely to be more effective and cost-efficient than indiscriminately intensive responses.

Building on this, the current review also highlights the characteristics of those who are more likely to sexually reoffend. Those who commit contact sexual offences, who breach their conditional release orders, and who have extra-familial victims are more likely to reoffend generally and sexually. Extra-familial offenders are also more likely to have histories of non-sexual offending. These factors could indicate a greater willingness to overcome legal and practical obstacles in order to offend, including sexually, and may reflect stronger sexual deviance and/or antisociality. Indigenous status and low SES were predictive of reoffending in some studies, although these risk factors may be less important for juvenile offenders and those with histories of general offending.

Consistent with prior research (Hanson & Bussière 1998; Hanson & Morton-Bourgon 2005; McCann & Lussier 2008), juvenile offenders were more likely to reoffend sexually and generally than adult offenders, although they were less likely to have histories of sexual and general offending, probably because of their age. These findings add to the now considerable body of evidence for adolescence as a high-risk period for various forms of criminal and antisocial behaviour, including sexual offending. Among adult offenders, youth generally predicted sexual reoffending as well, although there may be greater variation in risk across adulthood than many existing studies reveal. Critically, while risk factors for reoffending were largely consistent across juvenile and adult offenders, this review does not examine psychological or clinical risk factors, which may differ starkly between adult and juvenile offenders.

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6. Reoffending among child sexual offenders

Christopher Dowling, Anthony Morgan and Kamarah Pooley

Given the significant harms caused by sexual offences against children, there is considerable academic, clinical and policy interest in the extent to which perpetrators reoffend after detection. An established body of research has examined rates of reoffending among child sexual offenders, along with the predictors and correlates of their offending (see Hanson & Bussière 1998; Hanson & Morton-Bourgon 2005; McCann & Lussier 2008; Seto, Hanson & Babchishin 2011; Seto & Lalumière 2010 for reviews). A rapid evidence assessment of 33 studies published since 2010 on reoffending among child sexual offenders processed through the criminal justice system found that reported rates of general reoffending (generally 20% and higher, depending on follow-up period) were notably higher than reported rates of sexual reoffending (generally 15% or lower, depending on follow-up period; Dowling et al. 2021). These findings are consistent with those of other reviews (Lussier & Mathesius 2018; Seto & Lalumière 2010), showing that many child sexual offenders commit a wide range of other crimes.

Dowling and colleagues' (2021) review also examined predictors of reoffending. Consistent with the broader criminological literature (Britt 2019; Nagin & Paternoster 2000), they found younger offenders and those with histories of non-sexual offending were more likely than older offenders, or offenders with no history of non-sexual offending, to reoffend non-sexually. Younger offenders, those with prior offending (sexual and non-sexual), and histories of community order breaches and sexual offences against extra-familial children, were more likely to sexually reoffend. More broadly, research has found that higher levels of both antisociality (ie impulsivity, recklessness, aggression and a lack of empathy) and sexual deviance (eg sexual preferences for children over adults, abnormal preoccupation with sex) are associated with an increased likelihood of sexual reoffending among child sexual offenders (Hanson & Bussière 1998; Hanson & Morton-Bourgon 2005; Seto & Lalumière 2010). While sexual deviance is taken as indicative of a stronger sexual desire for children, antisociality is thought to facilitate crime (including sexual offending) in that it underpins weaker moral and cognitive restraints against acting on this desire (Pullman, Stephens & Seto 2016).

Prior order breaches and extra-familial sexual offending could be indicative of a willingness to overcome legal and practical obstacles to sexually offend, and may reflect a stronger sexual desire for children. Building on this, some studies have found that offenders who expend greater effort over a longer period of time to access and 'groom' children for sexual abuse are more likely to sexually reoffend (eg Hanson & Harris 2000). However, others have found that those who attempt to solicit children online are less sexually deviant (Seto et al. 2012). The risk profiles and reoffending probabilities of these offenders may depend on whether they are contact-driven (ie procuring and grooming children for real-world sexual abuse) or fantasy-driven (ie procuring children for online sexual interactions; Briggs, Simon & Simonsen 2011). Importantly, Dowling and colleagues' (2021) review includes a number of studies examining child sexual abuse material (CSAM) offenders. Research on these offenders has found that their rate of general (sexual and non-sexual) reoffending is slightly lower than that of other child sexual offenders (Babchishin, Hanson & VanZuylen 2015; Babchishin et al. 2018; Brown & Bricknell 2018; Seto, Hanson & Babchishin 2011). Additionally, while rates of sexual reoffending among CSAM offenders are comparable to those of other child sexual offenders, there is some evidence CSAM offenders are less likely to sexually reoffend. However, when they do reoffend, they are more likely to commit CSAM and other non-contact offences.

Comparative studies have drawn attention to the importance of distinguishing between CSAM offenders and other sexual offenders in research samples (for reviews see Babchishin, Hanson & VanZuylen 2015; Babchishin et al. 2018; Brown & Bricknell 2018; Garrington et al. 2018; for recent Australian research see also Henshaw, Ogloff & Clough 2018). In short, CSAM offenders tend to be more sexually deviant and find it harder to engage socially and sexually with others. Meanwhile, contact and dual (contact and non-contact) child sexual offenders tend to be more generally antisocial and have weaker connections to informal social controls that regulate behaviour such as work, school and family. That CSAM offenders are less likely to sexually reoffend despite exhibiting higher levels of sexual deviance may be due to their lower levels of antisociality and their stronger connections to informal social controls, both of which could allow them to exercise greater restraint. Additionally, the ease of accessing CSAM in low-risk online environments could mean that many CSAM offenders are opportunistic users of it, who are unlikely to persist when it becomes more difficult or dangerous (ie after police detection; Wortley & Smallbone 2012).

Despite a large body of international evidence, Dowling and colleagues' (2021) review located only three Australian studies (Daly et al. 2013; Goodman-Delahunty & O'Brien 2014; Krone & Smith 2017). Goodman-Delahunty and O'Brien (2014), following offenders referred to a treatment program for an average of around 10 years (*SD*=4.5 years), found a general reoffending rate of 32 percent, and a non-sexual reoffending rate of 20 percent. Daly and colleagues (2013), following offenders for an average of around four years, found a notably higher general reoffending rate of 54 percent in their sample of juvenile sexual offenders. Consistent with the rest of the studies in Dowling et al.'s (2021) review, fewer than 10 percent of offenders in both studies sexually reoffended. The only Australian study to date examining reoffending among CSAM offenders specifically (Krone and Smith 2017) reported findings similar to those of international research. Examining reoffending over an average of about 3.5 years, they found that seven percent sexually reoffended, most (5%) with another CSAM offence, although a smaller proportion escalated to contact or grooming sexual offences (1% each).

There is a clear need for further rigorous Australian research examining baseline rates of reoffending among child sexual offenders, particularly CSAM offenders, along with its predictors. There is also a lack of research that compares CSAM offenders with contact and procurement/grooming offenders. This research is critical to informing the scale, implementation and targeting of treatment and criminal justice responses to child sexual offenders, particularly those that assume a high degree of persistence in sexual offending, such as sexual offender registers, indeterminate sentencing regimes, and sexual offender-specific treatment.

This study examines reoffending in an Australian sample of child sexual offenders. It addresses the following questions:

- What proportion of child sexual offenders commit further sexual and non-sexual offences after their first police proceeding for child sexual offences?
- How long after their first police proceeding for child sexual offences do offenders commit further sexual and non-sexual offences?
- What factors are associated with a higher likelihood of committing further sexual and non-sexual offences?
- Are there differences in the likelihood, types and predictors of further sexual and non-sexual offences between child sexual assault, child procurement/grooming and CSAM offenders?

Methods

Sample and data

This study examines the officially recorded offending and custodial histories of a sample of 1,092 male offenders who were born on or after 1984, and were first proceeded against for child sexual offences by NSW Police Force between 1 January 2004 and 31 December 2013 (inclusive). Data were provided by the NSW Bureau of Crime Statistics and Research (BOCSAR). The dataset includes all recorded offending and custody episodes for offenders between 1 January 1994 and 31 December 2018 (inclusive). Child sexual offences were operationalised using Australian and New Zealand Standard Offence Classification categories (Australian Bureau of Statistics 2011) and Law Part codes (Judicial Commission of New South Wales 2020), and defined in accordance with the *Crimes Act 1900* (NSW). Offenders were classified based on their most serious child sexual offence at their first police proceeding for child sexual offending:

- child sexual assault offenders (*n*=863)—those whose most serious offence involved contact sexual offences against a person under 16 years of age (ie attempted or actual rape and other forms of indecent assault);
- child procurement/grooming offenders (*n*=33)—those whose most serious offence involved soliciting or manipulating a person under the age of 16 for sexual purposes (online or offline); and
- child abuse material (CSAM) offenders (*n*=196)—those whose most serious offence involved the distribution or possession of sexually explicit material depicting a person under 16 years of age.

Importantly, child sexual assault offenders could also have been proceeded against for child procurement/grooming and/or CSAM offences, while child procurement/grooming offenders could also have been proceeded against for CSAM offences. However, only a small number of offenders (*n*=48) were proceeded against for more than one type of abuse.

Half of offenders (48%) committed their first child sexual offence as a juvenile (ie 10–17 years of age), while 43 percent were juveniles when they were first proceeded against for child sexual offences. Thirteen percent of offenders indicated that they were Aboriginal or Torres Strait Islander at their first police proceeding, and half (48%) lived in areas classified as regional or remote based on Accessibility/Remoteness Index of Australia scores (Hugo Centre for Population and Housing 2018). Almost a third (29%) lived in areas ranked in the lowest quartile of the Socio-Economic Index for Areas (Australian Bureau of Statistics 2018), suggesting a significant degree of socio-economic disadvantage.

Most (62%) had more than one sexual offence at their first police proceeding. Ten percent also had sexual offences committed against non-child victims (including sexual offences against adults, bestiality, and offences against the public involving voyeurism and exposure) recorded prior to their first police proceeding for child sexual offences, and a little under one-fifth had prior non-sexual violent (16%) or non-violent (18%) offences. Child procurement/grooming offenders were less likely to have been juveniles at their first police proceeding for child sexual offending, and when they committed their first sexual offence (18% for both), than child sexual assault offenders (45% and 55%) and CSAM offenders (39% and 41%; $\chi^2(2, 1{,}092)=10.73$, $p<0.01$, Cramér's $V=0.10$; $\chi^2(2, 1{,}092)=28.29$, $p<0.001$, Cramér's $V=0.16$). Meanwhile, CSAM offenders were less likely to have recorded histories of non-sexual violent (5%) and non-violent (11%) offending than child sexual assault offenders (18% and 19%) and child procurement/grooming offenders (21% and 18%; $\chi^2(2, 1{,}092)=20.20$, $p<0.001$, Cramér's $V=0.14$; $\chi^2(2, 1{,}092)=8.16$, $p<0.05$, Cramér's $V=0.09$).

Analytic strategy

The follow-up period used to measure reoffending constitutes the total amount of time an offender was able to offend between the date on which their first police proceeding for child sexual offending was finalised and 31 December 2018. Any time served in custody was subtracted from the total amount of time between these two dates. The average adjusted follow-up time was 8.9 years (SD=2.7; range=0–14.7). Reoffending was said to have occurred when offenders were proceeded against by NSW Police Force during this follow-up period. Minor traffic offences (ie speeding, parking fines) were excluded. Breaches of custodial or community orders were also excluded, as the study was interested in new episodes of offending. Sexual and non-sexual reoffending were examined separately. Sexual reoffending includes any sexual offences committed against children or adults, bestiality, and sexual offences against the public involving exposure and voyeurism during the follow-up period. Sexual offences not examined in this study include certain offences against public sexual standards (ie those involving prostitution and pornography), being an accessory after the fact to sexual offences, breaches of sex offender-specific community orders, and outdated sexual offences (eg those criminalising same-sex activity).

Survival analysis was used to measure reoffending as a function of the time an individual was free to reoffend. The analysis accounts for the variable observation periods of offenders and any time spent in custody during the follow-up period. Cox regression, which is an extension of survival analysis, was used to determine whether there were differences in the hazard (or risk) of reoffending between groups of offenders. Cumulative reoffending probabilities and hazard ratios (HR) were used to examine reoffending patterns. Whether those who sexually reoffended transitioned to different sexual offences was examined descriptively.

Logistic regression models were used to identify the predictors of sexual and non-sexual reoffending, both overall and for each type of child sexual offender, examining the criminal history, offence-specific and demographic variables discussed above. Predicted probabilities, adjusting for covariates using marginal standardisation (Muller & MacLehose 2014), were calculated for each significant predictor.

Limitations

The following results do not account for offences that do not come to the attention of police and meet the threshold for criminal justice intervention. The current data do not include information on certain offence characteristics (eg the relationship of the offender to the victim, the use of violence) or exposure to treatment, which have been shown to influence the likelihood of reoffending. While offence-switching between initial and further sexual offending episodes is examined, the omission of more detailed offence information also prohibits an examination of how and under what circumstances reoffending occurs. Sexual reoffending results combine further child and non-child sexual offences to account for, and allow examination of, offence-switching during the follow-up period. While this was of interest in the current study, it should be noted that not all who sexually reoffended did so against a child. Finally, the sample was restricted to male offenders, excluding 60 female offenders in the sample originally provided by BOCSAR. Over 95 percent of child sexual offenders are male—a higher proportion than for any other major form of crime (Australian Bureau of Statistics 2020). Additionally, female sexual offenders have been shown to differ significantly from male offenders in offending patterns and predictors of offending (eg Bourke et al. 2014).

Results

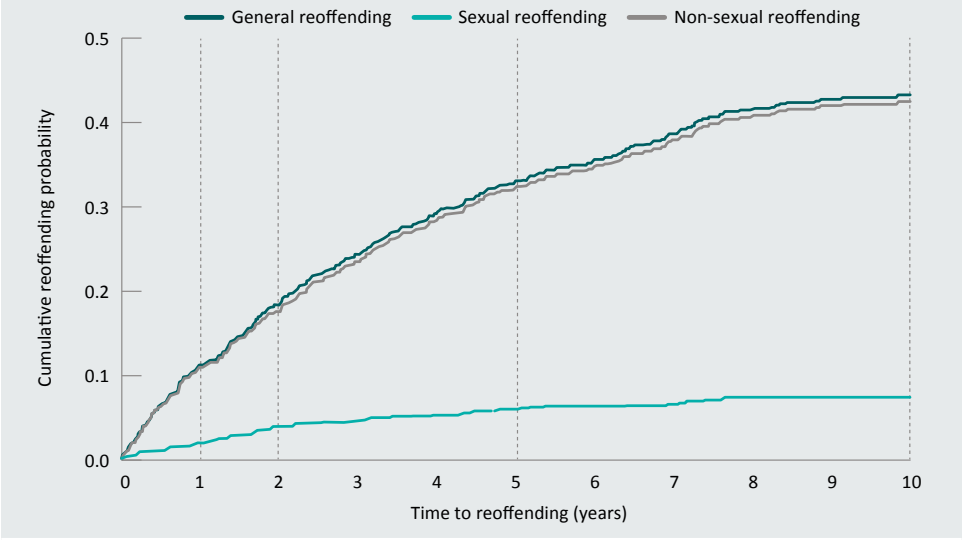
What proportion of child sexual offenders reoffend after their first police proceeding for child sexual offences?

Figure 1 plots the cumulative sexual and non-sexual reoffending probabilities (ie failure curves) for child sexual offenders over the entire follow-up period. Cumulative probabilities at one year, two years, five years and 10 years are reported in Table 1. Overall, 43 percent (95% CI=40%–46%) of offenders reoffended either sexually or non-sexually within 10 years of their first police proceeding for child sexual offences. Seven percent (95% CI=6%–9%) reoffended sexually in this period, and 42 percent (95% CI=39%–46%) reoffended non-sexually.

Sexual and non-sexual reoffending rates were compared using Cox regression run on a duplicated dataset with a single merged reoffending variable. A variable distinguishing reoffending types (sexual or non-sexual) was entered into the model, and standard errors were adjusted to account for clustering within offender ID. The difference observed was significant (HR=8.42, 95% CI=6.60–10.73, $p<0.001$). At any given point in time during the follow-up period, child sexual offenders were over eight times more likely to reoffend non-sexually than sexually.

There was also some evidence of offence transition among child sexual offenders who reoffended. More than half the offenders who sexually reoffended committed an offence type different to their offence at the first police proceeding (56%, *n*=42). Transitions were most often to CSAM offending or sexual offending against non-child victims. Of those who sexually reoffended, 25 percent went on to commit either or both of these types of sexual offences (*n*=19 each). Fewer transitioned to committing child sexual assault (11%, *n*=8) or child procurement/grooming offences (8%, *n*=6).

Figure 1: Cumulative reoffending probabilities for child sex offenders, by years from first police proceeding



Note: Vertical lines denote 1, 2, 5 and 10 year intervals

Source: NSW BOCSAR 2020 [dataset]

Table 1: Cumulative reoffending probabilities for child sex offenders, by principal offence type, with confidence intervals				
	1 year (95% CI)	2 years (95% CI)	5 years (95% CI)	10 years (95% CI)
Sexual reoffending				
Child sexual assault offenders	0.01 (0.01–0.02)	0.03 (0.02–0.05)	0.05 (0.04–0.07)	0.06 (0.05–0.08)
Child procurement/ grooming offenders	0.12 (0.05–0.30)	0.12 (0.05–0.30)	0.19 (0.09–0.37)	0.28 (0.13–0.54)
CSAM offenders	0.01 (0.00–0.05)	0.04 (0.02–0.08)	0.08 (0.05–0.12)	0.09 (0.06–0.15)
All child sex offenders	0.02 (0.01–0.03)	0.04 (0.03–0.05)	0.06 (0.05–0.07)	0.07 (0.06–0.09)
Non-sexual reoffending				
Child sexual assault offenders	0.11 (0.09–0.13)	0.19 (0.16–0.22)	0.33 (0.30–0.37)	0.44 (0.40–0.48)
Child procurement/ grooming offenders	0.16 (0.07–0.33)	0.16 (0.07–0.33)	0.31 (0.18–0.50)	0.40 (0.22–0.64)
CSAM offenders	0.09 (0.05–0.14)	0.12 (0.08–0.17)	0.28 (0.22–0.34)	0.36 (0.29–0.43)
All child sex offenders	0.11 (0.09–0.13)	0.17 (0.15–0.20)	0.32 (0.30–0.35)	0.42 (0.39–0.46)

Note: CI=confidence interval

Source: NSW BOCSAR 2020 [dataset]

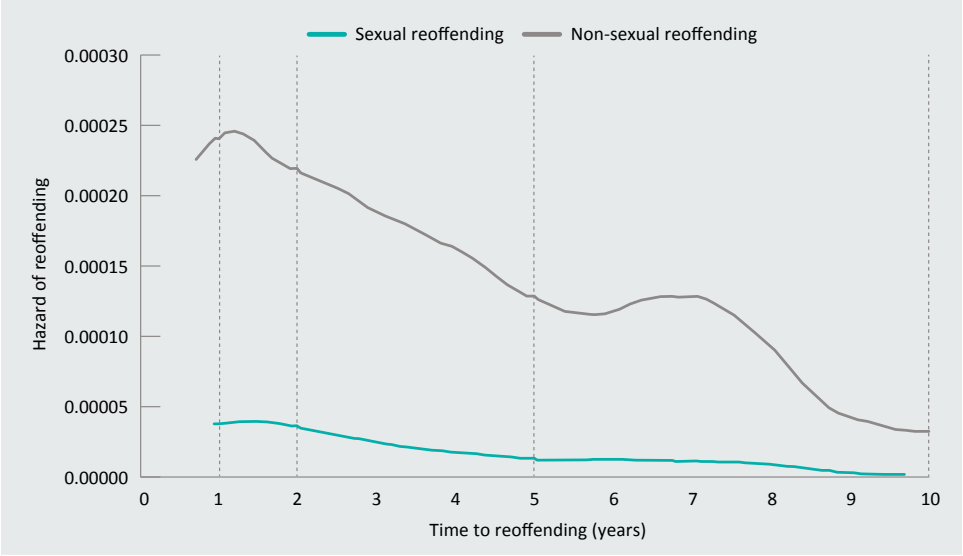
How long after their first police proceeding for child sexual offences do offenders commit further sexual and non-sexual offences?

The failure curve in Figure 1 and cumulative probabilities in Table 1 reveal a number of important findings about how long it takes child sexual offenders to reoffend. An estimated two percent of child sex offenders sexually reoffended within one year of their first police proceeding, and four percent within two years. The rate of failure (sexual reoffending) slowed after this period, with six percent reoffending within five years and seven percent within 10 years.

Similar results emerged in relation to non-sexual offences. An estimated 11 percent of child sexual offenders reoffended non-sexually within one year of their first police proceeding for child sexual offences, 17 percent within two years, 32 percent within five years and 42 percent within 10 years.

Taken together, these results show that the highest risk period for reoffending, both sexually and non-sexually, is the two-year period following their first police proceeding. This is further illustrated by the hazard curve for sexual and non-sexual reoffending, presented in Figure 2. This shows the hazard (risk) of reoffending at each time point, and clearly shows a peak in the relative short-term.

Figure 2: Hazard of sexual and non-sexual reoffending for child sexual offenders, by years from first police proceeding



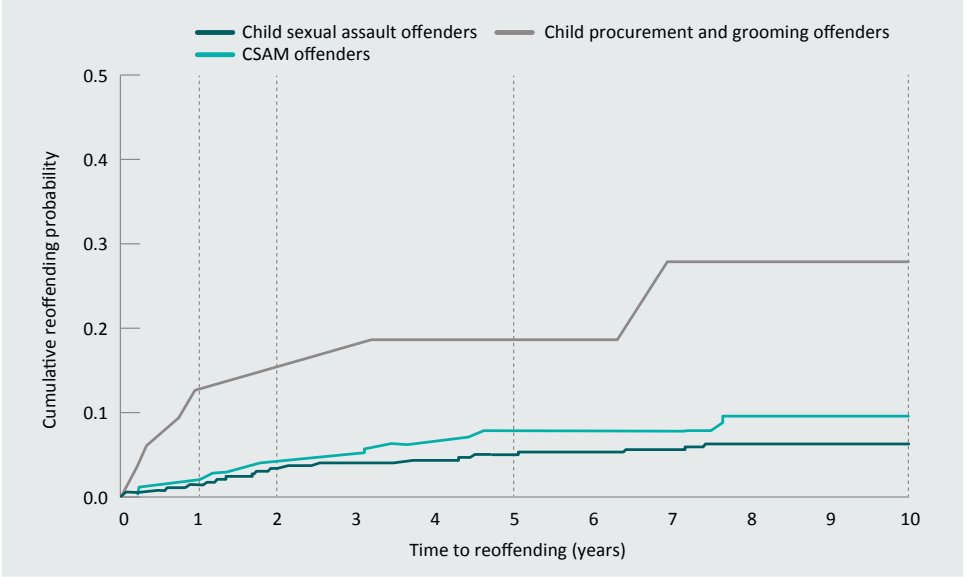
Note: Vertical lines denote 1, 2, 5 and 10 year intervals

Source: NSW BOCSAR 2020 [dataset]

Differences in the likelihood and types of reoffending between child sexual assault offenders, child procurement/grooming offenders, and CSAM offenders

Differences in reoffending between child sexual assault, child procurement/grooming offenders and CSAM offenders were analysed next. Survival analysis revealed that more than one-quarter (28%) of child procurement/grooming offenders sexually reoffended in the 10 years following their first police proceeding for child sexual offences, compared with nine percent of CSAM offenders and six percent of child sexual assault offenders (Table 1 and Figure 3). Cox regression, run as an extension of this survival analysis, was used to further analyse differences in the risk of sexual reoffending between these offender groups. Child procurement/grooming offenders were assigned as the reference category. There was a significant difference between child procurement/grooming offenders, and both child sexual assault offenders (HR=0.23, 95% CI=0.10–0.51, $p<0.001$) and CSAM offenders (HR=0.34, 95% CI=0.14–0.83, $p<0.05$). At any given point in time during the follow-up period, child procurement/grooming offenders were more than four times as likely as child sexual assault offenders (1/0.23=4.34), and around three times as likely as CSAM offenders (1/0.34=2.94) to sexually reoffend.

Figure 3: Cumulative probabilities of sexual reoffending among child sexual offenders, by years from first police proceeding



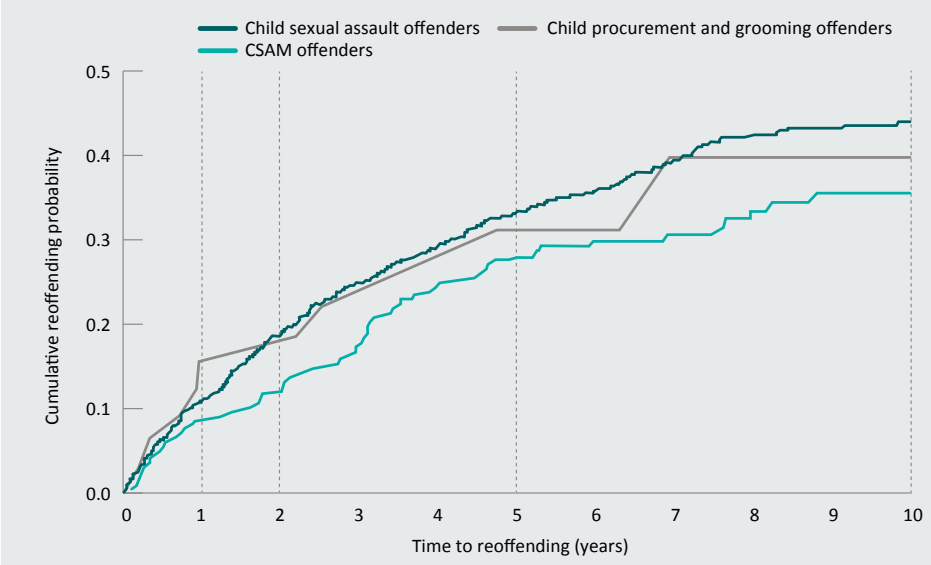
Note: Hazards were proportional, assessed using Schoenfeld residuals. Vertical lines denote 1, 2, 5 and 10 year intervals

Source: NSW BOCSAR 2020 [dataset]

Almost half of child sexual assault offenders (44%) reoffended non-sexually in the 10 years following their first police proceeding for child sexual offences, compared with a third of CSAM offenders (36%) and 40 percent of child procurement/grooming offenders (Table 1; see also Figure 4). Cox regression, using child sexual assault offenders as the reference category, revealed significant differences in non-sexual reoffending between these and CSAM offenders (HR=0.76, 95% CI=0.59–0.99, $p<0.05$; see Table 1 and Figure 3). At any given point in time during the follow-up period, child sexual assault offenders were 31 percent more likely than CSAM offenders to have reoffended non-sexually (1/0.76=1.31). There was no difference between child sexual assault offenders and child procurement/grooming offenders (HR=0.88, 95% CI=0.48–0.1.61, $p=0.68$).

Almost two-thirds of child sexual assault offenders who sexually reoffended went on to commit a different sexual offence (62%, *n*=32). Over a quarter sexually reoffended against a non-child victim (31%, *n*=16) and/or with CSAM (29%, *n*=15), while only six percent went on to engage in child procurement/grooming offences. CSAM offenders who sexually reoffended (*n*=21) were the least likely to commit a different sexual offence (43%, *n*=9). These offenders most often went on to commit child sexual assault (*n*=5), while two committed a child procurement/grooming offence and one committed a sexual offence against a non-child victim. Most of those with child procurement/grooming offences who sexually reoffended (*n*=7) did so with a different sexual offence (71%, *n*=5). This was most often a CSAM offence (*n*=3) or a sexual offence against a non-child victim (*n*=2). None went on to sexually assault a child.

Figure 4: Cumulative probabilities of non-sexual reoffending among child sexual offenders, by years from first police proceeding



Note: Hazards were proportional, assessed using Schoenfeld residuals. Vertical lines denote 1, 2, 5 and 10 year intervals

Source: NSW BOCSAR 2020 [dataset]

Predictors of reoffending, and differences between child sexual assault offenders, child procurement/grooming offenders, and CSAM offenders

The final stage of the analysis examined predictors of sexual and non-sexual reoffending among child sexual offenders. Logistic regression models were run predicting sexual and non-sexual reoffending in the two years following the first police proceeding for child sexual offences. Predicting short-term reoffending was of interest here due to the heightened risk of offending in the first few years following criminal justice system contact, and also because many offenders continue to have contact with the criminal justice system throughout this period (eg probation and parole, community sentences, police registration). Due to the low number of child procurement/grooming offenders, analyses were not undertaken for these offenders. Additionally, the low number of CSAM offenders who sexually reoffended during this period (*n*=8) prohibited multivariate analysis of its predictors. Chi-square analyses with Fisher's exact tests were used instead.

The ages at which offenders committed their first offences correlated strongly with the ages of their first police proceeding for child sexual offending, and were excluded. Five offenders who were followed for less than two years were excluded, as were those with missing data on one or more of the predictors examined. This left a sample of 932 child sexual offenders, including 732 child sexual assault offenders, 170 CSAM offenders and 30 child procurement/grooming offenders.

Child sexual offenders with prior non-sexual violent and non-violent offending, Indigenous offenders and those living in a regional or remote location at the first police proceeding for child sexual offences were more likely to reoffend non-sexually (Table 2). Prior violence was associated with a 47 percent increase in the predicted probability of reoffending (17% vs 25%), while the predicted probability of reoffending for those with prior non-violent offending was over twice that of those without (15% vs 33%). The predicted probability of reoffending was around 65 percent higher for Indigenous (28%) than for non-Indigenous offenders (17%), and around 71 percent higher for those living in regional or remote locations (24%) than for those in urban centres (14%). Offenders who committed their first child sexual offence as an adult (16%) were 37 percent less likely to reoffend than juvenile offenders (22%).

The same factors emerged as important, and to a similar magnitude, in predicting short-term non-sexual reoffending among child sexual assault offenders. However, only Indigenous status and the number of child sexual offences committed were associated with non-sexual reoffending among CSAM offenders. The predicted probabilities of reoffending were over three times higher for Indigenous CSAM offenders (40%), and those with more than one child sexual offence (24%) than for non-Indigenous offenders (11%) and those with one child sexual offence (7%).

These factors also emerged as important in predicting short-term sexual reoffending among child sexual offenders. The predicted probability of reoffending was six times higher for those with more than one child sexual offence, although both groups had low rates of reoffending (1% vs 6%). Additionally, the predicted probability of reoffending was around twice as high for Indigenous offenders as for non-Indigenous offenders (7% vs 4%), but again rates across both groups were low.

Given the small number of CSAM offenders in this analysis who sexually reoffended (*n*=8), and the fact that results are not independent of the influence of other predictors, results need to be interpreted cautiously. Much like child sexual offenders generally, Indigenous status and the number of child sexual offences at first police proceeding significantly predicted sexual reoffending among CSAM offenders. Indigenous CSAM offenders (33%, 3 out of 9) were over 10 times as likely to reoffend as non-Indigenous CSAM offenders (3%, 5 out of 163). Additionally, all CSAM offenders who sexually reoffended had more than one child sexual offence at their first police proceeding (11%, 8 out of 75 vs 0%, none out of 113).

Table 2: Predictors of short-term sexual and non-sexual reoffending among child sex offenders

	All child sexual offenders		Child sexual assault offenders		CSAM offenders	
	Non-sexual reoffending OR (95% CI)	Sexual reoffending OR (95% CI)	Non-sexual reoffending OR (95% CI)	Sexual reoffending OR (95% CI)	Non-sexual reoffending OR (95% CI)	Sexual reoffending OR (95% CI)[a]
Prior adult sexual offending[b]	ns	ns	ns	ns	–	ns
Prior non-sexual violent offending	1.70 (1.12–2.56)*	ns	1.63 (1.04–2.53)*	ns	ns	ns
Prior non-violent offending	2.81 (1.89–4.18)***	ns	3.27 (2.12–5.01)***	ns	ns	ns
More than one child sexual offence at first police proceeding[c]	ns	5.19 (1.81–14.91)**	ns	3.76 (1.11–12.71)*	5.04 (1.35–18.84)*	–
Adult at first police proceeding	0.65 (0.46–0.93)*	ns	0.63 (0.42–0.93)*	ns	ns	ns
Indigenous	1.94 (1.23–3.06)**	2.26 (1.05–4.84)*	1.67 (1.01–2.75)*	ns	5.93 (1.45–24.18)*	10.87 (2.23–53.04)**
Lived in low socio-economic area at first police proceeding	ns	ns	ns	ns	ns	ns
Lived in regional/ remote area at first police proceeding	1.94 (1.36–2.75)***	ns	2.18 (1.47–3.22)***	ns	ns	ns

***statistically significant at $p<0.001$, **statistically significant at $p<0.01$, *statistically significant at $p<0.05$

a: Fisher's exact test used instead of logistic regression due to low sex reoffending rate ($n=8$)

b: Prior adult sex offending was excluded from the model predicting non-sex reoffending in CSAM offenders due to collinearity

c: While statistically significant, having more than one child sexual offence at first police proceeding was a perfect predictor of sexual reoffending in CSAM offenders, and it was not possible to calculate an OR

Note: OR=odds ratio, CI=95% confidence interval, ns=not significant. Model statistics as follows: (1) All child sexual offenders; non-sexual reoffending Model $\chi^2(df, n)=74.95$ (8, 932), $p<0.001$, Nagelkerke $R^2=0.13$; sexual reoffending Model $\chi^2(df, n)=31.50$ (8, 932), $p<0.001$, Nagelkerke $R^2=0.10$; (2) Child sexual assault offenders non-sexual reoffending Model $\chi^2(df, n)=66.72$ (8, 732), $p<0.001$, Nagelkerke $R^2=0.15$; sexual reoffending Model $\chi^2(df, n)=18.76$ (8, 732), $p<0.05$, Nagelkerke $R^2=0.08$; (3) CSAM offenders non-sexual reoffending Model $\chi^2(df, n)=27.17$ (7, 170), $p<0.001$, Nagelkerke $R^2=0.23$; sexual reoffending more than one child sexual offence $p<0.001$, Cramér's $V=0.36$; Indigenous status $p<0.001$, Cramér's $V=0.22$.

Source: NSW BOCSAR 2020 [dataset]

Discussion

This study has examined reoffending in an Australian sample of child sexual offenders. Results are largely consistent with those of prior reoffending studies (Hanson & Bussière 1998; McCann & Lussier 2008; Seto, Hanson & Babchishin 2011). Main findings are as follows:

- Sexual reoffending among child sexual offenders was rare. In fact, the estimated rate of reoffending after 10 years (7%) is towards the lower end of the range reported in Dowling and colleagues' (2021) review.
- Child sexual offenders were much more likely to reoffend non-sexually than sexually. After 10 years, two in five child sexual offenders had committed further non-sexual offences.
- The likelihood of sexual and non-sexual reoffending is highest in the two years following the first police proceeding for child sexual offences, and steadily decreases over time.

These findings lend further support to the now considerable body of research showing that, for many, child sexual offending is part of a broader pattern of criminal behaviour, underpinned by antisocial, impulsive and aggressive tendencies and a lack of empathy—characteristics that also drive their involvement in non-sexual offending (Hanson & Morton-Bourgon 2005; McCann & Lussier 2008; Seto & Lalumière 2010). Meanwhile, the heightened risk of reoffending in the shorter term could partially be due to a monitoring effect, with closer supervision of offenders in the period immediately following criminal justice system contact increasing the likelihood that further offences will be detected. This period may also see some offenders re-exposed to the stressors that underpinned their initial sexual offences, while others may experience new stressors as a result of their involvement with the criminal justice system.

These findings highlight the importance of implementing more intensive treatment, incapacitation and monitoring responses in the first few years after criminal justice system contact, and targeting these interventions at those offenders most at risk of reoffending. They also support the utility of interventions addressing criminal and antisocial behaviour broadly, rather than sexual offending specifically.

Child sexual assault offenders were the most likely to reoffend non-sexually, and the least likely to reoffend sexually. This broad category likely encompasses a variety of offenders, from those whose sexual offending is persistent and predatory, to opportunistic or impulsive offenders whose motivation to sexually abuse children is more ambivalent. Those whose principal child sexual offences were procurement or grooming-related, in contrast, may constitute a more homogeneous, sexually deviant group of child sexual offenders who were determined to procure a child for sexual contact. Alternatively, the higher rate of sexual reoffending in this group may reflect the ease with which they can continue to interact sexually with children (or access CSAM) in an online environment in which accessing victims and materials requires little effort and comes with little risk. The latter conclusion is supported by the fact that no procurement/grooming offenders who sexually reoffended did so with a contact sexual offence. Meanwhile, the low rates of sexual *and* non-sexual reoffending among CSAM offenders, and the very small number who escalated to contact offences, is consistent with prior research showing similarly low rates of sexual reoffending, and less criminal involvement, among these offenders.

Those with a history of non-sexual offending were the most likely to reoffend non-sexually, while those with more than one child sexual offence at their first police proceeding were more likely to sexually reoffend. Juveniles were also more likely to reoffend non-sexually. Indigenous offenders and those living in regional and remote areas were more likely to reoffend both sexually and non-sexually. This may reflect the barriers those living outside urban centres can face in accessing effective support, justice and treatment services that address sexual offending in particular (Law Council of Australia 2018).

While the risk profile of child sexual assault offenders for non-sexual and sexual reoffending was consistent with the profile of child sexual offenders generally (likely because they account for the majority of the sample), the only significant predictors of non-sexual and sexual reoffending among CSAM offenders were the extent of prior child sexual offending and Indigenous status. Other common predictors of non-sexual reoffending, such as age and prior offending, did not emerge as important. International studies have similarly struggled to identify reliable predictors of reoffending in CSAM offenders (eg Eke, Helmus & Seto 2018), highlighting the need for further research of this offender population. Additionally, this could reflect the highly opportunistic nature of CSAM offending. Importantly, identifying predictors of sexual reoffending in the current study was also made difficult by the small number of CSAM offenders who reoffended.

