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Notes for contributors

Articles for consideration should in the first instance be sent to the Secretariat, Inspector Scott McLaren at mclaren.scott@police.qld.gov.au for initial consideration. They should be no more than 6000 words long (not including references) and be Harvard referenced. Articles should be based upon the aims and objectives of the journal and the evidence based policing approach.

Contributions

Articles on issues of professional interest are sought from Australasian police officers and police academics. Articles are to be electronically provided to the Secretariat, mclaren.scott@police.qld.gov.au. Articles are to conform to normal academic conventions. Where an article has previously been prepared during the course of employment, whether with a police service or otherwise, the contributor will be responsible for obtaining permission from that employer to submit the article for publication to Police Science. Contributors are expected to adhere to the Journal's publishing guidelines. These guidelines are available in this journal. All papers are peer-reviewed.

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Universities

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Message from the President

American Society of Evidence-Based Policing (ASEBP)

Superintendent **David Cowan** President



Since the Society's inception in 2013, the annual conference has been one of our primary activities. And that's for good reason as it brings together police and leading academics from around the world, with exciting research directly relevant to policing challenges. For the last 6 years, we have held the conference at the Australian Institute of Police Management at Manly. Whilst AIPM has served us well over that time, with world leading facilities and warm hospitality, we have felt some 'growing pains' in recent years. We have had to carefully manage numbers and keep a reserve list of those who missed out, with many disappointments. The time had come to take a risk and bid AIPM a very appreciative farewell.

In October 2019, we partnered with the Australian Institute of Criminology and held the conference at Old Parliament House in Canberra, with the theme 'How the Evidence Base can Inform Policing and Law Enforcement'. In the lead up, we had some nerves about whether we would get the numbers required. That was a waste of energy. We had more than 220 attendees with 40 presentations. which is more than double the attendees previously. We were also privileged to have attend the United National Delegation on Crime prevention showcasing our efforts internationally.

I would like to extend my appreciation to our international key note speakers Professor Gloria Lavcock. University College London and Dr Renee Mitchel, Sacramento Police. I would also like to sincerely thank the organising committee and in particular Anthony Morgan from the Australian Institute of Criminology who lead the event. It was a huge success and thank you to all who attended and presented.

We are now planning the next conference and partnering with New Zealand Police Evidence Based Policing Centre to be held in Auckland New Zealand 5-7 August 2020. This is a fantastic opportunity for the Society and I encourage you all to attend. What I have learnt from these conferences is that it is not just about the compelling research presented, it is also about the connections you make with other police officers and academics from around the world, who are so willing to collaborate. It also gives you important time to think about some of the complex challenges we all face and hopefully some inspiration to lead evidence based change in community safety.

We concluded the conference with our Annual General Meeting, where I was elected as President. This is a great honour for me and I would like to thank those who put their trust in me to do this important role. I would like to thank outgoing President Assistant Commissioner Debbie Platz, AFP, for her tireless work, steady hand and friendship.

Our Executive Committee will meet shortly to plan the coming year and the ongoing growth of the Society. Our membership continues to grow and we are so fortunate to have the direct support of state police agencies along with New Zealand Police, the Australian Institute of Criminology (AIC), Australian Policing Advisory Agency (ANZPAA), Australian Institute of Police Management (AIPM), Australian Federal Police (AFP) and the Australian Boarder Force (ABF). I would also like to acknowledge University of Queensland and KPMG as special advisors to our Board.

I hope to see you in Auckland, 5-7 August 2020!

Superintendent David Cowan

President – ANZ SEBP



Sergeant Jonas Baughman is a 16-year veteran of the Kansas City Police Department (KCPD). A native of the Kansas City area, Sergeant Baughman joined the KCPD after obtaining a B.A. in psychology from Creighton University. He has held assignments in patrol, investigations, crime/intelligence analysis, and administration during his tenure.

ASEBP in Review

First, ASEBP has been awarded a \$500,000 grant from the US Department of Justice's National Institute of Justice to develop and implement a curriculum on applied criminology and crime management for sworn officers. This program will fill a critical gap in evidence-based policing by providing law enforcement officers with the skills they need to identify, interpret, apply, and generate research on what works and what matters in policing. The training will also be available to police academics and will serve as a catalyst for the development of sustainable researcher-practitioner partnerships. This three-year award will begin in January of 2020.

ASEBP board members have been travelling the country presenting at a host of practitioner and researcher conferences on the critical importance of evidence-based practices, including the International Association of Chiefs of Police (IACP) Conference, the American Society of Criminology (ASC) Annual Conference, and the FBI National Academy.

While many presentations focus on the broad applicability of EBP, members are also demonstrating both their methodological and subject matter expertise across a broad range of topics including independently conducting randomized controlled trials as a sworn officer, leveraging data to improve diversity in the ranks, sustaining researcher-practitioner and multi-disciplinary partnerships, and evaluating deterrence strategies.

ASEBP co-founder Renee Mitchell was also honored as a keynote speaker at this year's Australia and New Zealand Society of Evidence-Based Policing conference in Canberra, Australia, where she provided an honest assessment of police training.



Sergeant Jonas Baughman

- ASEBP continues to issue a series of materials for its growing membership and the public that summarize relevant research findings with an eye towards integrating results in practice. Research briefs have addressed managing risk of psychological trauma, critical incident impact on community attitudes towards the police, effects of police surges on crime, collaborative approaches to youth truancy, reviews of existing body-worn camera literature, and the relationship between police training and procedural justice to name a few. ASEBP also produces and distributes regular research digests and a publicly available blog, in addition to facilitating robust discussions of EBP on social media.
- ASEBP also hosted its first annual research-in-brief contest, in which researchers and practitioners were challenged to create a brief and accompanying video that described a crime-related research article. Thought-provoking and highly entertaining submissions came in from across the country, with the winning brief and video - submitted by Lincoln Police Department Officer Luke Bonkiewicz exploring opportunities for crime analysts to drive program and strategy evaluations in law enforcement agencies.
- Finally, ASEBP is gearing up to host its fourth annual conference on June 1 and 2, 2020. ASEBP is partnering with American University's School of Public Affairs to host the conference in the nation's capital. and we anticipate our most dynamic program to date, including leadership from major city agencies, federal and local government, community groups, world-renowned researchers, and major police associations

Canadian Society of Evidence Based Policing (CAN-SEBP)



RESEARCH BRIEF American Society of Evidence-Based Policing

July 2019



Jacek Koziarski

PhD Student at the University of Western Ontario

Since our previous update, CAN-SEBP has placed a continued emphasis on creating knowledge mobilization tools. In addition to our monthly #EBPwebcast and Methods Video Series, we have since added "Hands On, How-To" Research Tutorials to our growing collection of tools for police practitioners.

This newest addition to our toolbox takes the form of a short video that contains step-by-step instructions on how to use certain tools and methods to conduct various analyses. To-date, we've produced tutorials on how calculate descriptive statistics in Excel, how to create pivot tables in Excel, and how to calculate the weighted displacement quotient (WDQ), among others. New tutorials are launched monthly and are free to access through the 'Members Only' section of the CAN-SEBP website.

Furthermore, we also have new knowledge mobilization tools that we plan to release in the near future, such as Infographics to accompany each of our Methods Videos (for those who prefer to consume the same information from a static image) and podcasts. Keep an eye out on our twitter feed to learn more about these when they launch!

Finally, our biggest development since the previous update, however, has been the launch of Square One - the first 'What Works' Centre in the Canadian context. More specifically, Square One provides police practitioners with a rapid assessment of the evidence base for popular policing programs that are used in Canada. This is done by succinctly answering five questions: (1) Is the program based on existing research?: (2) Has the program been independently evaluated?; (3) Was the program rigorously tested?; (4) Has the program evaluation been replicated/reproduced?; and (5) Was the program tested in Canada? Each assessment is conducted by an academic and is subsequently reviewed by an expert in the field through a doubleblind process. To-date, we've conducted numerous assessments on various programs, such as Gun Buyback Programs and Bicycle Registries, all of which are also free to access through the CAN-SEBP website.

We definitely have lots on-the-go, but lots more in store for 2020! Should anyone want to take part in an #EBPwebcast, produce a Methods Video or Research Tutorial, or conduct an assessment for Square One, please feel free to get in touch (CANSEBP@gmail.com)!

Social scientists are aware that exposure to traumatic events commonly cause psychological distress and can even have lasting effects on individuals' psychological state and ability to function. This is not only limited large scale disasters like being in a war zone or natural disaster, as even more common daily catastrophes such as assaults or traffic accidents can also result in severe psychological distress. Since the mid 1980's, there has been an increasing interest in early psychological interventions, also known as "debriefings," after exposure to traumatic events. Debriefing is a psychological treatment intended to reduce the distress that arises after exposure to traumatic events, and to prevent the development of Post-Traumatic Stress Disorder (PTSD) or other psychiatric disorders from occurring.

Particularly, the use of single session, one- time individual psychological debriefings have increased over the last 20 years in hopes of preventing the onset of Post- Traumatic Stress Disorder (PTSD) and reducing overall psychological distress. This practice originated in the military, where the goal was to use these early interventions to help get soldiers back into combat shortly after experiencing a traumatic event. Debriefing has since been used in many different circumstances: police officers involved in shooting incidents, rape victims, traffic accident victims, medical students whose patients have died, rescue workers involved in natural disasters, drivers of trains who have witnessed people jumping under their trains, and many other tragic incidents. The question is - does the use of psychological debriefings reduce the chance of PTSD occurring?

To answer this question, researchers examined the results of nine comparable studies conducted across five countries (United Kingdom, Ireland, Netherlands, Austria, and the United States). In each study, individuals age 16 and above who were exposed to a tragic incident no more than 4 weeks before the single session psychological debriefing (reliving of the trauma and the emotional reactions that followed) - some interventions were immediate (less than 10 hours after the traumatic event) and others were delayed (more than 48 hours). The studies measured rates of PTSD, general psychological distress, depression, and anxiety among all participants. The researchers measured the impacts of these debriefings in three ways:

- 1. Compared to a control group, which did not receive any debriefings following a traumatic event.
- 2. Compared to an educational intervention, which teaches people how to cope with their distress after a traumatic event.
- 3. Compared the timing of the debriefing (immediate vs. delayed).

The strength of this study is that it allows researchers to measure the effectiveness of psychological debriefings on many different individuals on an international scale.

The results of this study are quite startling and raise serious questions about the effectiveness of debriefings as a tool for reducing psychological stress. After analyzing the results from the different studies, the researchers concluded that there is absolutely no evidence to support that single session debriefing prevents the risk of developing PTSD or reduces psychological distress, depression, and anxiety. Researchers found that debriefing is either equivalent to, or worse than, control or educational interventions. Evidence from two of the

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Australia & New Zealand Society of Evidence Based Policing

Preventing PTSD: To Debrief or Not to Debrief?

Heather Prince

longest studies, that followed up with participants for three years after their debriefing, suggest that debriefings might actually increase the risk of PTSD and depression. Researchers found that for those who are at the most risk for developing PTSD, it is unlikely they willbehelp edbydebriefings, and infact they could actually cause more harm. The degree of harm that debriefing can cause is still unknown.

Social scientists speculate that there could be a variety of reasons for the failure of debriefing treatment: ranging from the length and timing of the debriefing, to broader, cultural changes in society. The researchers note that the practice of debriefing assumes that there is a predictable pattern of reactions to traumatic events, and that a onetime discussion of these incidents is therapeutic. However, the lack of evidence supporting the use of psychological debriefings clearly shows that it is not a therapeutic treatment in many cases, as individuals cope with trauma differently.

The researchers identify the following problems with the use of debriefings: Discussing a recent traumatic event can cause a "secondary trauma," which typically worsens psychological distress by vividly re-living the incident.

Debriefings may produce psychological distress in those who otherwise would not have developed severe distress just by their increased awareness of it.

Focusing on a single traumatic event may divert attention away from other important factors that differ between each individual trauma victim.

The researchers conclude that other models, such as the use of "screen and treat" programs, may offer better alternative approaches to effectively prevent PTSD and reduce psychological distress, although these other models need to be evaluated as well.

Takeaways

Debriefing is a psychological treatment intended to reduce the distress that arises after exposure to traumatic events, and to prevent the development of Post-Traumatic Stress Disorder (PTSD) or other psychiatric disorders from occurring.

The strength of this study is that it allows researchers to measure the effectiveness of psychological debriefings on many different individuals on an international scale.

Psychological debriefing is either equivalent to, or worse than, control or educational interventions in preventing and reducing the severity of PTSD, general psychological distress, depression, and anxiety.

There is absolutely no evidence to support the use of psychological debriefing as an effective treatment for the prevention of PTSD following traumatic events. Debriefing of trauma victims cannot be recommended in either the military or civilian life and should cease.

Reference:

Rose, S. C., Bisson, J., Churchill, R., & Wessely, S. (2002). Psychological Debriefing for Preventing Post Traumatic Stress Disorder (PTSD). Cochrane Database of Systematic Reviews. https:// doi. org/10.1002/14651858.CD000560

SEBP Australia & New Zealand Society of Evidence Based Policing

We aim to make evidence based methodology part of everyday policing in Australia and New Zealand

CALL FOR NOMINATIONS

Distinguished Police Scientist Award

This annual award recognizes a member of the ANZSEBP who is an innovative law enforcement practitioner who is central to the implementation of a high quality program of work that advances Evidence Based Policing in their agency. These leaders of evidencebased policing not only help make high-quality police scholarship possible but also advance significant reforms in policing by utilizing science in their decision making.