The current study addresses an important gap in research on child sex offending, examining a large sample of offenders, including CSAM offenders, adding to the small number of Australian studies. The findings are critical to understanding the nature and patterns of their offending, and informing the scale and targeting of treatment and criminal justice responses.

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7. Cyber strategies used to combat child sexual abuse material

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Introduction

There is no definitive statistic regarding the *amount* of child sexual abuse material (CSAM) accessible online. The National Crime Agency of the United Kingdom identified 2.88 million accounts registered on darknet CSAM sites in their national strategic assessment (Johnson & Patel 2019). The National Center for Missing and Exploited Children (NCMEC) received more than 18 million reports in 2018 (NCMEC 2020). According to the Australian Federal Police there were 17,905 reports of online CSAM images identified in 2018 alone (Akerman 2019).

This crime presents significant challenges to law enforcement, as new technology continuously creates novel opportunities for CSAM perpetrators (Seto 2013). The anonymity, accessibility and affordability of the internet also offers a unique environment in which to commit offences (Wortley & Smallbone 2006). Research indicates online sharing platforms have been responsible for the acceleration in the pace of CSAM creation and distribution. The NCMEC recorded 23.4 million instances of CSAM between 1998 and 2017, with 9.6 million (40%) being recorded just in 2017 (Bursztein et al. 2019). The proliferation is also evident in Australia, with the Australian Federal Police receiving over 8,000 more CSAM referrals in 2018 than in 2017, with each report potentially relating to thousands of images and videos (Akerman 2019).

The rapid rise in the availability of CSAM has occurred alongside swift advances in technologies such as high-speed internet, increasingly fast central processing units in computers, and virtual reality (Broadhurst 2019). Distribution channels have also followed the development of new forms of online technology. Where email and computer networks were once the main methods of distributing CSAM files, new apps and Tor (The Onion Router) browsers have since been adopted (Bursztein et al. 2019). To protect their anonymity, offenders also now use protected network connections (virtual private networks), encryption and proxy servers (Balfe et al. 2015), along with the darknet.

The internet has also created new forms of CSAM such as live streaming of abuse with payment through various financial instruments (United Nations Office on Drugs and Crime 2015). Live streaming involves viewing child abuse in real time, allowing the CSAM offender to interact with the abuser and to request acts they want committed against the child (Açar 2017; Europol 2019). Often these offenders will make the payments using various anonymous service providers, financial institutions and cryptocurrencies to avoid drawing suspicion (Australian Transaction Reports and Analysis Centre 2019).

CSAM is regularly found on and removed from social media by platform providers. For example, a Northern Territory resident was recently arrested by Northern Territory Police for using social media platforms to transmit CSAM which was identified by NCMEC (Mirage 2020). In 2018, Facebook announced that in one quarter they had removed 8.7 million pieces of content violating their child nudity or sexual exploitation policies identified using artificial intelligence (AI; Hutchinson 2018). Facebook has teams working constantly to identify and remove this content and make reports to NCMEC which are then referred to international law enforcement (Hutchinson 2018). However, these strategies have been critiqued as insufficient, with calls for

social media companies to 'do more' to combat CSAM (Hunter 2019). Facebook's recent plans to implement end-to-end encryption, for example, received international criticism given the technology will present a barrier to identifying and reporting CSAM (Hunter 2019).

While therapeutic and educational strategies have long been a key part of child sexual abuse prevention and response (Smallbone, Marshall & Wortley 2008), and many of these have been translated to the prevention of CSAM, cyber strategies used in the prevention of CSAM are relatively new. In essence, this research synthesis captures the current state of practice for cyber strategies that aim to reduce CSAM. It offers to enhance understanding of the strategies for a broad audience of non-cyber experts who are devoted to CSAM reduction, by identifying and breaking down complex technological interventions. Thus, this chapter should be a valuable resource for those in other disciplines such as law or counselling, and in non-cyber specialist roles within law enforcement. Innovatively, this study focuses on the use of technology to reduce CSAM, which is distinct from previous research which aimed to identify instances of CSAM across the many traditional and evolving platforms. In doing so, this synthesis identifies key strategies and explores the background of each, how they work, and the evaluative research, along with the benefits, limitations and implementation considerations. The strategies presented are not recommendations; instead, they represent a review of the research.

Methodology

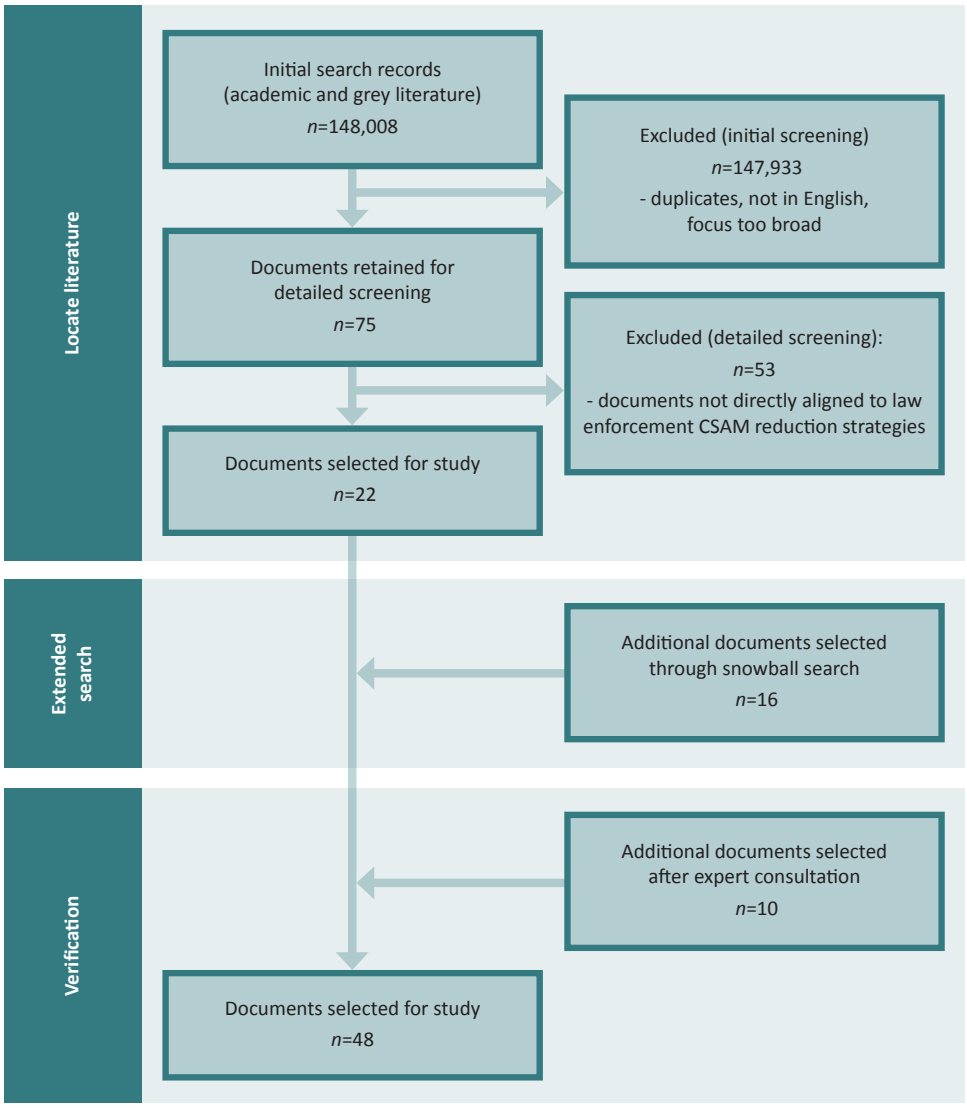
This research aimed to identify and explain current national and international cyber CSAM reduction strategies. This was achieved through a comprehensive literature search of unpublished (grey) and published (academic) literature. The literature search was designed to be exhaustive in identifying current strategies and was not restricted by the methodological hierarchy of evidence. The search process is displayed in Table 1. Data extraction was undertaken by a primary reviewer and verified by two secondary reviewers.

Search results are displayed in Figure 2. Five key strategies emerged across the 48 articles. The research synthesis was completed strategy by strategy using a deductive approach, with documents examined for the background of the strategy, how each strategy is theorised to work, the evaluative research, along with its benefits, limitations and implementation considerations. Data analysis was undertaken by a primary reviewer and verified by two secondary reviewers. Discussion among reviewers was also used to advance interpretation.

Literature sourced is indicated in the reference list with a (*) symbol. Due to publication constraints, representative literature is included in this chapter. The authors can be contacted for a complete list. The research team also hosted a roundtable in December 2019 with six key national cyber experts and academics. During the roundtable, the research team summarised each strategy identified from the initial search records, selected snowball documents and literature sourced from expert consultation. These experts verified that the strategies were representative of those employed in the field.

Table 1: Search process			
Stage	**Description**	**Steps**	**Activities undertaken**
1	Preparation	▪ Establish search aims and guidelines	▪ Academic and grey literature ▪ Not restricted by methodological hierarchy of evidence ▪ Date range: open ▪ Search conducted June/July 2019
2	Locate literature	▪ Conduct search of selected search platforms ▪ Two-stage document screening	▪ Online search platforms included: HeinOnline, Google Scholar, Scopus ▪ Broad search terms included: child exploitation, cybercrime, forensics ▪ Initial screening (title) excluded documents not published in English, duplicates, and documents not specific to CSAM ▪ Detailed document screening (abstracts/articles) excluded documents not directly focused on cyber CSAM reduction strategies, documents not available in full text
3	Extended search	▪ Snowballing search of reference lists and citations	▪ Reference list and citation searches on selected documents to ensure comprehensive identification of current CSAM reduction strategies
4	Verification	▪ Contact with experts (academics, practitioners, stakeholders) to source unpublished research literature and practice wisdom	▪ Two international experts (United States of America) shared published research literature ▪ Subsequent roundtable discussion with 6 national experts (representing 4 organisations) to verify representativeness of identified strategies
5	Documentation	▪ Search processes and results documented	▪ See Figure 1

Figure 1: Search results



Results

Five cyber strategies were identified: peer-to-peer network monitoring, automated multi-modal CSAM detection tools, using web crawlers to identify CSAM sites, pop-up warning messages, and facial recognition. One of these strategies (facial recognition) was not subject to evaluation and the other four had very limited evaluation (peer-to-peer network monitoring, automated multi-modal CSAM detection tools, using web crawlers to identify CSAM sites, and pop-up warning messages).

The authors acknowledge that law enforcement also use other strategies to combat CSAM, such as proactive investigations. However, this study focuses on key technological strategies; less cyber-focused strategies are addressed in a separate publication (Christensen et al. 2021). The authors also acknowledge the role of strategies beyond cyber and law enforcement disciplines, including intervention helplines for potential offenders, public awareness campaigns, education for children, and therapeutic programs for CSAM offenders. These strategies are discussed in a separate paper (Rayment-McHugh, McKillop & Christensen forthcoming).

The cyber disruption strategies discussed below may be explained by situational crime prevention (SCP) theory (Clarke 1980). SCP underpins all five disruption strategies identified in this chapter. This theory focuses on the specific characteristics of a situation, as opposed to the motive and characteristics of an offender (Huisman & van Erp 2013). Such a perspective is imperative when understanding CSAM offences. SCP is also applied to contact child sexual offending—for example, public awareness campaigns can remove excuses and reinforce standards of behaviour in the community, reducing permissibility (Wortley & Smallbone 2006). However, in contrast with contact child sexual offending, the internet offers a unique criminogenic environment characterised by anonymity, accessibility and affordability (Wortley & Smallbone 2012). This unique environment creates challenges for the prevention of CSAM and, given the role of technology and the internet, the prevention strategies used for contact child sexual offending cannot be seamlessly transferred by cyber specialists.

SCP proposes that crime prevention occurs by altering opportunity structures within a given situation or environment (Huisman & van Erp 2013). In particular, Cornish and Clarke (2003) identified 25 SCP techniques, which come under five primary strategies:

- increasing effort by making it more difficult to commit a crime in that environment;
- increasing the risk of getting caught;
- reducing rewards from crime;
- reducing provocations to offend; and
- removing excuses for crime.

Strategies that disrupt networks (increasing effort and reducing rewards), that identify offenders and victims (increasing risks) and that set standards of behaviour (remove excuses) appear most relevant to CSAM reduction (Wortley & Smallbone 2012).

Peer-to-peer network monitoring

Peer-to-peer (P2P) communication is a common form of file sharing. It was originally used for illegal access to movies and music but has evolved to include the widespread distribution of CSAM. Monitoring P2P network communication assists law enforcement to identify major CSAM distributors, to locate and prosecute persons in possession of CSAM, to identify child victims, and to remove CSAM sites (Schell et al. 2007).

P2P network monitoring involves law enforcement using investigation tools to collect data travelling across a network to identify whether it contains CSAM (Schell et al. 2007). Included in the data captured are the internet protocol addresses (a numerical label assigned to a computer or device) of those computers that are party to the communication of CSAM. Hash values (numeric values created by transforming a dataset such as an image) are also compared to those in law enforcement databases, and positive matches are taken for follow-up investigation (Wolak, Liberatore & Levine 2014). File names are also automatically monitored on the P2P network (Peersman et al. 2014).

This strategy enables law enforcement to identify and remove large libraries of CSAM images, reducing access to this material. Therefore, the strategy disrupts offending by reducing opportunities and by increasing the risk of detection (Wortley & Smallbone 2012). In line with SCP, network monitoring may also increase the perceived risk of offending among CSAM consumers, challenging the perception that the internet is anonymous and safe, but only if network monitoring capabilities and arrests are publicised (Wortley & Smallbone 2012).

Some studies have investigated the dimensions of P2P CSAM networks (eg Wolak, Liberatore & Levine 2014) and used this knowledge to estimate the extent to which overall CSAM availability could be reduced with targeted intervention. Wolak, Liberatore and Levine (2014) estimate that if law enforcement targeted high-contribution computers on just one network (Gnutella), CSAM availability on that network could be reduced by 30 percent. Hurley et al. (2015) further suggest that removing the top 0.01 percent of P2P sites would effectively remove up to 41 percent of available CSAM.

Network monitoring is a valuable tool to be used alongside other technological options. It also has the effect of alerting CSAM users that there is an active law enforcement presence on the networks, which may influence some consumers' decisions about continuing to view this content. However, this strategy has several limitations. It requires intensive labour and investment of law enforcement resources (Wolak, Liberatore & Levine 2014). The quantity of CSAM amplifies this challenge. Technology itself may also limit effectiveness. For example, when new images not previously classified are not identified by hash values, they may go undetected by law enforcement (Peersman et al. 2016). Internet protocol addresses can also be changed at the will of the offender.

While little research has explored the application of network monitoring in Australia, implementation requires the use of relevant software for forensic analysis. It also necessitates action by law enforcement to proactively investigate and serve subpoenas on internet service providers to identify the account to which an internet protocol address is allocated. Further inquiries are required to identify possible persons linked to that address, before seeking and then executing a search warrant.

Automated multi-modal CSAM detection tools

The automatic detection of CSAM can be challenging, particularly in the presence of legal adult pornography. Compared to simply analysing file names and hash values, a multi-modal classification approach to identifying CSAM videos and images has yielded greater discrimination, improving the accuracy of CSAM detection. For example, using a single form of detection (eg skin tone analysis) is not necessarily reliable in differentiating CSAM from adult pornography. Thus using multiple methods to classify material and detect CSAM is more robust and accurate (Schulze et al. 2014). Such automated content classification tools are imperative given the dramatic growth in the number of images and videos online.

One example of automatic detection is the PhotoDNA program developed by Microsoft, which identifies images on publicly available websites (Penna, Clark & Mohay 2005; Westlake, Bouchard & Frank 2012). PhotoDNA compares the hash values of online images against those in the NCMEC database, and any matches are reported to the police for investigation (Microsoft 2020a). The capabilities of PhotoDNA are in the process of being extended to video, using similar identification protocols as for images (Microsoft 2020b).

This technology increases the efficiency and accuracy of CSAM detection. The proliferation of CSAM means digital forensic practitioners spend lengthy periods analysing data, delaying investigations. Automatic detection assists with this workload, providing law enforcement with a time-efficient alternative to visually detecting CSAM. In line with SCP, the risk of detection is a significant consideration in an individual's decision to offend, and the perceived anonymity of the internet is a factor in CSAM offending. Thus any efforts to increase the risk of detection (and reduce anonymity) may reduce this crime (Wortley & Smallbone 2012).

While limited research has explored the impacts of multi-modal classification, in their study of 2,500 CSAM images and 2,500 non-sexual images of children, Gangwar, Fidalgo, Alegre and González-Castro (2017) found CSAM detection methods that use multiple features to identify CSAM (eg shape, text, and colour) perform better than those using a single feature (eg skin colour). Schulze et al. (2014) found that using multiple features improved accuracy in distinguishing between CSAM and adult pornography, reducing the rate of errors from 16 percent to eight percent for videos and from 17 percent to 10 percent for images, in contrast with using only one classification method.

This strategy has many benefits. For example, it has the capacity to identify CSAM that was unknown and whose hash value had not been included in any law enforcement database. Tools such as PhotoDNA provide a valuable resource to law enforcement investigators locating and categorising large volumes of known CSAM in suspects' collections, eliminating the need for investigators to do this work and reducing the potential harm to them. However, several limitations exist, such as the issue of steganography. Steganography is the practice of hiding a message within a seemingly ordinary object or message in plain sight, such that it can only be found by someone who knows where to look. For example, a CSAM image may be embedded within an innocuous photo (Penna, Clark & Mohay 2005). While this multi-modal approach aims to capture these instances where images have been modified, as time goes on, offenders may identify methods to avoid detection. Due to the highly sophisticated nature of this multiple classifications approach, expert training on the use and interpretation of this tool is required.

Using web crawlers to identify CSAM sites

Websites hosting CSAM are often linked. Web crawlers are automated scripts or programs that are used to automatically 'crawl' across many websites. Law enforcement activate a web crawler on a known CSAM site. The web crawler follows the links on each site, identifying the volume of confirmed CSAM (Westlake, Bouchard & Frank 2012). This approach seeks to identify where CSAM is being distributed and presents investigators with an opportunity to remove the central sites, inhibiting CSAM distribution.

The detection of CSAM is enhanced by the automated nature of web crawlers. Web crawlers assist law enforcement by automatically detecting CSAM and mapping relationships between sites. After detecting CSAM sites, law enforcement can disrupt network relationships by removing larger, more popular sites, which in turn starves the smaller sites of the traffic they previously received from them.

This technology works much faster than manual methods, allowing for the quicker identification of CSAM. Knowledge of web crawlers among offenders, particularly those hosting CSAM sites, may prevent crime as, according to SCP (Cornish & Clarke 2003), web crawlers may increase risk of detection and reduce rewards through the resultant site disruption. Eliminating ties between sites may also make it more difficult for offenders to access certain sites (Joffres et al. 2011).

Law enforcement statistics show the effectiveness of web crawlers in identifying CSAM. For example, Project Arachnid, operated by the Canadian Centre for Child Protection, used a web crawler over a six-week period and processed over 230 million web pages, over 5.1 million of which hosted known CSAM images, including over 40,000 unique images (Canadian Centre for Child Protection 2017). This highlights the utility of web crawlers in detecting CSAM. Targeting websites with the highest degree of centrality can be effective in reducing the connectivity between these sites and those linked to them (Joffres et al. 2011). Joffres et al. (2011) showed that removal of the five CSAM sites with the strongest relationships to other CSAM sites reduced site capacity by 36 percent, damaging CSAM networks more than randomly removing websites. If these sites no longer exist, viewers of CSAM cannot access them to view content or use them to directly link to other sites.

Web crawlers are beneficial to law enforcement particularly as the active involvement of investigators is minimal. Taking down these sites creates the potential for suspects to be identified and arrested, as well as child victims to be identified and located. Regarding limitations, web crawlers are inherently restricted to the keywords and hash values used. Along with the training required to operate web crawlers, this strategy requires law enforcement to identify certain keywords, hash values, and major sites. Law enforcement must nominate an initial site and develop a list of CSAM related keywords and hash values for the web crawling tool to search for. Some checking of web crawler results is also required by law enforcement.

Pop-up warning messages

Pop-up warning messages attempt to prevent offenders, particularly first-time offenders, from accessing CSAM. These messages appear when individuals type certain words into a search engine (Prichard, Watters & Spiranovic 2011). This strategy places focus on users understanding that searching for and viewing CSAM is a criminal act, and the unexpected warning elicits concerns about being identified and caught. The message increases in severity with the seriousness of the search terms used.

In line with SCP (Cornish & Clarke 2003), pop-up warning messages are thought to reduce a potential offender's perceived sense of anonymity, increasing the perceived risks of getting caught. Pop-up warning messages can also potentially prevent offending by removing excuses (Prichard, Watters & Spiranovic 2011). Targeting distorted thinking patterns is important, as researchers suggest that cognitive distortions can contribute to individuals commencing and continuing their engagement with CSAM (Prichard, Watters & Spiranovic 2011). For example, warning messages could challenge the distortion that CSAM offenders are 'just viewing' the material and 'not touching' a child.

Recent research (Prichard et al. 2021) examined the effectiveness of warning messages in discouraging individuals from accessing a 'honeypot' (pretend) website claiming to contain barely legal pornography. Results support the effectiveness of warning messages as a CSAM reduction strategy. Deterrence focused warning messages (eg those stating that IP addresses can be traced), significantly reduced the number of individuals who proceeded to access the site. This suggests value in increasing the perceived risk associated with this behaviour. Results, however, did not support the effectiveness of messages about the harm to victims, suggesting the type and format of the messages may impact on their success.

This strategy requires further research and evaluation, including the examination of longer term impacts and potential displacement to other sites (Prichard et al. 2021). Other possible limitations should also be examined. While a warning might deliver a deterrent effect, the warning message alone does not offer longer term support or assistance for the individual (Baines 2018). Including referrals to relevant services as part of the warning message may address this.

Facial recognition

New and evolving facial recognition technology seeks to identify victims and offenders in CSAM. AI facial recognition applications such as Clearview AI have been used by law enforcement internationally. An image of a suspect (or victim) is uploaded to Clearview AI by the investigating officer and algorithms are used to map the face of the suspect (or victim). Unique characteristics of the face (eg distance between eyes, nose width) are used to generate this algorithm as a distinct identifier of the individual. The software then checks this against a facial recognition database to find any instances of the suspect (or victim) where they can be positively identified, notifying law enforcement. One example is the Child Sexual Exploitation Image database, which has the capacity to identify victims, offenders and likely locations through forensic analysis of images and hash values (Broadhurst 2019).

The NCMEC use facial recognition software to search images across the different web surfaces (surface web, deep web and darknet) to match images of missing children (International Centre for Missing and Exploited Children 2018). Such software can provide highly accurate facial analysis, face comparison, and face search capabilities. It can also be used to match potential abductors against law enforcement databases, thus providing a potential lead to the location of the child (Oxford 2019). In line with SCP, facial recognition technology increases the risk of detection, disrupts the production of further CSAM (Schell et al. 2007), and removes victims from harm. By identifying CSAM victims and offenders, law enforcement can extend CSAM investigations beyond existing suspects to their social networks.

While no evaluation research has assessed the effectiveness of facial recognition technology, it is an emerging tool that receives some praise among law enforcement. Detectives in Georgia, Texas and Florida have reported that the Clearview AI application works 'incredibly well' and has helped them solve cases (Hill 2020). In terms of victim identification, Indiana detectives uploaded the images of 21 victims (from the same offender) to Clearview AI and identified 14 of them (Hill & Dance 2020). The Royal Canadian Mounted Police's National Child Exploitation Crime Centre used Clearview AI on 15 cases, resulting in the positive identification of two children (Russell 2020). Clearview AI estimate that 600 law enforcement agencies use their facial recognition software in criminal investigations (Kashmir 2020). Broadhurst (2019) argues the use of AI has the potential to enhance the ability of law enforcement enough to impact CSAM distribution networks. This can be seen as an evolving field of opportunity for law enforcement investigators. However, this strategy can be limited if there is a lack of cooperation among international governments and social media corporations. Without cooperation, there may be limited or no access to image databases. As this is a developing strategy, understanding of further limitations may grow in the future.

Discussion

This chapter captures the current state of practice for cyber strategies that aim to reduce CSAM. It was evident that limited evaluation research has been undertaken. This means there is limited information on the effectiveness of these strategies, how often the strategies are deployed and whether they can be effectively used in unison with other strategies. This is one area requiring further research. While it may be years before rigorous evaluation research is carried out on these strategies, the current findings offer useful insights into existing practice and enhance understanding of how the strategies work and the available evaluative research, along with the benefits, limitations and implementation considerations.

Five cyber strategies were identified: P2P network monitoring, automated multi-modal CSAM detection tools, using web crawlers to identify CSAM sites, pop-up warning messages, and facial recognition. The automated nature of these strategies is particularly important given the demands placed on law enforcement by the dramatic growth in CSAM (Australian Federal Police 2017). It was evident in the literature that the reduction of CSAM online is a joint endeavour by both law enforcement and industry. This means that reducing instances of CSAM online is neither the sole responsibility of any one organisation nor a task that law enforcement can undertake alone.

SCP (Clarke 1997) underpins all five strategies. Key to this approach are activities which aim to make offending behaviour difficult (increase the effort required), increase the risk of detection, reduce rewards associated with offending behaviour, remove situational precipitants (reduce provocations), and remove excuses and clarify the offender's role in the behaviour (Cornish & Clarke 2003). Of note is that all five identified cyber strategies, except for pop-up warning messages, are centred on detection and identification. That is, the risk of detection and the effort required to commit CSAM offences are increased, and associated rewards lowered. For example, P2P network monitoring allows law enforcement to remove large libraries of CSAM, thereby increasing the effort involved in offending. In contrast, pop-up warning messages are largely focused on increasing the perceived risk of CSAM offending, by reducing a potential offender's perceived sense of anonymity online, reducing permissibility and setting expected standards of behaviour. Opportunities to further eliminate excuses for CSAM offending, or to design new strategies to target online situational precipitants (prompts, permissibility, pressure, or provocations) are worthy of further exploration.

As many of these strategies are new and emerging, future research is required. Facial recognition technology is evolving and becoming a valid law enforcement tool to identify victims and suspects. There appears to be great potential in researchers working closely with law enforcement to establish the effectiveness of facial recognition. This research could explore what proportion of attempts to use facial recognition to identify suspects and victims are successful. Research with social media providers and web hosting services could establish whether and how often AI products have identified children and led to their rescue. Government agencies that hold facial images of their citizens, such as Australian Border Force (customs) and the Australian Passport Office, could be asked to assist in the comparison of facial recognition mapping against their databases.

Despite the benefits of these strategies, several limitations were identified throughout, particularly concerning technology. For example, due to steganography, law enforcement need to keep track of the keywords and hash values used, particularly when using web crawlers and P2P monitoring. Hash values can be changed when an image is cropped, which may or may not be done deliberately. Moreover, due to the ever-enhancing technology used by offenders, many of these strategies will need to be continually updated to avoid becoming obsolete. These strategies may also be limited by the level of cooperation offered by social media corporations and international government agencies, which requires ongoing consideration in future planning.

Given that law enforcement alone cannot reduce instances of CSAM, professionals in other fields who are devoted to CSAM reduction could use their expertise in various ways to contribute to cyber strategies. For example, the ethical and legal issues with facial recognition require further exploration. In particular, law professionals could carry out research into the legality of using facial recognition software when images are obtained from commercial applications. This research could also explore the legal issues for investigators using facial recognition tools and databases of images, including concerns as to the uploading of images of children being subject to sexual abuse onto commercial computer servers located in foreign countries. To provide another example, practice professionals who deliver therapy to CSAM offenders could significantly contribute to developing the text of pop-up warning messages. These professionals could identify the messages that would be most effective among this heterogeneous offending group, along with ways to build in referrals to relevant services.

Conclusion

This study identified five key strategies: P2P network monitoring, automated multi-modal CSAM detection tools, using web crawlers to identify CSAM sites, pop-up warning messages, and facial recognition. Disrupting CSAM across the multitude of online platforms and services requires collaboration between international law enforcement and industry. No organisation, whether technical or law enforcement, can operate in isolation. In the distribution of CSAM, the technical advantages are strongly in the CSAM offender's favour, although it can be argued that emerging technology, particularly in the fields of AI incorporating facial recognition, gives law enforcement a unique opportunity. Law enforcement have the ability to not only identify and rescue child victims, but identify and prosecute the offenders, preventing new CSAM being uploaded and shared. Through further research exploring the number of positive identifications made due to AI, or how to enhance the effectiveness of pop-up warning messages, cyber strategies have the potential to make CSAM offending a riskier and less rewarding proposition for individuals. The expertise of professionals in other fields who are devoted to CSAM reduction can also contribute to cyber strategies.

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8. Criminal justice responses to child sexual abuse material offending: A systematic review and evidence and gap map

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Reducing child sexual abuse material (CSAM) offending is a pervasive concern for the criminal justice system, with global offending increasing in reach, magnitude and severity (Fortin & Proulx 2019; Ly, Dwyer & Fedoroff 2018; Seto et al. 2018; Simon, Luetzow & Conte 2020). Although difficult to estimate prevalence on a global scale, a point of consensus in the literature is that as young people's access to the internet has grown, there has been a concomitant rise in CSAM offending (Fortin & Proulx 2019; Henshaw, Darjee & Clough 2020; Henshaw, Ogloff & Clough 2018), defined as the production, dissemination, access and possession of material depicting abuse and/or sexual exploitation of children (Greijer & Doek 2016). Prevalence estimates range from 1.7 percent to 4.2 percent (Dombert et al. 2016; Seto et al. 2015), with the number of available materials in the millions and rising each year along with reported incidents (Bentley et al. 2019; Carr 2017; Internet Watch Foundation 2020).

While in many ways the impacts of CSAM offending are similar to those of contact child sexual abuse, CSAM victimisation is considered a unique form of trauma with chronic impacts due to the continued availability of materials (Canadian Centre for Child Protection 2017; Gewirtz-Meydan et al. 2018; Hanson 2017; National Center for Missing & Exploited Children 2019; von Weiler, Haardt-Becker & Schulte 2010). To address this crime and its far-reaching impacts, it is vital to identify and synthesise the evidence base of robust evaluations of criminal justice approaches to CSAM offending to determine which policies and practices are effective and which are not.

Empirical research in the area of CSAM largely focuses on offender and offending typologies and risk factors (Brown & Bricknell 2018; Garrington et al. 2018; Houtepen, Sijtsema & Bogaerts 2014; Krone 2004; Ly, Dwyer & Fedoroff 2018; Merdian et al. 2013; Steely et al. 2018). There is also an emerging body of intervention research on practices to counter CSAM offending (eg Brennan et al. 2019; Cohen-Almagor 2013; Krone et al. 2020; Lilley 2017; Ly, Dwyer & Fedoroff 2018; Quayle & Koukopoulos 2018; Smallbone & Wortley 2017; Wortley & Smallbone 2012), yet there is a clear gap in the CSAM literature. To date, there has been no comprehensive and robust synthesis of the types and effectiveness of criminal justice responses to CSAM offending.

Research into countering CSAM offending is complicated by a range of factors. First, there is a lack of common definitions and terminology across jurisdictions and research (Garrington et al. 2018; Henshaw, Ogloff & Clough 2017; Krone & Smith 2017). Terms such as 'child exploitation material', 'child sexual exploitation', 'child pornography', 'online and offline sexual offending', and 'child sexual abuse material' are used interchangeably throughout the literature. Second, conducting research, detecting CSAM offending and countering CSAM offending are complicated by the use of information communication technologies and the internet, which play a key role in the growth and diversification of CSAM offending (Beech at al. 2008; Davidson et al. 2020; Henshaw, Darjee & Clough 2020; Wager et al. 2018).

Third, a large proportion of CSAM is accessed, downloaded and shared online, facilitated by the anonymity afforded to offenders on the darknet and other encryption techniques (Balfe et al. 2015; Brown & Bricknell 2018; Haasz 2016; Simon, Luetzow & Conte 2020; Steel et al. 2020). Fourth, there is ongoing debate about whether CSAM offenders and offending are distinct from contact child sex offenders or offending (for reviews see Babchishin, Hanson & Hermann 2015; Henshaw, Darjee & Clough 2020; Henshaw, Ogloff & Clough 2017, 2018; Krone et al. 2020; Perkins et al. 2018; Soldino, Carbonell-Vayá & Seigfried-Spellar 2019; Steely et al. 2018; Tener, Wolak & Finkelhor 2015). This debate has likely resulted in CSAM-specific offences and offenders being subsumed under other types of child sex offences and offenders in the existing research (Henshaw, Ogloff & Clough 2017). Fifth, given the nature of CSAM offending, interventions that involve criminal justice practitioners are likely to span different settings, involve multiple agencies, and require modifications to the approaches used to respond to offline or physical child sex offending (Henshaw, Darjee & Clough 2020; Henshaw, Ogloff & Clough 2017, 2018; Martellozzo 2013; McKibbin, Humphreys & Hamilton 2017; White et al. 2018; Wild et al. 2019).

Collectively, these issues have implications for locating evidence on criminal justice responses to CSAM offending. One major issue is that evaluations of these interventions extend beyond traditional criminal justice literature repositories to span multiple disciplines (eg information technology, education, psychology), which makes this research significantly less accessible to practitioners and policymakers. To provide a comprehensive evidence base to inform best practice (Brennan et al. 2019), a thorough and meticulous approach is needed to locate and assess the available evidence. Therefore, we conducted a rigorous systematic review of the effectiveness of criminal justice responses to CSAM offending, and generated an evidence and gap map of the evaluation evidence across the policing, courts and corrections arms of the criminal justice system.

Our review aimed to examine the following research questions:

- How effective are criminal justice responses to CSAM offending when implemented by:
  - policing agencies and practitioners;
  - judicial agencies and practitioners;
  - correctional agencies and practitioners; or
  - multiple criminal justice agencies?
- Does the effectiveness of criminal justice responses to CSAM vary according to the type of intervention, geographical location, research design or outcome measures used in evaluation studies?
- Which interventions, outcomes, geographical locations and criminal justice sectors have been rigorously evaluated, and where are the evidence gaps?

Method

Our review adopts the methodological approach endorsed by Liberati et al. (2009) and the Campbell Collaboration (www.campbellcollaboration.org). In addition to a traditional systematic review, we visualise the state of the evidence using an interactive evidence and gap map of the studies deemed eligible for our review. Evidence and gap maps (EGMs) systematically and visually present research evidence on a particular topic via a matrix that maps the state of the evidence, including identifying where evidence is missing (Snilstveit et al. 2016).

Search strategy

We systematically searched a comprehensive range of sources to identify studies for our review. The Global Policing Database (www.gpd.uq.edu.au) and Corrections Database—both built and maintained by the University of Queensland—were the primary search sources for policing and correctional research. These two databases are built by systematically searching over 85 academic databases and repositories of research, and then systematically screening this research for quantitative impact evaluations in the area of policing and corrections, broadly defined (see www.gpd.uq.edu.au and Sydes et al. 2018). For these two databases, we used a highly sensitive search comprising 32 terms related to 'child' and 38 terms representative of CSAM.

In addition, we implemented further systematic searches to capture studies in law and judicial literature and allied disciplines such as information technology, psychology and education. We searched a total of 67 additional academic databases, journals, and grey literature repositories (eg CSAM-related websites, research centres and agencies). For these additional searches, we iteratively piloted search strategies to arrive at one that balanced sensitivity and specificity. The final search string comprised search terms across four categories:

- child (*n*=12 terms);
- CSAM (*n*=58 terms);
- criminal justice (*n*=114 terms); and
- evaluation (*n*=23 terms).

As a final step, we harvested references from all eligible studies and conducted forward citation searches on all eligible studies and studies included in harvested reviews. The technical report (available from the authors on request) provides a detailed record of the search strategy.

Inclusion criteria

To be included in our review, each document captured by the systematic search needed to meet all inclusion criteria, outlined below.

Research time frame and setting

To provide the most up-to-date synthesis of literature, studies were included in our review only if: (a) they were published between January 2000 and December 2018, and (b) they reported on impact evaluations conducted between January 2000 and December 2018. Given the global nature of CSAM offending, we included studies conducted in any country.

Population

To provide a comprehensive synthesis of the evaluation literature on criminal justice responses to CSAM offending, a broad range of study populations were considered eligible for our review, including:

- criminal justice practitioners (police, courts, corrections);
- CSAM victims (aged under 18 years, all genders); and
- CSAM offenders (all ages and genders).

Interventions

To be eligible for inclusion in our review, studies must have reported on an impact evaluation of a criminal justice intervention or approach that aimed to address CSAM offending. We defined a criminal justice 'approach' to include any strategy, technique, therapy, activity, campaign, training, directive, funding initiative or organisational change that involved the criminal justice system in some way (other agencies or organisations may also have been involved). Criminal justice system involvement was broadly defined as:

- criminal justice system initiation, development or leadership of the intervention;
- criminal justice system staff or populations as recipients of the intervention;
- criminal justice system practices as the focus or target of the intervention; or
- the criminal justice system delivers or implements the intervention.

As noted above, in the search strategy, we also attempted to reflect the variation in terminology and associated definitions. We adopted the jurisdiction-specific yet sufficiently broad definition of CSAM used by Queensland's *Child Exploitation and Dangerous Drugs Amendment Act 2013* (s 207A). CSAM is:

> …material that, in a way likely to cause offence to a reasonable adult, describes or depicts a person, or a representation of a person who is, or apparently is, a child…
>
> (a) in a sexual context, including for example, engaging in a sexual activity; or
>
> (b) in an offensive or demeaning context; or
>
> (c) being subjected to abuse, cruelty or torture.