- Nominees must be or have been a member of a law enforcement agency, either as a sworn officer or civilian employee; and
- Nominees must have been central to the implementation of a documented rigorous scientific evaluation in their affiliated agency. Such evaluations can be conducted for various interventions, policies, or practices and include a wide variety of outcomes (i.e., crime reduction, improvement in citizen satisfaction, reduction of fear, improvements in police legitimacy, etc.); and
- Nominees must show a record of incorporating and translating evidence-based practices in their agency. These practices may include implementing strategies that have been shown to be effective in reducing and preventing crime or using practices supported by research that address fear of crime, police legitimacy, internal accountability, and other law enforcement concerns. Such a record of practice might also include greater incorporation of science and scientific processes in decision making or training.

Selection decisions are made by the ANZSEBP Management Committee.

The Award winner will receive: free registration at the annual SEBP conference, a speaking role at the SEBP conference, an award plaque, free subscription to the Journal of Experimental Criminology for one year, and a published interview about his/her accomplishments to appear in Police Science.

To nominate for this award please complete the Distinguished Police Scientist award nomination form and submit online.

Outstanding Police Experiment Award

This award recognizes a single research project that contributes significantly to policing science. To be eligible a study must have been conducted within the last five years.

- Nominees can be individuals or teams.
- The study must be an impact evaluation that assesses the effectiveness of a policing intervention.
- A policing intervention is defined as some kind of a strategy, technique, approach, activity, campaign, training, directive, or funding/organisational change that involves police in some way (other agencies or organisations can be involved). Police involvement is broadly defined as police initiation, development or leadership where police deliver or implement the intervention or where police are recipients of the intervention. We will also

consider interventions that are related, focused or targeted to police practices.

- The project must use randomised experimental (e.g., RCTs) and guasi-experimental evaluation designs with a valid comparison group that does not receive the intervention. We will accept designs where the comparison group receives 'business-as-usual' policing, no intervention or an alternative intervention (treatment-treatment designs) and quasi-experiments that control the assignment of cases to treatment and control groups (regression discontinuity), match the characteristics of the treatment and control groups (matched control), statistically account for differences between the treatment and control groups (designs using multiple regression analysis), or provide a difference-in-difference analysis (parallel cohorts with pre-test and post-test measures). Single group designs will not be considered. The following designs will be considered:
 - Randomized Controlled Trials
- Meta-analyses
- Cross-over designs
- Regression discontinuity designs
- Designs using multivariate controls (e.g., multiple regression)
- Matched control group designs with or without pre-intervention baseline measures (propensity or statistically matched)
- Unmatched control group designs with pre-post intervention measures which allow for difference-in-difference analysis
- Short interrupted time-series designs with control group (less than 25 pre- and 25 post-intervention observations)
- Long interrupted time-series designs with or without a control group (≥25 pre- and post-intervention observations)
- Unmatched control group designs without pre-intervention measures where the control group has face validity
- Raw unadjusted correlational designs where the variation in the level of the intervention is compared to the variation in the level of the outcome
- Treatment-treatment designs

Selection decisions are made by the SEBP Executive Committee.

The Award winner (or winning team) will receive: free registration at the annual SEBP conference, a speaking role at the SEBP conference, an award plaque, free subscription to the Journal of Experimental Criminology for one year, an invitation to publish the project results in Police Science.

To nominate for this award please complete the Outstanding Police Experiment award nomination form and submit online.

Key Dates

Nomination Opens:	1 March 202
Recipient Notification:	1 July 202

United Kingdom Society of Evidence Based Policing (UKSEBP)





Alex Murray Commander, Metropolitan Police, Specialist Crime

Commander Alex Murray graduated from Birmingham University in 1996 and joined West Midlands Police where he worked in CID and uniform roles in the cities of Birmingham, Coventry and Wolverhampton. In 2008, he graduated from Cambridge University, with a Masters degree in Criminology. His thesis developed the understanding of police legitimacy within Muslim communities. He is passionate about involving the community in reducing crime and has led West Midlands Police on preventing violent extremism. He is the founder, and currently Vice Chair, of the Society of Evidence Based Policing and has introduced randomised control trials into West Midlands Police as a means of understanding what works in reducing harm and providing value for money. In 2014, he received the Superintendents award for Excellence in Policing and has been recognised by George Mason University's Centre for Evidence Based Policing. He is a visiting scholar at Cambridge University, has been associate director of the Cambridge Indian Police Service Training Programme and was part of the UK National Disaster Victim Identification Team. Alex now serves with the Metropolitan Police following a transfer there in 2019.

Guns, Knives & Evidence Based Policing

Violence is the Number One priority for many UK police forces at the moment. There are rises in homicide in the capital and County Lines is a strong focus driver of youth violence (County Lines are when young dealers travel and take over territory in outlying towns away from the bigger cities). There are many refrains in progressive policing at the moment including the impossibility of arresting yourself out of the situation, being trauma informed contagion, focusing on adverse childhood experiences or adopting a public health approach.

All of this has merit and is ultimately true but if there is one thing we know about policing and police leadership you need clear focus and

there is a danger that with a multitude of approaches we suffer mission creep. This is why the UK SEBP conference this year is about 'Guns and Knives' the evidence of what works for policing. What is the role of policing within a partnership landscape in the battle against violence and what is the most effective use of our time? I think the answer is as follows but would appreciate starting a debate. For simplicity I believe the evidence points us to three areas in the area of proactivity.

1. Accurate data highlighting the best hot



- spots. Religiously police them 2. Problem solving. Violence
- is preventable and clusters, environmental factors are important and deep analysis and action makes a difference
- 3. Accurate data forecasting which offenders (who are also more likely to be victims) we should focus on. Focus on them using the 'pulling levers' approach.



Australia & New Zealand Society of Evidence Based Policing

That perhaps seems too simple but then for too long the bias towards novelty has confounded many and diluted our focus. This though is not about old fashioned policing. If there is one thing the evidence has shown us it is that we do not do what we say we do. Every police leader will say that their organisation does these three things but I can guarantee they don't do it as well as they could.

Patrol varies according to where the officers want to go (ask the editor, Simon Williams about his experience of hot spot policing). We get the wrong offenders and then pull the wrong levers and finally

> the implementation of problem solving is notoriously tricky.

> That is why in this year's conference we are amplifying the importance of demonstrating leadership in tracking (or you could call it intrusive leadership. Knowing what your staff are doing and making sure it is right).

> SEBP UKL continues to grow with great regional conferences held in the South East and South West. Our regional coordinators there are making a huge difference. The Met Police has a growing movement of evidence based practitioners.

> It is running many experiments and has a strong leadership focus on being data driven and applying evidence based practice. We want to do so much more but it is clear to me that evidence based policing is increasingly becoming the bedrock for action in most forward thinking police services.



A Conference to Remember: Reflections on #ANZSEBP2019



Simon Williams (New Zealand Police, Secretariat ANZ SEBP)

In 2018 demand for registrations meant we had a waiting list, but registrations for #ANZSEBP2019 far exceeded expectations and really highlight the growing appetite of the policing and law enforcement community across the region to see, hear and share new evidence of what works, what doesn't and what looks promising to keep our communities safer.

Our decision to move the 2019 conference from the spiritual home of the ANZ SEBP, The Australian Institute of Police Management (AIPM) in Sydney, to a larger venue was one the committee did not take lightly. However, the move to Old Parliament House for this year's event enabled over 200 colleagues to witness some truly awesome presentations and take away high quality knowledge and insights into the growing evidence based across the region.



A packed Old Parliament House listens on as Professor Gloria Laycock presents on the similarities between Evidence Based Policing, Crime Science and Problem Oriented Policing.

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Our outgoing President, Assistant Commissioner Debbie (Australian Federal Police) welcomed over 200 delegates on day one at Old Parliament House in Canberra, a truly stunning venue, and began by presenting the society's annual awards; Distinguished Police Scientist and Outstanding Police Experiment.



Assistant Commissioner Debbie Platz (AFP, 3rd from left) addressing the conference.

Congratulations went to Superintendent David Cowan (Victoria Police, current President of the ANZ SEBP) on becoming the 2019 ANZ SEBP Distinguished Police Scientist. This annual award recognises a member of the ANZSEBP who is an innovative law enforcement practitioner, central to the implementation of a high quality program of work that advances Evidence Based Policing in their agency.

These leaders of evidence- based policing not only help make highquality police scholarship possible but also advance significant reforms in policing by utilising science in their decision making.



Superintendent Bruce O'Brien (New Zealand Police) walks conference through the creation of an Evidence Based Policing Centre for New Zealand.



Superintendent David Cowan (Victoria Police) addresses conference following his award.

The Outstanding Police Experiment Award for 2019 went to a multidisciplinary team from Queensland Police and The University of Queensland (UQ). This award recognizes a single research project that contributes significantly to policing science, this year's winner was the project: Developing police-public crime prevention partnerships with IM-PACT. Congratulations go to Senior Sergeant Bruce Peel and Senior Sergeant Darren Green from Queensland Police Service, in partnership with Dr Sarah Bennett from the University of Queensland. This really highlights what can be achieved when academic and police colleagues work together, a real theme of the evidence being presented this year.

The packed conference programme then kicked into full swing with keynotes from Renee Mitchel (Sacramento Police Dept and ASEBP Exec Committee Member), Dr Geoffrey Barnes (Western Australia Police), Professor Gloria Laycock (UCL Jill Dando Institute) and Professor Lorraine Mazerolle (University of Queensland).

Our keynotes were followed by invited speakers from across the region, with contributions from New Zealand Police, the Australian Institute of Criminology (AIC), Queensland Police, Victoria Police, The Australian Institute of Police Management (AIPM), The Australian Federal Police and Griffith University. The ANZ SEBP Executive Committee would like to formally thank all keynote and invited speakers for their time, energy and commitment in driving an evidence based approach to problem solving, in particular for taking the time to share their stories and applied research with our delegates.



Renee Mitchell addresses conference on Police Training: What works, what doesn't and how we should change the future of police training.



Dr Geoffrey Barnes (WA Police, Vice President ANZ SEBP) addressing conference on forecasting to predict future offending.



Professor Lorraine Mazerolle (University of Queensland) talks about her systematic review of the impact of drug law enforcement.



Professor Gloria Laycock (UCL Jill Dando Institute) addresses conference on evidence based policing and crime science

A real highlight of this year's conference was hearing about evidence based policing in practice, we were able to hear short shot presentations from twenty police officers, police staff members and academics working in partnership with police across the region.

The standard of applied research happening right across the region is testament to the growing appetite for making better, more informed, evidence based decisions. The ANZ SEBP Executive Committee would like to formally thank short shot presenters for their significant contribution in building the evidence base and taking the time to share their findings.

Of course, a conference of this size and quality could not have been possible without the leadership of the organising committee. A special thanks goes to Anthony Morgan from the AIC, who chaired the committee and was instrumental in co-ordinating with our conference partner, Conference Design. Finally our thanks also go to the staff and management of Old Parliament House who provided both a warm and friendly service at an exceptional venue.

On a final note the ANZ SEBP now has a new President, Superintendent David Cowan from Victoria Police. The committee would like to place on record its thanks to Assistant Commissioner Debbie Platz for her leadership, commitment and unwavering support in continuing to advocate for evidence to inform police and law enforcement decision making. Debbie remains on the executive committee as the representative for The Australian Federal Police.

The ANZ SEBP Executive Committee look forward to welcoming you to #ANZSEBP2020, our next conference will be hosted by Vodafone NZ in Auckland, New Zealand between the 5th and 7th August 2020. Registrations will open soon at https://www.anzsebpconference.com.au/.

A majority of presentation resources from #ANZSEBP2019 are now available at www.anzsebp.com



Evidence Based Policing CONFERENCE 2020

SAVE the date 5–7 August 2020 Vodafone NZ HQ Smails Farm Auckland



ANZSEBP 2020 will be co-hosted by the New Zealand Evidence-Based Policing Centre NZ Evidence-Based **Policing Centre and Vodafone** at the Vodafone NZ HQ.

Follow us at @anzsebp or go to www.anzsebp.com for latest news and updates.

EVIDENCE -BASED POLICING • • • • • CENTRE









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Clear evidence: Home loan confusion is costing Aussies

One in three Australians have a home loan, yet the home loan process continues to baffle us - and that can mean missing out on valuable savings. The last six months have delivered remarkable changes to the home loan market. Towards the end of 2018, the Reserve Bank of Australia (RBA) was hinting that rates were likely to climb higher.

The space of just a few months saw a complete turnaround. Interest rates have plunged, led by back to back rate cuts from the RBA in June, July and October. Yet home owners could be missing out on the savings of lower rates, spooked by concerns about a complex home loan process. Research by Aussie showed that 69 per cent of homeowners admit they should review their refinancing options, but it all just seems too hard

Solving the mortgage mystery

New research commissioned by Aussie confirms that Australians generally view the home loan process with trepidation. An overwhelming 70% of Australians describe the home loan process negatively, citing it as stressful, a waiting game, difficult, painstaking and rigid.

Surprisingly, it's not just first home buyers that are confused. Three out of five (58%) experienced home buyers, are still not sure what documents banks assess during the home loan application process.

The result is that many home owners could be paying a home loan rate that's higher than necessary.

The conditions are all in home owners' favour

Undoubtedly, the home loan application process has become more complex. But fears of a complicated home loan process shouldn't force home owners to stick with a mortgage charging an over the top rate. As John Symond Chairman of Aussie, explains, "Today's property market has all the right conditions: we've got low interest rates and national average auction clearance rates are around 70%. However, Aussies could be missing out on this opportunity because they're overwhelmed or confused by the home loan process."

No matter whether you're looking to cut your home loan costs, or you want to take advantage of a property market on the upswing to upgrade to your next home, there is a solution.

The advice and support of a mortgage broker can streamline the increasingly complicated home loan process. As a home loan expert, a broker offers up to date information. And that matters.

Mortgage myths abound

Aussie's research found that 87% of people believe it is important to know that someone is across all the current regulations, procedures and processes. The problem, is that we often get conflicting (and incorrect) messages from wellmeaning friends and family - who in many cases are fueling mortgage myths.

The Aussie survey found two-thirds of Australians have received home loan advice from someone, whether they wanted it or not. And some of the myths that abound are extraordinary.

Close to one in two of Aussie's respondents believe that tax returns are application criteria (they're not). One in 10 think medical history is checked by lenders when assessing a loan (it isn't). Some even believed 'women are high risk for home loans because they tend to get pregnant' (myth busted). In contrast, 84% of Australians said they believed there are significant benefits to working with industry professionals.

Navigate the mumbo jumbo

A mortgage broker isn't just across the constant change in regulations and lender policies. As Symond notes, "A broker can help guide you through the application process to minimise and explain the jargon, paperwork and 'mortgage mumbo jumbo', which adds unnecessary confusion to the average Aussie."

The bottom line is that two-thirds of Australians believe that mortgage brokers make getting a home loan easier. To add to the appeal, an Aussie Broker's service comes at no cost to home owners

As interest rates continue to fall to new record lows, no Australian home owner should be missing out on the savings. Contact Aussie to discover how easy it can be to switch to a more competitive loan or lender, and start pocketing the savings of lower repayments.

To make a free appointment with an Aussie Broker, visit aussie.com.au

Dr Karla Lopez, Craig Darragh and Scott Howard

Police department are widely tasked with the management of a child protection/sex offender register for the protection of the community. New Zealand and Australia are no different. While the former manages one register across the country, the latter has registers in every state, connected federally (to varying degrees) by the National Child Offender System (NCOS) database. Along with the responsibility for maintaining up to date information reported by Registered Sex Offenders (RSOs), there are ongoing public expectations that offenders are appropriately monitored, and their offending disrupted. That is despite the fact, that police are seldom allocated additional operational resources to cope with this important demand.

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In the state of Victoria, Australia the state police force has committed significant effort and resources to implement an evidence-based offender management framework. Its aim is to assist police to identify, amongst thousands of RSOs, those who pose the highest risk to the community. The evidence it relies upon derives from the sex offender research literature which has identified a range of robust risk factors, signalling both long term likelihood and imminent potential to reoffend. These factors have been combined into actuarial tools (e.g. Static 99, Hanson and Harris, 2003) which are established for their predictive accuracy over the long term. Risk is also analysed with dynamic risk assessment tools, designed to identify short-term risk. In establishing its offender management framework, Victoria Police has invested in training staff to utilise actuarial tools and has developed a dynamic risk assessment tool (SHARP) designed to optimise the use of data readily available to police to derive the risk score (Lopez, Boer, Kirby & Davis, 2019). Internal analysis of risk assessment efforts indicate that a large proportion of offenders (87%) who have committed a further sexual offence while registered were assessed as posing a high risk. However, appropriately identifying high risk sex offenders is insufficient when the objective is to protect the community.

In an effort to improve its impact on offenders with an ongoing propensity to reoffend, in 2018, Victoria Police funded a number of specialist, operational resources to proactively manage their risk. There is a team allocated to each police region with the task of assisting the local case manager to proactively engage with high risk RSOs. How to identify them? This team has the capability and agility to investigate a range of offenders, but this requires currency in intelligence and risk assessment holdings. The limited number of staff members working on assessing and re-assessing risk makes it impracticable to reassess all offenders on the registers every year, let alone every few weeks or months.

Victoria Police is not alone in attempts to utilise advanced data analytics techniques, though the use of artificial intelligence to guide offender management work is arguably ground breaking. For example, Queensland Police Service are currently developing Harm Evaluation Ranking Tool (HERT) which is designed to identify and rank offender based on their own potential for committing significant harmful offenders. The HERT views risk in totality and not on the probability of event. It takes a series of known factors, applies a series of algorithms and weightings to the data using validated forensic predictors and agreed upon definitions of risk and harm of offending. The resulting HERT output ranks offenders from the highest known potential for committing harmful offences to those who have no identifiable data indicating a history of or factors associated with harmful offences at this time (Queensland Police Service, 2019).

In the UK, Kent Police in partnership with the Cambridge Centre for Evidence Based Policing has developed the Evidence- Based Investigation Triage (EBIT) system. This enables police to become

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more effective and efficient in resource prioritisation and allocation without sacrificing legitimacy. EBIT achieves this by calculating the likelihood that a case will result in a judicial outcome, incorporating a public interest assessment that identifies victim vulnerabilities and offender propensities. Over its application to 15,000 cases thus far, the number of cases requiring a secondary police investigation have halved, achieving the same level of successful judicial outcome (World Class Policing, 2019).

Victoria Police has developed the SOR (Sex Offender Registry) Priority Persons of Interest (SPPI) Tool in order to expedite the identification of the highest risk offenders on the sex offender register. It assists operational police to identify offenders most likely to reoffend sexually within the next 12 months who may therefore require disruption, intervention or proactive investigation. This is a crucial advantage to make the best use of limited proactive police resources dedicated to protecting the community from further sexual harm.

Methodology

To identify sex offenders that are most likely to commit further sex offences in the next 12 months, Supervised Machine Learning was utilised and trained on a large dataset that consisted of nearly 50 predictive features found through research and Subject Matter Expertise. The following is a list of some of the common predictive features found to be predictive.

Figure 1: Predictive Features



Given the vast majority of RSOs are adult males, registered offenders outside of these parameters were excluded from the cohort (e.g. juveniles, females). Subsequent predictive features were extracted from a ten-year period (2006 – 2015) that was sourced from Victoria Police's system Law Enforcement Assistance Program (LEAP).

Several Machine Learning algorithms were trialled on the training data including Logistic Regression, Random Forests and Gradient Boosting. As Machine Learning methods are more computationally complex models that require the right software/hardware Python was used however they are far superior at learning non-linear patterns in the data and are good at learning predictive patterns in the data. A process called cross-validation was used to determine the best model in which case for this data was the Random Forest algorithm. The Random Forest algorithm uses tree based methods to make predictions. Decision Trees are handy as they can easily be transformed into pseudo-code. This pseudo-code was ported over to a SAS Enterprise Program and turned into a program that can provide the end user, Sex Offender Registry staff with the ability to deploy the Machine Learning process as needed. As the Pseudo-code is static, the Random Forest algorithm will need to be re-trained to keep it contemporary and adapting as new data sources arise.

The main purpose of prediction in this case is for prioritisation purposes. Therefore the output from SAS program lists/ranks Registered Sex Offenders (RSO's) from highest likelihood to lowest likelihood of reoffending over the next 12 months. This is done to ensure resources are focussed on RSOs posing the highest risk to community safety.

Analysis

The SPPI tool ranks a large cohort of offenders, only some of whom are of immediate concern to police mitigating risk in the community. Although the tool ranks all offenders who are recorded as RSOs on the primary Victoria Police database, only around 60% of these offenders are managed in the Community at any given time. The remainder reside in other jurisdictions or are incarcerated. Additionally, the rankings assigned to offenders who are being managed in the community require further refinement to make them useful in practice. The SOR maintains or has access to a variety of other databases that can be used to enrich the SPPI Tool's output. To this end, SOR Analysts created a Visual Basic (VBA)-enabled Excel workbook that combines the SPPI output with the following data sets:

- An SPPI Rank denoting relative likelihood of reoffending from highest to lowest.
- Overall Risk (High, Medium or Low) as assessed by SOR's Offender Management Team (based on the Static-99 and SHARP assessment tools).
- Offence Category (CEM, other non-contact offending, contact offending or combinations thereof depending on the offender's history).
- The number of Information Reports involving the offender in the current calendar year and whether any potential breaches of the Sex Offenders Registration Act (Vic) (2004) were identified in these.
- Current Compliance Manager and Division responsible for the offender's management
- Whether the offender has been previously investigated by the Offender Management Division's (OMD) Proactive Targeting Team, the result of any investigation and when this occurred.
- Whether the offender has ever been previously considered at a divisional Tasking and Coordination meeting and the outcome of this discussion.
- Whether the offender is subject to the Serious Offenders Act (2018)(the most restrictive community supervision scheme in the state for this cohort).

Enriching the SPPI data in this manner allows stakeholders, primarily investigators and Registry staff, to more easily assess the risk posed in conjunction with the level of potential harm associated with each offender and any outstanding opportunities for police intervention. Enriched SPPI data is now included in a number of meetings and processes, primarily the OMD Tasking and Coordination meeting.

Australia & New Zealand Society of Evidence Based Polici

The data is used both to define a cohort for discussion, as well as to contextualise offenders raised via other avenues (e.g. current intelligence, concerns of managing investigators). SPPI data also feeds into Proposed Prisoner Release data to indicate any offenders re-entering the community who may require additional management. This has increased the potential for a more immediate response to high risk offenders exiting custody.

In the future, enriched SPPI data may form a basis for regional Compliance Managers to prioritise the RSOs they are responsible for managing in the community – both to help them rank problematic offenders, or to raise awareness of seemingly compliant offenders who are nevertheless highly ranked by the SPPI Tool. Ultimately, these activities increase opportunities to proactively investigate and identify risk.

Conclusion

It is broadly documented that AI has the potential for automating the collation and connection of information and intelligence to optimise police situational awareness. Automation can deliver faster results, with reduced errors between larger sets of data than what can be carried out by people, thus facilitating a more efficient, informed police response (Kennedy, 2019). The output of such processes still requires human guidance to ensure ethical and meaningful police action. As such, policing agencies, which deal in highly complex environments, are justified to proceed with caution.

The SPPI, employing machine learning has already demonstrated utility in operational settings to guide proactive investigations of specialist police resources tasked with preventing sexual reoffending by registered persons. It is clear that the role of Al is complimentary to the individual analysis undertaken by teams with expertise in sex offender risk assessment and management. That is, it is insufficient to know that someone is prone to reoffending, you must consider the harm they stand to inflict and the potential for police to intervene. Police work alongside treatment providers, child protection services and reintegration services which need support, not disruption. Successful outcomes for the community involved the ultimate reduction of reoffending, which includes appropriate offender reintegration and an effective police response to monitor their progress throughout the process.

Despite the SPPI's promise, work is ongoing to ensure its efficacy and defensibility as evidence-based police practice. Work will soon be undertaken to validate the Tool's output by comparing those who it predicted to be at higher risk of reoffending against those who actually went on to commit further offences. Although given that intervention and disruption activities have been deployed, offences prevented cannot be measured. There is also ongoing potential to increase the data set by incorporating information from the national database, with the aim of further enhancing prediction. Naturally the evolution of the tool and rigour in its application warrants ongoing attention, which remains an operational imperative for Victoria Police.

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JOINING AND DISAFFILIATION FROM OMCGs

Dr Julianne Webster and Dr Winnie Chiu, Queensland Police Service (QPS)

Introduction

Why do OMCGs join and leave gangs? This is the question that prompted our research into OMCGs, which is being conducted in partnership with the QPS Organised Crime Gangs Group and the Australian Institute of Criminology (AIC).

Law enforcement agencies have traditionally measured success in combating OMCGs through quantifying the outcomes of targeting activities such as arrests, charges, court sentencing, assets seized and forfeitures. However, countries like Australia are increasingly recognising the promising outcomes from programs such as those operating in Scandinavia and the United States, to support individuals to leave crime gangs and influence the development of pro-social behaviours (Pyrooz, Weltman & Sanchez, 2019; Roman, Decker & Pyrooz, 2017).

The investment into the development of programs for any individual engaged in criminal activities is significant, so it is crucial that these programs are based on the best available evidence to ensure the biggest impact. Existing research which discusses factors why people join gangs largely relates to youth gangs and delinquency – and shows that males from disadvantaged backgrounds, who are disengaged from education (Higginson et al., 2018; Raby & Jones, 2016), have troubled personal relationships (Raby & Jones, 2016; Windisch, Simi, Ligon & McNeel, 2016), and who have substance use and/or mental health issues (Calderoni et al., 2019) are more likely to be engaged in offending in a group or gang. But do the same factors that apply to youth also hold true for adults who are recruited into an OMCG?

Likewise, existing research examining why adults leave OMCGs in western countries align predominately with life course criminology which identifies age, and significant events in a person's life as being most influential factors in their decision to stop offending (e.g. Boxer, 2019; Decker, Pyrooz & Moule, 2014; Roman et al., 2017). But is leaving a criminal gang the same as stopping offending?

Due to seeking to understand the reasons why adults join or leave OMCGs in the Queensland context, we commenced a piece of research to inform the development of an exit program for Queensland OMCGs and a range of prevention initiatives at key intervention points. The purpose of this research is to: 1) inform national law enforcement about the factors influencing both recruitment into and disaffiliation from OMCG; and 2) inform the development of prevention and exit program strategies for the Queensland context.

Research Project

Prior to the commencement of the research we conducted analysis of the criminal histories of OMCG members who had 'disaffiliated' and found that offending changed both in volume and in harm following leaving a gang. To better understand why this was occurring, our research uses interviews with disaffiliated OMCGs to examine the factors that influence individuals to join OMCGs, to understand what their lives were like while they were in the gang, and the factors which influenced them to leave. We also ask respondents what advice they would give to a person who is considering joining a gang – which to date is overwhelmingly: 'DON'T – it's not what you think it is'.

An intentional decision was made to not ask about any offending either before, during or after leaving the gang as this wasn't the focus of what we wanted to know – and we also avoid an ethical minefield. The key focus is understanding why ex-OMCG members have decided to become members of OMCGs and what factors influenced them to leave to help identify the key intervention prevention points, and the ideal composition of an exit program.