We defined 'material' congruent with this legislation, to include 'anything that contains data from which text, images or sound can be generated' (s 207A), which can be generated remotely via telecommunications channels (eg live webcam or peer-to-peer networks via internet and mobile phones). We defined a 'child' to be a person aged under 18 years. We specifically defined CSAM offending to include downloading, soliciting, producing, transmitting, viewing and distributing CSAM. (A comprehensive list is in the technical report, available from the authors on request.)

Study designs

Our review included a select range of rigorous study designs that allowed for reliable conclusions to be made about intervention effectiveness. Eligible comparison conditions and/or groups included no treatment, placebo, 'business-as-usual', waitlist control, or an alternative treatment.

Randomised control trials (RCTs) are considered the gold standard for evaluating intervention effectiveness. While other study designs are considered less causally robust, they can be appropriate to include in reviews of interventions conducted in contexts in which RCTs may not be feasible, such as in criminal justice settings (Weisburd 2000). In the absence of RCT evidence, strong quasi-experimental studies that have attempted to minimise threats to internal validity can be included to provide preliminary causal evidence for the effectiveness of an intervention (see Farrington 2003; Shadish, Cook & Campbell 2002). Our review included studies that used the following research designs:

- systematic reviews (with or without meta-analyses);
- randomised control trials;
- matched or unmatched control group designs with or without pre-intervention measures in addition to post-intervention measures;
- long time-series designs without a comparison group, with at least 25 pre- and post-intervention observations; or
- short time-series designs with a comparison group, with at least 10 pre- and post-intervention observations.

We planned to conduct moderator analyses by study design, to assess the impact of study design on results; however, we found too few studies to permit this type of analysis.

Outcomes

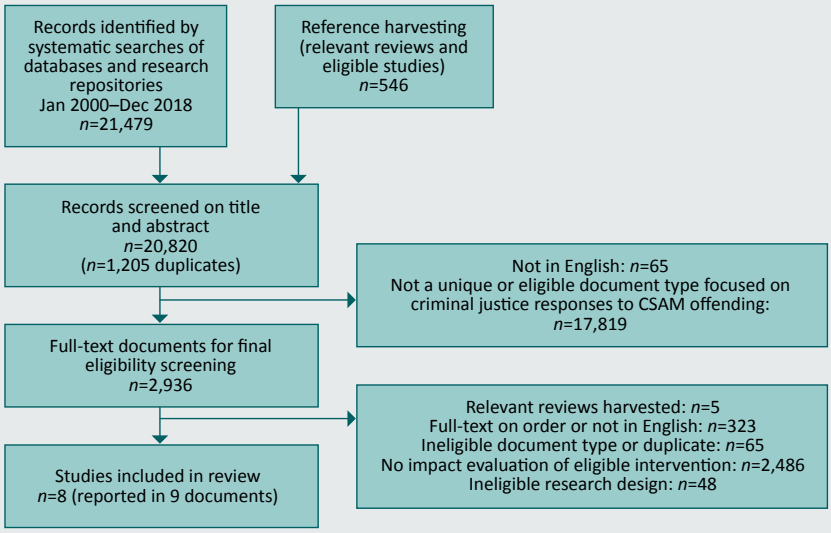
To provide a comprehensive synthesis of the current literature, we placed no restrictions on the types of outcomes used to evaluate criminal justice responses to CSAM offending.

Results

Search and screening

The systematic searches identified 22,809 records, which were imported into *SysReview* (review management software, Higginson & Neville 2014) and screened by five review authors (EE, LH, JM, SR, GH) to determine their eligibility for inclusion in the review. Prior to independent screening, all staff undertaking screening completed (a) training based on standardised screening guides; and (b) a test-set of screenings that were assessed by the first author to ensure consistent decision-making. In addition, regular meetings were held to discuss inclusion or exclusion of research that could not be unequivocally excluded by the screener. We harvested and screened potentially eligible studies from the reference lists of four reviews relevant to the topic as well as from the reference lists of all eligible studies, resulting in another 514 records. Figure 1 provides a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart for the attrition of records through the systematic screening stages. Eight studies (reported in 9 documents) were deemed eligible for our review.

Figure 1: PRISMA flow diagram



Summary and synthesis of eligible studies

The final corpus of eight studies contains varied interventions and outcomes, meaning that meta-analysis of study effects was not possible. In addition, not all studies reported sufficient data to calculate standardised effect sizes. Accordingly, the following sections provide a qualitative synthesis of the eligible studies with comment on the magnitude of the intervention effect. Given the diverse nature of the studies and lack of quantitative syntheses using standardised effect sizes, caution is needed when comparing the effectiveness of the criminal justice responses to CSAM offending summarised in our review. We refer readers to the technical report (available from the authors on request) which contains a risk of bias assessment for the included studies.

Time frame, settings, research designs and criminal justice sectors

The eight eligible studies spanned 2003 to 2017. Five were conducted in the United States, two were conducted in Europe (across multiple locations), and one was conducted in the United Kingdom. The review located no randomised controlled trials. All studies used unmatched control group designs, and some study authors enhanced the rigour of their findings by using multivariate models to control for confounding variables. Most studies examined the policing arm of the criminal justice system (*n*=6), only two focused on courts or judicial agencies, and there were no correctional or multiagency studies.

Policing interventions

Six studies, reported in seven documents, quantitatively evaluated the impact of police interventions for addressing CSAM offending. The studies captured a range of interventions and outcomes, with four studies drawing on self-reported exposure to interventions via surveys and two studies directly testing applied interventions. Based on a survey of 168 law enforcement practitioners in the United States, Marcum and colleagues (2010, 2011) examined two intervention approaches in their study. Specifically, they examined whether the numbers of CSAM investigations and arrests in 2007 and 2008 were affected by either the presence or absence of a designated cybercrime task force/department, or the receipt of training for cybercrime investigations. The authors found that having a designated cybercrime task force/department significantly increased the number of CSAM investigations and arrests. (While exact figures were not provided, analysis showed a significant Beta weight in a regression model.) In comparison, specialised training in cybercrime did not significantly increase CSAM investigations or arrests in 2008, but it did significantly increase arrests in 2007. Despite the lack of significance, the effects were in the expected direction, whereby training was associated with an increase in arrests. The authors suggest that training in isolation may be insufficient to lead to arrests, particularly if police departments lack the resources to support CSAM investigations, if the training is not focused entirely on CSAM, or if the quality of the training is variable.

In a similar study, Wells (2003) surveyed US law enforcement agencies to identify a sample of 532 cases pertaining to internet sex crimes against children and examined whether investigative training affected rates of arrest, search, seizure, or other law enforcement actions. Of the 191 officers who answered the training question on the survey, 35 reported completing no training, 122 reported completing training, and 34 reported that they were not sure of the training they had completed. Wells found that officers who had completed training and those who had not were equally likely to make arrests in internet sex crime cases but more likely to conduct searches (90% versus 83%) and to seize computers (89% versus 74%).

Davidson et al. (2017) used survey data from police in the United Kingdom, Ireland, Italy and the Netherlands to examine the impact of police training in computer-mediated crimes against children (CMCAC). Sixty-one percent of respondents (*n*=776) had not completed any training, and 39 percent had completed either specialised or general training in the area (*n*=482). The authors found that police officers who completed specialised training were more prepared in the area of CMCAC than those who received general training or none. In addition, officers who received specialised or general training were more knowledgeable about national legislation in the area (97% and 96% respectively) than those who had not received training (43%). This same pattern of results was found for knowledge of international legislation in the area of CMCAC.

Brady (2017) focused on the implications for police practitioners of investigating CSAM offending. Using survey data collected from US Internet Crimes Against Children Task Force staff (*n*=433), Brady examined whether working undercover impacted levels of secondary traumatic stress, burnout and compassion satisfaction. Compassion satisfaction was defined as the enjoyment someone receives from accomplishing their professional roles and responsibilities. Using regression models which controlled for a range of other factors, Brady found that working in an undercover role significantly improved staff compassion satisfaction. (Exact figures were not provided, but analysis showed a significant Beta weight in regression model.) However, Brady did not find that working undercover significantly impacted secondary traumatic stress or burnout, which may have been due to mitigating factors such as support systems outside of work and positive coping strategies that were found to be inversely related to stress and burnout in the study sample.

Peersman and colleagues (2016) worked with law enforcement agencies in Europe to develop and evaluate live software (iCOP) that integrates artificial intelligence and machine learning to automate the identification of CSAM in peer-to-peer networks. Using data previously classified by law enforcement practitioners, the authors tested a range of different machine learning algorithms to ascertain which approach would provide the most precise recognition in practice. The authors found that support vector machines were superior to Naïve Bayes and logistic regression algorithms.

In the final policing study, Bourke and colleagues (2015) examined the tactical use of a polygraph at varying time points after first contact with police in the context of CSAM offending (the day of the search warrant, 3–4 days after the search warrant was executed, 1–5 days after the search warrant was executed). Using a sample of 127 CSAM suspects with no known history of contact sexual offences, the authors found that a higher proportion of suspects polygraphed three to four days after the execution of the search warrant (61%) disclosed offences compared to offenders polygraphed on the day the search warrant was executed (56%) or one to five days later (54%).

Judicial or legislative interventions

Two studies quantitatively evaluated the effect of judicial or legislative interventions for addressing CSAM offending. In the United Kingdom, Alison and colleagues (2012) used a survey of citizens (*n*=227) and police officers (*n*=60) to examine whether two different types of 'expert' profiles of CSAM offenders influenced guilty judgements. Respondents were asked to rate the guilt of an 'orthodox' and 'unorthodox' CSAM offender according to a pre-prepared profile on a scale from zero percent (not guilty at all) to 100 percent (certain he is guilty). They were then presented with an expert's profile that matched either the 'orthodox' or 'unorthodox' offender and again asked to rate the perceived guilt of the offender. The authors found that respondents considered the suspect less guilty and adjusted their guilt rating to a lower percentage on the scale for the suspect who best aligned with the expert profile they were provided compared to the suspect who was incongruent with the expert profile.

Buzzell (2007) used data from the US National Prosecutors Survey (*n*=2,341) to determine whether a range of factors predicted whether a legal practitioner had prosecuted a CSAM case. Of relevance to our review is the finding that having a budget for expert consultation was associated with more CSAM prosecutions than having no budget for expert consultation. This finding remained even after controlling for other potentially confounding variables (eg community context).

Correctional interventions

No studies quantitatively evaluated the effectiveness of a correctional intervention for addressing CSAM offending using an eligible research design. Although some eligible interventions were identified, these interventions were either not evaluated or were evaluated using ineligible (less rigorous) research designs (Dervley et al. 2017; Gillespie et al. 2018; Middleton, Mandeville-Norden & Hayes 2009). Numerous studies evaluated the impact of correctional interventions for sex offenders; however, very few specified the type of sex offender participants. When study authors did specify the types of sex offenders in their samples, none examined the impact of the intervention separately for CSAM offenders specifically.

Multiagency interventions

No studies quantitatively evaluated the effectiveness of a multiagency intervention for addressing CSAM offending. Although eligible interventions were identified, these interventions were either not evaluated or were evaluated using ineligible (less rigorous) research designs (eg Davidson et al. 2009, 2011; Dooley et al. 2011).

Evidence and gap map

We constructed an evidence and gap map (EGM) that plots the eight eligible studies across nine intervention or criminal justice sector categories by a range of outcomes and types of populations. Intervention/sector categories included training for police, cybercrime task forces, undercover agents, automated software, polygraph examinations, use of expert profiles, budgets for consulting experts, correctional responses, and multiagency responses. This does not represent the full breadth of possible criminal justice responses to CSAM offending (see, for example, Baines 2019; DeMarco et al. 2018 for overviews).

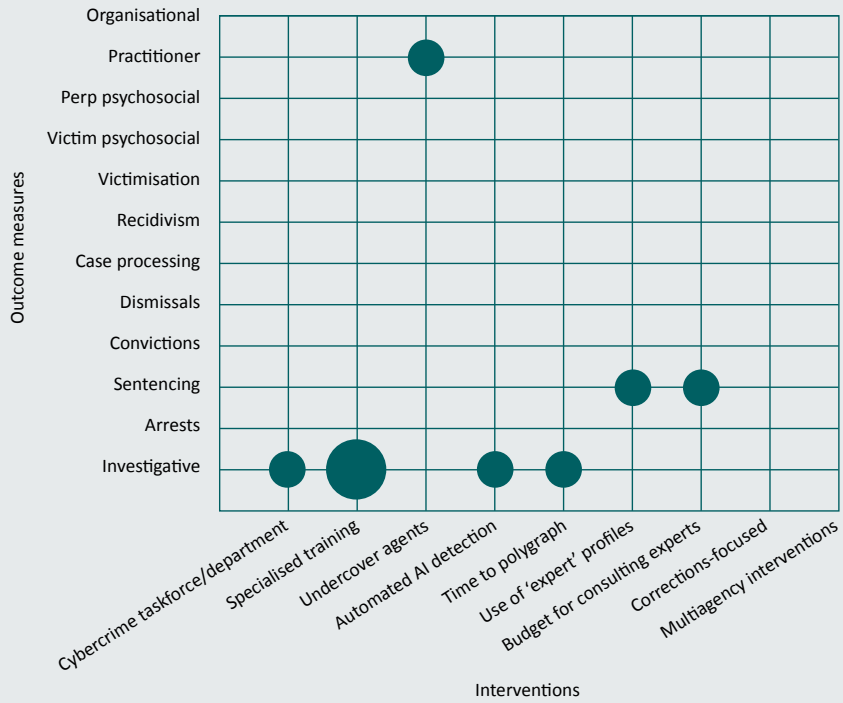
The EGM in Figure 2 maps the eight studies eligible for our review. Dots on the graph show where the outcome and intervention categories intersect. The size of the dot represents the number of studies for that particular intervention and outcome. Specifically, small dots represent one study and the larger dot represents three studies. Spaces without dots indicate an absence of evaluation research, highlighting areas requiring further research.

To construct this static version of the EGM, studies were categorised by their intervention and outcome category and then plotted on a bubble graph in Microsoft Excel. The intervention categories were coded as they appear below. We used 12 outcome categories, as defined in the technical report (available on request). These categories broadly capture the most common measures used within the criminal justice research literature and specific outcomes relevant to CSAM offending (eg creation, possession or sale of CSAM).

The EGM illustrates the dearth of evidence across all criminal justice sectors, particularly for corrections and responses involving either more than one criminal justice agency or a criminal justice agency and another type of agency (eg health, education, information technology).

Although we had intended to also map the evidence using study populations, we do not include this dimension here because all but one study used practitioner populations. Hence, another significant gap in the impact evaluation evidence is studies focusing on victims of CSAM offending, CSAM offenders, and broader populations that may assist in primary prevention of victimisation using interventions informed by evidence from criminal justice responses, such as parents, teachers, school counsellors and general practitioners (eg Cohen, Edberg & Gies 2011; Davidson et al. 2011; Davidson & Martellozzo 2008). The EGM also illustrates substantial gaps in the types of outcomes used to measure intervention effectiveness, with the majority of studies falling in the investigative category.

Figure 2: Evidence and gap map of evaluation evidence for criminal justice responses to CSAM offending



Note: AI=artificial intelligence

Discussion

We provide the world's first systematic review of the evidence base for impact evaluations of criminal justice responses to CSAM offending. We implemented a rigorous search and review methodology to identify and synthesise any assessment of a criminal justice response to CSAM offending that had been evaluated using any type of outcome measure. We aimed to include studies involving a range of different populations (eg offenders, practitioners, victims) that were published between January 2000 and December 2018.

Our findings demonstrate a general lack of robust impact evaluations of criminal justice responses to CSAM offending. Only eight studies met eligibility criteria for our review, six of which fell within the policing sector of the criminal justice system. The other two related to the judicial arm of the criminal justice system. We identified no eligible impact evaluations of either correctional responses to CSAM or multiagency responses with at least one criminal justice partner. We also identified no randomised controlled trials, which are generally considered the gold standard for establishing whether an intervention is effective.

The evidence for policing interventions covers a range of different approaches that have been evaluated using an equally diverse range of outcome measures. The evidence suggests that training in the area of CSAM can have a variable impact on police arrest and investigative practices, and a positive impact on police practitioners' knowledge of national and international legislation. Other promising approaches include having a specialised policing task force to increase CSAM arrests and investigations, strategically using polygraph to increase offender disclosures, and using automated software to identify CSAM. It is unclear whether police officers working undercover in the context of CSAM investigations affects their wellbeing, but it does not seem to reduce their level of job satisfaction. Caution needs to be exercised, however, when examining most of the above findings, as they are drawn from surveys asking police about their previous training rather than prospective impact evaluations.

The evidence for judicial or legislative responses to CSAM is sparse. One study suggests that variations in the use of expert testimony in CSAM trials can influence jury decision-making. Another study suggests that allocating funding to prosecutors to enable consultation with experts may increase the number of CSAM prosecutions. Although there were promising correctional and multiagency approaches captured by our systematic search and screening, none of these has been rigorously evaluated (see, for example, Davidson et al. 2009, 2011; Dooley et al. 2011).

Our EGM visually summarises both the existing evaluation evidence for criminal justice responses to CSAM offending and the gaps in CSAM evaluation research. Aside from the clear gaps in the corrections sector and limited research in other criminal justice sectors, there are also substantial gaps in evaluation evidence across key populations and outcomes relevant to CSAM offending. For example, we identified no eligible evaluations focused on victims of CSAM offending or harm reduction, very few focused on offenders, and no studies that measured the impact of interventions on important outcomes such as recidivism, psychosocial outcomes for victims and perpetrators, convictions or sentencing.

We note that our review captured a large body of evaluation research in the area of child sexual offending more broadly. During the systematic screening process, we identified evaluation studies that often specified the types of sex offenders or victims in their samples—including CSAM offenders—yet these studies did not examine the actual impact of the intervention on these populations. Research suggests the characteristics, contexts and aetiologies of contact, non-contact, mixed and CSAM-only offending are different but overlapping (DeMarco et al. 2018; Henshaw, Darjee & Clough 2020; Krone et al. 2020; Ly, Dwyer & Fedoroff 2018; Merdian et al. 2013; Neto at al. 2013). As such, it was not appropriate to include and synthesise these studies with studies focused purely on CSAM offenders. For example, existing intervention models in the area of child sex offending may not translate directly to CSAM offending and its consequences (Henshaw, Ogloff & Clough 2017, 2018; Ly, Dwyer & Fedoroff 2018; Merdian et al. 2020). In light of this, it will be important for future evaluation research to prospectively design and rigorously evaluate evidence-informed interventions that are tailored to the nature of CSAM offending and offenders (eg Beier et al. 2016; Henshaw, Ogloff & Clough 2017, 2018; Perkins et al. 2018; Proeve & Wolf 2019).

Overall, the existing intervention literature in the area of CSAM is largely descriptive, with potentially promising interventions evaluated with low-quality research designs that do not reliably establish effectiveness (see also Gallo 2020; Perkins et al. 2018). This is despite ongoing and resounding calls for robust evaluations to inform policy and practice since the formation of the US Internet Crimes Against Children Task Force in 2001 (National Research Council 2013; US Department of Justice 2016). Without a rigorous evidence base, policymakers and practitioners are unable to make reliable decisions about what criminal justice responses are effective in addressing CSAM offending and, potentially, what may be harmful. Ultimately, our review reveals scarce evaluation research, which limits the ability to holistically address CSAM offending and operationalise the Australian Centre to Counter Child Exploitation's four pillars of 'prevent, prepare, pursue and protect'.

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9. Enhancing evidence-based treatment of child sexual abuse material offenders: The development of the CEM-COPE Program

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Introduction

Global access to the internet has facilitated the increased accessing, distribution and production of child sexual abuse material (CSAM, also known as child exploitation material, or CEM). Consequently, the number of individuals detected for CSAM offences has increased in recent years (Australian Centre to Counter Child Exploitation nd; Victoria Police 2014). CSAM is a significant societal problem that causes and perpetuates long-lasting harm to victims, who are both directly sexually abused and repeatedly revictimised through the ongoing distribution and accessing of CSAM long after the abuse occurs (Gewirtz-Meydan et al. 2018). As such, there is a clear need to prevent CSAM-related offences, with the availability of primary, secondary and tertiary level prevention interventions increasing in recent years (see Perkins et al. 2018).

Until recently, psychological treatment approaches for CSAM offenders were largely informed by theories and frameworks relating to 'offline' sexual offenders (Seto 2013). Increased research attention over the past decade, however, has led to a greater understanding of the distinct psychological and offending characteristics of CSAM offenders without a history of contact offending (CSAM-only offenders) as compared to offline child sexual offenders (contact offenders) or offenders who engage in both CSAM and contact sexual offences (dual offenders). This, in turn, has provided a more nuanced understanding of both the risks posed by and treatment needs of CSAM-only offenders, and the associated shortfalls of attempts to address CSAM offending within existing sexual offender treatment frameworks. Increasingly, the research base indicates that traditional programs are unlikely to align with risk–need–responsivity (RNR) principles (Bonta & Andrews 2017), and that specialised treatment approaches are warranted to best address the criminogenic needs of CSAM offenders.

This chapter describes the development of the Victorian CEM-COPE (Coping with Child Exploitation Material Use) Program (Henshaw et al. 2019), an evidence-based, specialised treatment program for CSAM-only offenders. To contextualise the development of the program, an overview of the research on CSAM-only offender characteristics and recidivism rates is provided. The implications for treatment practices among CSAM-only offenders are discussed before outlining the specific rationale, objectives and specifications of the CEM-COPE Program. Finally, ongoing challenges and areas for future research into CSAM offender treatment are considered.

Defining characteristics of CSAM-only offenders

The growing comparative research base on CSAM offenders has increasingly demonstrated that CSAM-only offenders differ from both contact offenders and dual offenders across several demographic, psychological and offending characteristics. Specifically, meta-analytic (Babchishin, Hanson & VanZuylen 2015) and other comparative studies (Henshaw, Ogloff & Clough 2018, 2017) indicate that, in comparison to contact offenders, CSAM-only offenders are less likely to have:

- histories of physical and sexual childhood abuse;
- severe mental illness or substance use problems;
- early conduct problems, adult criminality, and general impulsivity;
- cognitive distortions and victim empathy deficits; and
- direct access to children (ie in the 'offline' world).

In contrast, CSAM-only offenders are more likely to:

- be young, white, highly educated and employed;
- have difficulties with intimate relationships, sexual intimacy, self-esteem and assertiveness;
- have paedophilic and hebephilic sexual interests;
- have sexual regulation and preoccupation difficulties (eg higher rates of masturbation, pornography use, and use of sex as a coping mechanism); and
- have problematic patterns of general internet use.

Based on the findings of their meta-analysis of 30 comparative studies, Babchishin, Hanson and VanZuylen (2015) concluded that CSAM-only, dual and contact-only offenders could be distinguished based on three key factors: antisociality, sexual deviance and opportunity for offending. While dual and contact offenders demonstrated higher levels of antisociality and opportunity for offending than CSAM-only offenders, CSAM-only and dual offenders were distinguished from contact offenders by their higher levels of sexual deviance as well as demographic characteristics associated with internet access (eg younger age, white, higher education levels, white-collar employment). Evidence of key differences among these groups suggest that CSAM-only offenders may present with unique pathways to offending, and thus different treatment needs, when compared to contact sexual offenders.

Motivating and facilitating factors related to CSAM offending

Seto's motivation–facilitation model of sexual offending posits that sexual offending occurs in the context of both motivating factors (factors that 'create the intention or desire to sexually offend') and facilitating factors (factors that 'increase the likelihood [of] a sexual offence…given the presence of relevant motivations'; Pullman, Stephens & Seto 2016: 482). Examples of motivational factors include paraphilias, sexual compulsivity, intimacy and social skills deficits, and an absence of appropriate sexual outlets. In contrast, facilitating factors include both trait-based factors, such as offence-supportive attitudes and beliefs, psychopathy and poor self-regulation skills, and situational factors including sexual arousal, negative mood states, intoxication, and access to victims (Pullman, Stephens & Seto 2016).

The defining characteristics outlined above suggest that while sexual deviance is likely to be a relevant motivating factor for both CSAM and contact offending, antisociality is less likely to be a key facilitating factor for CSAM-only offenders. Instead, CSAM offending may be facilitated by other characteristics of CSAM offenders. For example, the higher rates of sexual and internet regulation problems among CSAM-only offenders indicate that difficulties in regulating both sexual arousal and broader online behaviours may be key offence-facilitating factors among individuals who are motivated to use CSAM.

Additionally, specific interpersonal and psychological deficits (eg difficulties with assertiveness, self-esteem and relationship functioning) may potentially act as motivating and facilitating factors for CSAM offences. Indeed, one early investigation of CSAM offending pathways identified the intimacy deficits and emotion dysregulation pathways being the most commonly endorsed among CSAM offenders (Middleton et al. 2006). More recent qualitative studies have also identified emotion dysregulation and low distress tolerance as common characteristics associated with the onset and continuation of CSAM offending (Surjadi et al. 2010; Winder & Gough 2010). High rates of certain personality pathologies have also been identified among this group (up to 78%; Niveau 2010), with avoidant, dependent, schizoid, and borderline personality disorder or features being the most common (Magaletta et al. 2014; Webb, Craissati & Keen 2007).

Together, these findings indicate that sexual deviance, excessive internet use and deficits in sexual regulation, emotional regulation and perhaps select interpersonal skills (eg assertiveness) may contribute to the commission of CSAM offences. However, further research among non-offending, offending, and repeat offending populations is required to determine the precise nature and strength of the relationship between CSAM-only offender characteristics and the onset and continuation of CSAM offending.

Recidivism among CSAM-only offenders

Another distinguishing feature of CSAM-only offenders relates to their sexual recidivism rates and offending trajectories. Consistent with the low levels of antisociality found among CSAM-only offenders, recent comparative research has demonstrated that CSAM-only offenders are significantly less likely to sexually reoffend than dual offenders. In their examination of 346 North American CSAM offenders, Eke, Helmus and Seto (2019) found that only eight percent of CSAM-only offenders accrued a new sexual charge or conviction over a five-year period, compared to 25 percent of dual offenders. Similar results were obtained in a larger study of 690 CSAM offenders from the United Kingdom, with dual offenders sexually reoffending at 2.5 times the rate of CSAM-only offenders (26% vs 10%) over an average of 13 years (Elliott et al. 2019). This finding holds true across different sexual offence types, with dual offenders having higher recidivism rates than CSAM-only offenders for both CSAM (18% vs 6%; Eke, Helmus & Seto 2019) and contact (9% vs 4%; Elliott et al. 2019) offences. This counters historical concerns regarding the potential for CSAM-only offenders to 'escalate' to contact sexual offending over time, with international evidence showing up to four percent of CSAM-only offenders committing subsequent contact offences (Elliott et al. 2019; Seto, Hanson & Babchishin 2011). Low reconviction rates (0.66%) for contact offences were also recently reported among a small sample of Australian CSAM offenders (*n*=152) followed over an average of 3.5 years (Krone & Smith 2017). Taken together, these findings indicate that the primary risk posed by CSAM-only offenders relates to further CSAM offending rather than contact offending.

Treating CSAM-only offenders

Treatment dosage and needs

The low recidivism rates and unique personal and offending characteristics of CSAM-only offenders raise clear questions about the utility of employing existing treatment programs among this offender population. Given that existing programs were designed to prevent contact offending among offline offenders, these programs may not be appropriate for CSAM-only offenders. Indeed, in a recent examination of established community-based sexual offender programs, Elliott et al. (2019) found that CSAM-only offenders demonstrated little change in most psychological treatment variables (eg offence-supportive attitudes, socio-affective functioning, and impulse control). Also, change in these psychological variables was not associated with subsequent offending rates, highlighting the limited impact of these treatment programs in rehabilitating CSAM-only offenders.

Several implications arise from the available research findings regarding the treatment needs of CSAM-only offenders. In accordance with RNR model, treatment selection and intensity should be proportional to offender risk level and target the criminogenic needs that are directly linked to offending behaviour (Bonta & Andrews 2017). In practice, this typically translates to moderate and high-risk offenders being prioritised for interventions, while treatment is withheld for low-risk offenders. The issues of risk and need are inter-related, with the level of risk being determined based on an assessment of the presence and relevance of various individual risk factors and criminogenic needs. Generally, the greater the number of risk factors and needs identified, the higher the risk and likelihood of recidivism (Craig, Beech & Harkins 2009).

The lower recidivism rates of CSAM-only offenders in comparison to more diverse sexual offenders therefore raise questions about the utility and necessity of providing treatment of any kind to this offender population. Although recidivism rates are low in the available evidence, data are currently limited to official records of detected offenders with fairly short follow-up periods, potentially underestimating true recidivism rates. Moreover, definitions of risk levels can arguably be viewed as relative to specific populations—that is, some CSAM-only offenders are likely at greater risk of reoffending than others, despite low rates overall. Clearly some CSAM-only offenders do reoffend, indicating that appropriately targeted treatment may be of use for at least a small proportion of these offenders. In this context, the risk principle indicates that, if offered, treatment programs for CSAM-only offenders should be of a lower intensity (shorter in duration) than typical sexual offender treatment programs (which frequently comprise between 100 and 300 hours of content; Gannon et al. 2019).

Additionally, the unique characteristics and recidivism patterns of CSAM-only offenders indicate that specialised interventions targeting CSAM-specific risk are likely more effective than existing interventions targeting contact offending. To some extent, however, the development of evidence-based interventions for CSAM-only offenders and CSAM-specific risk has been hindered by the lack of definitive knowledge about the specific treatment needs of this group. Although understanding of the defining characteristics and offending trajectories of CSAM-only offenders has increased, clear and consistent predictors of recidivism are yet to be established among this population. Seto and Eke (2015) examined the predictive power of 44 variables and found that only three significantly predicted recidivism among CSAM-only offenders. Each of these variables related to possessing a higher proportion or number of CSAM/pornographic materials depicting males as opposed to females. None of the other items—demographics, criminal history, substance misuse, access to children, deviant sexual interests, or CSAM offence characteristics—were associated with subsequent offending. This finding could potentially be attributable to the low recidivism base rate (8%) among this sample, which may have limited the power of the analyses to detect significant effects.

In the absence of clear predictive factors for CSAM offending, clinicians and program developers must rely on the broader empirical research base on the characteristics of CSAM-only offenders and the ways in which they differ from other offenders. As outlined above, the available research suggests that interventions focusing on sexual and emotion regulation, internet use and interpersonal skills are likely to be most pertinent to CSAM-only offenders. In contrast, research findings indicate that interventions targeting antisocial attitudes, substance use, general lifestyle instability, and victim empathy are likely to be of less relevance for CSAM-only offenders (Babchishin et al. 2018; Babchishin, Hanson & VanZuylen 2015).

It has long been known that programs that fail to adhere to RNR principles are likely to lead to poorer outcomes (Andrews et al. 1990). Thus, providing lengthy and poorly targeted programs to CSAM-only offenders is not consistent with best-practice principles. At best, this would likely lead to an over-servicing of CSAM-only offenders, representing an ineffective and unnecessary use of criminal justice resources. At worst, it has the potential to increase risk by neglecting key offence-specific needs (eg sexual and internet regulation) or, in the case of over-servicing, reducing opportunity to engage in other pursuits important to general wellbeing and prosocial lifestyle (eg employment, leisure activities, general mental health treatment; Bonta and Andrews 2017).

Emerging treatment approaches

Several CSAM-specific interventions have emerged in the past decade in recognition of the disparity between traditional treatment programs for sexual offenders and the treatment needs of CSAM-only offenders. Available programs are varied with regards to modality, approach and content. For example, individuals can access self-guided support via online programs such as 'Stop it Now' (Lucy Faithfull Foundation 2019) or 'Troubled Desire' (Institute of Sexology and Sexual Medicine 2019), as well as manualised group-based therapeutic interventions (described below; Gillespie et al. 2018; Middleton, Mandeville-Norden & Hayes 2008). Broader preventative treatments and services are also available globally, including specialised treatment programs for non-offending individuals and online, dual and contact sexual offenders. These services use both therapeutic and peer-led initiatives to support individuals potentially at risk of sexually offending (see Perkins et al. 2018).

To date, only two programs specifically targeting CSAM-only offenders have been empirically evaluated. Middleton, Mandeville-Norden and Hayes (2009) evaluated the Internet Sexual Offender Treatment Program (i-SOTP) among a sample of 264 CSAM offenders. The i-SOTP is a group-based intervention in the United Kingdom that comprises 35 two-hour sessions delivered across six modules. The topics of the modules include identifying personal values and building motivation, offence analysis, victim awareness development, emotion regulation and intimacy skill development, addressing compulsivity and sexual deviance, and relapse prevention strategies. Participation in the i-SOTP was associated with significant improvements across measures of pro-offending attitudes, socio-affective functioning (eg self-esteem, assertiveness) and impulsivity and self-management skills. The program was recently revised (and re-titled 'i-Horizon') to more accurately reflect the growing empirical evidence relating to CSAM-only offender treatment needs. It now comprises 46 hours of CSAM-targeted content delivered across both group and individual sessions (Babchishin et al. 2018; Her Majesty's Prison and Probation Service 2018). To our knowledge, the revised program has not yet undergone empirical evaluation.

More recently, Gillespie et al. (2018) evaluated the Inform Plus program. This program is a group-based psychoeducational intervention in the United Kingdom that aims to support individuals to cease CSAM offending. It entails 10 group sessions of 2.5 hours each, covering offence analysis; the role of sexual fantasy in sexual offending; addictions and compulsions; disclosure, social skills and relationships; criminal justice information; victim empathy; lifestyle changes; and future planning (Gillespie et al. 2018). Ninety-two men, most of whom were under investigation by the police for CSAM-related offences and yet to receive a conviction, participated in the program and the associated evaluation. Similar to the i-SOTP program, participants experienced improvements across measures of social competency, emotion regulation skills, empathy, internet-related attitudes, and general mental health following program participation. These improvements were largely maintained 12 weeks after completing the program. Participants also subjectively perceived that they were more able to manage their thoughts, feelings and behaviours related to their CSAM offending following program completion (Dervley et al. 2017).

Taken together, the evaluations of both the i-SOTP and Inform Plus programs provide preliminary support for the need for and effectiveness of CSAM-specific programs. Although neither of these evaluations examined recidivism or reconviction rates, the results suggest that criminogenic needs of CSAM-only offenders can be successfully targeted via community-based group interventions. Given the emerging nature of this evidence and ongoing developments in treatment approaches, further research is required to reveal which components of the treatment are effective for this population. Additionally, given that both empirically evaluated interventions were delivered in the United Kingdom, there is a need for program evaluation in different cultural contexts.

The CEM-COPE Program

At present there are no widely available programs designed specifically for CSAM-only offenders in Australia. Instead, CSAM offenders who receive treatment are either placed in existing treatment programs designed for offline sexual offenders, or given individual treatment delivered on an ad-hoc basis. Where clinicians have a solid understanding of the current literature (including its limitations) and are well informed about the treatment needs of CSAM offenders, individual intervention is likely to be more effective in reducing recidivism than existing sexual offender group treatment programs. However, not all clinicians will possess such understanding or have ready access to emerging empirical literature, thus potentially limiting the effectiveness of interventions delivered individually. As such, there remains a clear need for intervention options for CSAM-only offenders in Australia. This was the impetus for the development of the CEM-COPE (Coping with Child Exploitation Material Use) Program (Henshaw et al. 2019), an empirically-informed group treatment program for CSAM-only offenders. The following sections provide an overview of the program development process and program specifications, as well as a brief description of the associated research pilot project.

Program development process

The CEM-COPE Program builds upon existing CSAM treatment research, programs and evaluation outcomes and targets the likely criminogenic needs of CSAM offenders. It was developed using a two-stage process. First, an extensive review of the literature pertaining to CSAM offender characteristics, risk factors and treatment considerations was conducted. Where available, manuals or outlines of existing specialised treatment programs were also reviewed, along with any associated research evaluation outcomes. We then collated outcomes across specific psychological domains to formulate the likely treatment needs to be addressed by the program.

The second stage comprised the development of a preliminary program outline and program manual based on the outcomes of the review stage. This was aided by collaboration with an expert consortium of leading international and national clinicians and researchers in the fields of CEM offending, sexual offending, and forensic intervention. The consortium included Dr Michael Seto, Dr Angela Eke, and Professor Ethel Quayle (international members) and Dr Karen Owen, Dr Joel Godfredson, and Dr Angela Sorotos (local members). Each consortium member provided feedback on initial versions of the program outline and manual. This feedback was collated and reviewed by the primary development team, before being integrated into the revised program outline and manual to form the CEM-COPE Program as described in the following section.

Objectives and specifications

The CEM-COPE Program is a 10-session program designed for CSAM-only offenders with no known history of contact sexual offences. In keeping with RNR principles, it aims to assist individuals to understand and manage their risk by providing low-intensity psycho-education and skills-based intervention in areas empirically related to CSAM offending or recidivism. Beyond the core RNR principles, the program also emphasises and promotes participants' strengths, growth, wellbeing and personal safety. As such, an integrated goal of the CEM-COPE Program is to empower individuals to harness and further develop their strengths and skills so that they may live balanced, meaningful lives, free of offending.

The overarching objective of the program is to reduce the risk of future CSAM offending by supporting group members to:

- understand why and how they offended to identify avenues for intervention and skill development;
- build and reinforce psychological skills to support desistance; and
- develop self-management plans based on what they learnt throughout the program, including the identification of any ongoing offence-specific or broader psychological treatment needs.

The CEM-COPE Program's 10 two-hour sessions are delivered weekly, in a closed group format, with each session building upon the previous sessions and associated homework tasks. Session topics and content include:

- group establishment, motivation, and goal setting;
- legal issues and offence formulation;
- emotional awareness and regulation skills;
- problematic internet use and sexual regulation skills;
- relationship and communication skills; and
- self-management and relapse-prevention planning.