Approach and Considerations

The division of roles for the study included unsworn researchers from the QPS Intelligence Command to design and manage the research, with sworn members (who had experience in interacting with OMCG members as complainants, witnesses, and offenders) to conduct the interviews. An option was also given to respondents to elect to have a phone interview with an unsworn researcher.

The melding of police practice with researcher practice posed some challenges that had to be worked through. The considerations included:

- 1. How would risk associated with contacting some ex-OMCG members be assessed?
- 2. How would the ex-OMCG members be approached?
- 3. Where would the interviews take place (e.g. the home of the respondent and if there are circumstances where this would not be a suitable option)
- 4. How would safety concerns or other issues be documented and reported?
- 5. What if the respondent is intoxicated?
- 6. Would a second officer accompany the interviewer (as part of usual police practice)?
- 7. Would the interview be recorded?
- 8. How would the respondents' answers be captured?
- 9. Would the officer be armed (as per usual police practice)?
- 10. What types of 'flags' would deem the respondent an unsuitable/ unacceptable risk?
- 11. What would occur if the interview situation became risky immediately before or during?
- 12. What if concerns were raised for the respondent by conducting an interview with them?

The key methodological and research protocol elements that were agreed upon by the Ethics Committee were:

- 1. One experienced and research-interview trained Detective would conduct all interviews, unless the respondent requested an interview with an unsworn researcher by telephone.
- 2. The PhD qualified researchers are responsible for all aspects of the research including training and selection of interviewers, checking all interviews and providing guidance if required to the interviewer, secure storage of all data, and reporting to partners and ethics committee.
- 3. Full risk assessments are to occur prior to contacting all potential respondents.
- 4. The last known phone number recorded for the person is used to make contact.

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- 5. The approach to the prospective respondent involves the Detective explaining the research, who is involved, what is involved including the types of questions, anonymity, confidentiality and what the data will be used for, the voluntary nature of the process and how consent will be sought. The respondent is also informed that the research does not involve any discussion about offending. During this phone call, the respondent is asked if they are interested in being involved in the research and if they agree a date, time and place to conduct the interview are set.
- 6. Prior to the interview a further risk assessment is conducted, and confirmation of the scheduled interview occurs.
- Before the interview commences, the information and consent process are completed and if the respondent has agreed to having the interview recorded – their consent is verbally captured.
- 8. Following the interview, the interviewer asks the respondent how they are feeling after the interview, and if any anxiety is disclosed referral options are discussed. Likewise, a follow up phone call will be made with the respondent.
- 9. The interviewer returns to the office to listen to the recording and/ or transcribe notes into the data capture tool on the QPS secure server.
- 10. The centralised record of the interviews is updated to reflect completion of the interview, provision of recording to researchers and entry of data completed.
- 11. The interviewer meets with the chief QPS researcher at the end of every interview to debrief.

Interview Process and Response

The interview is semi-structured with an emphasis on steering respondents through the questions, asking clarifying questions and prompting the respondent, if required. This conversational style has worked very effectively with this cohort of respondents given the expected reluctance to disclose. The interviewer's natural and open communication style elicits trust and develops rapport quickly and easily. Importantly our interviewer understands the OMCG culture and skilfully steers respondents through the interview questions with connecting comments and anecdotes. These skills, experience and knowledge are crucial for the success of the interviews.

The response rate for the interviews, to date, is higher than anticipated with 30 completed interviews. Respondents have been eager to talk about their personal stories while addressing the interview questions. Further, most respondents have agreed to their interview being recorded. To date, a small number of respondents approached have declined the opportunity of an interview due to various questions including ill health and not wanting to revisit a closed chapter of their lives.

Initial Findings: Themes

Initial findings reveal that the reasons explaining why Queensland OMCG members join and leave gangs are different from the reasons discussed in the existing overseas research. This highlights the importance of conducting research in the local context to inform appropriate evidence-based prevention responses.

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STRATEGY AND TACTICS INTELLIGENCE AND COVERT SERVICES COMMAND (ICSC) As the study is ongoing, preliminary findings indicate that there could be two distinct groups emerging. We coin these as the 'older' and the 'younger' OMCGs. Some of our older cohort have indicated they joined an OMCG after establishing their lives (qualifications, jobs, businesses and often family) and were attracted to the 'brotherhood' and bikes and culture of comradery. Whereas our young cohort have indicated their motivations to join an OMCG relate to their perceived 'image' of a gang member and attraction to culture of violence, the 'income', the steroids and attempting to increase their attractiveness to women. Interestingly many of the younger cohort also have jobs or businesses before joining, and many are recruited because they can offer something to the club.

In terms of reasons for leaving the gang, recent changes in Queensland legislation is one emerging theme along with high levels of dissatisfaction with the way the club is run, and dislike of activities members are expected to be involved with. In some instances, family conflict has played a role in persuading disaffiliation. Very rarely is only one reason for leaving given, which suggests disaffiliated OMCGs in our study weigh up the pros and cons of staying versus leaving. In some cases this involves consideration of what disadvantages are associated with continuation, including penalties, restrictions or other consequences and impacts.

While it is still too early to determine what the key intervention points are and what might work best at these points to disrupt or prevent OMCG membership and involvement, our findings to date highlight that it is important to understand the local context and environment when designing intervention programs and initiatives to achieve the strongest prevention impact.

It is expected that data collection will continue until January 2020, with key findings published with our research partners AIC Serious and Organised Crime Research Laboratory (SOCR-Lab) in the form of AIC Trends and Issues papers.

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Using Evidence-Based Research to Select Effective Covert Office



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Selecting Believable Covert Police

Abstract

In Australia and many jurisdictions around the world, police use deception to gain intelligence, to prevent offences from occurring. and to solve crimes. Where deception is used, the risks to the investigation and to the safety of police officers increases, especially for undercover operatives and teams managing informants, as fictitious stories exposed by suspects could lead to retaliation against police. Success in covert fields relies on the believability of police in fictious roles, yet the effective use of deception in covert fields of policing and criminal interviews remains relatively underexplored in the literature and in everyday practice. Current selection processes for police assigned to these areas do not include tests to identify effective 'liars', as standardised, reliable tests do not currently exist. The current research investigates lie- and truth-production ability of three groups (84 university students, 50 Australian police officers-in-training, 53 experienced covert police officers) by exploring their deception and their personality. Importantly results indicate that neither sex nor age are indicators of believability as a storyteller, supporting broader organisational aims for fairness in selection and cultural change. Further, undesirable traits such as Machiavellianism also have no relationship with either truth or lie production. Other results indicate extraversion. social skills. sentimentality and diligence are key to deception success. Implementation of deception capability tests prior to training provides police with an evidence-based, low-cost method of improving operational safety and effectiveness, thereby reducing exposure of covert training, methodology and assets.

Success for operational police is no longer purely assessed on the number of arrests. Instead the emphasis is on detection, prevention, and disruption as well as prosecution of offences. Criminals have been educated via our court systems to restrict the amount of evidence they leave behind; they use gloves, they don't speak on phones or communicate via emails; instead, they meet in person. Therefore, to obtain information or intelligence regarding planned criminal activities, police need insider information, and/or people who can attend faceto-face meetings with criminals.

Undercover operatives, human sources handlers, surveillance officers and witness protection officers are all covert officers; that is, law enforcement officers who use assumed identities and cover-stories to protect their real identity and/or to protect others who are gaining information from criminal entities. To be effective, covert officers must be believable in any story they tell, as their own life, and the life of others, may depend on it. Covert officers are usually chosen via numerous and rigorous selection tests, yet currently, a non-subjective test of believability or deception ability is not included. This omission represents not only a risk to the covert officer and their police and civilian colleagues, it also represents a risk to organisational reputation and a massive cost to the agency. Successful applicants undergo extensive training and are exposed to covert methodology and capabilities; however of those who pass the course, a number are not ever used, often without reason, and at times based on a trainer's (subjective) assessment of the risk of deploying them being too great. Including an objective test of believability within the selection process prior to training, would reduce exposure of covert systems and would ensure a good fit between people and covert roles (for more information regarding selection processes regarding police and witness protection officers see Semrad & Scott-Parker, 2018; Semrad, Vanags, & Bhullar, 2012).

The process of ascertaining what makes people believable when they lie or when they tell the truth, was explored via a systematic literature review (Semrad, Scott-Parker, & Nagel, 2019a) which identified that research conducted regarding deception was limited, the methodology unreliable, and the findings varied. The overarching issue was the lack of alignment between a definition of deception and the research operationalisation of deception. Deception as defined by most scholars is an act, without notice, vet purposeful. not requiring words or success, which transmits false information to another person, which the storyteller knows to be false (Vrij, 2002; Zuckerman, DePaulo, & Rosenthal, 1981). However, research under the banner of deception often examined opposing opinions (Riggio, Tucker, & Widaman, 1987), or people lying to a mirror or video camera (Lloyd, Summers, Hugenberg, & McConnell, 2018). Further, theoretical associations between deception ability and negative personality traits such as Machiavellianism, narcissism and psychopathy, known as the Dark Triad (Paulhus & Williams, 2002), were not only mixed, but also led to concerns regarding the types of police officers that might be selected (Semrad, Scott-Parker, & Vanags, 2019). Also, test results regarding the associations between abilities and personality traits often conflicted; such as correlations between deception capability and Emotional Intelligence (EI), and findings regarding deception capability and some of the broader personality traits found within the Big Five (Semrad, Scott-Parker, et al., 2019a).

Issues regarding methodology

As both lie production and lie detection are assessed by people, to move an evaluation of 'effective liar' from the subjective to the objective, a number of judges need to reach blind consensus. Also, as well as genuinely being a lie, the situation in which the lie is being told needs to be realistic and reflect the real-world application of the research. The issue for research regarding covert operatives is finding a balance between realistic scenarios where one person is lying to other people, and testing the same story and circumstances with many people. Other methodological issues surfaced regarding the types of questions asked; while unscripted is realistic, set questions provide research stability and test-re-test validity; diversity of the participants in sex, age and experience is also required; and the relationship between the participants, whether known or unknown to each other, should be documented. Another research issue is the motivation and importance of being successful in a lie (Pardo, 2018). A university student participating in research is unlikely to be as motivated to be believed as is an undercover operative negotiating with a drug dealer. Also, the researcher's instructions need to be consistent, for example, 'please indicate as many lies as you can' is very different to 'please indicate as many lies and truths as you can'. Subsequent results will see fluctuations in response bias. While these issues and others were considered in the design of each experiment, there is no definitive 'best practice' for deception research. Based on the studies identified in the literature review, and a reinvigorated theory that good liars are also good lie detectors (Wright, Berry, & Bird, 2012), which would be particularly relevant to covert police officers, research regarding selection processes based on personality traits and skills and abilities commenced.

A larger program of research exploring liar believability

The first study used an adapted version of the Game of DecelT (Wright et al., 2012) to compare the deception ability of 84 university students to their personality traits, skills and abilities, as tested by the theories (measure; author) of the Dark Triad (Short D3; Jones & Paulhus, 2014), El (MSCEIT; Mayer, Salovey, & Caruso, 2002), Big Five (HEXACO; Lee & Ashton, 2004). The guestions used in the original Game of DecelT were not published, therefore the first author developed the questions for this study (see Semrad, Scott-Parker, Paterson, & McCann, 2018 for the 12 questions) based on the research regarding the relationship between emotions and leakage theory (Porter, Brinke, Baker, & Wallace, 2011). The Game of DecelT has participants sit together in a large circle. In turn, each person has a turn at drawing a guestion card and telling a story (truth or lie is pre-determined by the card drawn), while the remaining circle members act as lie detectors. The advantage of the game is the ability to compare a participant's lie production score with their lie detection score. A strength of this study was that, by and large, the students were not known to each other, which is more aligned with covert practices when deception is used. Results from Study 1 revealed that:

- the ability to lie successfully is not related to the ability to detect lies (additionally, the skills were underpinned by different traits);
- lie detection accuracy was 48.3% (less than chance at 50%);
- · lie production ability is not related to sex or age;
- lie production ability is not related to El;
- lie production is only related to the Dark Triad trait of narcissism; and
- lie production is related to traits within the HEXACO domains of Honesty-Humility; Extraversion and Openness to Experience.

Together the results correspond with polygraph research (lacono & Ben-Shakhar, 2019) and a meta-analysis of lie detection research (Bond & DePaulo, 2008) which examined more than 200 studies, which identified that there are no reliable and consistent measures of deception. Simply put; humans can not accurately detect lies. Therefore, the research project discarded further lie detection analysis and focused solely on deception production (or storytelling), which is more accurately separated into 'truth production' and 'lie production', as covert operatives need to be believed whether they lie or they tell the truth.

The second experiment used the same deception test (DecelT; Wright et al., 2012) and the same personality trait, skills and ability measures (Dark Triad, El, HEXACO); however used different participants; this time 50 Australian Federal Police (AFP) recruits (Semrad & Scott-Parker, 2019). Importantly, AFP recruits are a subset of the general population, chosen through a selection process, and therefore more likely to be indicative of the general policing population from which covert operatives are chosen. However, as the AFP recruits were classmates, they were known to each other to varying and unknown degrees. Results with police recruit participants revealed that:

- the ability to lie successfully is not related to the ability to detect lies (additionally the skills were underpinned by different traits);
- production (truth and lie) is not related to sex or age;
- production (truth and lie) is not related to El or any Dark triad traits; and
- lie production is associated to traits within the HEXACO domain of *Extraversion*.

The results support the previous university student findings regarding the HEXACO, while the null findings regarding EI and Dark Triad measures advocated their removal from further testing. Two measures which further explore earlier findings regarding extraversion and credibility (Sociability/Extraversion; Ivanova, 2016; Ethos/Credibility; McCroskey & Teven, 1999) were added. Additional alterations to the experiment methodology focused on the deception test which reduced 12 questions to 6 (see Semrad, Scott-Parker, Nagel, & Vanags, 2019 for full questions), and utilised an independent person to ask all the covert operatives the same questions. Also, only the covert operative and the independent person were in the room at the time of the video-recorded interview.

This third and final experiment (Semrad, Scott-Parker, Nagel, et al., 2019) separated out the roles of storyteller and lie detector by using two different groups; Group 1, the storytellers, comprised 52 AFP officers with current or previous covert experience; Group 2, the lie detectors, consisted of 111 university students and members of the general public who watched the video interviews of Group 1 'storyteller' participants, unaware that they were real police officers. Also, although 'lie detectors' still assessed stories as lies or truth, the overall ranking was assessed as believability. Results revealed that:

- believability is not related to sex and generally not related to age (see Police opinions below);
- there was no difference in believability ratings made by university students, compared to members of the general public;
- people who are believed when they tell the truth are also believed when they lie;
- believability is based on high scores in traits within HEXACO domains of Honesty-Humility, Extraversion, Emotionality and Openness to Experience;
- believability is related to the Ethos/credibility measure of Competence; and
- believability is negatively associated with *talkative* people, such that people who spoke excessively were believed less.

Police opinions

Interestingly, although generally there were no differences in age scores, there was a difference for the lie production version of the question 'Is circumcision child abuse?', where, not unexpectedly given the drastic reduction in the number of circumcisions conducted in Australia over the past three decades, the older the participant, the less likely they were to believe that circumcision was child abuse. This result led to the examination of the opinions of the 53 covert police officers across all six opinion questions (Do you like to fly?, Do you have a dog?, Is circumcision child abuse?, Should Australia have a death penalty?, What is your favourite holiday experience?, What is your favourite meal?). While most results were unsurprising, another significant and interesting finding was that 81.1% of the group were opposed to capital punishment, which was contrary to not only to police in the United States of America, but also police in the United Kingdom, both of whom support the death penalty (Fielding & Fielding, 1991: Hughes & Robinson, 2013). Even more interesting was the comparison of opinion between AFP covert officers and the university participants, who opposed the death penalty (72%), and the AFP police recruits who supported the death penalty (58%) (an analysis of the opinions and the corresponding personality traits are detailed in Semrad, Scott-Parker, & Nagel, 2019b).

Conclusion

This larger, multi-year research project examined the personality traits underlying truth and lie production to establish the basis of believability. Results across three experiments produced consist results indicating that people high in Honestly-Humility, Extraversion, Emotionality, and Openness to Experience are likely to be more believable than people low in the traits. This testing not only provides face-validity as it provides a fair and robust selection test to be added to any current recruitment process, but also impacts on retention of the best-suited officers for the role, thereby supporting organisational objectives of equity and accessibility. Current fiscal and political challenges mean that organisations are required to act efficiently and with caution. The implementation of tests which select officers based on their believability, prior to attending training and being exposed to covert methodologies, equipment and assets, would provide police with an evidence-based, low-cost method of improving operational safety and effectiveness. Further, the lack of sex-based differences regarding believability has contemporary implications and is vitally important in particular to police forces who are actively seeking to obtain sex-balanced employment opportunities to reflect the community they serve. Future research should expand testing to include other professions requiring believability such as lawyers, military leaders and salespersons. As with all testing, greater numbers of participants would strengthen the findings.

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The Geography of Darknet Drug Importation in New Zealand: Evidence from recent operations

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Abstract

Despite efforts by enforcement agencies around the world to curb the growth of the online drug trade taking place via the anonymous 'darknet' platform, its use continues to increase. Understanding the 'demand' side of darknet drug trade is critical to ensuring that enforcement and prevention efforts are evidence based and thus more likely to be effective. The present paper aimed to add to this understanding by focusing on one of the more tangible aspects of this trade: where the drugs are delivered. We used Police administrative data from two recent operations to investigate the choices made by those suspected of importing drugs into New Zealand from the darknet, focusing on the shipping name and address for delivery. Consistent with rational choice and routine activities explanations of crime location choice, the data revealed a strong preference for home delivery, with a minority of suspects, typically those importing supply level quantities, using addresses and names through which they could not be traced. These key findings are supplemented with other insights into the age, criminal history and decision-making of importers available from the data.

This study makes several novel contributions to the wider literature on cybercrime. It is the first to use police administrative data on imports and transactions, thereby enabling a point of contrast or corroboration with previous self-report based studies of darknet users. It is also the first to analyse darknet drug importation at the micro geographic (specific address) level, and to set the analysis in the context of environmental criminology theories. As seen in many other criminal domains, the location choices made by those importing drugs via the darknet reveal consistent patterns, explained by these theories, which can help inform investigative and prevention-oriented strategies.

Keywords

Drug importation, darknet, environmental criminology, geographic analysis

Introduction

In the past few years NZ Police have conducted several operations involving the investigation of importation of illicit drugs into NZ via darknet marketplaces. It is apparent from these operations that the volume of darknet drug importations is high, involving street values in the millions of dollars, and increasing. Importations are typically identified in one of two ways: when packages containing drugs are intercepted by Customs, or when information is received from overseas law enforcement agencies containing the details of darknet marketplace transactions where drugs have been shipped to NZ addresses.

The information collected during these operations on the locations of the shipping addresses, and the offenders involved, presented an opportunity for research to better understand how and why offenders select the shipping addresses. This understanding could then inform the development of prevention and investigative strategies, in the same way that understanding 'traditional' offline offenders' spatial choices helps target prevention activities and investigations (Brantingham and Brantingham, 1981; Rossmo, 2000).

Previous literature and research questions

The existing literature on darknet and cybercrime does not appear to have looked into this micro geographic level decision making about importation locations. First, there are studies describing macrogeographic darknet drug trade patterns, identifying country to country and domestic trafficking flows from the "ships from" and "ships to" countries listed in advertisements for drugs (e.g. Broséus et al., 2017; Dittus et al., 2018; Dolliver et al., 2016; Martin et al., 2018)

Second, there is literature discussing or testing the ability of environmental criminology theories - routine activities theory (Cohen and Felson, 1979), rational choice theory (Cornish and Clarke, 1986), and crime pattern theory (Brantingham and Brantingham, 1981, 1991) - to explain cybercrime. This literature has focused on cybercrimes involving victims, such as hacking, ransomware, fraud and scams, identity theft, stalking and cyberbullying

(e.g. Bossler and Holt, 2011; Choi, 2011; Leukfeldt and Yar, 2016; Miró Llinares and Johnson, 2018; Williams, 2016), Several studies have considered darknet market based activities from an environmental criminology perspective, applying routine activities theory to illegal gambling (Choi, 2018) and using crime script analysis to identify the stages and activities involved in the stolen data market (Hutchings and Holt, 2015) and the sale (rather than purchase) of drugs (Lavorgna, 2014). However, in all the above studies, the focus is on online space as a setting for offenders and victims to converge, the routine online activities of victims and offenders which lead to increased risk of victimisation or offending, and capable guardianship in the form of cyber-security measures.

Even when offline spatial elements of cyber offences have been considered with reference to these theories, this consideration has been limited to macro geographic levels or other types of cybercrime. For example, differences in countries' regulations, security and demographics make some countries more attractive or less capably guarded than others as targets (Miró Llinares and Johnson, 2018; Williams, 2016). At the micro level, physical proximity is reflected in online social networks and connections, which may facilitate the spread or contagion of cybercrimes such as malware through email chains, sexting or cyberbullying (Miró Llinares and Johnson, 2018).

Lastly, there are several studies describing darknet drug purchasers' behaviour based on surveys (Barratt et al., 2016a, 2014), interviews (Barratt et al., 2016b; Ormsby, 2016; Van Buskirk et al., 2016; Van Hout and Bingham, 2013a), case studies (Horne et al., 2015; Van Hout and Bingham, 2013b) and anecdotal sources (Afilipoaie and Shortis, 2015). But these make no reference to theory, and they do not quantify the prevalence or determinants of consignment location choices.

The choice of delivery address when importing drugs via the darknet, and what this choice can indicate about the offender. is thus an under-researched topic of both theoretical and operational significance. The present study therefore aimed to explore the limited available data on darknet drug importation in New Zealand to provide initial descriptive answers to these broad research questions:

and operation

100%

90%

80%

70%

60%

50%

40%

30%

20%

10%

0%

0

28

- I. What relationship is there between darknet drug consignment addresses and the home address or other addresses offenders are associated to (that are known to Police)? Is this relationship consistent with that found for 'traditional' crimes and explained by relevant environmental criminology theories?
- Ш What other factors are associated with darknet drug importers' selection of the address for shipping their purchases?

Method

Data

This research used a combination of quantitative and qualitative data. Spreadsheets from relevant operations collated by the National Organised Crime Group and High Tech Crime Group provided details of importations. Operation A data included records of customs intercepts of drugs destined for NZ addresses, logged in 2016 and 2017, these were not necessarily from the darknet. Operation B data included darknet drug purchase transactions from 2016 to mid-2017, with NZ delivery addresses, that a foreign police agency had sent to Police for investigation. It included transaction details such as purchaser's username, and the name and address for deliverv.

This information was supplemented with data from the National Intelligence Application (NIA) in relation to suspects identified for the intercepts/transactions, including: home and other associated addresses, criminal history and demographics (age, gender). During each operation, police conducted door knocks at the delivery addresses and the addresses of suspectsⁱ identified through initial investigations. These visits aimed to identify or confirm suspects for the imports, and included intelligence interviews with those who were willing, to collect information about their MO and decision-making using a structured guestionnaire. The intelligence interview data was anonymised and made available to the research team to supplement analysis of the quantitative data.

Data coding and analysis approach

Consignment addresses and names for the imports were coded based on their link to the suspect(s)ⁱⁱ. The addresses were categorised as: home or neighbouring address, family or friend's home, workplace, PO Box or no (apparent) link. The names were categorised as: own name, part of their name, family or friend's name or no link. Imports were also coded as either for personal use or supply based on thresholds specified in the Misuse of Drugs Act 1975. Suspects were coded as suppliers if the total amount over multiple imports was supply level. The distances between suspects' home and other addresses and the consignment addresses were also calculated.

Analyses included descriptive statistics and bivariate tests of relationships between import, address/name link and offender variablesⁱⁱⁱ. The intelligence interview data was thematically analysed using a grounded theory approach (Glaser and Strauss, 2004).

Results

The imports and suspects

There were over 300 imports in each of the operations' datasets. Suspects were identified for 60% of Op A imports and 88% of Op B imports, resulting in 141 Op A suspects and 47 Op B suspects.

As shown in Figure 1, about 70% of Op A suspects had only one import (that we know

Figure 1 Number of imports per suspect for each operation



Figure 2 Drug types¹, and quantities imported, by operation

% of imports per drug type and quantity



of from its interception), with 8 per suspect at most. Op B (all darknet) had more imports per suspect, with 4 suspects having over 20.

As Figure 2 illustrates cannabis was the most frequent drug in the Op A data, usually imported in personal-level quantities (although the threshold for supply is very high). This may be a result of higher Customs detection rates for cannabis, and the use of more readily accessible clearnet sites for purchasing cannabis (as apparent from the intelligence interview data).

MDMA was predominant in Op B, partly due to the highest frequency suspect with 70 imports of MDMA, which were almost all supply level. These were comparable proportions per drug type to those reported by surveys of darknet drug purchasers (Barratt et al., 2016a; Carpentier, 2018; Van Buskirk et al., 2016).

Of the suspects, 33% from Op A imported supply quantities, compared to 55% from Op B. Most suspects imported only one drug type (Op A 91%/Op B 66%); more suspects in Op B imported a range of drugs. There were age differences between the two groups with Op A suspects being older (17% under 20, 44% over 30) and Op B suspects younger (32% under 20, 17% over 30).

In both operations, almost half the suspects had no prior offences, about a fifth had prior drug offences, and half had prior non-drug offences

We checked for relationships between quantity imported and age and criminal history and only one emerged. For Op B those importing at supply level were significantly more likely to have a prior offence (69%) than personal importers, only 38% of whom had a prior offence, X^2 (1, N = 47) = 4.56, p < 0.05. Surprisingly, suppliers were just as likely to have a prior drug offence as personal level importers. There was no significant association between supply level and age for either operation.

Consignment name and address choices and associated factors

The vast majority of suspects used either their own address, own name, or both for at least one import. For Op A, 94%/91% of supply/ personal level suspects used and both an address and name they had some link to for at least one import. These proportions were lower for Op B (81%/62%), the darknet importers. The relative proportions of suspects per consignment address and name link type are displayed in Figure 3.

A significantly higher proportion of Op B suppliers used an address to which they had no apparent link for at least once (42%), by comparison to personal level importers (5%), X^2 (1, N = 47) = 8.61, p < 0.01). For both operations, there were significantly higher proportions of suppliers (A: 15%, B: 50%) with at least one import to which they had no name link, than those importing for personal use (A: 5%, B: 19%), A: X² (1, N = 141) = 4.82, p < 0.05; B: X2 (1, N = 47) = 3.94, p < 0.05.

There were very few significant relationships between address/name links and age or criminal history, and only in Op B. For Op B, suspects who used an address to which they had no link were more likely (than those who didn't) to have prior offences $(83\% \text{ vs } 46\%), X^2 (1, N = 47) = 5.12, df =$ 1, p < 0.05. Likewise for names, 82% of those who used an unlinked name had prior offences, compared to 40% of those who never used an unlinked name, X^2 (1, N = 47) = 7.87, p < 0.01. Similarly, those who used a linked address and name were less likely to have prior offences than those who didn't (45% vs 79%), X^2 (1, N = 47) = 4.36, p < 0.05). These results are not surprising given offending history was related to importation level and importation level was related to choosing locations with no apparent link. To summarise, Op B's suppliers, who tended to have more prior offences, exhibited a higher degree of precaution in their location and name choices. Critically though, the majority

Figure 3 Percentage^{iv} of suspects with at least one import per address (left) and name (right) link type



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Figure 4 Frequency of furthest distance between home and shipping address, by drug quantity

Maximum distance from home to any consignment



still had some link to either the name or address for at least one import.