Homework tasks typically consist of reflective exercises or experiential skills practice to support the development of both insight and risk-relevant psychological skills. The program draws on concepts and techniques from a range of evidence-based psychological treatment modalities, including acceptance and commitment therapy, cognitive behavioural therapy, and dialectical behavioural therapy.

Target population: Inclusion and exclusion criteria

The CEM-COPE Program is designed specifically for individuals with a history of accessing, possessing and distributing CSAM. Individuals with a history of CSAM production may also participate in the CEM-COPE Program if their offending is limited to the creation of material in the absence of a direct victim (eg altering images of children to make them sexual, or writing erotic material featuring children).

Conversely, the program is not intended for individuals with a history of more diverse sexual offending, including contact offending; CSAM production involving the direct abuse of an identifiable victim (eg filming one's own abuse of a child or filming sexual interactions with children via webcam); or sexual solicitation offences (eg using the internet to solicit CSAM from children or engage in sexual chat with children online). These individuals are excluded as they may require more intensive offence-specific intervention targeting more extensive and diverse needs.

The program is also not recommended for individuals with active severe mental health conditions (eg schizophrenia or bipolar disorder), enduring cognitive impairments (eg intellectual disability or acquired brain injury), or acute and high-risk suicidal or self-harming behaviours. Such conditions would likely impede the progress of both the individual and the broader group and would require a more targeted and individualised approach to support progress.

Pilot project

The CEM-COPE Program is currently being piloted through the Problem Behaviour Program of the Victorian Institute of Forensic Mental Health (Forensicare) in Melbourne, Australia. The overarching aim of the pilot project is to obtain feedback from group members and facilitators regarding the clinical utility, efficacy and feasibility of the CEM-COPE Program. This will be primarily achieved through qualitative analysis of focus group interview data and basic descriptive analysis of survey-based feedback data. Pre- and post-treatment scores on several self-report questionnaires will also be compared to provide a preliminary assessment of the program's ability to reduce offence-specific deficits (eg compulsive internet use, emotion and sexual regulation difficulties).

One round of the CEM-COPE Program has been delivered thus far. Although sufficient data are not yet available for analysis, participant engagement has been good and feedback on the program has been positive to date, with practical considerations offered regarding program pace, length and format. Ongoing data collection will allow for formal data analysis and further refinement of the CEM-COPE Program, with the view to undertaking more extensive and robust evaluation among larger samples of CSAM-only offenders in future.

Challenges and future directions

Which CSAM offenders need treatment?

While empirical knowledge of CSAM offender characteristics and risks has steadily increased over the past two decades, important questions remain about effective clinical and legal practices among this population. The available evidence on the offending trajectories of CSAM-only offenders suggests that offenders tend to fall within one of three treatment-related groups:

- offenders who are unlikely to sexually reoffend and thus require no treatment (at least 75% and perhaps up to 95% of offenders);
- offenders who are at risk of further CSAM offences and require specialised interventions (most of the remaining offenders); and
- offenders who are at risk of contact offending and may need more intensive intervention that mirrors existing programs for contact offenders (a very small minority).

The difficulty, however, lies in identifying the offenders who should be prioritised for treatment in the absence of clear predictors of recidivism or formal risk assessment practices. Although the available research suggests that existing risk assessment tools are likely appropriate for use with dual offenders, the different characteristics and recidivism patterns suggest that they should be used cautiously, if at all, with CSAM-only offenders (Henshaw, Darjee & Clough 2020). While some risk assessment tools specifically for CSAM offenders have recently been developed (eg the Child Pornography Offender Risk Tool; Eke, Helmus & Seto 2019; Seto & Eke 2015), they are yet to be extensively validated among diverse samples of CSAM offenders or established as consistently effective for CSAM-only offenders, potentially due to low recidivism base rates.

A related issue is the likely under-representation of CSAM offending within existing recidivism studies, which to date have been based on official offending records. Although under-reporting is a problem for most sexual offences (see Gelb 2007), this poses particular challenges for CSAM offender risk assessment given the difficulties of accurately predicting rare events (Seto & Eke 2015). Because of the expansive, unregulated and pseudo-anonymous nature of the internet, there are likely to be many more offenders than are detected by authorities. Online reports related to online child sexual exploitation vastly outnumber the offenders sentenced in recent years (see Australian Centre to Counter Child Exploitation nd; County Court of Victoria 2017; Magistrates Court of Victoria 2017). Establishing recidivism rates based on self-report information is also challenging, given the mandatory reporting requirements for both online and contact sexual offences in many jurisdictions, including Victoria (s 327 *Crimes Act 1958*).

The inability to accurately identify the CSAM offenders who are most at risk of subsequent reoffending means that interventions are unlikely to be accurately targeted towards those with the greatest need. This may also result in the over-servicing of many low-risk CSAM-only offenders who do not require any form of treatment, even if specialised programs are available. In addition, this has the potential to obscure the outcomes of program evaluations, given that treatment samples may include offenders who are unlikely to reoffend whether or not they participate in interventions. Thus, evidence-based practice for treatment of CSAM-only offenders will remain imprecise until our understanding of the predictors of CSAM offending is improved and clearer guidelines for risk assessment are developed.

Directions for future research and program development

Given the challenges outlined above, there is a clear need for ongoing research to clarify the degree of risk posed by CSAM-only offenders and the relationship between psychological and offending characteristics and later offending (or desistance) among this group. In particular, studies that seek to establish and replicate predictive relationships between offender or offence characteristics and the trajectories of CSAM-only offenders would be beneficial in enhancing both risk assessment and treatment practices. Moreover, further evaluation and validation of both existing and emerging risk assessment tools is required to develop robust, evidence-based risk assessment practices among the broader CSAM offender population. Given the low base rates of reoffending in official records, future research would ideally be conducted among large representative samples over lengthy follow-up periods, with collaboration and data linkage occurring across jurisdictions.

In addition, evidence-based treatment practices would be enhanced by the ongoing evaluation and validation of emerging specialised treatment approaches. These evaluations should examine both changes in characteristics related to offending risk and recidivism outcomes throughout and following treatment. Repeated follow-up over longer periods would also improve understanding of whether treatment-related changes are long-lasting, or whether additional 'booster' sessions are required. Ideally, evaluation studies should also include control samples of individuals who receive either no treatment or traditional treatment approaches to ensure that any significant effects can be attributed to the specific programs being evaluated. Finally, it would also be beneficial to compare outcomes across existing specialised programs to determine whether programs with particular formats, specifications or theoretical approaches lead to positive and long-lasting clinical and behavioural change.

Regarding the CEM-COPE Program specifically, it is expected that the outcomes of the current pilot study will allow for further refinement of the program ahead of more formal and rigorous evaluation of its effectiveness in reducing CSAM-related risk. Assuming that such endeavours provide evidence of effectiveness, it is hoped that the program will be made available for use within both correctional and forensic mental health services nationally. Alternative versions of the program could also potentially be developed to target various subgroups of CSAM offenders (eg offenders with autism spectrum disorder or intellectual disability) if further empirical information indicates that this is warranted.

Conclusion

The substantial increase in the number of individuals accessing, distributing and producing CSAM in recent decades has led to increased interest in the intervention needs of CSAM-only offenders. Evidence of the distinct characteristics and recidivism patterns of CSAM-only offenders indicates that traditional programs are unlikely to be suitable, and that specialised intervention is warranted. While specialised programs are emerging internationally, both accessibility and evaluation remain limited. In particular, there are limited options for interventions that address CSAM-specific risk in Australia. As such, many local CSAM-only offenders are likely to receive inappropriate treatment.

The newly developed CEM-COPE Program is an important development in local evidence-based practice for the management of CSAM-only offenders. Although further development and evaluation is required prior to widespread implementation, it is anticipated that the CEM-COPE Program and associated research will assist in preventing CSAM offending and inform future practice for the management of CSAM-only offenders. Broader research into the risk posed by CSAM offenders and the effectiveness of existing and emerging specialised programs is also required to inform best practice internationally. In particular, research that aims to identify and clarify risk factors and risk assessment practices for CSAM offenders is crucial to ensure that interventions are appropriately targeted towards higher risk offenders and that more robust treatment evaluations can be undertaken. Such research would lead to enhanced therapeutic responses to CSAM offending that promote desistance from offending, offender wellbeing and, ultimately, the safety of children internationally.

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10. Developing automated methods to detect and match face and voice biometrics in child sexual abuse videos

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The proliferation of child sexual abuse material (CSAM) online is outpacing law enforcement's ability to manage the problem (National Center for Missing and Exploited Children 2020). These increasing workloads have significant and severe implications for investigators, with recent evidence tying this work to a range of serious psychological harms, including secondary traumatic stress disorder, emotional exhaustion, intrusive thoughts, burnout, and interpersonal and marital problems (Bourke & Craun 2014; Burns et al. 2008; Powell et al. 2015; Seigfried-Spellar 2018). To address these problems, investigators are increasingly integrating automated software tools into their investigatory workflows. These tools can be used to detect or locate files containing CSAM (eg using hash values), as well as extract information from within files (eg biometrics) that can be used to identify both victims and/or offenders (Canadian Centre for Child Protection 2021; Council of Europe 2021; Internet Watch Foundation 2021; Interpol 2022, 2018).

Biometric detection and extraction approaches, in particular, can increase investigatory capacity and enhance CSAM investigations. These tools typically rely on the detection of 'primary' biometric modalities including faces (Macedo, Costa, & dos Santos 2018; Ulges & Stahl 2011) but also use other 'soft' biometric modalities to detect nudity (de Castro Polastro & da Silva Eleuterio 2010; Vitorino et al. 2018), skin tones (Islam, Watters & Yearwood 2011; Sae-Bae et al. 2014; Yaqub, Mohanty & Memon 2018), and subject age (Gangwar et al. 2021; Islam et al. 2019).

However, the reliance on face as the main biometric routinely used in CSAM investigations has several limitations—for example, the lack of distinct facial features appearing in children, the inability to reliably estimate age, instances where the background and the skin tone of the child are similar, the degree of nudity present, and the substantial proportion of CSAM that purposefully shields faces from view (Moser, Rybnicek & Haslinger 2015; Phippen & Bond 2020; Srinivas et al. 2019; Yiallourou, Demetriou & Lanitis 2017). These problems lead to higher than desired rates of false positive and false negative matches, thus reducing task automation and requiring manual intervention (and exposure) by investigators. Recognising these limitations, researchers have advocated for augmenting facial recognition by combining it with additional primary biometrics (eg voice or iris recognition, fingerprints, and vascular patterns) and soft biometric attributes (eg skin/eye/hair colour and tattoos; Bursztein et al. 2019; Sae-Bae et al. 2014).

Trends in the distribution of CSAM online demonstrate that producers and consumers increasingly prefer video files and lucrative on-demand live streams (Brown, Napier & Smith 2020; Dance & Keller 2020; Maxim et al. 2016). In fact, 2019 marked the first year that reports of child sexual abuse (CSA) videos outpaced those of images (National Center for Missing and Exploited Children 2020). This shift highlights the growing importance of video in CSAM investigations, which practitioners flag as an area needing attention, given that video processing capabilities are not yet as mature as those of images (Sanchez et al. 2019). Further investment in such capabilities has the potential to vastly enhance investigators' capacity to identify victims and offenders in CSAM, given the ability to use additional biometric modalities not present in static images, such as voice.

This chapter describes the development of software that uses a combination of biometric modalities (both visual and auditory information) contained within a video file to increase the likelihood of matching CSAM victims. This software, entitled the Biometric Analyser and Network Extractor (BANE), is designed to ingest CSAM (particularly videos), extract multiple biometric attributes (currently faces and voices), and match subjects across videos based on these biometric attributes. This chapter is presented in four parts. First, the research aims guiding this work are articulated and elaborated upon. Second, a methodological account is provided, detailing the software development process and the challenges encountered. Third, results are presented, illustrating the matching performance of the software using a testing database of CSA videos depicting victims, compiled by Australian law enforcement agencies. Finally, the implications for future research are discussed.

Aims

This research aims to address current limitations associated with using only facial recognition to identify CSAM victims. While facial recognition has proven effective for investigators, it is limited in its ability to derive matches where faces are concealed or the media is of poor quality. Moreover, the proliferation of videos depicting CSA provides new opportunities to augment existing tools to function in new environments. Accordingly, we propose that combining facial recognition with other biometric modalities, namely speaker recognition, can reduce both false positive and false negative matches, and could enhance analytical capabilities during investigations. The following section provides an overview of the software tool, BANE, designed and developed by the research team specifically to analyse CSAM.

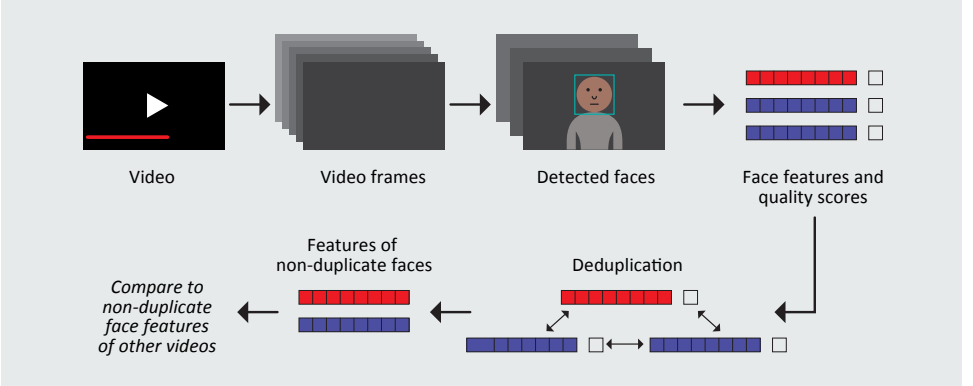
Methodology

Software development

The research team developed a unique video processing methodology as a means of overcoming many of the challenges associated with this form of media. BANE is designed to: (1) ingest video files identified for analysis, (2) extract faces, (3) recognise voices and (4) generate inter-video matches based on these extracted biometric characteristics across the media database. Each of these steps is described in turn.

BANE is equipped to ingest and extract biometric information from a variety of common video formats and was tested using .avi, .mp4, .mkv, .mov, .m4v, .mpg, .mpeg, .3gp, .3gpp, .asf, .wmf, .wmv, .divx and .vob extensions. Videos are ingested and fully decoded using the MoviePy video editing and processing Python package (which uses the FFmpeg library), resulting in a complete sequence of frames and corresponding waveform files. BANE has an application programming interface that processes the face and voice information in each video and compiles the results within its database. Once all the videos are ingested into the database, subject faces are extracted and processed through a four-step pipeline (see Figure 1).

Figure 1: Illustration of the face recognition pipeline for a single video



First, every 30th frame in the video (corresponding to approximately one frame every second) is analysed with the face detector to discern how many, if any, faces are present in the frame and their location within the frame. To this end, BANE was developed to allow for different facial recognition algorithms to be implemented or taken out, depending on the context. However, in this work, we use a face recognition algorithm developed by the Australian Government's Defence Science and Technology Group (DSTG), which has been specifically designed to recognise children's faces better than other existing algorithms (Yiu, Malec & Michalski 2021). This algorithm was trained on a diverse range of facial imagery (which included children), and is a convolutional neural network based algorithm, which learns during the training phase which features to use for optimal performance. It does this by maximising the distance between class centres while minimising the distance from samples to their respective class centre.

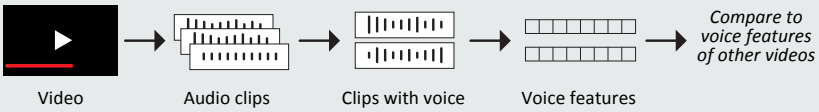
Second, facial features are extracted from the detected faces using DSTG's algorithm. Once detected, each face is assigned a 'face quality score'—determined by a machine learning system trained to identify face images that lead to higher match scores (Hernandez-Ortega et al. 2019).

Third, the faces within a single video are matched with each other to determine how many faces, if any, are duplicates of the same subject. This step also uses DSTG's algorithm, which was validated using a closed-source dataset, achieving a true match rate of 97.9 percent at a 0.01 percent false match rate. For comparison purposes, the algorithm was evaluated on the open-source dataset of facial images 'Labeled Faces in the Wild' (Huang et al. 2008), achieving a true match rate of 91.9 percent at a 0.01 percent false match rate (acknowledging, however, that this data contains adults only). If the software determines that multiple facial images are of the same person (ie the match score among them is above a specified threshold), then the face with the highest 'face quality' score is marked as the representative face (to be used later for matching) and the rest are marked as duplicates.

In the fourth and final facial recognition step, the set of representative faces from a video are compared to all representative faces from other database videos using the matcher component, and a match score (a similarity score where higher values indicate more similarity) is derived between –1 and 1. By default, BANE alerts the user to a 'match' only for video pairs if the maximum score among all faces in the video pair is above a match score threshold of 0.67 (ie the 'extremum' approach). This threshold corresponds to a 0.01 percent false match rate and a 99.0 percent true match rate.

Once the face matching process is complete, BANE commences the four-step speaker recognition process (see Figure 2). First, the audio from each video is extracted and cut into segments, depending on user-defined parameters (eg a full video or 5-, 10- or 30-second clips).

Figure 2: Illustration of the speaker recognition pipeline for a single video



Second, audio segments are processed using a voice activity detector (WebRTC 2017) to ensure that only clips containing voices are entered into the database for subsequent matching.

Third, voice attributes are processed using a speaker recognition algorithm and matcher, specifically designed to address challenging scenarios such as where speech and extraneous noises (eg background music) occur simultaneously. This algorithm, developed and validated by Chowdhury and Ross (2020), extracts features from voice using two commonly deployed features: mel frequency cepstral coefficients (MFCC) and linear predictive coding (LPC). MFCC and LPC represent speech perception features modelled on the human auditory perception system, and speech production features modelled on the human vocal tract. These features are then fused (combined) using a convolutional neural network.

Fourth, using this algorithm, each audio segment from a video is compared to all audio segments from other videos and a match score is given. Two videos are linked as containing the same person if the voice match score is above a certain threshold. As for matching faces, the extremum approach is used to derive match scores (ie the highest match score is used). We use a match score threshold of at least 0.80 as previous analyses of the speaker recognition algorithm on the VoxCeleb database (Chung, Nagrani & Zisserman 2018) identified this as the optimal match threshold in applications such as ours.

Once the face and voice processing and matching is complete, matches can be viewed using a custom-built graphical user interface. In viewing matches, the user can adjust the match score tolerance to better suit the specific operational environment (default: ≥0.67 for face, ≥0.80 for voice).

Compilation of CSA video testing dataset

The BANE software was supplied to Australian law enforcement agencies to evaluate on an annotated database of known CSA videos for the purpose of testing its matching performance. The database contained 70 videos, in their original formats (*.mp4 and *.avi), comprising 21 distinct primary subjects (child victims) with between two and five videos of each. These videos were selected to represent many of the challenging conditions that investigators encounter in real-world deployment. Accordingly, videos contained a variety of forms of CSA, including materials that were both staged and self-produced, and also contained subjects from a range of ages (roughly between 5 and 14 years old). Videos were, on average, 118 seconds in length, with the shortest being 10 seconds and the longest 718 seconds (approximately 12 minutes).

Four criteria governed video selection and inclusion in the dataset. First, each video contained CSAM, as defined under Australian law. Second, each video contained a primary subject (a child) whose face was visible at some point and whose voice was clearly audible (ie they spoke at least a few words). Third, videos containing more than one voice were excluded to permit a standalone assessment of the speaker recognition algorithm. Finally, if any secondary subject (eg offender) appeared in more than one primary subject's videos, those videos were excluded. This ensured that matches identified were of the primary subject and not a secondary (eg background) subject, which would undermine the testing procedure.

Analytical procedure

The entire testing dataset was ingested into BANE and the videos were processed as per the methodology outlined above. Faces were successfully detected in and extracted from 68 of the 70 videos. Voice clips were successfully extracted from 68 of the videos. There was no overlap between the videos in which faces could not be extracted and those for which voices could not be extracted. The research team elected to include the four videos where only a single biometric cue was extracted in the analysis, to simulate real-world deployment, where the quality of files varies. The performance test routine included two additional steps in order to automatically generate results. First, BANE was provided with information pertaining to the 'ground truth' of the dataset. Each video pair was labelled as a genuine pair (where both videos contained the same subject) or an imposter pair (where the videos contained different subjects). Using this data, BANE was programmed to assess its own match performance.

Results and discussion

Given the composition of the database, there were a possible 91 genuine video pairs (ie two videos containing the same subject) and 2,324 imposter video pairs (ie pairs of videos containing different subjects). The performance results for face recognition, speaker recognition, and fusion (face and speaker combined) are presented separately.

Matching performance using only face or speaker recognition

Figures 3 and 4 display the performance for face recognition and speaker recognition in the form of receiver operating characteristic (ROC) curves, which plot the true match rate (% of genuine video pairs correctly classified as a match) against the false match rate (% of imposter video pairs erroneously classified as a match), at many thresholds. Users may select a threshold according to operational requirements. For example, law enforcement may select a lower threshold, to capture the greatest number of genuine matches, but in doing so will need to accept a greater number of imposter pairs being incorrectly classified as matches. Conversely, investigators may select a high threshold, which will reduce the number of imposter matches identified but also reduce the proportion of genuine matches identified.

Figure 3 depicts the ROC curve for face recognition and shows that a false match rate of 1.0 percent corresponds to a true match rate of 72.1 percent. If a higher true match rate is prioritised, accepting a higher false match rate, a false match rate of 5.0 percent corresponds to a true match rate of 91.9 percent. Figure 4 reports the ROC curve for speaker recognition and shows that a false match rate of 1.0 percent corresponds to a true match rate of 65.1 percent. Again, if the priority is identifying as many genuine matches as possible, a higher false match rate of 5.0 percent corresponds to a true match rate of 84.9 percent. These results demonstrate that both face and speaker recognition can effectively be independently used for matching purposes in CSAM contexts, with relative performance being scalable according to investigator needs.

Figure 3: ROC curve for face recognition at all thresholds

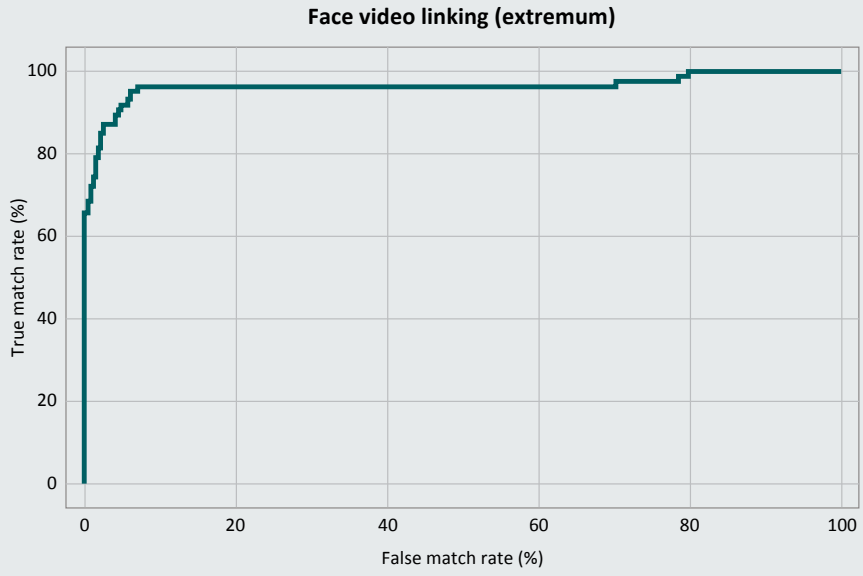
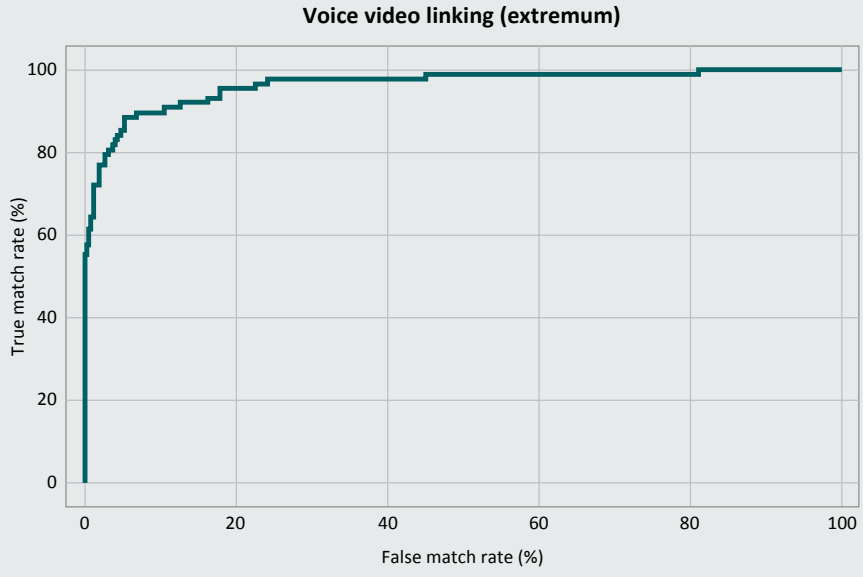


Figure 4: ROC curve for speaker recognition at all thresholds

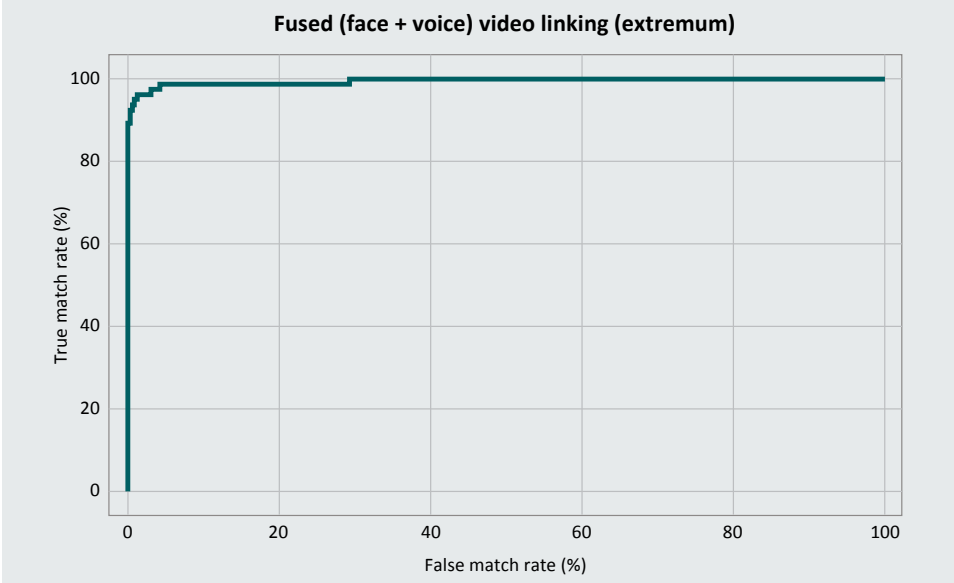


Fusion (combining face and voice)

The respective match scores reported for both face and voice can also be combined to create a fusion match score. Biometric fusion combines match scores from multiple sources to render a single, combined match score (Ross, Nandakumar & Jain 2006). This can be used to improve the error rates observed in Figures 3 and 4.

The first step of fusion involves standardising the face and voice scores, so that each exists in the range from 0 to 1. The final fused scores result from summing corresponding face and voice scores. This has the potential to improve match scores for one biometric attribute by supplementing it with another. Figure 5 demonstrates the utility of this approach, achieving a true match rate of 93.8 percent with a false match rate of 1.0 percent, and a 98.8 percent true match rate with a false match rate of 5.0 percent. Put another way, any observed deficiencies with face recognition (Figure 3) and speaker recognition (Figure 4) are overcome by combining these biometric attributes for each subject.

Figure 5: ROC curve for fusion (face and voice) at all thresholds



The results underscore the importance of using (fusing) multiple primary biometric attributes for recognition (Chowdhury et al. 2018) and reinforce Bursztein et al.'s (2019) and Sae-Bae et al.'s (2014) call for the use of classification or clustering techniques when matching biometric attributes. This is particularly important in an environment where video quality can be poor or features obscured, thereby limiting single attribute matching performance. Devising automated methods to derive matches using multiple biometric cues has the potential to greatly enhance the depth and scale of investigations beyond the use of hash values (particularly at a time when the volume of CSAM requiring investigators' attention continues to proliferate). Moreover, using automated technologies such as BANE has the added benefit of reducing investigators' direct exposure to CSAM (ie removing the need to manually watch and catalogue media) and can help address the excessive workloads and high degree of burnout frequently experienced and reported in the literature (see Foley, Louise & Massey 2020).

Limitations and directions for future research

BANE represents a first attempt at integrating the automated extraction and matching of multiple biometric attributes across CSA videos. The software development and testing process was challenging, and a number of limitations emerged which should be addressed in future research.

The software requires a high level of computational intensity, which has been accounted for in the software development roadmap. The software was developed to be flexible with respect to its deployment environment, and has been tested on local desktop machines using the central processing unit (CPU), but also in high-performance clusters using graphics processing units (GPUs) for enhanced performance. Future versions of the software will further prioritise performance (including through software optimisation, as well as transitioning to a cloud-based infrastructure) and facilitate large-scale deployment.

The testing database contained selected videos that were specifically included because they contained both a face and voice that were clearly discernible and verifiable. It is acknowledged that videos encountered by practitioners in operational settings may not always contain good quality facial images and/or voice recordings, which may result in degraded performance. Moreover, it is expected that CSAM encountered 'in the wild' will often contain additional variability beyond that portrayed in the videos included in the testing dataset. For example, videos may contain faces and voices of subjects from a wider array of ages (ie from infants and toddlers to teenagers). In addition, videos may also contain multiple speakers or a tremendous range of vocal sounds, including whispers, screams, crying, laughing or singing. Therefore, the creation of larger training and testing CSAM datasets by law enforcement will provide important insights into these contexts and drive the development of new algorithms capable of effectively operating under such conditions.

Some innovative work has already been undertaken with regard to facial recognition, with new algorithms being trained, such as the DSTG's algorithm, included in this study, which was specifically developed to recognise both children's and adults' faces. New methods are also emerging with respect to speaker recognition, permitting speaker disambiguation using novel clustering and deep learning techniques (see Park et al. 2022). However, further development of these and other approaches will likely be required in order to achieve the accuracy necessary to support full-scale operational deployment.

We acknowledge the potential for algorithmic bias in the results presented. The facial recognition algorithm was tested for gender and age bias and found to perform better with children than other algorithms (Yiu, Malec & Michalski 2021). Similarly, the speaker recognition algorithm was tested for gender and language bias; however, this was done with adults only (Chowdhury, Cozzo & Ross 2020). Given the nature of CSAM, we were unable to ensure that various ethnicities and genders were represented equally in our test data. Therefore, it is possible that certain biases could exist. Future research should attempt to test these, and other incorporated algorithms, for such biases.

While videos were required to contain a face and voice to be included in our testing dataset, a proportion of CSA videos being distributed online contain neither a face nor a voice. This suggests a need to extend the software's extraction and matching capabilities to include additional soft and primary biometric attributes, such as vascular patterns, age, gait, gender, hair colour and ethnicity (eg Macedo, Costa & dos Santos 2018; Moser, Rybnicek & Haslinger 2015; Sae-Bae et al. 2014; Yiallourou, Demetriou & Lanitis 2017). Such algorithms can be integrated into future iterations of BANE and may further enhance matching performance (for individual attributes and combinations of attributes).

Beyond the development and integration of additional algorithms, future research can also target deeper integration of BANE with other data collection technologies, such as the web crawler previously developed by the research team, 'The Dark Crawler' (Monk, Allsup & Frank 2015; Westlake, Bouchard & Frank 2017). These technologies, designed to crawl the surface web and darknet, can be coupled with BANE to permit widespread automated detection, collection and analysis of CSAM as it becomes available online. To accomplish this task, software like The Dark Crawler will require further development to enhance video detection and extraction capabilities to account for evolving CSAM preferences and trends. For example, new video formats (such as live streaming) and website implementations have become increasingly commonplace (Cubitt, Napier & Brown 2021; Internet Watch Foundation 2021), and need to be identified and specifically accounted for in future iterations of the software. In developing and deploying these capabilities, researchers and practitioners must also acknowledge their ethical and legal obligations and strictly adhere to best practice (see Brewer et al. 2021; Jain, Klare & Ross 2015; Tanwar et al. 2019).

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URLs correct as at February 2022

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11. Warning messages to prevent illegal sharing of sexual images: Results of a randomised controlled experiment

Jeremy Prichard, Joel Scanlan, Tony Krone, Caroline Spiranovic, Paul Watters and Richard Wortley

The consensual sharing of digital sexual images is now a common form of sexual expression among adults (Mori et al. 2020) and adolescents (Madigan et al. 2018). Where these behaviours become exploitative and potentially illegal we find two overlapping constructs of cybercrime: image-based abuse (IBA) and child sexual abuse material (CSAM). IBA research is interested in the abuse of people of all ages—adults and minors—and findings demonstrate unambiguously that IBA occurs in both populations. A study of 4,274 Australians aged 16 to 49 years found that 20 percent had sexual or nude images taken of them without their consent, 11 percent reported that such images were distributed without their consent and nine percent had received a threat that such an image would be distributed (Powell, Henry & Flynn 2018). This same survey indicated that sharing sexual self-images voluntarily (43%) and/or when pressured to do so (41%) were common experiences for young people aged 16–29 years (Henry, Flynn & Powell 2019: 10).

Similarly, self-report survey studies have indicated that 38 percent of Australian youths aged 13–15 years have sent an image of a sexual nature of themselves to others (Lee et al. 2015), six percent aged under 18 years have sent a sexual image of another person without that person's consent (Crofts et al. 2015), and 15 percent of women aged 15–17 years have experienced IBA (Office of the e-Safety Commissioner 2017a).

IBA may also constitute CSAM where the person depicted in an image is, or appears to be, a minor. The IBA–CSAM overlap might occur where, for example, an 18-year-old adult photographs their 16-year-old sexual partner. However, the production and distribution of CSAM by offenders who are themselves minors is a rapidly expanding problem (see Dodge & Spencer 2018; Falligant, Alexander & Burkhart 2017; Lewis 2018; McNeish & Scott 2018). CSAM can be generated by minors in different contexts (see Office of the e-Safety Commissioner 2017a, 2017b). These include, but are not limited to, the filming of sexual assaults (eg Robinson 2006), non-consensual filming during consensual sex, covert image production (eg 'upskirting'), and 'selfies' of solo sex acts, nudity or sexual posing (Wolak et al. 2018). Some self-generated material can be produced and consensually shared with one individual (eg a boyfriend) but then non-consensually shared with others. In other situations, minors can be coerced or blackmailed into supplying self-generated CSAM to another person.

Responding to these behaviours is a difficult task for government and non-government agencies. Determining the boundary between criminal and non-criminal behaviour is not always simple. Despite being sexual in nature, material generated or shared by minors might not constitute CSAM at law (Lee et al. 2013: 34–36). Nor indeed is such activity necessarily harmful (see Lee et al. 2015). There may also be an age-related bar to prosecution, such as instances where children under the age of criminal responsibility generate or share CSAM. These situations may require responses from health and welfare agencies and schools. Where an offence can be proven, there is a broad range of potential offending behaviour—from minor offences through to egregious acts of sexual cruelty—requiring nuanced justice system responses.

The generation or sharing of CSAM by minors can result in significant psychological distress for the young people depicted in the material and their families (Office of the e-Safety Commissioner 2017b; regarding adult IBA victims see Gassó, Mueller-Johnson & Gómez-Durán 2021). A compounding factor is that the material can be uploaded to open websites—'revenge porn' sites, Facebook, Snapchat, Reddit, Twitter, Tumblr and so forth (Belton & Hollis 2016; Office of the e-Safety Commissioner 2017a). On the open internet, minor-generated CSAM can be accessed by members of paedophilic subcultures, stimulating the CSAM market more broadly. By way of example, of 153 offenders investigated by the Australian Federal Police for CSAM offending, seven percent possessed CSAM images that were produced in a school setting (Krone et al. 2017: 46).

While we have good estimates of the prevalence of IBA, the amount of CSAM produced or shared by Australian minors is difficult to quantify. However, the scale of the problem is potentially very large. At the 2016 Census, the nation had approximately 880,000 people aged between 12 and 17 years (Australian Bureau of Statistics 2016a). Teenaged Australians had a higher rate of internet access than any other age group in 2016–17 (Australian Bureau of Statistics 2016b). A range of factors have been identified that put young people at an increased risk of offending online. However, it is the opportunity to offend provided by modern technology—namely common access to digital cameras and the ease of uploading material to the internet—that is widely regarded as one of most salient factors (Quayle & Koukopoulos 2019; Wortley & Smallbone 2012).

Warning messages as a prevention strategy

While IBA and CSAM are inherently internet-based phenomena, it is critical to recognise the relevance of scientific research examining how people respond to messages in the real 'offline' world. This research, now many decades old, shows that 'hard-copy' messages can mitigate hazards in everyday life arising from motor vehicles, industrial machinery, poisons, pharmaceuticals, foodstuffs and so on.

Importantly, research has repeatedly demonstrated that the effectiveness of messages is greatly influenced by how they are designed. Table 1 lists design features that increase the likelihood of compliance.

Table 1: Features of message-design that influence human decision-making

Messages are more likely to influence decision-making when they:

- attract attention;
- are clear and concise;
- impart explicit information about specific hazards, potential harms, and what to do to avoid harm;
- are believable;
- come from a credible source;
- match the degree of danger to specific colours;
- match the degree of danger to alert symbols like '!'; and
- match the degree of danger to signal words like 'caution' or 'warning'.

See Haddad et al. 2020; Prichard et al. 2022

This evidence base has largely been ignored by crime prevention literature to date. Nonetheless, studies have demonstrated that messages can work to varying degrees. For instance, postal letters have been shown to be potentially useful in reducing insurance fraud (Blais & Bacher 2007) and tax evasion (Coleman 2007) and protecting victims of online fraud (Cross 2016).