Calculating the distances between consignment addresses and suspects' addresses (home or other associated address) painted a consistent picture. Given the dominance of home as the choice of delivery location, there were very few instances where home wasn't the closest address to the consignment location.

This means there was no 'buffer zone' of fewer offences close to home as seen for other types of crime (Rossmo, 2000). As displayed in Figure 4, Op B suppliers were more likely to have used consignment addresses at least a small distance from home than personal level importers. Figure 4 excludes three outlier with distances above 100 kilometres; in those cases the consignment addresses were co-offender's or family's homes.

Other choices involved in darknet drug importation

The intelligence interview data provided some additional insights into the choices involved in darknet drug importation.

There were 39 interviews for Op A, and 11 for Op B. Caveats apply given these small numbers and the context in which such interviews take place: the results should be taken as tentative and not necessarily representative of all darknet importers.

Thematic analysis of free text responses to the question 'why online?', identified decision-making factors relating to effort, risk and reward consistent with rational choice theory. The themes identified, and mentioned in at least two interviews, were:

- perceived lower risk of detection and greater anonymity by comparison to purchasing offline ease/convenience of purchasing online
- lack of knowledge of where to access offline
- price, with online being cheaper (by comparison to street prices which tend to be higher in NZ than other countries)
- personal safety, by comparison to dealing with gangs
- higher quality of the drugs available online
- being motivated by testing the system to see if it would work, as its own reward.

Other choices covered by the interviews included whether importers also used the clearnet for purchasing drugs, their payment methods and, for Op B only, how they chose the delivery address. The vast majority of Op A suspects used the clearnet, predominantly but not exclusively for cannabis. Op A suspects also tended to pay by credit card or paypal type transfers, meaning that there would be electronic records of their payments more easily traceable via bank records than bitcoin, which was always used in Op B's darknet transactions.

The few Op B interviewees who discussed how they chose the delivery address mentioned considering alternatives such as PO Boxes, friends' or fake addresses, but that these options were too expensive or not worth the risk of not receiving the product. Although these qualitative insights are based on just a few cases, they paint a consistent picture to the quantitative results: most drug imports, be it from clear or darknet, are purchased by people who could be traced via the consignment name or address, but the risk of detection is perceived as very low.

Discussion

Taking advantage of the availability of two administrative datasets with records of drug imports into NZ, this research provides insight into the decisions of importers, particularly in relation to their choice of delivery address, and the investigative and preventative opportunities that these choices reveal.

Our results were, in the main, consistent with descriptions of darknet drug purchasers' demographics and motives reported in previous interview and survey studies, and with theories of environmental criminology explaining location choice in other criminal contexts.

The characteristics of suspects for Op B in particular appear in line with international cohorts. Surveys have also found that darknet drug purchasers tend to be younger than non-darknet drug users, perhaps reflecting generational trends in use of this technology (Barratt et al., 2014: Van Buskirk et al., 2016). Poly-drug use, as seen in the Op B sample, was also reported as more common amongst darknet than non-darknet users in an Australian study (Van Buskirk et al., 2016). The same study reported recent histories of property crime and drug dealing for 31% and 45% of darknet users, though it is difficult to compare these self-report past-month figures to our life-time measures based on Police records. Future research could look at more recent offence records, to enable such comparison and help investigations by identifying more detailed criminal history profiles

Answering our first research question, there's evidence of rational choice (Cornish and Clarke, 1986) related calculations in the decision making of darknet and other online drug purchasers', including in the frequent decision to have the drugs delivered to a home address. Consistent with overseas surveys of darknet drug purchasers' motives for purchasing online (see Europol, 2017 for a summary), convenience, safety and quality factored into this NZ cohort's decisionmaking. In accordance with routine activities (Cohen and Felson, 1979) crime pattern theories (Brantingham and Brantingham, 1981, 1991), the home 'node' was by far the most frequent consignment location choice, and when it was not home there was a 'distance decay' pattern consistent with other studies of distance from home to crime.

Further, the distance outliers were often the home of a co-offender or family member, and therefore still within the offender's 'awareness space'. The lack of a buffer zone was striking. In the case of online drug importation, the convenience of home delivery appears to outweigh considerations of detection. Other means of placing distance between the offender and the consignment address, such as using a fake or partial name may be compensating for the lack of geographic distance.

On the second research question, we found associations between consignment location choices, the quantity being imported and the criminal history of suspects (for Op B). Those importing larger quantities were more likely to have criminal histories and to have used delivery names and addresses to which they had no apparent link, with those addresses therefore being further away from home.

As already alluded, our results have practical implications for police and other enforcement agencies. The tactics used in the present operations are promising; door knocks at consignment and neighbouring addresses may identify even some supply level offenders. These should be done promptly. It was apparent from the data that delays between the detection of the imports and the door knock operations meant that in some cases suspects had moved on and could not be traced. When offenders cannot be traced through the consignment address or name, geographic profiling (Rossmo, 2000; Rossmo and Velarde, 2008) could be applied to prioritise searches for suspects and packages for customs checks. Prevention efforts could include messaging to increase perceived risks, particularly assumptions about online anonymity and the chances of detection.

These recommendations are subject to caveats due to the methodological limitations of this study. First, the two datasets were not random samples but ones of convenience, though contrasting these datasets from two different sources provided some corroboration. However, both datasets suffer from selection bias as it is likely that Police were more likely to identify suspects if they used a linked address or name. The proportions of linked names and address are therefore likely to be overestimates. Given the high number of imports for which suspects were identified, however, even if all remaining imports involved the use of unlinked addresses and names, the linked proportion would remain high and our conclusions would stand.

Further, as mentioned above, the intelligence interviews, while standard police practice for collecting information about offenders' modus operandi for operational purposes, were not research interviews designed and conducted in a way to minimise selection and response biases. They can only be interpreted as indicative of some of the factors informing darknet importation choices, not comprehensive, conclusive or completely representative of all importers.

Future research could help to confirm our findings. Bigger datasets may exist in other jurisdictions which would enable more robust, and detailed, analysis. This might include more granular analysis considering specific drug types, a wider range of criminal history variables, and how address choices evolve over time as offenders potentially escalate from personal to supply level (as evident with some suspects in our sample).

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Questions about consignment address and name choice could be also included in future interview or survey studies with larger samples.

Conclusion

Despite high profile takedowns of darknet drug marketplaces, their use as an alternative means for purchasing drugs continues to increase (Europol, 2017; Van Buskirk et al., 2017). Understanding the decisions and behaviours of those importing drugs via the darknet could help enforcement agencies address this issue from the 'demand' side. This research has contributed to improving this understanding, particularly in relation to importers' decisions about where to have the drugs sent. In revealing the (somewhat) rational calculation to use traceable consignee details in the majority of cases, this research highlights opportunities to address demand through swift investigation and increasing the (perceived) risk of online importation. Further research in this new domain for environmental criminology is encouraged, to help identify additional opportunities to support investigative and preventative policing efforts.

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End Notes

- The term suspect is used in preference to offender in this research to reflect the fact that although there were multiple sources of evidence implicating the person's involvement in the import, they had not always been recorded as an 'offender' in the NIA database.
- ii. In the handful of cases with multiple suspects co-offending, import addresses and names were coded as linked to a suspect if they were linked to any of the suspects, but only one suspect was included in the analysis of suspect level variables (age, criminal history, distance to home, etc)
- iii. The sample size was too small for multivariate analyses
- iv. Percentages add to more than 100% as some suspects used different addresses/names for different imports.



Exploring Police Demands for Violent Behaviour on State of Origin Game Nights

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Abstract

Since its inception in 1980, the popularity and engagement with State of Origin has grown to become one of the key events on the Australian sporting calendar. The heightened competitive environment associated with the State of Origin series is often accompanied with violent behaviour among fans, when compared to standard rugby league season games. In anticipation of an increase in alcohol consumption, crowd disturbances, reported assaults and emergency department presentations, which are commonly reported nationally and internationally following sporting games, Queensland emergency services typically deploy additional staff on State of Origin game nights. Little research, however has explored the relationship between State of Origin game nights and trends in violent behaviour (such as assaults and domestic violence) in Queensland. Using police calls for service data and police reported offence data, the presentation explored the effect of game nights on assaults and domestic violence in Queensland, and the influence of game outcomes on policing demands. The findings of which have informed strategic decisionmaking of police resources on State of Origin game nights.

Introduction

The State of Origin is an annual, best-of-three, National Rugby League (NRL) football series, played between the Australian States of New South Wales (NSW) and Queensland. It is generally played at stadiums in NSW or Queensland's State Capital, and unlike other NRL games, is typically played on a Wednesday night. Almost 40 years since its inception, it has arguably become one of the largest sport followings in the country (Dimitrov, 2008) and is often accompanied by player and spectator violence and the use of emotive, war-like or militaristic reporting language by media outlets (Hutchins, 1997).

With regards to the relationship between sport and spectator violence, there is a general consensus in international studies supporting a relationship between contact sports and violence (see Abudato, 2015; Card & Dahl, 2011; Kirby, Francis & O'Flaherty, 2014; Ostrowsky, 2014). Across most studies, the consumption of alcohol remains a consistent factor in sport-related violence and as such its effect should be considered in conjunction with the sport-violence nexus. Factors such as use of illicit substances, associating with deviant peers, weather and other social or psychological factors are also believed to contribute to the relationship between sport and violence, making the relationship multifaceted rather than strictly causal (Adubato, 2015; Ostrowsky, 2014; Scholes-Ballog et al., 2015).

Further, when discussing sport and violence, the culture surrounding team sports such as football is often commented upon (Palmer, 2011; Kirby, Francis & O'Flaherty, 2014; Ostrowsky, 2014). The team creates a focal point around which a community can be built, often becoming part of the individual's social identity (Ostrowsky, 2014). The state identity associated with the Queensland team in State of Origin may serve to heighten these relationships. This strong team identification is potentially more likely to produce violence directed against an opposing team (Wann, Peterson, Cothran & Dykes, 2003), and as such, losses, particularly unexpected or 'upset' losses, are therefore likely to provoke a strong negative and violent reaction (Card & Dahl, 2011).



However, there is substantial variation in the conclusions of studies which explore the relationship between violence and sport, particularly in relation to the effect of the outcome on the likelihood of violence. Examination of three different demographics and contact games with comparable features showed an increase in domestic abuse from upset losses in America (Card & Dahl, 2011), an increase in assaults and domestic and family violence (DFV) regardless of game outcomes in the UK (Kirby et al., 2014), and an increase in emergency department presentations from winning in Geelong, Victoria, Australia (Miller et al., 2012). Reasons for this variation in the literature includes varving importance placed on confounding or contributing factors Ostrowsky (2014); and an unwillingness by the public to link DFV with national sports (Abudato, 2015).

Ultimately, the aim of this research is to determine the expected increase in the demands for police in relation to violence on State of Origin nights. Research within Australia has begun to explore the nature of the relationship between State of Origin games and violence. Livingston (2018), for example, analysed recorded incidents of domestic and non-domestic assaults on Wednesday nights across New South Wales, comparing State of Origin game nights and non-game nights between 2012 and 2017. The study found a significant increase in domestic assaults on game nights, as opposed to the surrounding Wednesday nights in which no game occurred. Furthermore, no significant increases in violence were found in Victoria, indicating that the effects identified in NSW were causal. Conversely, using emergency department presentations data from Queensland hospitals, Furyk and colleagues (2012) found a decrease in presentations on State of Origin game nights when compared with non-game nights. While these studies do not consider the impact of game outcomes on violence, these studies do indicate that police demands on State of Origin game nights, and the nature of the relationship between State of Origin and violence, is relatively unknown in the Queensland context.

Present study

The relationship between State of Origin, violence and assaults has not yet been examined using Queensland Police Service (QPS) data. As such this research will examine the relationship between sport and violence in a Queensland context by exploring whether State of Origin game nights are correlated with an increase in violence (assaults and DFV). The research questions addressed are:

- 1. What is the relationship between State of Origin Game nights and violent behaviour in Queensland?
- 2. Which QPS patrol groups does violent behaviours on State of Origin Game nights concentrate?
- 3. Is there a difference in violence based on the following characteristics?
- 4. What game characteristics predict violence on State of Origin game nights?

Taking into consideration the current literature on the relationship between violence and sporting events, it is expected that analysis of QPS administrative data will show an increase in violence on State of Origin game nights, thus indicating increases in police demand. However, it is not known what the impact of the game outcome on violence will be.

Methods

For this research, violence was characterised into two main streams, assaults and DFV. Data was extracted from two QPS administrative data systems: the Queensland Police Records and Information Management Exchange (QPRIME), which records incidents/crime data; and the Queensland Computer Aided Dispatch (QCAD) system, which records calls for service data. This data was linked with game outcomes, created from archived news articles on wins, losses, and predictions for each game. The timeframes for inclusion were 2015 to 2019, only capturing Wednesday evenings (6:00pm) to Thursday mornings (6:00am) during the months May, June and July across Queensland, reflecting the same timeframes utilised by Livingston (2018), and the months that the State of Origin series is played each year.¹

Results

Relationship between State of Origin and Violent Behaviour

To test if there were significant differences in the number of violent incidents between game nights and non-game nights, several t-tests were performed. The results, displayed in Figure 1, indicated that for both forms of violence there was a significant increase across Queensland on a State of Origin game night compared to a non-game night. This was evident in both calls for service for police, and in reported incident data.

Figure 1 Average number of violence incidents on State of Origin game nights and non-game nights



Source: QPRIME and QCAD.

Violent Behaviour by QPS Patrol Group

When geographically mapped by patrol group, there were substantial differences identified in the frequency of violent incidents on State of Origin game nights. Of the 51 QPS patrol groups, Brisbane City Central (N = 16), Cairns Metro (N = 9), and Logan (N = 8) patrol groups were the most common areas for calls for service for assaults on State of Origin game nights. Similarly, assaults as reported crime data also demonstrated high trends in Brisbane City (N = 20) and Cairns Metro (N = 13). However, surprisingly, there was a high number of reported assaults in Mount Isa patrol group (N = 19).

Comparatively, Cairns Metro (N = 58), Rockhampton City (N = 58) and Mount Isa (N = 50) patrol groups were the most common areas for calls for service for DFV on a State of Origin game night. However, Mount Isa (N = 120), Cairns Metro (N = 66) and Mackay City Stations (N = 60) patrol groups presented the highest number of reported DFV incidents.

Characteristics of Violence

To explore the nature of the violence by offence and offender characteristics on game and non-game nights, several t-tests were performed using data from QPRIME. The offence and offender characteristics examined included: the involvement of alcohol and other substances, the scene of the violence (private residence or public location, including licensed premises), indigenous status of the offender, and for DFV, the relationship between the respondent and aggrieved. The results of the t-test indicate there were no significant differences between offence and offender characteristics on game and non-game nights for both assault and DFV reported incidents.

Game Characteristics

Given the focus of this research is on violence and sport, game characteristics, such as game location (home/away), outcomes (Queensland win/loss) and predicted outcomes, were also explored to determine if aspects of the game can predict the increase of violence on a State of Origin game night. The findings of the Ordinary Least Squares (OLS) regressions indicate that there were no significant relationships between any of the game characteristics in predicting assaults and DFV on a State of Origin game night.

Discussion

Understanding the expected demands of police during State of Origin is key to improving responses to such events. The findings demonstrated that regarding the first research question, there was a significant increase in violence on a game night compared to nongame nights.

Regarding the second research question, the findings demonstrated violent behaviour on State of Origin game nights was substantially concentrated in several QPS patrol groups. The concentration of violence in the patrol groups were different for assaults and DFV, and for calls for service and incidents reported. This suggests that calls for service do not reflect police demands alone. We found that, particularly for Mount Isa, there were fewer calls for service for violence incidents reported, suggesting violent incidents on State of Origin game nights may be reported after the fact and police need to be cognisant that demand on game nights may not be concentrated to that particular night, but in the days or weeks following as crime is reported and investigated.

Regarding the third research question, the offence and offender characteristics between game and non-game nights remained largely the same. There were no significant increases on game nights regarding the number of incidents involving alcohol and substances, the scene of violence, offenders in terms of indigenous status, and for DFV incidents, the respondent and aggrieved relationship. This indicates that the demand for police across Queensland to respond to violence is simply of a greater volume across all types of offences.

Finally, regarding the fourth research question, game location and outcomes did not predict calls for service or reported crime, indicating that the level of violence does not vary no matter what the State of Origin results are on the night. Further, discrepancies in the expected game outcome and the actual game outcome (i.e. whether Queensland was predicted to win and instead lost and vice versa), did not predict calls for service or reported incidents.

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This work adds to the large amount of literature which finds sporting events is correlated with an increase in reported violence. Interestingly, the findings of the research align with the findings of Livingston (2018) who using NSW police data found an increase in domestic and nondomestic related assault on State of Origin game nights. However, it contrasts with the findings of Furyk and colleagues (2012) who using Queensland hospital data found a decrease in emergency department presentations, including for presentations of injury, poisoning and other external causes. Given the discrepancy between the findings of our study which uses Queensland police data and that of Furyk and colleagues (2012) who used Queensland hospital data, it could be speculated that police are able to effectively diffuse violence on a State of Origin game night which correlates with a decrease in injury severity and emergency department presentations, or that the nature of violence on game nights is that it is less likely to inflict injury. However, this is speculative and investigation of the relationship between police and hospital data on State of Origin game nights in Queensland is therefore warranted.

Interestingly, there were no differences between game and non-game nights in terms of the offence and offender characteristics. The finding that violence involving alcohol and substances did not significantly increase on game nights was unexpected, as previous studies identified a positive correlation between sporting events and alcohol, and the impact of alcohol on both assaults and DFV (see Kirby et al., 2014).

This work also adds to the variation in the findings of other international studies, which report different impacts of game characteristics on assaults and domestic violence. Speculation regarding the failure to find significance for an upset-loss in this research, in contrast to many other studies, may be due to a relatively low number of unpredicted losses for Queensland in the dataset. Only one of the 13 games included in the dataset were unpredicted losses. As such the data is likely to be insufficient to produce any predictive findings for unexpected game outcomes.

Implications for policing

This research has considerable implications for rostering of staff on game nights. Firstly, these results identify a need for greater police resources to respond to violent behaviour on State of Origin game nights. Secondly, the results also identify that demands for police resources to respond to violence which occurred on State of Origin game nights may not be realised until after the night, as crime is reported and requires investigation after the fact. Thirdly, the results identified that the type of violence being responded to on game nights is largely the same as non-game nights. Finally, the results identified that police demands do not vary depending on the results of the game.

Limitations and future research

There are several limitations to undertaking research using administrative data, and this study was no exception. First, the extent of DFV occurring within a community is difficult to determine, as underreporting is common among the population of DFV victims (Felson, Messner, Hoskin & Deane, 2002). Many incidents are not reported at the time of occurrence, with some never reported to the police at all (Voce & Boxall, 2018). As such, the data used only reflects self-reported violence to the police, or police-detected violence. Second, the research only considered police demand for violent incidents, and did not consider demand for other incidents on game nights that police routinely respond to, including public order and mental health incidents. Thirdly, the research does not consider the time taken to respond to violent incidents, which limits the scope of how demand was defined.

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Finally, due to restrictions in the dataset, it was not feasible to examine or control for the offence and offender characteristics when analysing the impact of the game location and outcome. Nor was it feasible to link the QPRIME and QCAD datasets to identify whether calls for service resulted in recorded incidents. Research that addresses these limitations would be beneficial in enhancing the understanding of violence and police demand on game nights.

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End Note

 While State of Origin games were traditionally held on a Wednesday evening, the 2018 and 2019 Series held one game on a Sunday evening. Due to the limited occurrences, Sunday was excluded from the dataset as to not disproportionally alter the dataset and allow for accurate comparisons between game and non-game night.

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Differing perception of DNA evidence and intelligence capabilities in criminal investigations

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Abstract

The ability to predict physical characteristics from DNA presents significant opportunities for forensic science. Giving scientists an ability to make predictions about the donor of genetic material at a crime scene can then give investigators new intelligence leads for cold cases where DNA evidence has not identified any person of interest.

However, the interpretation of this new form of intelligence requires careful analysis. The responses to an online survey, conducted in 2018-19, were used to examine how actors in the criminal justice system assess and interpret different types of DNA evidence and intelligence. The groups of focus for the survey were investigators, legal practitioners and the general public (as potential jurors). Several statistically significant effects were identified based on occupation and whether an individual had prior exposure to new DNA technology. Monitoring how those involved in interpreting reports from different types of DNA evidence and intelligence interpret them helps to ensure that decisions are made based on a sound understanding of their capabilities and limitations and may inform broader training and awareness strategies.

Introduction

Technological advances allow forensic scientists to dive deeper into the human genome than ever before. For decades forensic science has used so-called satellite DNA markers, understood not to be health informative, to compare crime scene samples to the DNA profiles of suspects, or to undertake searches against DNA databases (Frudakis 2010). This approach sought to balance individual privacy with the needs of law enforcement to use technology to identify suspects. Adoption of this technology has not, however, been without its challenges and misinterpreting DNA evidence, however well-intentioned, has led to miscarriages of justice (Gill 2014; Vincent 2010).

This article considers the new field of *forensic* DNA phenotyping, and how it can inform intelligence products.

Figure 1: Commercial application of DNA-based facial composite imaging. Superimposed is the arrest photograph of José Alvarez, Jr, who was convicted in 2016 of two murders.



Source: Parabon NanoLabs. Reproduced with permission.

Based on a survey of 260 respondents, the article evaluates how different groups interpret and assess these leads, comparing the perception of forensic DNA phenotyping reports, both text-based and picture-based, with traditional DNA statistical evidence reports. In this study we will demonstrate the potential for DNA intelligence to misdirect investigations and therefore a need for increased training and awareness for law enforcement and the judiciary.

A face from DNA?

New DNA genotyping technologies have allowed scientists to make predictions about the physical characteristics of a donor. Using predictive DNA phenotyping, it is possible to analyse an item of biological evidence from a crime scene and predict certain traits of the donor (Kayser 2015). Predictions can presently be made for characteristics

such as skin, eye and hair colour as well as the donor's bio-geographical ancestry (Chaitanya et al. 2018; Cheung, Gahan & McNevin 2017, 2018). These predictions can be presented in written form or, in some cases using commercial algorithms and forensic artistry, a facial composite can be generated predicting the possible appearance of the genetic donor at a predetermined age (Figure 1).

Investigative significance

Forensic DNA phenotyping is intended as an intelligence lead. Understanding how the various actors engage with different types of DNA evidence and intelligence is critical to developing strategies around the implementation of new technology.

Once a suspect has been identified, a DNA sample can generally be obtained from that individual using a buccal swab and the DNA profile compared directly to the crime scene profile using traditional probabilistic identification processes. Forensic DNA phenotyping is intended to be used primarily to exclude or narrow a wide suspect field, allowing investigators to focus their limited resources on identifying the individual who deposited the genetic material at the scene (Koops & Schellekens 2008).

However, DNA-based intelligence must be treated with some caution. Numerous factors can influence whether written or image-based predictions accurately portray the characteristics of the suspect (MacLean & Lamparello 2014). Flawed DNA intelligence can occur, even with accurate scientific analysis, due to pollution of crime scene evidence or, even more fundamentally, the biological evidence collected at a crime scene not having come from the offender, perhaps not even being deposited at the scene contemporaneously with the crime occurrina

While these risks are not limited to phenotyping, a probabilistic identification using traditional DNA markers will lead investigators to a 'match/no match' situation using a DNA database. A match would yield a name with investigators then seeking to locate and interview the identified individual. That person could then become a suspect in the investigation or could be excluded, for a myriad of reasons.

DNA phenotyping, by its very nature, is less precise. It relies on investigators understanding that the capability sits within an intelligence paradigm and must be assessed in the context of all the evidence in a case (Scudder et al. 2019). If this does not occur then, in future, we may see cases go cold as investigators run down leads based predominantly on DNA intelligence predictions.

Ask, Rebelius and Granhag (2008) assessed the experience of police officers on their assessment of inculpatory and exculpatory evidence. As these new DNA intelligence techniques are only now becoming used operationally, it can be hypothesised that even experienced police have less exposure and understanding of the limitations around this type of intelligence product.

Flawed or misinterpreted DNA intelligence can have potential effects at various stages in the investigative and criminal justice processes. This paper will focus primarily on the effects of misinterpretation of evidence by police and investigators. Some scenarios that could arise include:

 Imprecise or misinterpreted DNA intelligence being relied on by investigators, to the detriment of other viable leads.

- Prediction of physical traits or a suspect's 2018).
- harm.
- ٠ Defence counsel

The presentation of forensic evidence in court has been the subject of analysis and discussion, including detailed consideration of how scientists can accurately convey scientific meaning to non-scientists (Martire 2018; Ribeiro, Tangen & McKimmie 2019). With forensic DNA phenotyping, the importance of the community understanding and interpreting correctly extends far beyond the courtroom.

The readability and complexity of forensic reports, including language, sequencing and format, have all been the subject of academic review (Howes et al. 2014). Researchers have also highlighted the difficulties faced by non-scientists in assessing the probative value of forensic evidence (Biedermann & Kotsoglou 2018). Interpretation challenges have been recorded using both verbal and numerical scales, with proposed ways of resolving this issue including dual verbal and numerical scales, or visual representation (Martire, Kemp & Newell 2013). Statements around prediction of physical traits may be even more difficult to assess, particularly when an individual must consider the probabilities around several different traits together. Further complicating the issue are occurrences of pleiotropy and epistasis. For example, pigmentation traits like eye, hair and skin colour all share genetic markers associated with the melanin synthesis pathway (pleiotropy) and the effects of one marker may be influenced by another (epistasis) (Ducrest, Keller & Roulin 2008; Pośpiech et al. 2014).

The presentation of DNA intelligence through a facial composite is likely to assist in interpretation and understanding, but only

• DNA intelligence resulting in an individual being wrongly identified as a suspect based on their physical traits and subjected to privacy-intrusive processes, such as coercively taking a DNA sample.

appearance being used as a basis for DNA dragnets (Murphy 2007; Skinner

 Imprecise or misinterpreted DNA intelligence forming the basis for an application to a judicial officer for issue of a warrant, and the execution of that warrant perhaps causing unintended

highlighting inconsistencies between a DNA intelligence product and the physical attributes of the defendant, seeking to persuade a jury to put less emphasis on probabilistic-based DNA reports presented as part of a prosecution case.

if the person receiving the information is also aware of the context and limitations of the information they are assessing. A facial composite can only present a single prediction and needs to take account of the most likely physical characteristics at each point in its creation.