Regarding online warning messages, several studies indicate that internet users are prepared to heed warnings about hazardous online behaviours related to: perpetrating cyber-attacks (Testa et al. 2017); piracy (Ullman & Silver 2018); exposure to malware (Haddad et al. 2020); online gambling (Caillon et al. 2021; Gainsbury et al. 2015); pro-anorexia websites (Martijn et al. 2009); and disclosing personal information (Carpenter et al. 2018). While more research is needed to understand what individual factors might increase or decrease the likelihood of compliance with online messages, it is relevant to note findings from Zaikina-Montgomery's (2011) study. She found that warning messages could dissuade users from viewing legal pornography. However, an age difference was observed with respect to the warning that 'police may be called', which adolescent participants rated as less effective than did adult participants. One explanation offered for this result was that adolescents were more tech-savvy and consequently less inclined to believe that warning (Zaikina-Montgomery 2011: 228).

Messages to reduce the viewing of CSAM

Increasing attention has been given to automated online messages as a means of delivering information about CSAM in a targeted fashion to internet users who have just commenced offending or might be at risk of commencing offending (Prichard et al. 2019). Recommendations to investigate online messages have drawn on theoretical models found in health (Quayle & Koukopoulos 2019) and crime science (Wortley & Smallbone 2012).

Law enforcement agencies have trialled CSAM warnings. They are also used by internet companies (eg Google 2020; see further Prichard et al. 2022). To date the main focus has been on messages intended to dissuade users from viewing, accessing or downloading CSAM. We recently established that online messages can dissuade users from viewing material that eroticises adult–minor sex acts (Prichard et al. 2022). This experiment was a precursor to the study presented below, so the following details are relevant to note.

We subcontracted a commercial agency to design a men's fitness website targeting young adult men which we refer to as 'GetFit'. Like other 'honeypot' studies (eg Testa et al. 2017), we developed this website to covertly observe the behaviour of anonymous internet users. Among real advertisements, we included a fake advert for 'barely legal' pornography, which we used as a proxy for CSAM for legal and ethical reasons (see Prichard et al. 2022). Users who clicked on this advert were randomly allocated to either a control group, who received no message, or one of two experimental groups who received different types of warning messages. The messages purported to come from the administrators of the GetFit website. The messages were designed to incorporate the features presented in Table 1 (above). However, it is important to note that the messages in this initial study did not include any images or animation.

Nearly three-quarters of the control group (73%, *n*=100) attempted to enter the 'barely legal' website. In contrast, only 50 percent of the experimental groups who received a message about police monitoring (*n*=81) or criminal laws (*n*=99) entered the site. These differences were statistically significant and meaningful. The findings were interpreted as supporting situational crime prevention literature, which has argued:

- increasing the perceived risks associated with any offence will reduce the likelihood of the offending behaviour (Clarke 2017); and
- online CSAM warning messages will be effective because they can reach potential offenders at the moment they contemplate offending (Wortley & Smallbone 2012).

Testing online messages to prevent image sharing

The current study was conducted in collaboration with the Office of the eSafety Commissioner. The primary aim was to test whether automated messages can dissuade young men from uploading sexual images of women to pornographic websites. As outlined earlier, from a public policy perspective, we were particularly interested in the problem of image sharing by minors. However, as explained below, experimental research on minors was not feasible, and so our target sample primarily comprised males between 18 and 32 years old, some of whom may, for example, be considering uploading images of their underaged girlfriends. Nevertheless, we believe that lessons can be learned from this study more generally about the use of warning messages to prevent the sharing of CSAM by both adults and minors.

A secondary aim was to explore whether a message containing animated graphics would be more effective than a message containing static text alone. We hypothesised that the animated message would be more effective on the basis that congruent text and visuals have been found to enhance attention to and recall of warning messages (see, for example, Lochbuehler et al. 2018).

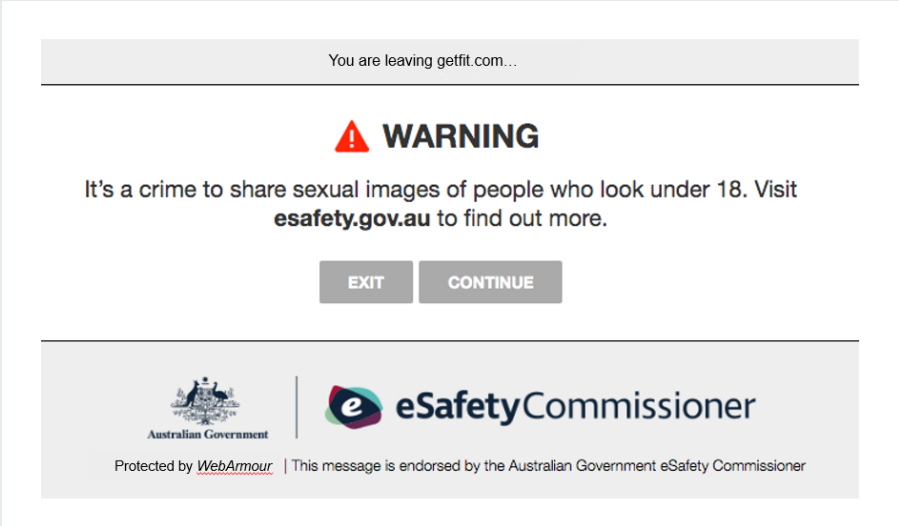
Design and procedure

We conducted a double-blind randomised controlled experiment with naïve participants who visited the GetFit website between 26 August 2019 and 30 March 2020. For this experiment we presented advertisements for a fake pornography website—referred to in this article as Swap My Babe (SMB)—which purported to offer users free access to pornography if they uploaded their own sexual image of a woman: 'upload your sexiest real pic, free instant access'. These advertisements were designed by our commercial partner and simulated advertisements used by real pornography companies.

Users who clicked on the advert were allocated to control or experimental conditions. Allocation was made using Mersenne Twister, a randomisation algorithm. The control group did not receive an online message and therefore could proceed directly to the fake landing page of the SMB website. The landing page was also designed by our commercial partner and mimicked the landing pages of real pornography sites. It provided users with the option of 'exiting' (navigating to the previous GetFit page) or 'entering', which triggered a message after a five-second delay from SMB: 'Sorry! We're undergoing routine maintenance. Please check back shortly.'

Experimental groups were presented with one of two messages. The text presented in both messages stated: 'It's a crime to share sexual images of people who look under 18. Visit esafety.gov.au to find out more.' Message A contained only static text, as depicted below in Figure 1. Message B combined the text with a nine-second 2D animation depicting a male character uploading a sexual image online and then being arrested.

Figure 1: Visual layout of Message A (text only)



Both messages indicated that the text was endorsed by the Office of the e-Safety Commissioner. Compliance with the evidence base on message design was achieved by ensuring our messages were clear, concise and believable; originated from a credible source; and contained an alert symbol (!) and a signal word ('warning'; see Table 1). Our messages covered participants' entire browser screen regardless of the type of device used. We also ensured that participants had to interact with the message in order to remove it (eg by clicking 'exit').

Authenticity and cybersecurity

Several steps were taken to ensure that the messages appeared authentic even to tech-savvy participants. This was clearly important for perceived believability, without which the experiment could fail. But it was equally imperative for cybersecurity—that is, to reduce the risk of cyber attacks against the GetFit website.

The bottom of the messages contained a small logo for a fictitious software package called WebArmour. Curious users who clicked on this logo were directed to the fake landing page of WebArmour, which explained that the software was used by websites to increase cybersecurity by scanning, blocking or displaying warnings on outbound links.

As described in greater detail previously (Prichard et al. 2022), we also:

- used different servers in Australia and overseas to maintain GetFit, the SMB landing page, the SMB advertisements, and the WebArmour landing page; and
- ensured that GetFit and SMB were only accessible through SSL, using certificates issued by trusted third parties, as opposed to non-SSL sites, which lack any proof of authenticity.

Recruitment

The experiment aimed to achieve high ecological validity by covertly observing users' behaviour without their knowledge. For legal and ethical reasons we could not recruit individuals under the age of 18 years. Social media advertising was used to attract English-speaking Australian men aged 18–22 years to the GetFit website, although internet users could take other routes to the website (eg organic searches). By targeting men only we both simplified the design brief for our commercial partner and increased the chance that the limited funds we spent on advertising would achieve a sufficient sample size (since men are more likely than women to use pornography; Rissel et al. 2017).

Outcome measures

Google Analytics provided metrics about the numbers of visitors to GetFit, their pathway to the site, and their behaviour at the site. We gathered the IP addresses of the participants who clicked on the SMB advert. No other information was gathered about the participants. With respect to our research questions, we measured whether participants attempted to 'enter' the SMB website landing page. With this information we created a dichotomous dependent variable, *desistance*.

We deleted repetitions of IP addresses through manual checking and excluded records identified as bots. These procedures mitigated the risk of double-counting and ensured that each IP address represented a real individual. Double-counting may have occurred if the same participant clicked on the SMB advert from different IP addresses (eg home and work). On the other hand, since one IP address can be used by multiple users, it is also feasible that we eliminated unique participants from the study.

Ethics

This research was approved by the University of Tasmania human research ethics committee (#H0012409). In accordance with international principles governing human research, despite the fact that the research involved covert observation, the study was conducted for the public benefit and it involved a low risk of causing distress to participants. We employed strategies to protect participants' anonymity, including isolated secure storage of IP addresses (for further details, see Prichard et al. 2022). No illegal behaviour was observed. In designing the SMB advertisements and landing page, our commercial partner purchased non-pornographic images of certified adult models from a registered company. In all images the models appeared to be adults and appeared to consent to the photography, for example by taking the photograph themselves, or facing the camera.

Results

Metrics provided through Google Analytics indicate that during the seven months that the experiment was conducted GetFit was visited from 28,902 unique IP addresses. Most of these IP addresses probably related to single individuals, although we cannot discern how many visitors may have used more than one IP address (eg by visiting the site at work and later at home). Traffic to GetFit primarily originated through paid social media advertising (62%) and organic searches (ie via search engine queries; 33%). The remainder came from miscellaneous routes, such as shared links (5%).

As detailed below, of the many thousands of visitors to GetFit we recorded 528 clicks on the SMB advertisements from unique IP addresses after repeat entries and non-human agents (eg bots) were excluded. This number represents 1.83 percent of all GetFit visitors, which by industry standards is a good click-through rate for web-based display advertisements (eg Irvine 2020). The main weakness of our method is that the demographic profile of the participants is unknown. However, we can conclude with some confidence that the participants were likely to be Australian males aged between 18 and 32 years. This is for two main reasons. First, the social media advertisements targeted Australian men aged 18–22 years, which suggests that approximately 18,000 of the 28,902 visitors (62%) fitted this demographic profile. (We acknowledge, though, that some individuals may lie about their age when they create their social media accounts.)

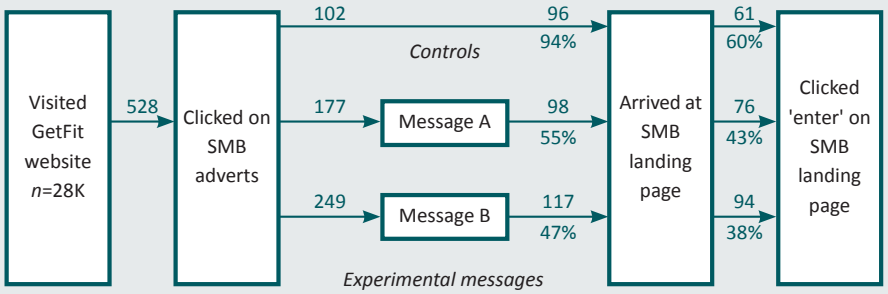
Second, our commercial partner advised that the organic traffic (33%) was probably mainly made up of the internet users we attracted to the GetFit website in the first experiment (Prichard et al. 2022). The number of visitors in that experiment was estimated to be 29,364. Over 90 percent of these arrived through our social media advertising campaign, in which we targeted Australian men aged 18–30 years. Taking into account that the first experiment started in November 2017—almost two years before the current experiment—we conclude that this 'original' cohort would now be aged between 20 and 32 years.

Desistance

The behaviour of the 528 participants who clicked on one of the SMB advertisements is presented in Figure 2. 'Desistance' refers to the proportion of participants who did not click 'enter' at the SMB landing page.

Our cell sizes were uneven due to the randomisation algorithm that we employed (a Mersenne Twister): 249 participants in the Message B group compared with 102 in the control. This algorithm ensured that the temporal allocation of a participant to an experimental group or control was independent of all prior allocations, ensuring no sequencing bias. However, the downside of this approach is that it does not guarantee an equal allocation of participants to any particular group. Future studies will use an approach that guarantees sequential randomness as well as equal allocation as far as possible. Of the 102 participants in the control group, 96 arrived at the SMB landing page. Six did not. How this occurred is not clear. This issue is considered further in the *Discussion*.

Figure 2: Number of participants who arrived at the SMB landing page and clicked 'enter'



At the SMB landing page 61 members of the control group attempted to gain access to the SMB site by clicking 'enter'. This means that the control desistance rate was 40 percent. The experimental groups had two opportunities for desistance. Their first opportunity was when they received a warning message which prevented them from advancing to the SMB site until they navigated away or confirmed their intention to visit the site. The second opportunity for desistance was—like the controls—at the SMB site. Of the 177 participants who viewed Message A, 98 continued to the SMB landing page and once there 76 clicked 'enter'. In the Message B group (n=249), 117 continued to the landing page and 94 clicked 'enter'.

Each of the experimental groups was compared with the control group. Fisher's exact test (1-sided) was applied to determine the statistical significance of differences in the observed proportion of users from each group who did not click 'enter' (ie desistance) on the SMB landing page. (In contrast to chi-square, there is no statistical test value to report when conducting Fisher's exact test.) For Message A and B groups, respective desistance rates were 57 percent and 62 percent. Individual comparisons found that the difference in desistance rates between the control group and Message A group (p=0.005, odds ratio (OR)=1.977 (95% confidence interval (CI)=1.205, 3.244)) and Message B group (p<0.001, OR=2.453 (95% CI=1.531, 3.931)) were statistically significant.

The effect sizes, as indicated by odds ratios, were small but either exceeded (Message B) or approached (Message A) the minimum threshold (ie OR=2.0) for a difference which is practically meaningful according to Ferguson's (2009) guidelines for the social sciences. In other words, the magnitude of the difference in desistance rates for the control group compared with the two message groups was meaningful. A pairwise comparison of the difference in desistence rate between Message A and B was not significant (p=0.16) indicating the messages were equally effective.

Discussion

Our study has demonstrated that individuals can be dissuaded from sharing sexual images if they receive an online warning message concerning a potential breach of CSAM laws. We believe that our findings are robust because the participants did not know they were being observed, and by randomly assigning the participants to control or experimental conditions we controlled for selection bias and other factors.

Importantly, it is very likely that participants exhibited real-life behaviours. Every dimension of GetFit and SMB was professionally designed. In fact, the SMB advert was markedly more attractive to users than the advert we used in the original 'barely legal' experiment (Prichard et al. 2022). This is evidenced by the fact that the original advert took 16 months to recruit a sufficient sample size, whereas the SMB advert took seven. Whether this was due to the type of pornography SMB purported to offer or the appearance of the adverts is unclear. Either way, the overall 'pitch' was evidently realistic from the perspective of internet users. Other indications that none of the users suspected the true research purposes of the websites include the fact that no complaints were received from users via the 'contact us' email address at GetFit, and neither GetFit nor SMB were subject to system trespass (hacking) attempts.

The warning messages in this experiment used colour and alert symbols appropriately, were simple and believable, did not disappear from participants' screens until they navigated away, and appeared to come from a highly credible source (the Office of the eSafety Commissioner). Given these features, it is perhaps not surprising that animation did not significantly increase message effectiveness. The animation was redundant because other features of the message had already caught participants' attention.

Of the many thousands of visitors to our men's fitness website, GetFit, 528 chose to click on the professionally designed SMB advert, which offered users free pornography if they uploaded their own images of women. The warning significantly reduced the click-through rate to the SMB website. The plainest interpretation of this finding is that, consistent with situational crime prevention literature (Clarke 2017; Wortley & Smallbone 2012), the warnings influenced some but not all participants' decision making by increasing their perception of the risks associated with the SMB website.

We believe that the results of our study can be generalised in two ways. First, although the messages used in the experiment specifically referred to the uploading of underage images, it is highly likely that they had a broader effect. While some of the participants may have been actually prepared to upload their own sexual image of a woman at the SMB website, others might have simply been curious about the pornography SMB purported to offer. For such individuals the warning message may have triggered generalised fears about the legality of the content at SMB. In other words, they may have wondered whether SMB contained CSAM. However, even where this was the case, the messages still demonstrated their crime prevention capacity by reducing the likelihood of distribution. This is because the messages diverted users away from a potentially criminogenic online environment—an online 'situation' where they could decide to share an image, regardless of their intentions prior to arriving at the SMB site. (In situational crime prevention terminology, the phenomenon whereby an intervention has an effect beyond its specific target is known as diffusion of benefits (eg Guerette & Bowers 2009).) Just the same, we might expect that specific warnings to prevent IBA among adult populations would be even more effective if the content of the message referred to the criminality of some IBA behaviours.

Second, despite the fact that our participants are likely to have been men aged 18–32 years, in our view the findings have implications for preventing the sharing of CSAM by minors—particularly those in the 15–17-year-old age bracket. This age group has demonstrated similar patterns of behaviour to adults with regards to IBA (eg Office of the e-Safety Commissioner 2017b; Powell, Henry & Flynn 2018). Additionally, since the wording of our messages was simple, we do not see any grounds for concerns about aged-based differences in literacy. Nor does there appear to be a sound reason to expect that the age-related differences observed by Zaikina-Montgomery (2011) might operate if our message was trialled with 15–17-year-olds. In Zaikina-Montgomery's (2011) study, unlike the adult participants, adolescent participants appeared disinclined to believe a warning that police would be called after an attempt to access legal pornography. However, we see no reason for our message to stretch credulity in the minds of adolescents because our warning is a simple statement of fact: it is an offence in Australia to share sexual images of people who look under the age of 18 years.

Agencies developing messages specifically to target 15–17-year-olds would need to ensure that they adhered to the literature on message design. In our view, messages could be appropriate and beneficial for younger age groups, including those under the age of criminal responsibility—particularly if messages were used to assist children to increase their online safety and reduce the risks of victimisation. However, very little indeed is known about message design in this context and great care would be warranted.

In terms of the limitations of this study, as discussed the main drawback of our honeypot method is the lack of data it yields about our participants. However, as we have argued previously (Prichard et al. 2022), this limitation is a fair trade-off for the benefits we have identified above. Six participants in the control group did not arrive at the SMB landing page. Why this occurred is not clear. Slow connectivity or computer speed might have led to a delay of a few seconds, during which the participants lost interest and navigated away. We cannot discern whether similar factors affected any participants in the experimental groups. Future experiments using the honeypot method to test the effect of messages will need to identify whether additional data can be ethically collected about participants' online behaviour while adequately protecting their anonymity.

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12. Australians who view live streaming of child sexual abuse: An analysis of financial transactions

Rick Brown, Sarah Napier and Russell G Smith

Introduction

In 2016, officers from Queensland Police Service's Taskforce Argos conducted a raid at the home of a 58-year-old man. The Campbelltown District Court later found that the man had been paying a woman in the Philippines to engage her two young daughters in sexual abuse, which he watched and directed live via the video communication platform Skype. The children were just two and seven years old when the abuse began, and it continued for almost five years (Cormack 2019b). The Australian man pleaded guilty to a number of offences including procuring a child for sex and engaging in sexual activity with a child under 16 outside Australia (Cormack 2019a).

Since the offender's sentencing in May 2019 the Australian Federal Police (AFP) revealed they have seen several other cases where Australians allegedly paid for and directed the sexual abuse of children abroad as they watched from their homes using popular live streaming platforms (Cormack 2019b). According to Europol and the Australian Transaction Reports and Analysis Centre (AUSTRAC), live streaming of child sexual abuse (CSA) is largely financially driven (AUSTRAC 2019; Europol 2019). However, little is known about the patterns in payments for CSA live streaming.

Background

What we know about live streaming of child sexual abuse

Live streaming of CSA is also known as 'webcam child sex tourism/abuse' (Masri 2015; Puffer et al. 2014; Terre des Hommes 2014), 'cybersex trafficking' (International Justice Mission 2019) and 'live distance child abuse' (AUSTRAC 2019; EFC 2015). Media articles reported live streaming of CSA occurring in the Philippines as early as 2008 (de Leon 2013). Given live video streaming platforms (and adult webcam sex shows) have been available to the public since the early 2000s, it was likely occurring even earlier than this.

Yet empirical research on the characteristics of CSA live streaming and those who engage in it is scarce. Law enforcement reports and research by non-government organisations (NGOs), investigative journalists and academics have shed some light on the issue (see the annotated bibliography of Maxim et al. 2016). The Internet Watch Foundation (IWF) conducted an international analysis of over 2,000 image and video captures from live streamed sexual abuse of children from August to October 2017 (IWF 2018). It used a snowball sampling technique that began with seed URLs for investigation. The IWF retrieved the seed URLs from its historic dataset and via search engines, entering keywords identified via the IWF Hotline to identify child sexual abuse material (CSAM). The IWF reviewed seed URLs manually to identify material that matched the study criteria. Analysis revealed that 98 percent of victims in the sample were aged 13 years or younger, and 28 percent were aged 10 years or younger. Of all the captures, 40 percent were classified by the IWF as containing serious sexual abuse, including the rape and torture of children (IWF 2018).

CSA live streaming is distinct from other child sexual abuse material shared on the internet due to the 'real time' element. Offenders often request how they want the child to be sexually abused either before or during the live streaming session (Açar 2017; ECPAT International 2017; Europol 2019; GACSAO 2016). According to Puffer et al. (2014), the impact on the victim is similar to childhood sexual trauma which includes traumatic sexualisation, betrayal and powerlessness. A study involving interviews with investigators of CSAM cases cited the challenges this crime poses for law enforcement, as live streaming leaves no visual evidence of the abuse apart from session logs and data usage trails. Police often rely on money transfers and call logs for evidence in an investigation (ECPAT International 2018). The legal and technological barriers to monitoring CSA live streaming in real time have also been noted (Açar 2017). In cases where the live streaming session is recorded and shared online, it contributes to the growth of child sexual abuse material available on the internet (Europol 2019).

While this crime occurs in multiple countries (Europol 2019), the Philippines has been identified by global law enforcement agencies, NGOs and academics as the 'hub' from which CSA live streaming emanates (AUSTRAC 2019; ECPAT International 2017; EFC 2015; Europol 2019; Puffer et al. 2014). NGOs attribute this to the poverty, English language proficiency, well-established remittance services and strong internet coverage in the Philippines (Batha 2016; ECPAT International 2017; Puffer et al. 2014).

Transactions for live streaming of child sexual abuse

In November 2019, CSA live streaming gained heightened attention in Australia when the financial intelligence agency AUSTRAC took legal action against Westpac Bank in respect of over 23 million alleged breaches of the *Anti-Money Laundering and Counter-Terrorism Financing Act 2006* (Cth). Westpac was accused of failing to monitor $11b worth of suspicious transactions, including those to the Philippines suspected to be for child sexual exploitation (Butler 2019).

A recent AUSTRAC intelligence report identified indicators of transactions involving CSA, including CSA live streaming. The indicators came from an intelligence-based analysis of investigations into Australians who made payments to known facilitators of CSA abroad (usually an adult who had access to the child victim). Indicators identified were: small transactions between $15 and $500, no identifiable pattern in transactions, no work or family links to countries to which a suspect was sending funds, travel to high-risk destinations, use of innocent payment descriptions (including 'accommodation', 'school', 'uniform', 'medical bills') and payments for access to a virtual private network (VPN), other encryption software and live streaming software (AUSTRAC 2019). It is important to note these are intelligence-based indicators flagged for law enforcement agencies to conduct further investigation.

Unlike the majority of offenders who share CSAM on the internet (Europol 2019), 'facilitators' of CSA live streaming almost always receive payment (AUSTRAC 2019; EFC 2015; Europol 2019; Masri 2015). Research suggests the cost of viewing CSA live streaming in the Philippines is often low (Masri 2015), due to the poverty of those who provide the services (see also Maxim et al. 2016, citing Wight 2016, who reported parents allowing access to young girls for €2 per day). The European Financial Coalition against Commercial Sexual Exploitation of Children Online (EFC) consulted with key NGOs on the issue. One NGO suggested payment amounts for a CSA live streaming session usually ranged from 500 to 2,000 Philippine pesos (approximately $14–$57 Australian; EFC 2015). This low cost of CSA live streaming appeals to sexual predators in developed countries wishing to avoid the risk of physically sexually abusing children. On the other hand, Europol flagged CSA live streaming as a potential risk factor for travelling to sexually offend (Europol 2016), as some consumers seek to abuse a child viewed in a live streaming session in person. However, no empirical research has investigated this.

How prevalent is live streaming of child sexual abuse and is it increasing?

While there are no available data on the prevalence of CSA live streaming, anecdotal evidence suggests global demand is high and that the crime is growing. In 2013, four researchers from Terre des Hommes Netherlands posed as pre-pubescent Filipino girls on 19 different online chat forums. Over a 10-week period, 20,172 people from 71 different countries asked the researchers posing as children to perform a webcam sex show. In the majority of interactions, only text communications occurred, but for a small proportion the researchers used a custom-designed and programmed computer model named 'Sweetie' to retrieve identifying information from predators (Terre des Hommes 2014).

In 2016, the Global Alliance against Child Sexual Abuse Online (GACSAO) administered a questionnaire to 33 member countries asking about online child exploitation. Respondents from 16 out of 19 countries who had investigated CSA live streaming stated that the number of cases had increased over the last five years (GACSAO 2016). Similarly, in 2019 the Virtual Global Taskforce (VGT) undertook a global survey of its members and partner agencies, which include law enforcement, NGOs and industry partners. Three out of nine law enforcement members and two out of three other members noted that CSA live streaming had increased in the last three years (VGT 2019). The spread of CSA live streaming has been attributed largely to the increase in high-speed internet and availability of affordable phones and other devices in developing countries (ECPAT International 2017; VGT 2019; WeProtect Global Alliance 2019).

Escalation of offending

While CSA live streaming is always harmful to victims, no research has explored whether the offending of consumers escalates over time in terms of the seriousness of the abuse (eg from viewing the children nude to requesting penetration/rape) or the age or number of victims. Some studies have focused on escalation of offending among consumers of other CSAM online. Quayle and Taylor (2002) conducted interviews with 13 males convicted of child sexual abuse material offences, finding the majority reported escalating from less extreme to more extreme forms of CSAM. Respondents' perceptions of this escalation included viewing images of younger children, viewing more serious forms of abuse and moving from 'legal' to 'illegal' material. One respondent described it as a 'downward trend' (Quayle & Taylor 2002: 343).

Davis, Lennings and Green (2018) analysed the categories of child sexual abuse material found in possession of a sample of convicted CSAM offenders. Although it was not possible to determine the order in which the images were accessed, they found that some offenders possessed material from both the lower and higher levels of the Combatting Paedophile Information Networks in Europe (COPINE) Scale (in which higher levels include rape and torture; Quayle 2008), suggesting a possible progression to more harmful material.

Given the reported growth in CSA live streaming cases, it is appropriate to study this phenomenon more closely. One promising methodology involves analysing the payments consumers make for CSA live streaming sessions. Understanding of transaction patterns can then be used to deter and disrupt sessions and, potentially, to assist in law enforcement action.

Research questions

Given that little systematic research has examined the nature and extent of CSA live stream offending, and none has examined Australian offenders, this research used existing Australian law enforcement intelligence datasets to examine two primary research questions:

- What is the profile of Australian CSA live streaming offenders, including demographic characteristics and criminal history?
- What is the pattern of financial transactions by Australian offenders who view CSA live streaming? Specifically, what is the frequency and average value of transactions, what is the relationship between criminal history and number of transactions made, and do these transactions change over time in a way that indicates escalation of offending?

To answer these questions, the research drew on the resources of three government agencies: the Australian Federal Police, the Australian Criminal Intelligence Commission and AUSTRAC.

Method

Data sources

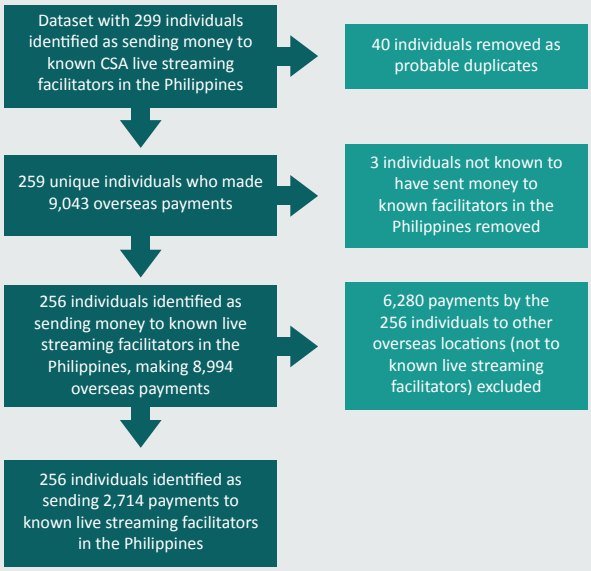
AUSTRAC collects and stores financial transaction data on individuals and businesses in Australia to identify financial crime. This includes transaction amounts and dates, receiver details (including country), payment type, payment provider details and demographic data of the payer and risk-related information on suspicious transactions. The Australian Criminal Intelligence Commission (ACIC) collects and stores criminal history information on individuals in Australia via the National Police Reference System (NPRS), among other types of data used by law enforcement. Information stored in the NPRS includes all prior charges and convictions, including the precise dates of offending, as well as demographic data on suspects and offenders (ACIC 2019). These data sources have been compiled for intelligence purposes and are subject to limitations as to the accuracy and verifiability of the data they contain.

In 2018, the Philippine National Police and the Philippine National Bureau of Investigation provided the AFP with a list of 118 persons arrested in the Philippines for facilitating the sexual exploitation of children. This sample is not representative of all individuals in this country or elsewhere who might have links to CSA. The AFP provided the names of these facilitators to AUSTRAC, who analysed AUSTRAC holdings. AUSTRAC identified 299 Australian-based persons who had sent funds to the 118 known facilitators of child sexual exploitation in the Philippines. At the time of identification, some of the 299 Australians had already been arrested for child sexual offences including paying to watch children sexually abused via live stream from the Philippines. Others are currently under investigation. As such, not all individuals in the study were convicted of or charged with CSA live streaming offences, although all were under investigation at the time of analysis.

Data extraction and matching

AUSTRAC provided selected transaction data on the 299 Australian-based individuals to the Australian Institute of Criminology for the purpose of the current study. AUSTRAC first sent the transaction data to the ACIC, which linked the data with criminal history data in the NPRS using a names and dates of birth algorithm. Any 'weak' matches were reviewed manually and a match decision was made. Once linked, the ACIC removed all identifying information (such as names/addresses and other potentially identifying information) of all suspects from the AUSTRAC and NPRS data before sending it to the Australian Institute of Criminology for analysis. A number of data cleaning routines were performed, and the final number of individuals included was reduced to 256 after removing duplicates or missing information. The remaining 256 individuals sent 2,714 payments to CSA live streaming facilitators in the Philippines (see Figure 1).

Figure 1: Sample development



Source: Philippines CSA live stream financial transaction dataset

Limitations

There are a number of limitations with this methodology that need to be considered. First, and most fundamentally, we cannot be sure every transaction was for CSA live streaming. For example, it is possible that some transactions were for contact sexual offending against children (if offenders travelled to the Philippines) or for live adult webcam shows not involving children. Payments may also have been made for other non-sexual purposes. However, consultations with the AFP suggest it is unlikely the transactions were for contact sexual offending given such purchases are usually made with cash in the destination country. Also, adult live webcam show workers would not normally require a facilitator to receive payments, as they can do this on their own. Further, the offences the facilitators in the Philippines were arrested for on other occasions suggest they were making money from the sexual exploitation of children, sometimes their own children. Therefore, it is unlikely that the Australian-based individuals in the current study were sending money to the Philippines-based individuals for reasons other than child exploitation.

Thus, most of the payments the facilitators received from the 256 Australian-based persons were likely for CSA live streaming. Even if a small number of the 2,714 transactions were not for CSA live streaming, we can be confident that overall patterns in the data reflect actual CSA live streaming transactions.

A second limitation of this study is that the transactions analysed here relate to the outcomes from one law enforcement operation in the Philippines that identified a cohort of Australians sending money to known CSA live streaming facilitators. It is unclear to what extent this group is representative of all those in Australia who purchase CSA live streaming services, or whether they are particular to this police operation.

Despite these limitations, this study provides some preliminary insight into an under-researched group and reveals new information about the profile of suspected CSA live streaming viewers, their patterns of transactions and live streaming behaviours.

Results

The matching process identified 256 individuals resident in Australia who had made at least one transaction to a CSA live streaming facilitator in the Philippines. This section examines the demographic profile and transaction history associated with these individuals.

Demographic profile

Given the anonymous nature of the dataset, relatively little demographic information was available on these individuals, which limits the ability to construct a detailed profile. The analysis therefore focused on age, occupation and offending history. Other demographic information, such as gender, was not available.

Age

The ages of the CSA live stream purchasers were initially calculated at the point of data matching (late 2019). The average age of the 210 individuals for whom information was available was 59 years (*SD*=11 years). The youngest CSA live streaming purchaser was 27 years and the oldest 82 years. Sixty-three percent (*n*=132) of CSA live streaming purchasers were aged between 50 and 69 years, compared with 23 percent of the Australian population (Australian Bureau of Statistics 2019). However, this analysis took no account of when the transactions were made and, as will be shown later, many of the transactions were historical (from 2006 to 2018).

Further analysis examined the ages of CSA live streaming purchasers at the time of the transactions. It should be noted that, as the year of transaction and current age were used for this analysis, there is a degree of error (up to two years) in these calculations. The number of transactions made by individuals also influences the results—those making more transactions will be represented more frequently.

Across the 2,557 (94%) transactions for which information was available (age was not available for 157 transactions), the average age at the time of the transaction was 54 years (*SD*=9 years). The youngest age at which an individual made a CSA live stream transaction was 20 years and the oldest was 76 years. Two-thirds (67%, *n*=1,703) of transactions were made by those aged between 50 and 69 years, while 41 percent (*n*=1,038) were made by those aged between 50 and 59 years. In contrast, just 12 percent of the Australian population were aged 50 to 59 years, highlighting the concentrated nature of transactions in this age range. A meta-analysis of 27 studies on (mostly) detected sex offenders found the average ages of online sex offenders (CSAM and grooming offenders) and contact sex offenders were 38.6 years and 43.6 years respectively (Babchishin, Hanson & Hermann 2011). A later examination of 22 studies similarly found the average age of CSAM offenders was 35 to 45 years (Brown and Bricknell 2018).

The average age of purchasers at the time of their first payment to the known CSA live streaming facilitator was 52 years. Sixty percent (*n*=126) made their first payment to the facilitators when they were aged between 40 and 59 years, while 59 percent (*n*=123) made their first transaction between 50 and 69. While for some purchasers this may represent the age of their first CSA live stream viewing, it is possible the purchasers had already paid other facilitators not known to police prior to these transactions.

Occupation

Information on occupation was available for only 39 (15%) of the 256 individuals. While this information cannot be considered representative of the group as a whole, it highlights the wide range of backgrounds from which CSA live stream purchasers came. Stated occupations included, among others, aged care worker, boilermaker, carpenter, chef, computer technician, driller, driver, gardener, mower, rigger, road freight transporter, sales assistant and tradesperson. Others described their occupation as accountant, architect, clerk, general manager, quality technician and self-employed. One described her occupation as housewife.

Offence history

Because the data were matched against the NPRS, it was possible to examine the entire officially recorded offence history of the suspected CSA live stream purchasers. More detailed analysis of offending histories will be provided in subsequent papers, with only a summary provided here.

Overall, 10 percent (*n*=26) of CSA live stream purchasers had at least one sexual offence (defined as aggravated sexual assault, non-aggravated sexual assault, non-assaultive sexual offences against a child, child sexual abuse material offences, sexual servitude offences, non-assaultive sexual offences, or sexual assault not defined) recorded in their criminal history. Seven percent (*n*=17) had a sexual offence against a child in their criminal history, while a further six percent (*n*=14) had a sexual offence against an adult (or a sex offence where victim information was not available) in their history (see Table 1). Five individuals (2%) had records of sexual offences against both children and adults.

Over half (55%) had no recorded criminal history, indicating that many of those engaged in purchasing CSA live streaming services were unknown to law enforcement authorities in Australia.

Table 1: Offence history of suspected CSA live stream purchasers (*n*=256)

	Number	Percent
Sexual offence against a child	17	6.6
Sexual offence against an adult/unspecified victim[a]	14	5.5
Other offence	114	44.5
No offence history	141	55.1

a: Includes sexual offences where victim information (adult or child) was unknown

Note: Percentages total more than 100% as individuals can appear in more than one category

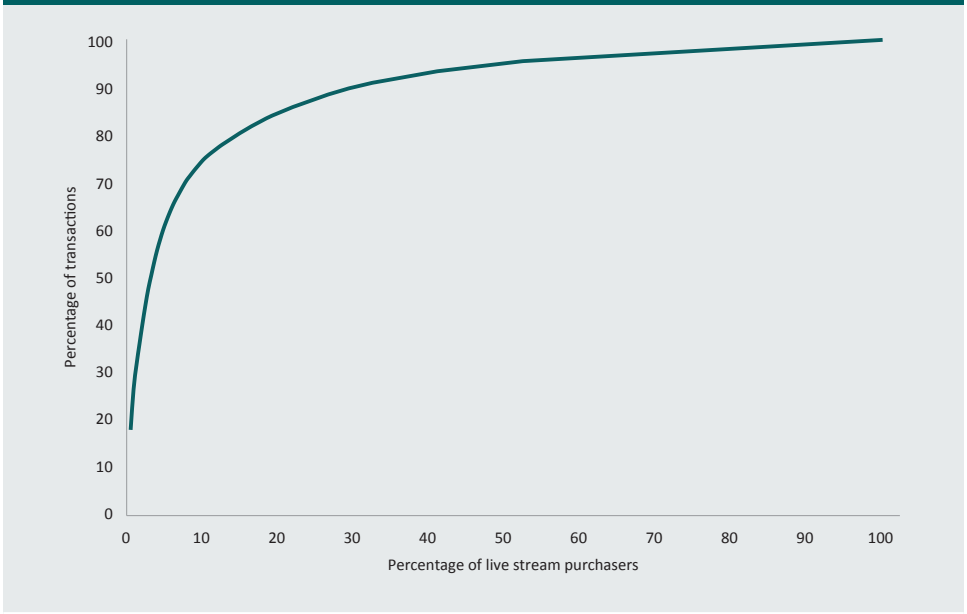
Source: Philippines CSA live stream financial transaction dataset

Financial transactions for live streaming of child sexual abuse

Data provided by AUSTRAC were examined for patterns in the financial transactions made by CSA live streaming purchasers. The AUSTRAC data reveal the 256 individuals who sent money to CSA live streaming facilitators in the Philippines had made a total of 8,994 overseas financial transactions (for any purpose). Of these, 2,714 (30%) involved sending money to known CSA live streaming facilitators in the Philippines and form the focus of this study. As indicated in Figure 2, many of these transactions were made by a small number of individuals. Just eight individual CSA live streaming purchasers (3%) made 50 percent (*n*=1,365) of all transactions to known CSA live stream facilitators in the Philippines. Even within this group there was a skewed distribution, with a small proportion making a large number of transactions. Among these eight individuals, the number of transactions per person ranged from 77 to 479.

At the other end of the spectrum, 25 percent (*n*=64) of purchasers accounted for less than three percent of transactions. Indeed, almost half (48%, *n*=122) of CSA live stream purchasers made only one transaction involving the known facilitators.

Figure 2: Cumulative frequency of transactions per CSA live stream purchaser



Source: Philippines CSA live stream financial transaction dataset

There was a moderate, statistically significant relationship between offending history and the number of transactions made. CSA live streaming purchasers with a history of sex offending (against either children or adults) were significantly more likely to have made more than one financial transaction (69%, *n*=18), compared with either those with a history of other types of offending (62%, *n*=55), or those with no criminal history (43%, *n*=61) (χ^2=10.82 (2), *p*<0.01, *V*=0.21). Other associations between variables were not statistically significant.

Value of transactions

The total value of the 2,714 payments made to live streaming facilitators was $1.32m, averaging $488 per transaction (noting that all values are expressed in Australian dollars). However, the average was skewed by a small number of very large transactions, with 193 (7%) valued at $1,000 or more each. The median value of all transactions was $78. Indeed, a quarter (25%, *n*=679) of transactions were valued at $36 or less, while three-quarters (*n*=2,036) were worth $170 or less.

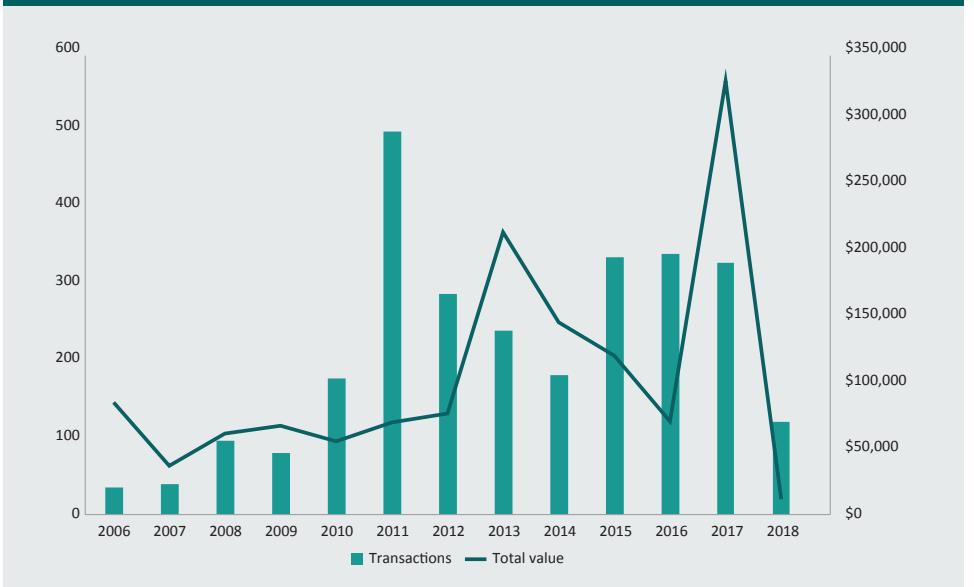
When analysed by individual rather than by transaction, the median value each person sent in total (for all transactions they made) was $100. Twenty-five percent of individuals (*n*=64) sent $49 or less, while a further 25 percent (*n*=65) sent $390 or more. There was no significant difference in the average amounts sent by sex offenders, other offenders and non-offenders (*F*=0.66 (2), *p*>0.05).

Change over time

The payments examined in this study were made to the known CSA live streaming facilitators over 13 years, from 2006 to 2018. Four transactions were recorded in 2019, but were excluded from this analysis as enforcement action against the known facilitators in the Philippines occurred in 2018, thus affecting the availability of CSA live streaming transactions in 2019.

There were large variations in the number and value of payments made over time. As shown in Figure 3, the number of transactions per year peaked in 2011, when 490 payments were made by 70 individuals to the CSA live streaming facilitators. There was a general upward trend in the total value of amounts being sent to the facilitators, peaking in 2017, when over $323,000 was sent by 20 individuals. However, this is skewed by one individual who sent over $292,000. The average value per transaction for the remaining 19 individuals was $106.

Figure 3: Number of transactions and total value of transactions (A$) per year



Source: Philippines CSA live stream financial transaction dataset

Escalation of offending

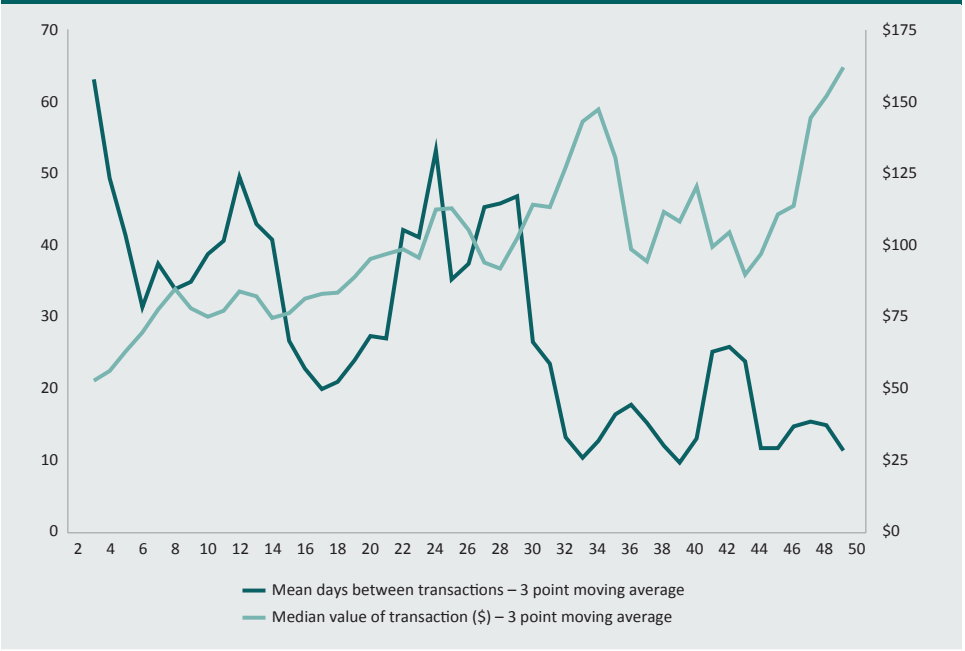
There is clear evidence of escalation in the frequency and potential severity of offending in the financial transactions made to CSA live stream facilitators. Further analysis examined the number of days between subsequent transactions among those who made more than one transaction. Of the 256 individuals making a financial transaction, 134 made a second transaction, declining to just 12 who made over 50 transactions. These 12 individuals made between 55 and 479 separate transactions each. Only their first 50 transactions are included in this analysis.

Figure 4 shows that the average time between transactions decreased as the number of transactions increased. While the average number of days between the first and tenth transactions was 44 days, the average number of days between transactions 41 and 50 was 17 days. This suggests escalation in the frequency with which individuals purchased CSA live streaming services as they viewed more content.

Figure 4 also shows the trend in the value of transactions made, by the number of transactions. As individuals purchased more CSA live streaming services, the median amount they paid for those services increased. The median was used for this calculation due to outliers in the amounts of money sent that heavily skewed the average. The median cost of the first 10 transactions made was $60. This rose to $120 for transactions 41 to 50. This suggests an escalation in the cost of the typical CSA live streaming event as individuals made more transactions. It was beyond the scope of this study to determine what the escalation in purchase price reflected. However, it is possible offenders were paying for live streaming sessions that involved more serious sexual abuse (eg penetration as opposed to viewing a child nude) or younger or more victims.

There was a moderate, statistically significant correlation between the value of transactions and the number of days between transactions (r=–0.43, p<0.01), suggesting that the cost of a CSA live streaming event increased as the time between events declined. It should be noted that this analysis was conducted on the entire sample, which had widely varying transaction histories. For example, while the majority (70%) of transaction histories were under one year, one extended to 12 years. To account for the impact of these differences, the analysis was repeated for the first 365 days of transaction histories for each individual, in order to provide comparable measurement. Broadly similar results were found, although the strength of the relationship between the value of transactions and the time between transactions was slightly weaker (r=–0.39, p<0.01).

Figure 4: Mean number of days between CSA live stream transactions and median value of first 50 financial transactions



Source: Philippines CSA live stream financial transaction dataset

Discussion

To our knowledge, this is the first study of CSA live streaming to combine financial transactions data and criminal history information to produce a detailed picture of the Australians purchasing such services and their patterns in doing so.

Regarding the demographic profile of those suspected of purchasing CSA live streaming services, only limited information was available in the records provided. However, the analysis revealed some insights not previously available. Where age was concerned, two-thirds of these individuals were found to be in their 50s or 60s. This is older than the ages of those found to view online child sexual abuse material and commit sexual offences generally. An examination of 22 studies found the average age of CSAM offenders was 35 to 45 years (Brown & Bricknell 2018) and a meta-analysis of 27 studies found the average ages of online sex offenders and contact sex offenders were 38.6 and 43.6 years respectively (Babchishin, Hanson & Hermann 2011). While this may be a function of the source of data for the current study, it may also indicate that CSA live streaming offenders are older than other CSAM offenders. This could have implications for preventive interventions (such as messaging campaigns), which may require different approaches to those targeted towards younger cohorts.

Where offending history is concerned, just 10 percent of these individuals had a history of sexual offending, with seven percent having previously committed a sexual offence against a child. However, these findings are within the range of what might be expected for online CSAM offenders in general. For example, a meta-analysis examining the results from multiple criminal record based studies found that one in eight (12%) CSAM offenders had committed a previous contact sexual offence (Seto, Hanson & Babchishin 2011). The prevalence of previous child sexual offending found in this study (including both contact and online offending) would be an under-estimate of the actual level of sexual offending, due to reliance on criminal justice measures. Indeed, self-reported prior contact sexual offending by CSAM offenders has been estimated to range from 51 percent to 60 percent (Seto, Hanson & Babchishin 2011). That may partly explain the high proportion of CSA live stream offenders with no criminal history, but it may also be a function of the difficulty of prosecuting such offences (ECPAT International 2018).

Analysis revealed that the majority of transactions were made by a very small number of individuals. This suggests that law enforcement activity concentrated on these individuals could have a major impact on access to CSA live streaming.

The fact that a large number of individuals made only one transaction is important, although the reason is unclear. Potential explanations might include that CSA live streaming facilitators were scamming individuals into sending money without providing any service in return, that purchasers moved to other facilitators not detected in the Philippines police operation, or that viewing CSA live stream content was not repeated by these offenders. Reasons for the last point may be that individuals were not satisfied with what they saw, either because it was too extreme or not extreme enough. This aspect deserves further research to understand what prevents a first-time offender from becoming a repeat offender, and to determine what individuals seek from CSA live streaming services. The preponderance of one-time suspects also limits the specific deterrent effects of law enforcement action, as a proportion of these individuals might not present a risk of reoffending anyway.

The present study did, however, provide some evidence of escalation in the frequency of and amounts paid for live CSA streaming. For those who made more than one transaction, as more transactions were made, the time between transactions declined and the value of the transactions increased. This could indicate both the increasing frequency of offending and, if monetary value is equated with seriousness, the increasing severity of offending. Escalation in online child sexual abuse has been identified by other researchers. For example, in their sample of child sexual abuse material offenders, Quayle and Taylor (2002) found that the majority escalated to viewing increasingly extreme forms of CSAM. However, to our knowledge, this is the first attempt to quantify escalation over time among CSA live streaming offenders in Australia.

Conclusion

This preliminary study provides some insight into the nature and extent of CSA live streaming behaviour among a cohort of Australians procuring such services from known CSA live streaming facilitators in the Philippines. While there are important caveats to the findings, they provide useful insights for responding to the problem. Many of those who purchase CSA live streaming sessions do so only once (unlike the small cohort of prolific offenders) and the majority have no recorded sexual offending history (similar to other sex offenders and CSAM offenders). With this in mind, and given that CSA live streaming escalates in frequency and severity over time, it is important to apply policies that are appropriate to the specific groups of individuals involved. Approaches that target specific offender traits and behaviours are likely to be more effective in reducing offending than general responses that target all those who participate in CSA live streaming in the same way. Law enforcement and policy bodies could make use of this information to allocate scarce resources more effectively to respond to those individuals most at risk of engaging in CSA live streaming.

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13. Predicting prolific live streaming of child sexual abuse

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Live streaming of child sexual abuse (CSA) was first acknowledged in 2008 (de Leon 2013) but may have begun earlier (Kuhlmann & Aurén 2015). This is a unique offence type, in which offenders procure and view sexual abuse of children across the internet in real time, in exchange for money, often specifying the type of abuse (Açar 2017; Europol 2019). While the mode of offending results in substantial barriers to monitoring and prosecuting these individuals (Açar 2017), the trauma experienced by victims appears no different to less technologically enabled forms of abuse (Puffer et al. 2014). This is a technologically and financially enabled crime type (Europol 2019), using the internet for live streaming and financial transactions for procurement. Although some evidence has emerged (Brown, Napier & Smith 2020), there is a paucity of analytical research considering the characteristics of offenders or transactions. This research seeks to apply a supervised machine learning approach to consider the characteristics of offenders who live stream CSA in high volumes.

The types of technology used and the behaviours exhibited by offenders suggest that online sexual offending is a continually evolving crime type. The growth of mobile internet access and alternative types of finance has created a difficult environment to police (WeProtect Global Alliance 2019). Additionally, while the methods offenders use are relatively well understood, there appears to be limited understanding of antecedent behaviours among offenders (WeProtect Global Alliance 2019). However, the emergence of new technologies appears to have enabled live streaming of child abuse, which the Internet Watch Foundation (2018) considers to be an established and prolific form of online CSA.

The *Terminology guidelines for the protection of children from sexual exploitation and sexual abuse* recommend use of the term 'live streaming of child sexual abuse', which 'can be used without stigmatising and/or otherwise harming the child' (ECPAT International 2016: 47). Given CSA live streaming is a financially enabled crime, it is different to most other types of offline (contact) and online sexual offending. Although this type of offending occurs in multiple countries, it has been suggested that the Philippines in particular has emerged as a 'hub' for CSA live streaming (Europol 2019), due to the country's high rate of poverty, English language proficiency and high-speed internet connections (Kuhlmann & Aurén 2015; ECPAT International 2017). The high global demand for CSA live streaming (Terre des Hommes 2014), coupled with the poverty experienced in vulnerable countries such as the Philippines, creates a situation conducive to financially enabled crime. The financial element makes CSA live streaming different to, for example, child sexual abuse material (CSAM) offences, where images and videos are mostly shared freely on the internet or traded for other CSAM (Europol 2019). Similarly, a study that analysed the chat logs from 179 online grooming offenders (DeHart et al. 2017) classified only a small sub-group as 'buyers' of sex with children (13%, *n*=23), while most used manipulative tactics to gain what they wanted from child victims. Because CSA live streaming is usually accompanied by a financial transaction (Europol 2019), analysing these transactions is a key method for both detecting and understanding the offending behaviour.

To inform the disruption of crimes such as these, it is exceptionally important to understand the characteristics and behaviours of offenders. Current research into online child sexual offenders has focused on CSAM and online solicitation offenders. For example, offenders who engage with CSAM and solicit children online have been categorised as younger, with limited employment and, consequently, limited access to finance compared with the general population (Babchishin, Hanson & Hermann 2011). Additionally, offenders who specifically engage in the online solicitation of children have been categorised as highly manipulative and centrally focused on sexual arousal and gratification (Kloess et al. 2015). However, there is little understanding of the characteristics and behaviours of offenders who engage specifically in live streaming of CSA.

Analysing child abuse and financial transactions

In recent times, machine learning (ML) analytics have provided an alternative method for considering complex datasets, with greater confidence than, for example, logistic regression (Couronné, Probst & Boulesteix 2018). Naturally occurring data generated in the process of undertaking daily activities, such as banking transactions, are often complex in structure as their purpose is not for research. For data such as these, the random forest is useful, as it is particularly good at interrogating non-linear interactions among variables (Berk 2013).

Recently, there has been a marked increase in the use of ML analytics in considering the two key areas of this research: child abuse and financial transactions. ML in association with text mining has proven to be a robust option for supporting identification of possible child abuse to assist practitioners (Amrit et al. 2017). Further, ML methods have been used to improve the triage decision making for reports of child abuse made to hotlines in the United States (Chouldechova et al. 2018). Analytics such as these are suggested to hold promise in supporting intervention programs and more accurately assessing risk as a means of preventing child maltreatment (Gillingham 2016).

Similarly, ML analytics are often applied to banking data, to identify and predict the key features of transaction behaviours. Supervised ML appears effective in interrogating transaction data to estimate the likelihood that a transaction was fraudulent, based on features such as the demographics of the individual, prior behaviours, and transaction history (Jullum et al. 2020). This research will consider the capacity of ML to identify the characteristics of individuals who engage in high-volume live streaming of CSA using banking transaction and criminal history data.

Methodology

Data

The Australian Transaction Reports and Analysis Centre (AUSTRAC) collects financial transaction data relating to individuals in Australia, primarily for the purpose of identifying financial crime. The Australian Criminal Intelligence Commission collects criminal history information relating to individuals who have come under notice for offending in Australia in the National Police Reference System. In 2018, the Philippine National Police and the Philippine National Bureau of Investigation provided the Australian Federal Police with a list of 118 individuals arrested for facilitating the sexual abuse of children. Using this information, AUSTRAC identified 299 Australia-based individuals who had made transactions with these known facilitators of child sexual abuse. At the time of data provision, some of these individuals had been arrested for child sexual offences, while others were under investigation. As such, there were individuals among these data who had not been charged with the live streaming of CSA at the time of analysis.

AUSTRAC provided transaction data relating to the 299 individuals to the Australian Institute of Criminology for analysis. However, prior to this, AUSTRAC provided the transaction data to the Australian Criminal Intelligence Commission so it could be linked to criminal history data in the National Police Reference System using names and dates of birth. This process resulted in a de-identified dataset of 256 individuals. (See Brown, Napier & Smith 2020 for the full data-matching methodology.)

Available data consisted of transactions processed between January 2006 and February 2019. Where demographic characteristics of individuals were unavailable, data were excluded from analysis. This resulted in a retained dataset of 207 individuals who had conducted at least one transaction with known facilitators of live streaming of CSA. These data included limited demographics, transaction details and criminal history.

Due to the nature of the data available, this is best considered a within-groups analysis. While it may have been beneficial to include a comparison dataset, these data were not available. Consequently, this analysis had a broad purpose: to consider whether, among a set of individuals known to have made financial transactions with facilitators of the live streaming of CSA, it was possible to identify those who would engage in the highest volume of transactions—and, more specifically, those individuals who would engage in 21 or more transactions with live streaming facilitators. This was the number of transactions made by the most prolific 10 percent of individuals whose data were available for analysis. Twenty-one individuals met these criteria, making between 21 and 141 transactions with live streaming facilitators. This group were referred to as the 'high-volume' group, with the remaining 186 individuals transacting in lower volumes.

While individual crime types were important in this analysis, the harm resulting from prior offences is emerging as a valuable measure of offending that accounts for the impact of offences rather than the volume (Ashby 2017). Specific to the Australian context, the Western Australian Crime Harm Index (WACHI) assigns a harm index weighted by the court penalties imposed (House & Neyroud 2018). The WACHI was developed based on the Australian and New Zealand Standard Offence Classification codes. Prior research in Australia has operationalised this harm index to measure the extent of harm among criminal groups (Morgan, Dowling & Voce 2020). Here, the WACHI is applied to the criminal history of individuals prior to their first live streaming transaction to provide an understanding of harm as a predictor of high-volume live streaming of CSA.

Data limitations

There are several limitations to the data used in this research. While we can be certain that these transactions involved money being sent to known facilitators of live streaming of CSA, we cannot be certain that each transaction was intended for that purpose. It is possible that they may have been for other sexual purposes, such as live streaming of adult sexual content. It is, however, unlikely that these transactions were for contact offending or non-sexual purposes (Brown, Napier & Smith 2020). Additionally, the data considered here relate to a single law enforcement operation in the Philippines. It is unclear whether individuals in this dataset are representative of live streaming offenders more broadly.

Finally, the unit of analysis in this research consists of offences detected by police. This is an important limitation, as consideration must be given to sexual offences committed prior to the onset of live streaming among these offenders. There are evident barriers to the reporting of both child and adult sexual offences (Gruenfeld, Willis & Easton 2017; Smith et al. 2010), which have additional implications for the disclosure, reporting and prosecution of offences (Bunting 2014). Consequently, it must be noted that while the recorded criminal history of individuals in this sample comprehensively represents those on record, undetected offences among this sample are an inherent possibility.

Analytical strategy

As previously noted, emerging evidence suggests that, particularly among complex datasets, the random forest algorithm performs notably better than logistic regression (Couronné, Probst & Boulesteix 2018). While it must be noted that there are a relatively small number of individuals in this dataset, data available for each individual were complex, with a relatively large number of covariates compared with the sample size, suggesting the importance of a non-parametric approach (Couronné, Probst & Boulesteix 2018). While the random forest algorithm has typically been used for large datasets, it appears to be an effective method for interrogating and making predictions from substantially smaller datasets than was available here (Choi & Ma 2020; Zhang & Wang 2009). In simple terms, the random forest model has been used for analysis here due to its proven ability to discern important effects among complex and limited data, with substantially greater success than more traditional analyses.

This analysis employs a receiver operating characteristic (ROC) curve to determine the robustness of the random forest model. The ROC curve assesses the rate at which the random forest successfully classified high-volume live streaming offenders in these data. The closer the ROC curve is to the 45-degree angle presented in Figure 2, the less accurate the random forest model. The robustness of the random forest model is given as the area under the ROC curve (AUROC). This metric has been computed for a logistic regression using the same parameters as the random forest, to demonstrate the comparative robustness of these models. The random forest model, presented in Figure 3, demonstrates which variables were most important in the rate of prediction of high-volume live streaming, provided by the ROC curve. The random forest is interpreted through the mean decrease Gini coefficient (MDG) (Hong, Xiaoling & Hua 2016). The Gini coefficient details the proportion of the model accounted for by each variable. The higher the MDG, the more important the variable in predicting high-volume live streaming.

To facilitate modelling, the sample were randomised, with 70 allocated to a training set, and the remaining 30 percent used as a test set to measure the trained model's accuracy. This 70–30 split was used due to the size and complexity of the dataset (Hyndman & Anthanasopoulos 2014). It allowed sufficient data to train the model and then test it. Analysis was performed using the 'randomForest', 'dplyr', 'pRoc', 'pdp' and 'ggplot2' packages of the statistical analysis software R. The model was trained on individuals who engaged in high-volume live streaming of CSA, and then exposed to the test set.

A confusion matrix was computed to determine the accuracy of the random forest predictions in the test set. The confusion matrix compares the predictions to observed outcomes—in this instance, whether or not an individual engaged in high-volume live streaming. This measures the rate of error in these predictions, thereby assessing the practical success of the model (Barnes & Hyatt 2012).

Post-hoc partial dependence plots (PDPs) were computed for independent variables (Zhao & Hastie 2019) to provide the effect within variables. PDPs demonstrate the association between particular characteristics within variables, and high-volume live streaming, controlling for all other variables. The logit value moving from point to point within variables identifies the points within the range of the variable with the strongest association with high-volume live streaming. For example, it shows the transaction value or time between transactions most associated with prolific live streaming. Where plotlines fall, the association with high-volume live streaming decreases, while increasing plotlines indicate a stronger association with high-volume live streaming.

Results

Summary statistics

The ages of individuals at the time of their first CSA live streaming transaction ranged from 20 to 76 years, but the mean age was 52 years. Individuals who engaged in high-volume live streaming were typically marginally older, with a mean age of 54 years at the time of their first transaction (range: 34–67 years). The mean number of transactions for the high-volume group was 53 (range: 21–141), while those in the low-volume group made a mean of three transactions (range: 1–18). Both groups of individuals spent relatively small amounts per transaction.

Table 1: Transactions of low-volume and high-volume live streaming offenders

	Low-volume offenders (*n*=186)	High-volume offenders (*n*=21)
Age in years at first live streaming transaction (range)	52.13 (20–76)	54.64 (34–67)
Average number of transactions (range)	3.39 (1–18)	52.95 (21–141)
Median expenditure per transaction (range)	$45 (11–372)	$75 (16–335)
Median days between transactions (range)[a]	15 (1–746)	7 days (2–84)

a: Only includes individuals who made two or more transactions

Source: Philippines CSA live stream financial transaction dataset

Criminal history

Not all individuals had criminal histories featuring other types of criminal offending. Among the sample of 207 individuals engaged in live streaming of CSA, 98 (47%) had not come to the attention of the police for other types of criminal behaviour. Among the 21 individuals engaged in high-volume live streaming, 12 (57%) did not have a prior criminal history. High-volume streaming offenders who had a criminal history tended to begin offending later in life than low-volume offenders.

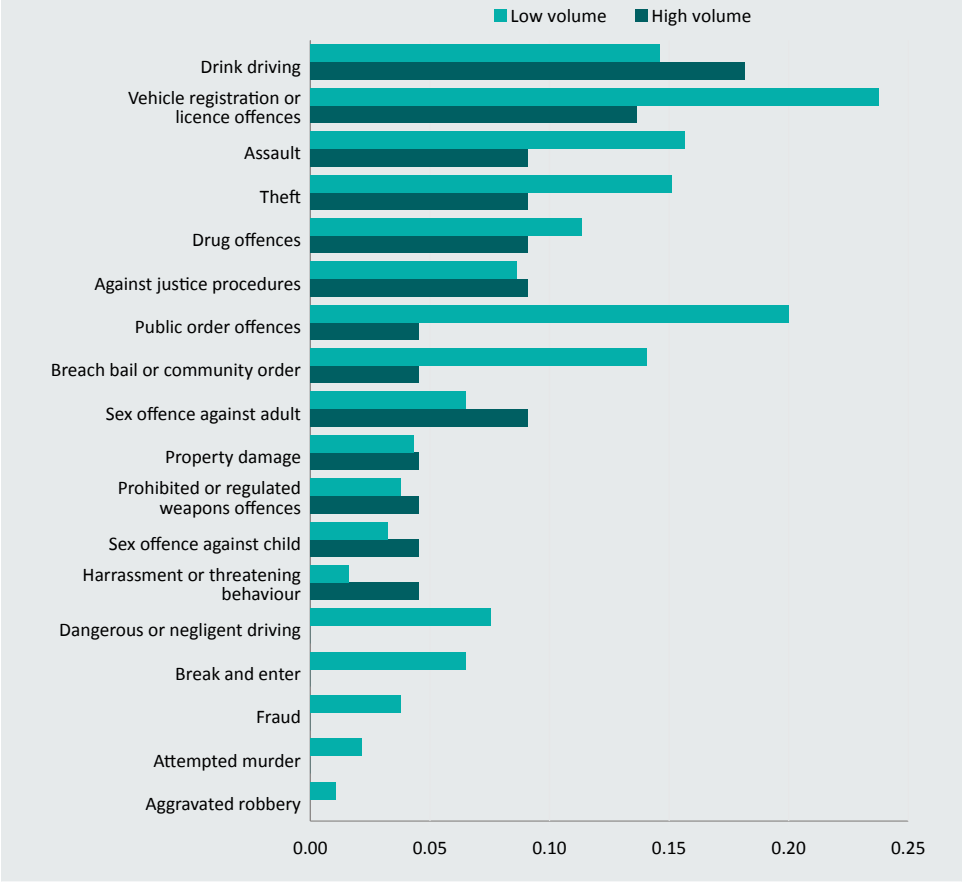
Table 2: Criminal histories of low-volume and high-volume live streaming offenders

	Low-volume offenders (*n*=186)	High-volume offenders (*n*=21)
Age in years at first criminal charge (range)[a]	30.22 (18–63)	43.23 (18–67)
Mean number of criminal charges	3.42 (0–51)	2.05 (0–9)

a: Only includes those with a criminal charge

Source: Philippines CSA live stream financial transaction dataset

Figure 1: Average number of offences prior to live streaming among those with at least one criminal offence



Source: Philippines CSA live stream financial transaction dataset

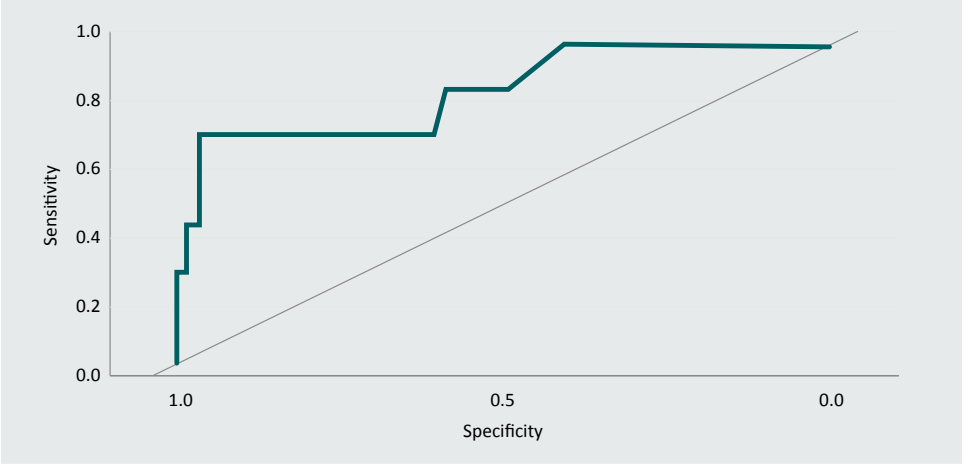
Prior sex offences

Given the crime type under consideration here, it was important to examine whether these individuals had a history of prior sex offences. Among the sample of 207, 14 individuals had a history of recorded sexual offences against adults, of whom two went on to engage in high-volume live streaming. Seven individuals had a history of sexual offences against children, of whom one went on to engage in high-volume live streaming. It appears that, while this may be considered an analogous offence type, there was little interaction between prior sex offences and subsequent live streaming of CSA.

Random forest analysis

The area under the ROC curve identified that this was a robust model with an AUROC of 0.852 (see Figure 2). The same data were then used to compute a logistic regression with the same intention, resulting in an AUROC of 0.607, supporting the contention that the random forest model was a more robust option for analysis of this complex dataset, despite the limited sample size.

Figure 2: ROC curve for random forest model trained on high-volume live streaming offenders

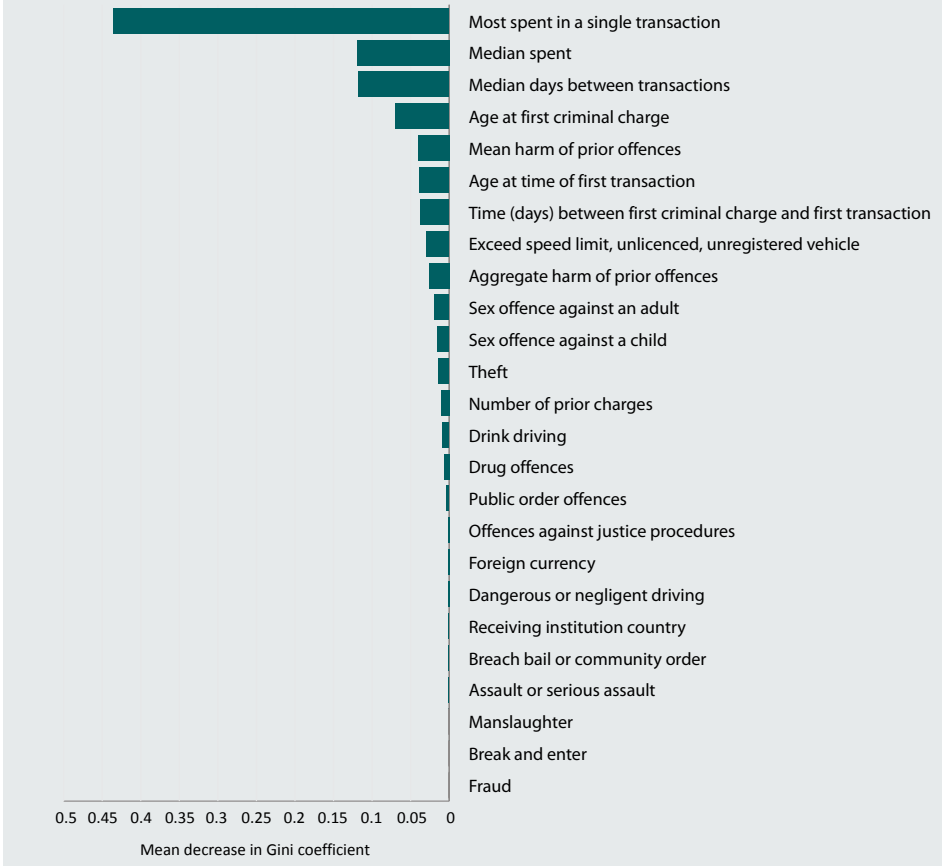


Note: ROC=receiver operating characteristic

Source: Philippines CSA live stream financial transaction dataset

Random forest results (Figure 3) identified the most important variables in the computation of this model. The most important three variables related to transaction data, including the most spent in a single transaction, the median spent across transactions and the median days between transactions. Demographic details of offenders were marginally less important. While the age of onset of criminal behaviour was noteworthy, the age at the time of first transaction did not feature a noteworthy MDG coefficient. Finally, the mean harm of prior offences bears some consideration, while the specific type of prior offences was not a good measure with which to identify high-volume live streaming offenders. This supported the notion that a history of sex offending against either adults or children was not a good means by which to identify those at risk of live streaming CSA. No criminal history variable was particularly useful in predicting high-volume live streaming offenders. Rather, transaction data proved most useful.

Figure 3: Variable importance associated with high-volume live streaming



Source: Philippines CSA live stream financial transaction dataset

Confusion matrix

To explore the predictive accuracy of the random forest model, a confusion matrix was produced for the test set. Table 3 identifies where the random forest correctly classified high-volume live streaming offenders, and where it failed. Given the limited sample available, and despite the prior success of random forest models among small samples, this was a difficult task. However, the model performed relatively well in classifying high-volume offenders among a small sample. It is also important that the model demonstrated some success in identifying those who would not engage in high-volume offending. This model was considered to perform well, but caution should be exercised, given the small sample size.

Table 3: Confusion matrix for predicting high-volume live streaming offenders			
	True low-volume offender	True high-volume offender	Classification error
Predicted low-volume offender	59	2	5%
Predicted high-volume offender	2	6	25%
Classification error	5%	25%	69

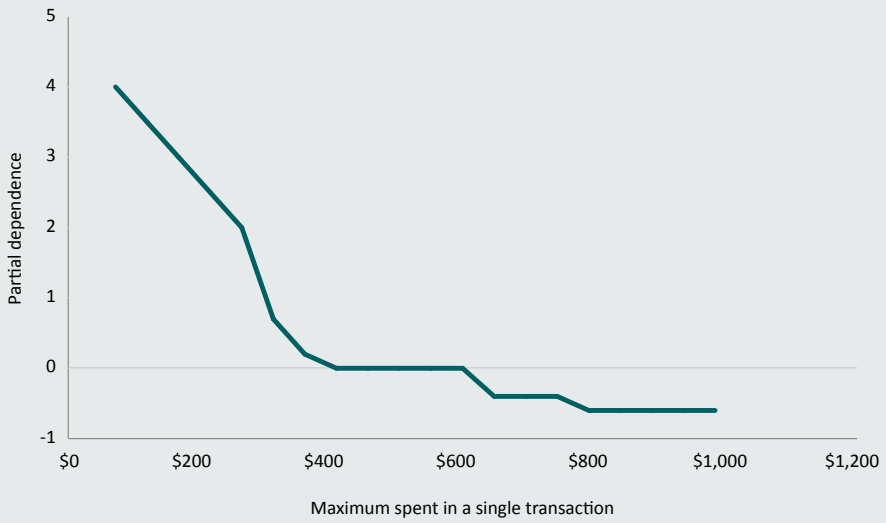
Partial dependence

Partial dependence plots were computed for five noteworthy variables. Among some variables, such as age at onset of criminal offending, the change is relatively minor, suggesting that the likelihood of high-volume live streaming was similar across the majority of age groups. However, among some PDPs there was substantial change, suggesting that there were specific points at which high-volume live streaming was substantially more likely than at others. The section below outlines the relationship between high-volume live streaming and each of these variables.

Most spent in a single transaction

The most spent in a single transaction was an important predictor of high-volume live streaming. Where the most spent in a single transaction was less than $200, the association with high-volume live streaming was strong. Where the most spent in a single transaction was above $300, the association declined substantially. Where the maximum amount spent in a single transaction was greater than $600, individuals were unlikely to engage in high-volume live streaming. Evidently, among this sample, the higher the maximum amount spent in a single transaction, the less likely an individual was to engage in prolific CSA live streaming.

Figure 4: Partial dependence plot for most spent in a single transaction and high-volume live streaming

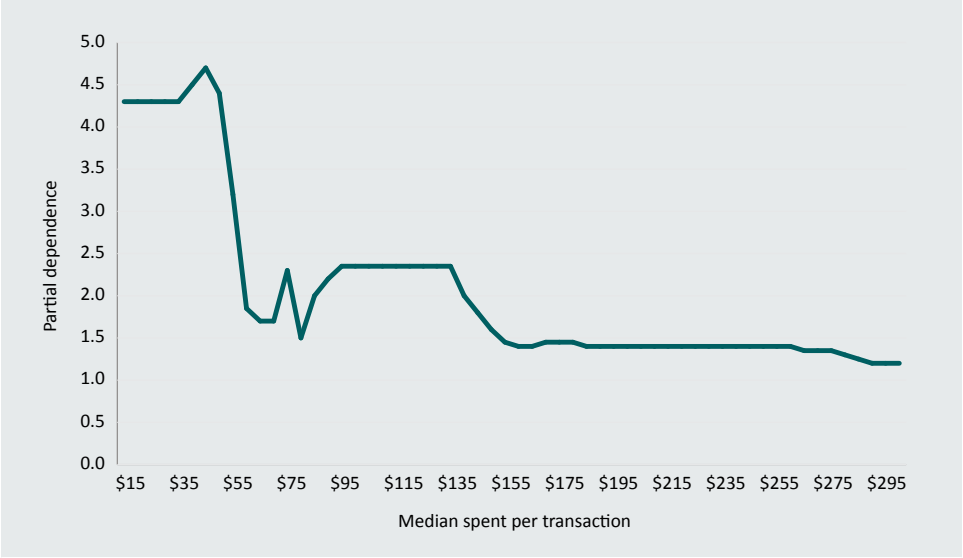


Source: Philippines CSA live stream financial transaction dataset

Median spent per transaction

To further interrogate this effect, it was important to consider the median amount spent per transaction. Figure 5 supports the notion identified in Figure 4, that individuals engaged in prolific live streaming of CSA tended to spend less on each occasion. The association with high-volume live streaming was strongest where the median amount spent per transaction was below $55. Above this value, the relationship between prolific live streaming and median amount spent weakened. However, this effect had a long taper, indicating that the association largely plateaued, remaining relatively constant after this point.

Figure 5: Partial dependence plot for median spent per transaction and high-volume live streaming

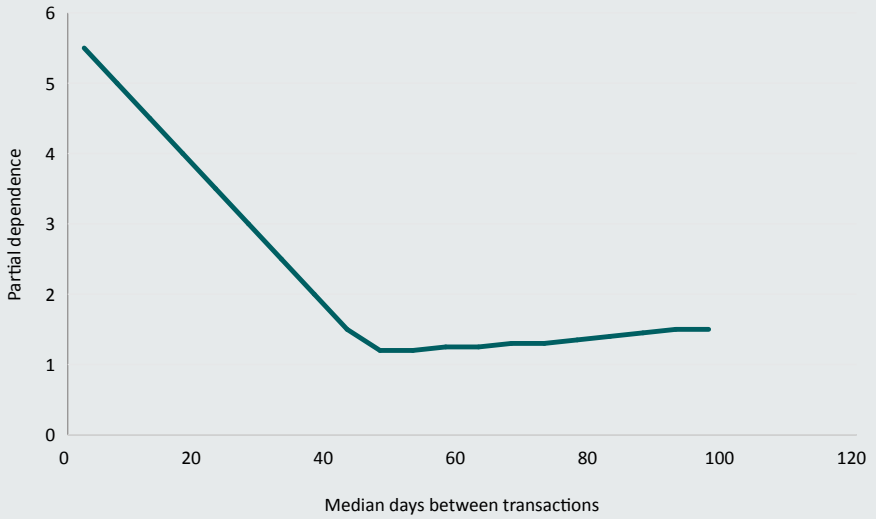


Source: Philippines CSA live stream financial transaction dataset

Median time between transactions

The PDP for median time between transactions suggested that, while more prolific live streaming was associated with comparatively small expenditure per transaction, it was also associated with a short time frame between transactions. As may be intuitive, Figure 6 suggests that the shorter the time between transactions, the greater the association with high-volume live streaming.

Figure 6: Partial dependence plot for median time between transactions and high-volume live streaming

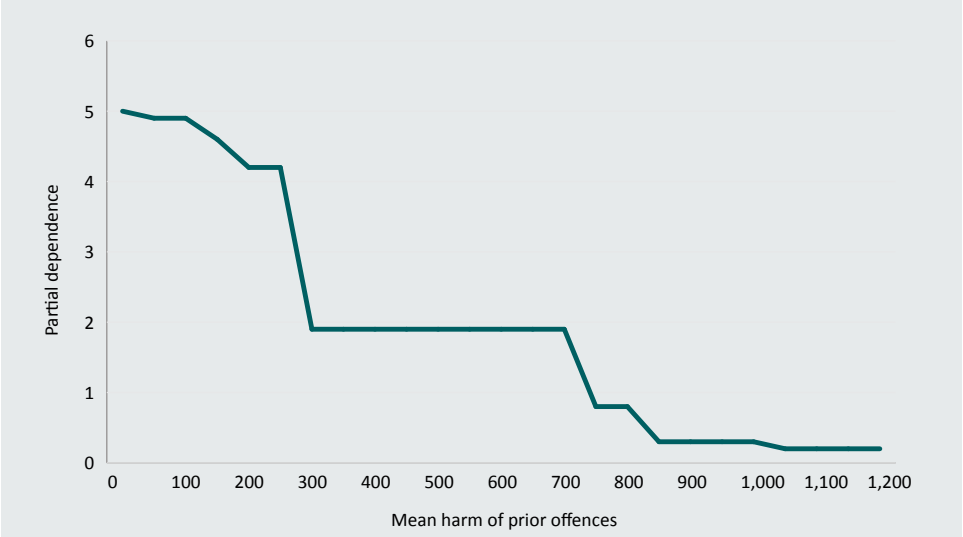


Source: Philippines CSA live stream financial transaction dataset

Mean harm of prior criminal offences

The criminal histories of individuals were important to consider. This analysis employed variables identifying the harm resulting from prior offences, as well as the age of onset of detected criminal offending. While neither of these variables were particularly strong predictors, they demonstrated some interaction with prolific live streaming. Figure 7 suggests that high-volume live streaming was most associated with individuals who did not have a history of detected high-harm offending. Rather, individuals for whom the mean harm per offence was relatively low were more likely to engage in prolific live streaming. This finding supports the notion that the individuals in this sample were unlikely to have committed a prior sex offence; however, as Figure 1 suggests, they were also unlikely to have engaged in violent offences. Prior high-harm offences were weakly associated with subsequent prolific live streaming of CSA.

Figure 7: Partial dependence plot for mean harm of prior offences and high-volume live streaming

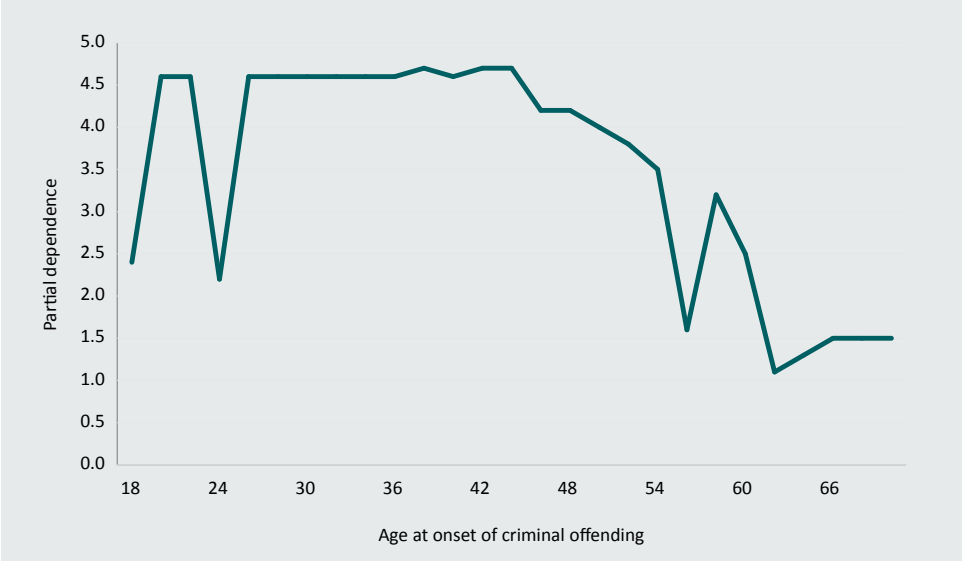


Source: Philippines CSA live stream financial transaction dataset

Age at onset of criminal offending

Finally, the age of onset of criminal offending appears to have little association with high-volume live streaming. The likelihood of prolific live streaming was relatively even up to around 50 years of age, at which point it declined substantially. The criminal history of individuals appears to give little insight into their likelihood of prolific live streaming. However, Figures 7 and 8 suggest that a history of low-harm offences prior to 50 years of age had some predictive value, but was typically outperformed by transaction variables.

Figure 8: Partial dependence plot for age at onset of criminal offending and high-volume live streaming



Source: Philippines CSA live stream financial transaction dataset

Discussion

These findings provide a relatively clear view of individuals who engage in high-volume live streaming. It was particularly important that the three variables most useful in predicting prolific live streaming were characteristics of financial transactions.

Transaction variables

Brown, Napier and Smith (2020) noted that, among those who made more than one transaction, the time between transactions declined. This assertion was supported here. Not only did high-volume offenders make transactions for CSA live streaming roughly twice as often as low-volume offenders, but the closer together these transactions were the higher the likelihood that the individual was engaging in high-volume live streaming. Additionally, where the maximum amount spent on a single transaction was less than $250, there was strong interaction with high-volume live streaming. The smaller the value of that maximum expenditure, the stronger this interaction was. This finding was supplemented by the finding relating to the median expenditure per transaction (Figure 5). The likelihood of high-volume live streaming was highest where individual transactions were $55 or less.

When viewed in totality, it appears that high-volume offenders typically made frequent low-value transactions and were unlikely to spend more than $250 in any single transaction. Among a different group of online sex offenders, Babchishin, Hanson and Hermann (2011) noted a lack of access to employment and finances. While this is a marginally different group, this may go some way to explaining the limited financial outlay among prolific CSA live streaming offenders. However, given the frequency of these low-cost transactions, it is possible that this is a strategy offenders use to avoid detection.

Criminal history variables

As Brown, Napier and Smith (2020) pointed out, the offending histories of individuals in this sample are roughly analogous to those of online CSAM offenders. The proportion of individuals who had a history of sexual offences (against children or adults) was higher among the prolific live streaming offenders than among the low-volume group. It would be beneficial to explore the potential link between high-volume CSA live streaming and contact sexual offending with a larger sample. While the extent of offending among both groups was relatively low, there was some suggestion that low-harm offences may precede high-volume live streaming. There was a moderate interaction between the mean harm of prior offences and the likelihood of high-volume live streaming. The stronger association was with a history of low-harm offending. This may partially be accounted for by under-reporting and the difficulty of prosecuting high-harm offences, particularly sex offences (ECPAT International 2018).

Seto, Hanson and Babchishin (2011) identified that the rate of contact sexual offending by CSAM offenders recorded in criminal justice data was substantially below the rate of self-reported contact offending among CSAM offenders. Given the rate of prior offending among CSA live streaming offenders is similar to the rate of contact sex offending among CSAM offenders (Seto, Hanson & Babchishin 2011), there is some suggestion that there was undetected high-harm offending. Regardless, while individual crime types were not associated with high-volume live streaming, a history of low-harm offending appears to have limited predictive value.

Onset of offending

While the demographic characteristics of offenders did not have a strong association with prolific live streaming, the characteristics of these individuals were noteworthy. While the age at first live streaming transaction was relatively similar for low- and high-volume offenders in this sample, the age at onset of criminal behaviour was not. Although analysis suggested that criminal history was not particularly associated with prolific live streaming among those with a criminal history, high-volume offenders tended to begin criminal behaviour later than low-volume offenders, and tended to commit fewer offences. Previous research has suggested that live streaming offenders tend to be older than those who commit other CSAM offences (eg possession or distribution of images/videos; Brown, Napier & Smith 2020), but the age of onset for offences prior to live streaming was similar to that of online and contact sex offenders identified by Babchishin, Hanson and Hermann (2011). This initial evidence suggests that, where individuals in this sample had engaged in prior criminal behaviour, it likely began at around the same age as the typical onset of offending among online or contact sex offenders.

Implications for law enforcement and financial institutions

In November 2019, AUSTRAC took legal action against Westpac Bank for failing to monitor $11b worth of suspicious transactions, including money sent to the Philippines suspected to be for child sexual abuse (Butler 2019). Enhanced technologies have resulted in new forms of child exploitation, and it is clear that financial transactions are attached to some of these—in particular, CSA live streaming. Financial institutions will require increasingly sophisticated methods to identify suspicious transactions. The findings from this study are a crucial first step in assisting institutions to identify suspicious transactions. For example, evidence here would suggest transactions for small amounts (below $55), sent frequently (around 7 days apart, certainly less than 20) to the Philippines or other countries identified as vulnerable to child exploitation could be flagged for further investigation by law enforcement.

However, it should be noted that any system used to identify suspicious transactions will need improved accuracy. The present research is largely a scoping study to consider the potential of machine learning to identify prolific live streaming offenders. The potential impact of false positives among this field of work is substantial, and may lead to the ineffective use of law enforcement resources and psychosocial harm to those incorrectly targeted. While these approaches have promise, analyses such as these should be applied to a larger dataset, with the intention of reducing false-positive rates, before they can be taken up by law enforcement.

Limitations

This research is best considered to be a within-group analysis of individuals who pay for CSA live streaming. These findings are not generalisable to all transactions processed by financial institutions. To establish this capability an additional analysis featuring a control sample is necessary. However, as a scoping study considering how well prolific live streaming behaviours could be identified, this analysis performed well and produced useful insight. While findings here only relate to individuals who engage in high-volume live streaming of CSA, there is potential to employ a control group of individuals who engage in live streaming more broadly.

Further, findings here relate to the data originating among the group of facilitators arrested in the Philippines. Given this data source, there may be inherent biases in these data that relate to the specific services provided by these facilitators. Analytically, collinearity, in which predictor variables are highly correlated, thereby reducing the reliability of findings, are important to note among naturally occurring data. While the random forest is uniquely placed to account for collinearity through bootstrap aggregation, and steps were taken prior to analysis to consider collinear variables, it should be noted that collinearity among naturally occurring data cannot be ruled out entirely.

Finally, data on the severity of offending were not available for this analysis. The metric employed for analysis was the volume of offending, but the nature of the offences is unknown. It is possible that offenders spending more per transaction were procuring more severe abuse. Further research is needed on the relationship between cost and severity of abuse.

Conclusion

This study considered whether machine learning analytics could offer insight into the transaction and offending behaviours of prolific live streamers of CSA. This is an emerging body of work in which the characteristics of offenders are largely unknown. The frequency and monetary value of transactions among these individuals are particularly important and have implications for identifying these crimes among financial transactions data. Offenders did not appear to have engaged in violent offending; rather, a history of low-harm offending was common, although the under-reporting of sexual offences among children and adults is an important consideration. Findings here may contribute to a better understanding of and ability to identify offenders who pay to watch the abuse of children via live stream, but further analyses of this type employing a control group could substantially contribute to this area of work.

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14. Live streaming of child sexual abuse: An analysis of offender chat logs

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Warning: this chapter contains graphic descriptions of child sexual abuse.

Live streaming of child sexual abuse (CSA) involves broadcasting acts of sexual abuse of children live via webcam to people anywhere in the world (ECPAT International 2017). CSA live streaming is difficult for law enforcement to investigate. Due to the live stream element there is often little evidence that the offence occurred apart from session logs, chat logs and data usage trails, unless one of the parties records the live streamed abuse (Açar 2017; ECPAT International 2018; Europol 2020a; Netclean 2019). CSA live streaming is also difficult to prosecute, as the laws in some countries have not 'caught up' with the unique characteristics of CSA live streaming (Dushi 2020).

Yet there is evidence that these offences are common. In 2013, four researchers from Terre des Hommes Netherlands posed as pre-pubescent Filipino girls on 19 different online chat forums. Over a 10-week period, 20,172 people from 71 different countries asked the researchers to engage in sexually explicit acts (Terre des Hommes 2013). Europol (2020b), in monitoring darknet sites, reported an increase in sharing of child sexual abuse material (CSAM) captured through webcam early in the COVID-19 pandemic (from March to May 2020). This included a category listed on forums as 'live streams'. Europol attributed this increase to offenders moving from contact offending to online offending due to travel restrictions.

Because CSA live streaming is often accompanied by a transaction (Brown, Napier & Smith 2020), this separates it from CSAM and online solicitation offending, for which money is rarely exchanged (DeHart et al. 2017; Europol 2019). Perhaps due to the difficulties associated with identifying, detecting and prosecuting CSA live streaming, there is very limited empirical research available on the characteristics of offenders, offences and victims. Such information is crucial for effective disruption and prevention.

Four studies provide some useful insight into CSA live streaming. The Internet Watch Foundation (2018) conducted an international analysis of over 2,000 image and video captures from CSA live streaming from August to October 2017. These captures were located via a snowball sampling method; URLs were identified through the Internet Watch Foundation's historic dataset of child exploitation sites or by entering key search terms into specified global search engines. The study found that 98 percent of CSA live streaming captures in the sample showed children aged 13 years or younger, and 28 percent showed children aged 10 years or younger. Forty percent of the captures were classified by the Internet Watch Foundation as containing 'serious' sexual abuse, with 18 percent involving the rape and sexual torture of children.

Brown, Napier and Smith (2020) analysed data extracted by the Australian Transaction Reports and Analysis Centre (AUSTRAC) for a sample of 256 Australia-based individuals who sent payments to the Philippines for CSA live streaming. Only 10 percent of these individuals had a recorded sexual offence. Although only limited demographic information was available, the authors found that almost two-thirds of offenders were aged between 50 and 69 years. Occupations of offenders varied, and included, for example, tradesperson (eg gardener, carpenter), computer technician, aged care worker and sales assistant.

Two other studies focusing on the Philippines—one that interviewed two survivors of CSA live streaming, and another that analysed cases of online sexual exploitation of children—found that offenders tended to be males aged over 40 years, often from foreign countries (International Justice Mission 2020; Kuhlmann & Aurén 2015).

The current study

As outlined above, currently there is very little information about CSA live streaming offenders, offences and victims. Previous research has demonstrated the utility of examining the online chat logs of child sex offenders to undertake both qualitative and quantitative analysis (DeHart et al. 2017; Kloess et al. 2017; McManus et al. 2016; Williams, Elliott & Beech 2013). For example, in studies examining online grooming of children, chat logs have provided information about perpetrators' requests for sexual acts and victims' reactions to these (de Tribolet-Hardy, Hill & Habermeyer 2020).

To improve current knowledge of CSA live streaming, the present study analysed chat logs from a sample of detected CSA live streaming offenders to answer the research question: What are the characteristics and nature of detected CSA live streaming offending?

Methodology

Sample

The study was approved by the Australian Institute of Criminology's Human Research Ethics Committee in 2020 as part of a larger body of work. The Australian Federal Police (AFP) provided the Australian Institute of Criminology with chat logs from eight cases involving Australia-based individuals. This was a purposive sample comprising cases the AFP was currently investigating or had previously investigated. The inclusion criterion was that a case had to involve an Australia-based adult who attempted to view CSA live streaming. One case was excluded from the study because the offender engaged in online grooming only (ie they did not request CSA live streaming from the victim), leaving a final sample of seven cases. Previous research has noted the challenges in investigating and proving CSA live streaming offences (ECPAT International 2018). Data were not available on the number of CSA live streaming offenders that have come to the attention of the AFP. Therefore, it was not possible to know what proportion of all offences in Australia the present sample comprised.

The chat logs of six cases occurred between March 2012 and April 2019. The time of the chat logs was unknown in one case (Case 6). The chat logs for two cases (1 and 2) comprised 1,659 and 5,838 pages respectively; the number of pages for cases 3–7 ranged from 3 to 235 pages (3, 6, 22, 12 and 235 pages, respectively). Police briefs were also provided, which included additional information about offending behaviour, criminal offending histories and demographic characteristics within the sample. All offenders were charged, convicted or under investigation for child exploitation offences at the time of the study. Two offenders had previous sexual offence convictions and were registered sex offenders at the time of their arrest. It is unknown whether the remaining five offenders had previous sexual offence histories, as this information was not provided by the AFP.

Although the final sample included only seven offenders, each offender could be in contact with multiple victims or facilitators (see Table 1) at any one point in time and could have committed multiple offences. As such, throughout this report multiple units of analysis are used: offenders, offences and victims (see Table 1 for definitions of these terms).

All seven offenders were male and were aged between 42 and 72 years at the time of their arrest or investigation (median age=58 years). All offenders were living in Australia. Four lived in Victoria and one lived in each of the following states: Queensland, Western Australia and Tasmania.

The relationship status and/or living situation of offenders was available for six of the seven cases. Four offenders were single at the time of the detected offending and one was separated. The remaining offender claimed to be engaged to a woman he regularly sent money to in the Philippines. However, he did not provide police with the name or date of birth of this individual. In regard to their living situations, three offenders lived alone, two lived with their mothers and one lived with his ex-wife and adult stepdaughter at the time of arrest or investigation. Of the five cases where information on offenders' children was available, three offenders had children of their own; in two of these cases, the offenders' children were adults, and in the final case the age of the children was unknown.

Employment information was available for six of the seven offenders either at the time of their offending or prior to their offending. Six offenders were working at the time of their offending and one offender was retired. At least one offender was currently working with children and one had formerly worked with children. Two offenders regularly complained in chat logs of having unstable employment and going through periods of having 'no money'.

As a cohort, the seven offenders were involved in 145 CSA live streaming offences (see Table 1 for definition of an offence). The number of offences per offender across the seven cases ranged from three to 88. However, as shown in Figure 1, one offender committed an unusually high number of offences (*n*=88) compared to other offenders in the study. There was a median of five CSA live streaming offences per offender (Table 2).

Analysis

Because this project was exploratory in nature, analysis of the data was informed by grounded theory and protocols (Charmaz & Belgrave 2012; Glaser 1978). The chat logs were analysed qualitatively in NVivo 10 (QSR International 2014), which allowed the researchers to select segments of text and copy them into themes and subthemes. The data were manually coded by the first two authors using open, selective and theoretical processes (see Glaser 1978). Open coding involved reading the chat logs line by line and applying basic labels to sections of data. Selective coding involved a more detailed analysis of sub-categories and themes. Finally, the authors used theoretical coding to identify links and relationships between codes to develop and link with theory (Thornberg & Charmaz 2013; Urquhart 2012).

Consistent with grounded theory principles, the themes identified through the analysis were primarily emergent—in other words, the analysis was led by the data, rather than attempting to 'fit' the data to pre-existing frameworks and theories. This said, pieces of key information from the chat logs were extracted on the basis that previous literature on CSAM or CSA live streaming had highlighted these as crucial knowledge gaps or areas for future research. This included the characteristics and severity of offending (Internet Watch Foundation 2018; Taylor, Holland & Quayle 2001) and the involvement of, or negotiation with, facilitators (Brown 2016; Kuhlmann & Aurén 2015). At each stage of the coding process, the first two authors discussed preliminary findings and agreed on refinements to the coding framework.

Key quantitative data (eg dates, number of victims, payment method and price) were stored in Microsoft Excel and exported to Stata MP14 for analysis. Definitions of key terms used as part of the analysis of the chat logs are provided in Table 1.

Table 1: Key definitions	
Victim	Child or young person (below the age of 18), usually located in the Philippines, who was abused or referenced/involved in negotiations for CSA live streaming. This would occur either as a result of the victim conversing directly with the offender or being 'offered' to the offender by a facilitator.
Chat log	Online discussions between an Australia-based offender and a facilitator and/or victim, mostly located in the Philippines.
CSA live streaming offence	An attempt by an offender, either successful or unsuccessful, to watch a child being sexually abused via a live stream video platform.
Facilitator (also known as a trafficker)	A person who organises and coordinates the abuse of a child over live stream, and often collects the money from the Australia-based offender.
Offender	Australia-based individual who attempts to view CSA live streaming.

Limitations

We acknowledge the external validity of overall conclusions derived from a sample of seven offenders may be limited. The sample was not representative of all CSA live streaming offenders and may be skewed towards more extreme, higher risk-taking offenders, which may be why these offenders came to the attention of police. It should also be noted that the chat logs analysed for this study were limited to those extracted by police for investigative purposes. These offenders may have engaged in other sexual offending and CSA live streaming that was not detected by police because these activities were not referenced in the provided chat log records. Further, chat logs that were extracted by police but deemed irrelevant for investigative purposes may not have been provided to the researchers. It should also be noted that substantial changes in offending will have occurred since the period covered by this study. For example, Yahoo! Messenger is no longer active and Skype now incorporates end-to-end encryption.

However, the chat logs included a wealth of detailed information that provided valuable insights into the nature of these offences. Further, as these offenders were not aware that their chat logs would be observed, they appeared to be uninhibited in discussing and requesting acts involving the sexual abuse of children. As such, they can be viewed as a reliable source of information about these behaviours, and are less impacted by factors such as social desirability bias which may hamper other forms of data collection, such as surveys and interviews with offenders (McGrath, Cann & Konopasky 1998; Tan & Grace 2008). Finally, previous qualitative studies have made a case for the value of in-depth data rather than breadth of data; given this, small sample sizes can provide rich qualitative data (Halsey & Deegan 2012; Kloess et al. 2017). Overall, the lack of empirical research into the nature of CSA live streaming makes the current study highly valuable, particularly as a starting point for further research to inform policy and prevention.

Results

Characteristics of CSA live streaming victims

Across the 145 offences, a total of 74 unique victims were identified; 43 were located in the Philippines, two each in the United Kingdom and China and one in Thailand. The exact location of 26 victims was not able to be determined from the chat logs. In one case (Case 1) the offender also contacted or attempted to groom children online in the following countries: Australia, Indonesia, Vietnam, Japan and Namibia. All of the victims were female. However, on rare occasions offenders were 'offered' male children by the facilitators. All of these offers were declined. Table 2 displays a summary of the offences across the seven cases.

Table 2: Summary of offences across cases

Case	Offender age (years)[a]	Offender marital status	Number of victims[b]	Number of live stream offences	Victim age range	Approximate price range per live stream offence[c]	Maximum COPINE level of offence[d]
Case 1	42	Single	22	88	12–17	$40–$404	9
Case 2	49	Single	22[e]	27	8–17	$40–$385	10
Case 3	67	Unknown/ living alone	4	3	10–16[f]	$25–$75	6
Case 4	47	Engaged[g]	4	5	7–8[h]	$15–$20	10
Case 5	72	Single	6	5	14–17	$90	–
Case 6	62	Separated	2	5	12[i]	$30–$65	8
Case 7	58	Single	14	12	10–14	$13–$50	7
Overall range	42–72	–	2–22	3–88	7–17	$13–$404	6–10
Median	58	–	6	5	14	$51	–

a: Offender's age at time of arrest or investigation

b: Number of victims of live streaming offences

c: Approximate price per offence converted from Philippine pesos to A$ in February 2021

d: Type of abuse requested and viewed during live stream, categorised according to the COPINE scale (Taylor, Holland & Quayle 2001); COPINE level not able to be determined for all offenders

e: Police briefs indicated offender engaged in sexual activity with at least 30 Filipina minors, but not all involved CSA live streaming

f: Police briefs indicated offender engaged in live streaming sessions with victims as young as 10, but chat logs examined contained victims aged 16 and of unknown age

g: Offender stated he was engaged to a woman in the Philippines but would not clearly specify to police this woman's name or date of birth

h: Offender requested a child as young as four years but was unable to obtain

i: Both victims were 12 years old

Source: CSA live streaming dataset [computer file]

The number of victims per offender ranged from two to 22 (median=6). Victim age ranged from seven to 17 years (median=14 years). Five of the seven offenders requested that a CSA live streaming session involve a victim of a specific age. The youngest age requested by an offender was four, but this offender was told by the facilitator that no four-year-old children were available at the time. Two offenders in the study also paid to watch adult females engage in sexually explicit acts via webcam.

When comparing the number of victims and the number of offences observed in each case, it was evident that some victims may have been abused on multiple occasions (ie experienced repeat victimisation). For example, in Case 1 there were 88 offences and 22 victims; in Case 2 there were 27 offences and 22 victims (Figure 1).

Figure 1: CSA live streaming offences and identified victims, by offender (*n*)

Note: Cases with more offences than victims indicate repeat victimisation of the same victim. Cases with more victims than offences indicate some CSA live streaming offences involved more than one victim

Source: CSA live streaming dataset [computer file]

Offence characteristics

Involvement of facilitators

In all seven cases that were the focus of this study, the Australia-based offender communicated with an adult facilitator to arrange the CSA live streaming in at least one offence. Across all offences (*n*=145), facilitators were involved in 51 offences. In the remaining offences where facilitators were not involved (*n*=94), the Australia-based offenders communicated directly with and paid the victims. However, it should be noted that two of the seven offenders (cases 1 and 2) committed the majority of CSA live streaming offences across the sample (79%, *n*=115) and also typically contacted victims directly, which skewed the results. When excluding these two cases, the remaining five offenders together committed 30 CSA live streaming offences, the vast majority of which (80%, *n*=24) involved a facilitator. Facilitators did not always provide the offender with the same child for CSA live streaming; in some cases, they provided different children on different occasions. Victims and facilitators often spoke in chat logs of needing money for food, clothes and school tuition. We discuss the characteristics of facilitators in chapter 15.

Platforms used for CSA live streaming

Offenders used a range of platforms to communicate with victims or facilitators prior to CSA live streaming sessions taking place (information was available for six cases). As shown in Table 3, Facebook and Yahoo! Messenger were the most common platforms used for chatting with victims and facilitators (both used by four out of six offenders).

To view CSA live streaming, offenders frequently used Facebook, Yahoo! Messenger, Skype and Viber (information was available for five cases). Yahoo! Messenger was the most common platform used, with four out of five offenders using this to view CSA live streaming (Table 3).

In some cases, the offender would begin chatting with a victim or facilitator on one platform and request to switch platforms to view the CSA live stream 'show'. In other cases the victim or facilitator would ask to switch platforms. In one case dating back to 2012 (Case 4), the offender often began chatting with facilitators and victims on Facebook, then would switch to Yahoo! Messenger for CSA live streaming. It should be noted that Facebook did not introduce video calls until 2015 (Chudnovsky & Reddy 2015), while Yahoo introduced them in 2008. Also of note is that Yahoo shut down its messenger service completely in 2018 (Wolfe 2018). The availability of video functions likely influenced the choice of platforms used by offenders. Platforms used by online child sexual offenders have changed over time, and the variety and relative modernity of the platforms indicated in Table 3 are associated with the time period in which the offences occurred. However, previous research has found that online child sex offenders use a mixture of both newer and more dated technology to offend (Balfe et al. 2015). Therefore, despite newer technologies being used by some offenders, it is possible that older technologies, such as those listed in Table 3, may still be used by offenders.

Table 3: Platforms used for online chat with victims/facilitators and CSA live streaming

Case	Platforms used for chat	Platforms used for CSA live streaming	Date range of chat logs
Case 1	Facebook Messenger, Skype, Viber	Skype	4/2/2012 – 19/7/2014
Case 2	Yahoo! Messenger, Facebook Messenger, Viber	Yahoo! Messenger, Viber, Facebook Messenger	18/3/2013 – 19/1/2016
Case 3	Yahoo! Messenger	Yahoo! Messenger	Unknown – 1/4/2014
Case 4	Yahoo! Messenger, Facebook Messenger	Yahoo! Messenger	Unknown – 16/6/2012
Case 5	Facebook Messenger, Skype	N/A[a]	Unknown – 25/4/2019
Case 6	Unknown	Unknown	Unknown
Case 7	Yahoo! Messenger	Yahoo! Messenger, Skype	31/8/2014 – 28/11/2014

a: Case 5 was an unsuccessful live streaming attempt

Source: CSA live streaming dataset [computer file]

Methods of payment

Offenders usually discussed the price and method of payment for CSA live streaming sessions with victims or facilitators during the online chat, prior to the offence taking place. While some offenders used multiple methods of payment, Western Union (*n*=4) and WorldRemit (*n*=3) were most commonly used for payment for CSA live streaming sessions, followed by Remitly (*n*=1). In one case (Case 2), the offender indicated they were banned from one remittance service, and simply used another service. Often the payment method was dictated by the victim or facilitator, who had a preferred service. In another case (Case 1), the facilitator provided the offender with detailed information on how to create an account with and use a remittance service. Once payment was transferred, victims and facilitators would collect the money at locations in the Philippines, such as financial services and pawn shops.

Usually, the facilitator or victim would negotiate with the offender over the price and type of sexual abuse to be viewed. Once both parties agreed on these factors, the offender would send the facilitator or victim proof they had transferred the money, such as a transaction number (see Table 4 for an example). It was common for the CSA live streaming session to commence immediately after this. However, in some cases the live streaming took place several days after payment, and sometimes did not take place at all.

Table 4: A 58-year-old offender paying a facilitator

The following is an excerpt of the chat log from Case 7.	
Facilitator:	how much u send now for young [children] show
Offender:	i want to see there faces first....and not under 12...ok..??
Facilitator:	ok how much u send
Offender:	1000..... [Philippine pesos] [Offender agrees to view two victims aged 12 and 13 years] ok...sent....[provides transaction number] .....amount is 1000...from [offender's name] from Australia you should get an sms soon
Facilitator:	ok

Price and severity of offending

As shown in Table 2, the lowest price that offenders in the study paid for CSA live streaming was approximately A$13 (all price conversions calculated from Philippine pesos in February 2021). The maximum price offenders paid was A$404; this was an unusually large payment which was made with a promise to the offender of 'lifetime shows' of CSA live streaming, although the chat logs indicated the offender did not receive a single 'show' from this facilitator. The median price offenders paid was A$51. While in most cases it was clear how much an offender paid for a single CSA live streaming session, in three cases (cases 1, 2 and 5) the offenders regularly sent money at the request of facilitators or victims for school, bills, food and clothes, as well as devices to facilitate live streaming. While these one-off payments did not always result in a CSA live streaming session, several regular payments for these items would often result in a CSA live streaming session.

The Combating Paedophile Networks in Europe (COPINE) scale measures the severity of child sexual abuse offences (Taylor, Holland & Quayle 2001). The type of abuse requested or viewed was evident for offences in five out of seven cases and the maximum COPINE score was recorded for each offender. In cases 3, 7 and 6 respectively, offenders requested or viewed abuse up to COPINE level 6 (explicit erotic posing emphasising genital areas of children, naked or clothed), level 7 (touching, mutual and self-masturbation, oral sex and intercourse by another child, not involving an adult) and level 8 (sexual assault of child involving digital touching by an adult). In cases 2 and 4 offenders requested or viewed abuse up to level 10 (children being tied, bound, beaten, whipped or otherwise subject to something that involves pain; see Table 2). Bestiality with a child (also level 10) was requested by one offender in the sample; however, it was unclear whether or not this request was fulfilled.

In two cases, the price per session increased when younger victims were requested. In one of these, the offender asked to watch a 12-year-old female being tied up, blindfolded and raped by an adult male (Case 2). The facilitator responded that this would cost 10,000 pesos (A$294), whereas the offender had previously been paying A$29–$59 to watch children aged 14 years being sexually abused with no adults involved. The offender agreed to pay the A$294; however, it is unclear whether or not he paid this money or if the act he requested took place.

However, more severe abuse and younger victims did not always result in a higher price. There was substantial variation in the prices allocated to specific abusive acts or victim ages across facilitators and victims. This indicates that more severe abuse and younger victims were not always associated with higher prices paid by offenders. In a particularly severe case, the offender asked to view a 'nasty' and 'brutal' rape of an eight-year-old girl's anus and throat by an adult male, paying only A$15 for this (Case 4). It was clear from the chat logs that this act took place.

In some offences the price increased with the number of victims. For example, in one case (Case 6) the offender paid A$32 to watch one victim being abused, and subsequently paid A$58 to watch two victims being abused. Again, however, this price change was not consistent across victims/facilitators or offences.

Outcomes of offences

Information about the actual outcome of the offence was available for only 41 offences. Of the 41 offences, 17 were successful (ie the offender viewed CSA live streaming) and 24 were unsuccessful (ie the offender did not view a 'show', usually because they had been scammed). In the other 104 offences, it was unclear whether the offender had viewed the session or not. This may be attributable to the offender switching to another platform or continuing the conversation over live stream.

Discussion

To the authors' knowledge, this is the first study to analyse chat logs from individuals who view, direct and pay for live streaming of child sexual abuse. A key benefit of chat log analysis is that it facilitates the collection of information about offending behaviour when the offender is unaware that they are being observed. The brutality of some of the language used by offenders in this study regarding how they wanted children in the Philippines to be abused as they watched is testament to this point.

The study analysed chat logs from seven offenders who committed 145 CSA live streaming offences. Only about one-third (35%) of offences involved a facilitator, although this result was skewed by two offenders who committed the majority of offences (*n*=115) and tended to contact and pay victims directly. The remaining five offenders arranged CSA live streaming via a facilitator in the majority of their offences. The median age of offenders in the present study was 58 years. Although the study used a small, unrepresentative sample of offenders, this finding aligns with the age of CSA live streaming offenders reported in two previous studies (Brown, Napier & Smith 2020; Kuhlmann & Aurén 2015). Brown, Napier and Smith (2020), while acknowledging that their sample was not representative, noted that the CSA live streaming offenders in their study were older than arrested or convicted CSAM offenders found in previous research.

The present study found that offenders viewed the abuse of children on widely used video-chat platforms—Yahoo! Messenger, Skype, Facebook and Viber—and the severity of abuse requested and viewed by offenders ranged from COPINE category 6, involving explicit erotic posing, to category 10, involving sadistic abuse and sexual assault of children. The median price paid by Australia-based offenders to watch a child being sexually abused was equivalent to A$51 in February 2021. This low price aligns with previous reports that CSA live streaming can be purchased for very small amounts (ECPAT International 2017; EFC 2015). However, the price was slightly lower than the A$78 median reported by Brown, Napier and Smith (2020), who analysed a sample of 2,714 CSA live streaming transactions.

Facilitators and victims appeared to prefer receiving funds for the abuse via remittance services, as the cash could be collected almost instantly. It has been noted that the Philippines has well-established remittance services (ECPAT International 2017). In addition, remittance services do not require the sophistication of encrypted transactions, such as cryptocurrencies, which may be beyond the resource capabilities of many facilitators and child victims, who sell these online abusive services for basic living necessities.

The payment that usually accompanies CSA live streaming differentiates this crime type from online solicitation offending, which rarely involves the offender paying the victim (DeHart et al. 2017). In a minority of offences, the price of CSA live streaming increased when the offender requested more severe abuse (as defined by the COPINE scale) and younger or more victims (as suggested by Brown, Napier & Smith 2020). However, this was not always the case; one of the lowest prices paid by an offender in the study was A$15 for viewing abuse that fell into COPINE category 10 and involved sadistic sexual assault of an eight-year-old child.

Research has suggested that extreme poverty may be a driver of CSA live streaming (ECPAT International 2017; Kuhlmann & Aurén 2015). The data in the current study provide some support for this, with victims and facilitators often telling the offenders they needed money for food, clothes and school tuition. The Philippines Statistics Authority (2018) estimates that, in 2018, 17 percent of the population (approximately 17.7 million people) in the Philippines had insufficient income to meet their basic food and non-food needs. Therefore, it is likely that poverty experienced by victims and facilitators contributed to the occurrence of CSA live streaming described in the chat logs.

The findings from this study have two key implications for policy, law enforcement and the financial sector. Firstly, there are distinctive characteristics of CSA live streaming transactions—they are under A$100, they take place via remittance services, and payments are sent to vulnerable countries. Any of these alone is not a strong indication of child exploitation or CSA live streaming; however, these multiple characteristics could be considered by financial institutions and law enforcement agencies when using sophisticated techniques, such as machine learning, to flag suspicious transactions for further investigation.

Secondly, the use of such popular platforms to arrange and watch the sexual abuse of children live has implications for 'big tech' companies in implementing more measures to prevent child abuse and exploitation from taking place on their platforms. While recent research has examined individuals who engage in online child sexual offences on the darknet (Leclerc et al. 2021; Woodhams et al. 2021), all 145 CSA live streaming offences in the present study occurred on the open web on popular platforms. Such offences could potentially be traceable by these companies if they invested in more innovative technology. Yet the end-to-end encryption proposed on platforms such as Facebook (Hunter 2019) will likely increase the challenges for law enforcement in detecting new and emerging forms of child exploitation. For example, such encryption will prevent police from accessing online chat logs, which are a key form of evidence in the investigation of CSA live streaming. This suggests a need for international law reform in the regulation and accountability of popular online messaging platforms to prevent and detect CSA live streaming. This is particularly important given Europol suggests that 'if air travel remains limited for the foreseeable future however, or becomes more expensive, it is also possible we will see an increase in virtual and proxy offending via live streaming' (Europol 2020b: 17).

Conclusion

With little evidence available for investigation and prosecution, live streaming of child sexual abuse presents challenges for law enforcement and policy development. However, two key factors emerged from this study that present potential points for intervention and disruption: (1) characteristics such as price ranges and the use of remittance services; and (2) law reform regarding online messaging platforms with which offenders commit their offences. Individuals in law enforcement, finance and policy aiming to reduce online child exploitation could focus on these two areas to help detect and prevent CSA live streaming in the future.

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15. How do child sexual abuse live streaming offenders access victims?

Sarah Napier, Coen Teunissen and Hayley Boxall

Child sexual abuse (CSA) live streaming involves broadcasting child sexual abuse over the internet to anywhere in the world (ECPAT International 2017). While there is evidence that demand for this type of abuse is high (Terre des Hommes 2014, 2013), it is difficult to investigate (ECPAT International; Netclean 2019) and prosecute (Dushi 2020). This is primarily because once the live feed has been closed there is no evidence that the abuse took place. According to International Justice Mission (2020), who analysed 44 cases of online sexual exploitation of young adults and children (including CSA live streaming) from Philippine law enforcement, Australians were the third most common (18%, *n*=7) nationality of 'customers'.

Recent empirical research has analysed financial transactions for CSA live streaming (Brown, Napier & Smith 2020; Cubitt, Napier & Brown 2021) and analysed chat logs to investigate the characteristics of CSA live streaming offenders and offences (Napier, Teunissen & Boxall 2021). However, to date, very little information and research exists about how offenders access victims, and the nature of their contact with facilitators and victims of CSA live streaming.

Accessing victims

To the authors' knowledge, only one empirical study has investigated how viewers of CSA live streaming identify and access victims. Kuhlmann and Aurén (2015) conducted qualitative interviews and focus groups with two CSA live streaming victims, representatives of the Philippine National Police, civil society and mothers residing in a low-income area of Manila. Philippine National Police members suggested that those who engage in 'child sex tourism' (contact offending) in the Philippines may continue the abuse via live stream after they return home (Kuhlmann & Aurén 2015). Participants in the focus groups suggested that online grooming of children in the Philippines can also be a common method offenders use to access victims for CSA live streaming. They also reported that 'many sex tourists are now using grooming via social media to facilitate child sex upon arrival in Cambodia' (Kuhlmann & Aurén 2015: 34). The study suggested that foreign offenders target countries like the Philippines, knowing that they will find children who are vulnerable to exploitation due to poverty (see Napier, Teunissen & Boxall 2021).

However, participants in Kuhlmann and Aurén's (2015) study also suggested that that, while some CSA live streaming offenders are preferential (ie are sexually attracted to children and so target them specifically), others may be opportunistic and only offend against children when the opportunity presents itself. As noted by the authors:

> While preferential abusers may very well groom adults simply to get to their children, it seems likely that some look specifically for adult prostitution, but turn child abusers once presented with the opportunity to have children put in front of the camera. (Kuhlmann & Aurén 2015: 37)

The views of Kuhlmann and Aurén (2015) are supported by a broader body of research which argues that while individual factors play an important role in the perpetration of CSA, situational factors or 'opportunity' are likely crucial in whether or not certain individuals choose to abuse or exploit a child (Wortley & Smallbone 2006). For example, the internet has increased the availability of CSA and child sexual abuse materials (CSAM) and decreased the cost and risks associated with it (Wortley 2012). The increase in availability of CSAM was demonstrated by a longitudinal analysis of data from the National Center for Missing and Exploited Children (NCMEC; Bursztein et al. 2019), which found that the volume of reports of CSAM grew a median of 51 percent per year during the period 1998 to 2017. In 2020, the NCMEC received over 21 million reports of CSAM from electronic service providers (NCMEC 2021). This increased availability may result in increased opportunity for individuals to view abusive material.

Facilitators

Several reports released by non-government organisations have highlighted the important role of facilitators in CSA live streaming. Also known as traffickers or operators, facilitators arrange the abuse of children via live stream and often collect the payment from the offender (Brown 2016). Facilitators force the child to engage in sexual acts alone or with others including children or adults (ECPAT International 2017). Facilitators may even record the abuse inflicted on the child and distribute it online (ECPAT International 2017).

International Justice Mission (2020) identified 141 facilitators across 71 cases involving online sexual exploitation of young people in the Philippines. Most facilitators were female (66%) and their median age was 27 years. Of the 217 victims where relevant information was available, abuse was mostly facilitated by their biological parents (41%) or other relatives (42%). However, similar research that examines CSA live streaming specifically is lacking.

Aim

This report is the second in a series (see Napier, Teunissen and Boxall 2021) that aims to improve knowledge of the nature of CSA live streaming by analysing chat logs involving Australia-based individuals investigated by the Australian Federal Police (AFP) for accessing CSA live streaming produced in the Philippines. Previous studies have demonstrated that chat logs can be a useful source of both qualitative and quantitative data about CSA-related offences, including live streaming (Black et al. 2015; DeHart et al. 2017; Kloess, Hamilton-Giachritsis & Beech 2019; Kloess et al. 2017; McManus et al. 2016; Napier, Teunissen & Boxall 2021; Williams, Elliott & Beech 2013). The present study aimed to answer three research questions:

- What methods do CSA live streaming offenders use to access victims and facilitators?
- What are the characteristics of CSA live streaming facilitators and what is their connection to victims?
- What is the nature of interactions between offenders and facilitators/victims of CSA live streaming?

Methodology

Sample

The study was approved by the Human Research Ethics Committee of the Australian Institute of Criminology (AIC) in 2020 as part of a larger series of work (see Napier, Teunissen & Boxall 2021). The AFP provided the AIC with chat logs from seven cases involving Australia-based men who had been investigated for attempting to request and watch the sexual abuse of children in the Philippines over live stream between March 2012 and April 2019. The chat logs included in the study were limited to those that the AFP had accessed as part of investigations into these individuals. Police briefs were also provided to the AIC, which included additional information about the offending behaviour, criminal offending histories and demographic characteristics of the individuals investigated.

All offenders were charged, convicted or under investigation for CSA offences at the time of the study. Two offenders had previous sexual offence convictions and were registered sex offenders at the time of their arrest. It is unknown whether the remaining five offenders had previous sexual offence histories. Although the final sample comprised only seven offenders, each offender was in contact with multiple victims or facilitators (see Table 1) at any one point in time and committed multiple offences. As such, throughout this report multiple units of analysis are used: offenders (*n*=7), offences (*n*=145) and victims (*n*=74; see Table 1 for definitions of these terms). For more detail on how the data were accessed, the characteristics of offenders, victims and offences included in the dataset, and the inclusion criteria for the study, see Napier, Teunissen and Boxall (2021).

Table 1: Key definitions for the current study

Victim	Child or young person (under the age of 18), usually located in the Philippines, who was abused or referenced/involved in negotiations for CSA live streaming. This would occur either as a result of the victim conversing directly with the offender or being 'offered' to the offender by a facilitator.
Chat log	Online discussions between an Australia-based offender and a facilitator and/or victim, mostly located in the Philippines.
CSA live streaming offence	An attempt by an offender, either successful or unsuccessful, to watch a child being sexually abused via a live stream video platform.
Facilitator (also known as a trafficker)	A person in the Philippines who organises and coordinates the abuse of a child over live stream, and often collects the money from the Australia-based offender.
Offender	Australia-based individual who views or attempts to view CSA live streaming.

Analysis

The chat logs were analysed in NVivo 10 with key quantitative data transferred to Stata MP14 for analysis. Analysis was informed by grounded theory and protocols (Charmaz & Belgrave 2012; Glaser 1978). The data were manually examined and coded by the first two authors using open, selective and theoretical processes (see Glaser 1978). Open coding involved reading fragments of the chat logs and applying basic labels to sections of data. Selective coding involved a more detailed analysis of subcategories and themes. Finally, the authors used theoretical coding to identify links and relationships between codes to develop and link with theory (Thornberg & Charmaz 2013; Urquhart 2012). Previous literature on online grooming and anecdotal reports on CSA live streaming informed the coding of grooming tactics and behaviours (DeHart et al. 2017; Kloess et al. 2017) and negotiation with and characteristics of facilitators (Brown 2016; Kuhlmann & Aurén 2015). At each of the three stages the coding was discussed and agreed on by all three authors.

Results

Access to victims

Analysis of the chat logs identified a small number of primary mechanisms through which offenders were able to access victims for CSA live streaming:

- offenders establishing relationships and contact with Filipino locals;
- offenders proactively contacting potential victims and facilitators through social media or dating sites; and
- facilitators proactively contacting potential offenders through social media and dating sites.

Forming relationships with Filipino locals

In all six cases where this information was available, there was evidence that CSA live streaming offences were facilitated through the offender forming relationships with adult Filipino locals. In four cases, the offenders met women online, either via social media or on dating websites. Some of the dating websites were specifically focused on Asian women (eg dateinasia.com). As shown in Case study 1, sometimes the offenders would form intimate online relationships with the women and/or pay them to engage in sexually explicit behaviour via webcam. This in turn led to the offender requesting and/or being offered CSA live streaming of children related to or known to the women.

In two cases, the offenders made contact and formed relationships with local women and families when they travelled to the Philippines for work or other reasons. It is unknown if these offenders sexually abused children during these initial trips, but it appears that they maintained contact online with the Filipino people once they returned to Australia. These offenders then requested and/or were offered CSA live streaming involving children related to or known to their contacts.

Case study 1: Case 6	
Offender	▪ Male aged 62 ▪ Separated, living with ex-wife and adult stepdaughter ▪ Employed in casual work that required regular domestic travel
Offending details	▪ 5 offences ▪ 2 victims (both aged 12 years) ▪ 1 facilitator (approximate age range=35–45 years), mother or carer of victims
Summary of how offender first engaged in CSA live streaming	The Australia-based offender engaged with a woman on Facebook Messenger, paying her for 'sex chat'. He told police that the woman must have provided his details to a facilitator who then added him on Skype. The adult female facilitator then commenced conversations with the offender and initially provided 'sex chat' and nude live webcam shows of herself for several months before offering younger females in webcam sex shows for money, which the offender accepted. The first females were 18–19 years old, but then he moved on to two 12-year-old girls cared for by the facilitator. During live stream shows he would expose himself over webcam to the child victims (who he referred to as 'youngs'), and request that the victims perform specific sexual acts.

Source: AIC CSA live streaming project [computer file]

Proactive contact through online platforms

Offenders accessing victims and facilitators could be as simple as the offender 'spamming' multiple individuals and engaging with those who subsequently accepted the contact. However, while some offences resulted from the offender contacting victims or facilitators themselves, others involved the offender being contacted by facilitators or victims directly. Case study 2 is an example of an offender who searched for and made direct contact with children online, but was also contacted by a facilitator via the friend finding function on Facebook. Please note that these chat logs are presented verbatim, and are often graphic in nature.

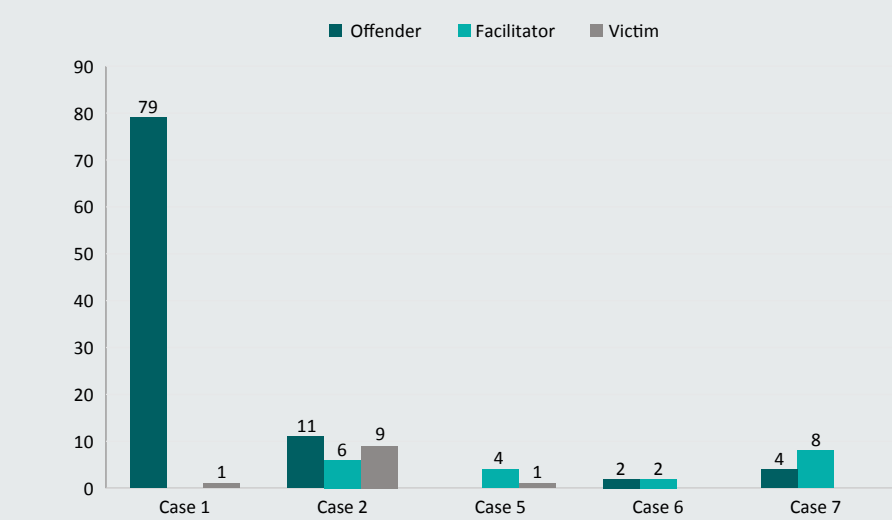
Case study 2: Case 2	
Offender	
▪ Male, aged 49 ▪ Single and living with mother; no children ▪ Worked irregularly in a trade, and also with youth	
Offending details	
▪ 27 offences ▪ 22 victims (median age=12) ▪ 8 facilitators (median age=19)	
Summary of how offender contacted victims and facilitators	
The offender sometimes directly added victims on Facebook and began conversations with them which would lead to CSA live streaming negotiations:	
Victim:	hello thnx for adding me..:) How did you get my fb account?

Case study 2: Case 2	
Offender:	I have no idea when I asked to add you who are you ?
Victim:	lol i see ur the one send me request i just confirm it
Offender:	How old are you
Victim:	i am 13
Offender:	do you cam?
Victim:	here in internet café the owner they not allowed to let young girl use cam
Offender:	but you have friends who have how much to see you ?
Victim:	i will ask first 1400pesos to see me…
Offender:	and what you do ?
Victim:	u mean in the cam?
Offender:	yes
Victim:	ill do naked [describes sex act with an eggplant]
Offender:	:) whats your yahoo
Victim:	[supplied]
Offender:	added you why you need money?
Victim:	…i need to pay for my school tuition
Other times, facilitators would contact the offender using the friend finding function on Facebook:	
Offender:	Hi, who are you ?
Facilitator:	im [name]
Offender:	where are you from ?
Facilitator:	cebu Philippines
Offender:	how did you find me?
Facilitator:	just saying find friends i click find friends then i add all
[A discussion about CSA follows, and the facilitator sends a photo of two children.]	
Offender:	how old are your twins in the picture?
Facilitator:	…already 11… are you willing to support them
Offender:	can I see them?
The discussion continues.	
Offender:	3000 [Philippine pesos], I get your account, I buy your daughters, and see private ?
Facilitator:	yes but only for onetime private?
Offender:	ok
The offender then paid using a remittance service.	

Source: AIC CSA live streaming project [computer file]

As seen in Figure 1, whether the offender, victim or facilitator initiated the contact that resulted in a live streaming offence differed across the cases included in the dataset, and across offences. For example, in Case 1 the offender initiated contact with victims or facilitators in 79 out of 80 of his offences. Conversely, in Case 7 the offender initiated contact in four of his offences, and the facilitator initiated contact in eight of his offences. In all cases where this information was available, individual offenders used multiple mechanisms to access CSA live streaming.

Figure 1: Individual who initiated the contact for each CSA live streaming offence, by offender (*n*)



Note: Information was missing in 8 offences in Case 1, 1 offence in Case 2, all offences in Cases 3 and 4, and 1 offence in Case 6. In offences where the offender initiated contact, he did so with either the victim or the facilitator

Source: AIC CSA live streaming project [computer file]

Facilitator involvement in CSA live streaming offences

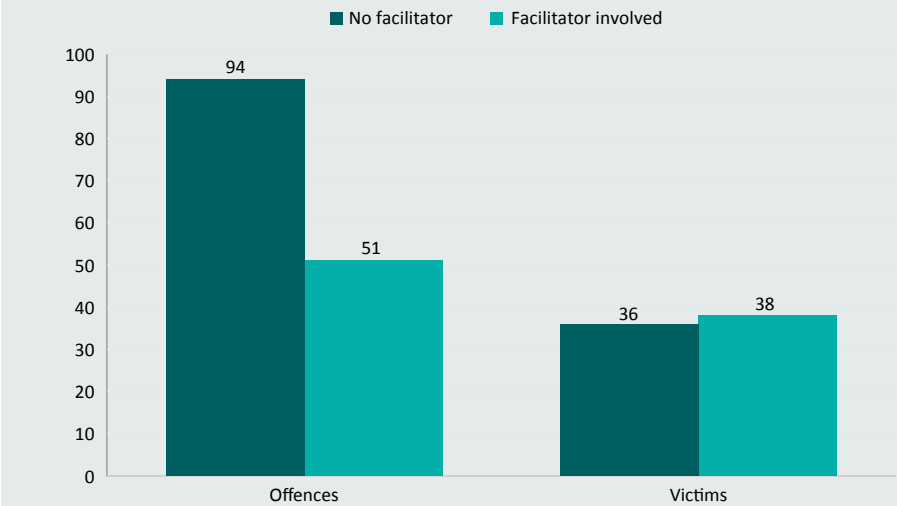
Of the 145 CSA live streaming offences included in the dataset, facilitators were involved in approximately a third (35%, *n*=51; Figure 2). Across the 51 offences, 20 unique facilitators were identified, and offenders used between one and eight unique facilitators (Table 2). Some facilitators provided CSA live streaming multiple times for the same Australia-based offender. Of the 51 CSA live streaming offences where a facilitator was involved, the number of offences ranged between one and 14 per facilitator (median=1). Where this information was available, all facilitators were located in the Philippines.

Table 2: Number of unique facilitators used by each offender (*n*)	
Case	**Unique facilitators the offender was in contact with**
Case 1	2
Case 2	8
Case 3	1
Case 4	3
Case 5	1
Case 6	1
Case 7	4

Source: AIC CSA live streaming project [computer file]

When data were analysed by victim rather than by offence, around half of the 74 CSA live streaming victims included in the dataset (51%, *n*=38) had a facilitator arrange their abuse via live stream (Figure 2). The remaining victims (49%, *n*=36) communicated directly with Australia-based offenders.

Figure 2: Number of offences and victims where a facilitator was involved (*n*)



Source: AIC CSA live streaming project [computer file]

Characteristics of facilitators

At least 15 of the 20 facilitators included in the dataset were female (information was missing for five facilitators). The exact or approximate age of 12 out of the 20 facilitators was known, ranging between 16 and 35 years (median=20 years). The age of one facilitator was provided as an approximate range (25–45 years), and the age of the remaining seven facilitators was unknown.

The relationship between the facilitator and victim was available for 27 out of 38 victims where a facilitator was involved (Table 3). In the majority of these cases (89%, *n*=24), the facilitator was a relative of the victim, most commonly their mother (*n*=13; one was described as mother or carer), followed by their sister (*n*=8), a cousin (*n*=2) or an aunt (*n*=1). Three victims were not related to their facilitators and the relationship was unknown for 11 victims. In summary, facilitators in the sample tended to be young females who were related to the victims.

Table 3: Relationship of facilitator to victim		
Facilitator	**Victims**	
	n	**%**
Family member	**24**	**89**
Mother	13	48
Sister	8	30
Cousin	2	7
Aunt	1	4
Non-family member	**3**	**11**
Total	27	100

Note: Limited to victims who had facilitators involved in their abuse. Excludes 11 victims where the relationship was unknown

Source: AIC CSA live streaming project [computer file]

Although information on most offences was limited, in eight offences where a facilitator was involved, the female facilitator 'joined in' with the CSA live stream session, either abusing the child or exposing/touching herself. There was also little information available about the backgrounds of facilitators. However, on three known occasions the facilitator also exploited themselves sexually via webcam without the involvement of children, indicating that they were involved in online sex work.

In three offences the facilitators were themselves only 16 and 17 years and were also categorised as victims. This is due to these facilitators also being involved in CSA live streaming shows themselves as well as facilitating the offender's access to other victims. For example, one facilitator who was 17 years old offered the offender her 12-year-old cousin for a CSA live stream session. This suggests that some facilitators of CSA live streaming had themselves been sexually exploited as children before becoming facilitators as they approached or reached adulthood.

Nature of interactions between offenders and facilitators/victims

Grooming

In many CSA live streaming offences the offenders would groom the victims and/or facilitators online. Many of these tactics and behaviours were consistent with those identified in the broader CSA literature on the online solicitation of children, such as compliments and romantic language (DeHart et al. 2017; Kloess et al. 2017). It was also common for offenders to ask victims personal questions including about breast size, pubic hair and if they were virgins. In Case 5, using the contacts he made during visits to the Philippines, the offender would target girls on social media and offer to provide academic tutoring services. Notably, this offender had previously been a school teacher, which may have increased the perceived legitimacy of these offers.

In comparison, while some offenders used the grooming tactics identified above, others instead took advantage of the financial vulnerability of facilitators and victims, using money to manipulate and gain control over them. Offering or paying money was the most common form of manipulation used. For example, some offenders would persistently remind victims or facilitators that they 'owed' the offender many 'shows' in return for the money the offender had provided. One offender used dehumanising language when negotiating with facilitators or victims—for example: 'Sex slave, nothing is off limits, can do anything to you…I think I should test your slave obedience' (Case 2; see also Case study 2).

Negotiation

All seven offenders in the sample were involved in negotiating or bargaining with facilitators and/or victims. These negotiations revolved around the forms of CSA that offenders were requesting (eg the extremity), the age of victims they were requesting to view, and the prices that they would pay. Offenders would often request to see specific types of sexual abuse via live streaming. In Case 2, the facilitator asked the offender for 3,000 Philippine pesos (A$81) to purchase a new computer. In exchange for this, the offender requested that a specific sexual act be performed on the child.

Other times, negotiations were based around the specific ages of the victims that offenders were either requesting or being offered for the abuse. In Case 7, for example, a facilitator told the offender that there were seven different girls available, aged between seven and 16 years. The offender replied: 'can i see there faces..?? 12 and above'. The offender in Case 4 requested specific ages and specific acts of abuse, asking to see graphic sexual abuse of an eight-year-old girl in exchange for 600 Philippine pesos (A$16). It was also common for offenders to bargain on prices with the facilitator, even when the price difference was as little as 100 Philippine pesos (about A$3), as shown in the following example:

Facilitator:	You want young?
Offender 6:	Just one
	Any new girls
Facilitator:	No just [previous CSA live streaming victim]
Offender 6:	Ok
Facilitator:	Shes here now
	How much?
Offender 6:	1200
Facilitator:	1,300
Offender 6:	1200
Facilitator:	Ok babe…ready?

Discussion

This study analysed chat logs from seven offenders who committed 145 CSA live streaming offences against 74 victims. Overall, each of the offenders in the sample had contact with at least one facilitator during the period for which they were observed. Four of the offenders had contact with more than one facilitator.

In offences where facilitators were involved (35%), they tended to be young women who were family members of the victim—mothers, sisters, cousins or aunts. Some facilitators were actively involved in abusing children during sessions. Local Filipino participants in Kuhlmann and Aurén's (2015) study reported that some people in the Philippines may exploit children within their families for a number of reasons. This includes poverty, a lack of meaningful and well-paid employment opportunities, a lack of knowledge about the harms associated with online child exploitation, and cultural myths that marrying a Westerner will result in financial stability (Kuhlmann & Aurén 2015). CSA live streaming, as with other forms of child exploitation, is a complex problem that has no borders. At the very least, findings from the present study emphasise a need to educate poverty-stricken families in the Philippines regarding the harms to children caused by CSA live streaming. These harms are likely to be similar to those of child sexual abuse and CSAM production, which include lasting psychological harm, self-blame, fear and suicidal ideation (Cantón-Cortés, Cortés & Cantón 2020; Salter et al. 2021).

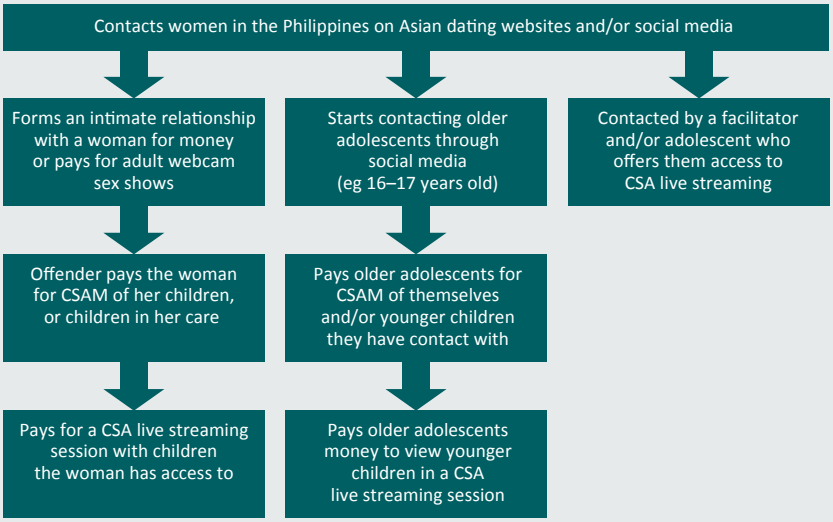
Considering that three facilitators in the present study were child victims themselves, future research is needed to investigate the factors that may drive some victims to become facilitators. These may relate to poverty, access to children, demand, knowledge of how to set up 'shows' and desensitisation due to their own abuse. This could identify important intervention points for preventing future CSA live streaming by victims who are rescued from exploitation situations.

However, it is important to note that, in two-thirds of offences in the present study, offenders communicated directly with victims. Some offenders used grooming tactics and behaviours that have been identified in other research—for example, providing compliments, using romantic language and asking inappropriate or personal questions (DeHart et al. 2017; Kloess et al. 2017). However, many offenders did not need to use grooming tactics to engage in CSA live streaming, as they received unsolicited offers from facilitators and victims through online platforms (see, for example, Case study 1). As such, it is important to acknowledge the complexity of this crime type, and that facilitators and even victims may be motivated to offer family members or even themselves for exploitation due to their own poverty. Offenders often took advantage of the financial vulnerability of victims and facilitators; money was used to gain power over them and coerce them to engage in sexually explicit acts for the offender's gratification. One offender in the study used dehumanising language regarding victims (eg 'I buy your daughters') and bargained with facilitators over price differences as small as A$3. This behaviour may stem from their need to control or humiliate children, and potentially women, although this study did not examine the latter aspect.

Two main pathways to victims

Consistent with the findings from Kuhlmann and Aurén's (2015) research, this study identified two key pathways through which Australia-based offenders accessed CSA live streaming. In the first scenario, offenders began by targeting women or teenagers online, including through online dating sites or their social media accounts (Figure 3). After forming relationships with these individuals (often in return for money), the offenders would ask for or be offered online access to younger children. This would lead to receiving images and videos of the children (some sexual, others non-sexual) and ultimately CSA live streaming.

Figure 3: Pathway 1—Targeting victims online (Cases 1, 3, 6 and 7)



Note: This information was missing for Case 4

Source: AIC CSA live streaming project [computer file]

In the second scenario, offenders would first travel to the Philippines for work or other reasons and befriend local families (Figure 4). They would keep in contact with these families online and upon their return to Australia offer them money for CSAM and CSA live streaming of their children or children they had access to. Alternatively, the offenders would receive unsolicited offers of CSAM and CSA live streaming from the families they met.

Figure 4: Pathway 2—Targeting families during trips to the Philippines (Cases 2 and 5)

Source: AIC CSA live streaming project [computer file]

Note: This information was missing for Case 4

In both pathways, there was evidence that some offences may have been opportunistic in nature, rather than driven only by a preference for children. In some situations, offenders initially paid adult females to engage in sexually explicit acts over webcam, and then moved on to CSA live streaming when it was offered to them by the women. In other situations, they were contacted directly by facilitators and offered access to CSA live streaming without ever requesting it.

Smallbone and Cale (2016) note that sexual offending occurs when individual factors interact with situational factors (opportunity). Therefore, individuals who are susceptible to CSA live streaming offences and initially seek out women may be prevented from offending through situational crime prevention measures (see Wortley 2012; Wortley & Smallbone 2006) such as increasing the effort associated with offending or increasing the risk of detection. For example, in some offences, facilitators used the 'find a friend' function in Facebook to identify Australia-based offenders to approach. The ability of offenders and facilitators to identify each other through existing online social networks could be disrupted by updating this feature to prevent this from occurring. For example, Facebook (now known as Meta) could restrict users outside the Philippines from finding people who live in the Philippines, or limit the number of people users can contact at once. Future research could investigate whether offenders also communicate with other like-minded offenders through social media to locate facilitators.

Other situational crime prevention measures that could be implemented to prevent CSA live streaming include the use of 'pop-up' warning messages (Prichard et al. 2021) that appear on specific social media and dating sites where exploitation may be likely to occur. In addition, primary prevention measures such as advertising campaigns (eg Stop it Now! nd) could target social media platforms to deter offending and refer individuals to treatment before CSA live stream offending begins or escalates. The findings from this study also support the argument that mainstream social media companies and dating sites should increase their focus on preventing child exploitation from taking place on their platforms.

Critically, most of the offenders in the sample accessed CSA live streaming through multiple mechanisms, either simultaneously or at different points in time. This demonstrates the versatility of offenders and the various opportunities for exploitation that exist in online platforms. This means that no single strategy is likely to be effective in preventing CSA live streaming; instead, multifaceted approaches are required.

Limitations

We acknowledge the external validity of overall conclusions derived from a sample of seven offenders may be limited, and that the sample was not representative of all CSA live streaming offenders. Additionally, the chat logs analysed for this study were limited to those provided by the AFP, and the offenders may have engaged in additional online chats with individuals that were not analysed. It must also be considered that there have been substantial changes to platforms used by the offenders in this study. Some platforms are no longer operating (eg Yahoo! Messenger) and others now incorporate end-to-end encryption (eg Skype).

However, these chat logs included a wealth of detailed information on 145 offences, providing insight into the nature of CSA live stream offending. These offenders were not aware that their chats would be observed and were uninhibited in discussing and requesting abusive acts. Thus, the data were likely not impacted by factors such as social desirability bias which may hamper other forms of data collection with offenders (McGrath, Cann & Konopasky 1998; Tan & Grace 2008). Further, previous research has shown that small sample sizes can provide rich qualitative data (Halsey & Deegan 2012; Kloess et al. 2017). The exploratory and novel nature of the current study provides an extremely valuable foundation for further research to inform policy and practice, given the lack of empirical research into the nature of CSA live streaming.

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URLs correct as at October 2021

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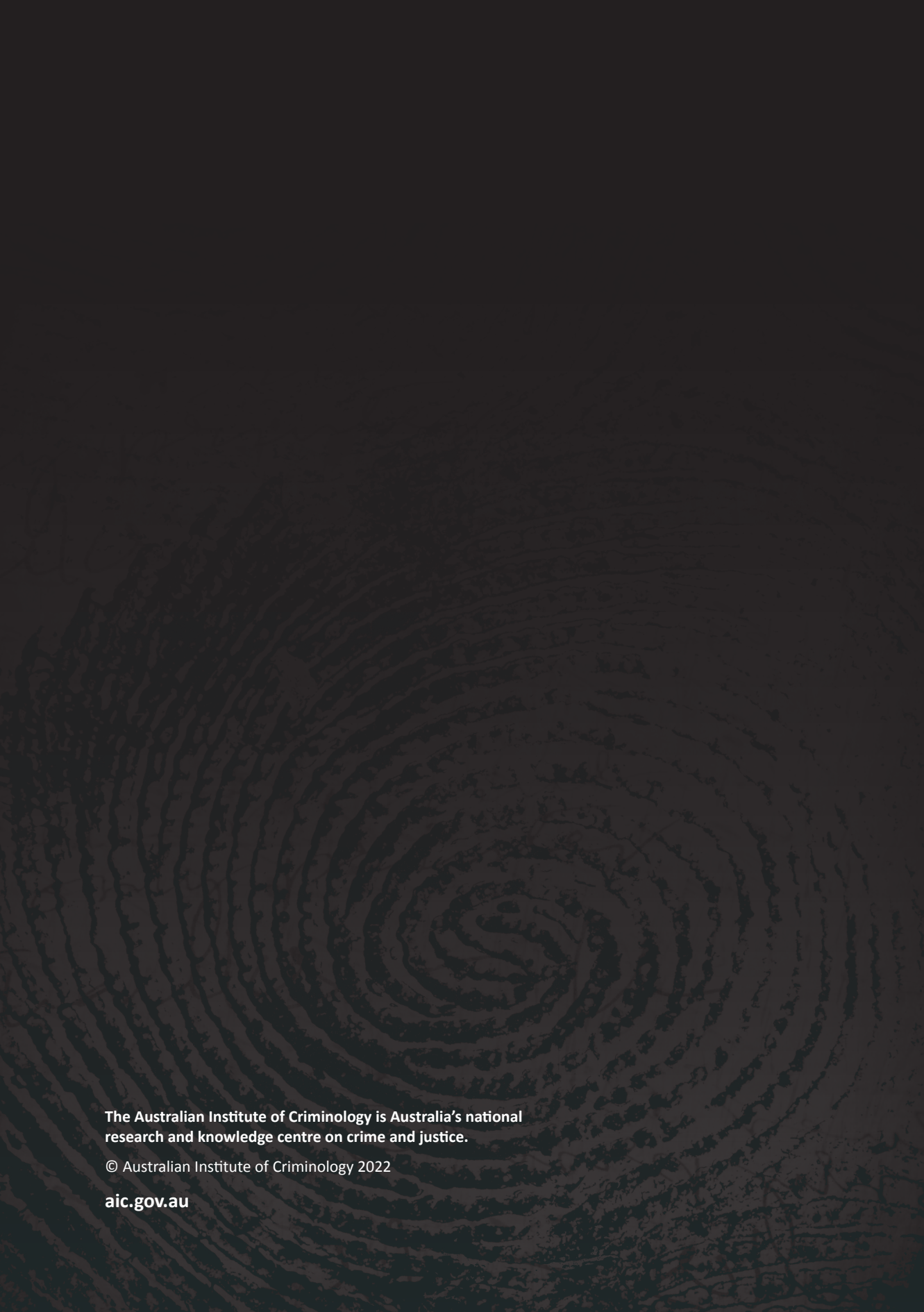

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