Samuel and Prainsack (2018) conducted qualitative analysis of police interpretation of predictive traits. Their survey showed a distinction between scientists and police, with police more willing to try predictive techniques with less proven reliability and validity, to identify suspects. The authors noted that 'it might be tempting to utilize [predictive DNA] tests even if they are have not yet been validated or if they have low predictive value - just in case they could be helpful' (Samuel & Prainsack 2018, p. 10). Cognitive bias is also relevant, as shown in the work of Charman, Kavetski and Mueller (2017), who examined whether an initial hypothesis of guilt influenced police officer perceptions of evidence in a hypothetical case.

Aims, Hypotheses and **Study Significance**

This study's aim is to assess how individuals from different professional backgrounds understand and assess traditional DNA statistical reports, and text- and imagebased DNA phenotyping reports.

The focus of analysis was three different groups of individuals, based on their current or immediate past profession. These groups were: (1) police officers and related professionals, (2) legal practitioners and judicial officers, and (3) other individuals, over 18 years of age, who may be potential jurors.

The study's hypothesis is that occupational background and/or previous exposure to forensic DNA capabilities could impact an individual's assessment of the reliability, trustworthiness and influence of those capabilities and in assessing the ability of the capability to narrow a suspect pool.

Methods

Study participants were recruited through paid advertising on the social media platform, Facebook, as well as through retweeted posts on Twitter. An advertisement was also placed in the ACT Law Society's e-mail newsletter. Participants were invited to undertake an online survey, which collected demographic information (Table 1) and then presented each participant with three scenarios.

A total of 260 responses were received, 25 respondents (9.6%) identified their current or last profession as a legal professional or tribunal/judicial officer, and 47 respondents (18.1%) identified their current or last profession as a police officer or related professional. For responses not drawn from the legal or police professions, the largest groups of responses were from students and those working in administration, academia or sales.

Of note, respondents were almost exclusively from countries with adversarial legal systems (refer to Table 1). Further study may be warranted in relation to countries with inquisitorial systems of justice.

Participants were shown three scenarios. each accompanied by three different photographs of individual faces:

- Scenario 1: A DNA evidence statistical report which provided comparative probabilities of a match between the person of interest and a randomly selected member of the community:
 - "The probability of this DNA profile match is 3 billion times more likely if [one of the named individuals] is the donor of the DNA than if a randomly selected member of the community is the donor."
- Scenario 2: A DNA phenotyping textbased report containing predictions of the statistical likelihood of hair colour and eye colour:
 - "A new form of forensic DNA analysis makes the following predictions about the person who deposited the sample at the crime scene: Greater than 80% likelihood that the donor has brown hair; Greater than 70% likelihood the donor has blue eyes."
- Scenario 3: A DNA phenotyping imagebased report which provides a rendered image based on laboratory predictions:
 - "[You have] received an image drawn by a forensic artist, based on the laboratory's predictions of physical features and possible ancestry of the donor of the crime scene sample."

Complexion: Fair (>70%) Eye Colour: Brown (>90%) Hair Colour: Red (>95%)



Table 1: Demographic characteristics

Characteristic – N (%)	Legal Professionals (N=25)	Police and related professionals (N=47)	Other (<i>N</i> =180)	Prefer not to say occupation (N=8)
Age		(
18 - 24	5 (20.0%)	1 (2 1%)	54 (30.0%)	3 (37.5%)
25 - 34	9 (36 0%)	11 (23.4%)	46 (25 6%)	4 (50.0%)
35 - 44	4 (16.0%)	17 (36 2%)	25 (13 9%)	0 (0 0%)
45 - 54	4 (16.0%)	15 (31.9%)	19 (10.6%)	0 (0.0%)
55 - 64	2 (8 0%)	3 (6 4%)	21 (11 7%)	1 (12 5%)
65 - 74	0 (0.0%)	0 (0.0%)	13 (7.2%)	0 (0.0%)
75 or older	0 (0.0%)	0 (0.0%)	2 (1.1%)	0 (0.0%)
Over 18 but prefer not to say	1 (4.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Gender				
Female	15 (60.0%)	29 (61.7%)	126 (70.0%)	6 (75.0%)
Male	10 (40 0%)	18 (38 3%)	52 (28 9%)	2 (25 0%)
Agender	0 (0.0%)	0 (0.0%)	1 (0.6%)	0 (0.0%)
Nonbinary	0 (0.0%)	0 (0.0%)	1 (0.6%)	0 (0.0%)
Country of Residence			. (, (,))
Australia	20 (80.0%)	43 (91.5%)	136 (75.6%)	7 (87.5%)
United States of America	2 (8.0%)	0 (0.0%)	9 (5.0%)	1 (12,5%)
United Kinadom	1 (4.0%)	2 (4.3%)	9 (5.0%)	0 (0.0%)
Canada	0 (0.0%)	0 (0.0%)	6 (3.3%)	0 (0.0%)
South Africa	0 (0.0%)	0 (0.0%)	6 (3.3%)	0 (0.0%)
New Zealand	0 (0.0%)	0 (0.0%)	5 (2.8%)	0 (0.0%)
Other	2 (8.0%)	2 (4.3%)	9 (5.0%)	0 (0.0%)
Employment Status		- (,)		
Employee or contractor, full-time	18 (72.0%)	44 (93.6%)	57 (31.7%)	3 (37,5%)
Employee or contractor, part-time	7 (28.0%)	1 (2.1%)	68 (37.8%)	0 (0.0%)
Not employed, looking for work	0 (0.0%)	0 (0.0%)	21 (11.7%)	2 (25.0%)
Not employed, not looking for work	0 (0.0%)	1 (2.1%)	13 (7.2%)	1 (12.5%)
Retired	0 (0.0%)	1 (2.1%)	15 (8.3%)	0 (0.0%)
Prefer not to sav	0 (0.0%)	0 (0.0%)	6 (3.3%)	2 (25.0%)
Number of employees*				(,
0	8 (32.0%)	24 (53.3%)	75 (60.0%)	3 (100.0%)
1-5	13 (52.0%)	8 (17.8%)	34 (27.2%)	0 (0.0%)
6-10	2 (8.0%)	2 (4.4%)	9 (7.2%)	0 (0.0%)
11-20	1 (4.0%)	2 (4.4%)	1 (0.8%)	0 (0.0%)
21-50	0 (0.0%)	4 (8.9%)	2 (1.6%)	0 (0.0%)
50+	1 (4.0%)	4 (8.9%)	2 (1.6%)	0 (0.0%)
Prefer not to sav	0 (0.0%)	1 (2.2%)	2 (1.6%)	0 (0.0%)
Highest educational qualification			(/	
Less than high school degree	0 (0.0%)	1 (2.1%)	3 (1.7%)	1 (12.5%)
High school degree or equivalent	0 (0.0%)	4 (8.5%)	15 (8.3%)	3 (37.5%)
Some college/university, but no degree	3 (12.0%)	7 (14.9%)	42 (23.3%)	0 (0.0%)
Associate degree	0 (0.0%)	0 (0.0%)	1 (0.6%)	0 (0.0%)
Bachelors degree	8 (32.0%)	17 (36.2%)	58 (32.2%)	2 (25.0%)
Postgraduate degree	14 (56.0%)	15 (31.9%)	51 (28.3%)	2 (25.0%)
Other	0 (0.0%)	3 (6.4%)	10 (5.6%)	0 (0.0%)
Studying			1	1
Studying full-time	1 (4.0%)	4 (8.5%)	66 (36.7%)	3 (37.5%)
Studying part-time	7 (28.0%)	9 (19.1%)	18 (10.0%)	2 (25.0%)
Not studying	17 (68.0%)	34 (72.3%)	95 (52.8%)	3 (37.5%)
Prefer not to say	0 (0.0%)	0 (0.0%)	1 (0.6%)	0 (0.0%)

* Number of employees relates only to respondents who indicated they were an employee or contractor (N=198).

Table 0. Drive experiments to types of DNA suidenes and intelligence

	Legal Professionals)	Police and related professionals	Other	Prefer not to say occupation
Previously seen a DNA evidence statistical report	N =23	N =43	N =166	N =6
Yes	11 (47.8%)	33 (76.7%)	80 (48.2%)	5 (83.3%)
Through my employment	6 (26.1%)	27 (62.8%)	22 (13.3%)	2 (33.3%)
Through my study	5 (21.7%)	10 (23.3%)	49 (29.5%)	1 (16.7%)
On television (documentary or news report)	5 (21.7%)	9 (20.9%)	29 (17.5%)	0 (0.0%)
On television or at the movies (fictional)	4 (17.4%)	7 (16.3%)	25 (15.1%)	1 (16.7%)
Print media (news story or feature)	6 (26.1%)	9 (20.9%)	24 (14.5%)	1 (16.7%)
Print media or a novel (fictional)	4 (17.4%)	4 (9.3%)	23 (13.9%)	0 (0.0%)
Other	0 (0.0%)	3 (7.0%)	5 (3.0%)	0 (0.0%)
Prefer not to say	0 (0.0%)	1 (2.3%)	0 (0.0%)	1 (16.7%)
No	12 (51.2%)	10 (23.3%)	86 (51.8%)	1 (16.7%)
Previously seen a DNA phenotyping text-based report	N =23	N =43	N =165	N =6
Yes	9 (39.1%)	12 (27.9%)	74 (44.8%)	2 (33.3%)
Through my employment	1 (4.3%)	8 (18.6%)	8 (4.8%)	0 (0.0%)
Through my study	3 (13.0%)	3 (7.0%)	31 (18.8%)	0 (0.0%)
On television (documentary or news report)	4 (17.4%)	7 (16.3%)	24 (14.5%)	0 (0.0%)
On television or at the movies (fictional)	5 (21.7%)	2 (4.7%)	43 (26.1%)	0 (0.0%)
Print media (news story or feature)	2 (8.7%)	1 (2.3%)	19 (11.5%)	1 (16.7%)
Print media or a novel (fictional)	1 (4.3%)	2 (4.7%)	26 (15.8%)	0 (0.0%)
Other	0 (0.0%)	0 (0.0%)	6 (3.6%)	0 (0.0%)
Prefer not to say	0 (0.0%)	0 (0.0%)	1 (0.6%)	1 (16.7%)
No	14 (60.9%)	31 (72.1%)	91 (55.2%)	4 (66.7%)
Previously seen a DNA phenotyping image-based report	N =23	N =43	N =165	N =6
Yes	9 (39.1%)	14 (32.6%)	77 (46.7%)	2 (33.3%)
Through my employment	1 (4.3%)	4 (9.3%)	5 (3.0%)	0 (0.0%)
Through my study	1 (4.3%)	2 (4.7%)	15 (9.1%)	1 (16.7%)
On television (documentary or news report)	3 (13.0%)	6 (14.0%)	32 (19.4%)	1 (16.7%)
On television or at the movies (fictional)	4 (17.4%)	7 (16.3%)	53 (32.1%)	1 (16.7%)
Print media (news story or feature)	2 (8.7%)	4 (9.3%)	17 (10.3%)	0 (0.0%)
Print media or a novel (fictional)	1 (4.3%)	5 (11.6%)	28 (17.0%)	1 (16.7%)
Other	1 (4.3%)	2 (4.7%)	6 (3.6%)	0 (0.0%)
Prefer not to say	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
No	14 (60.9%)	29 (67.4%)	88 (53.3%)	4 (66.7%)

Note: Participants who indicated that they had seen the product before were required to at least one response, but could select multiple responses

The scenarios were chosen to include both more common use of DNA in criminal investigations (Scenario 1) and two different potential applications of new DNA phenotyping technology (Scenarios 2 and 3). The scenarios were randomly presented in two orders, either with the DNA evidence statistical report (Scenario 1) presented first, or forensic DNA phenotyping reports presented first (Always Scenario 2, followed by Scenario 3).

Participants were asked the following questions, on a scale of 1 to 10, in relation to each of the three scenarios:

- 1. How reliable do you think the laboratory report is?
- 2. To what extent does the laboratory report influence your [investigative] decisions?
- 3. How much do you trust the laboratory report to correctly identify the [person of interest]?
- 4. To what extent would receiving this laboratory report narrow the focus of your inquiries?

Participants were then asked to order the three scenarios in terms of, firstly, their reliability and, secondly, how well they understood each report.

Participants were asked questions about whether they had seen each DNA report previously, through their employment, study, in the news media or in works of fiction. Finally, participants were given an opportunity to provide final comments in a free text field.

Results

Table 1 presents the demographic characteristics of the three groups, including age, gender, country of residence, employment status and education. Table 2 includes participant responses to questions about previous exposure to DNA reports.

Ordering of scenarios

The scenarios were randomly presented in two orders:

- 1. DNA statistical evidence report (Scenario 1) followed by DNA phenotyping textbased report (Scenario 2) and DNA phenotyping image-based report (Scenario 3); or
- 2. DNA phenotyping text-based report (Scenario 2) followed by DNA phenotyping image-based report (Scenario 3) and the DNA statistical evidence report (Scenario 1).

A Mann-Whitney analysis (Table 3) revealed a statistically significant difference for ratings of trustworthiness of the DNA statistical report depending on the order of presentation, such that it was rated .60 higher when DNA phenotyping reports were presented before the DNA statistical evidence report (p =.022).

Similarly, ratings of the ability to narrow suspects for the DNA statistical report increased by .57 (p = .034) when it was preceded by the DNA phenotyping reports. No other significant differences were observed based on the ordering of the scenarios.

Table 3: Analysis of ordering of scenarios

Criterion	DNA statistical evidence report presented first		Forensic DNA phenotyping reports presented first		Mann-	Asymp. Sig	
	Mean	N	Mean	N	- Whitney U	(2-tailed)	
How reliable							
DNA evidence statistical report	7.23	130	7.78	123	6996.5	.082	
DNA phenotyping text-based report	6.64	128	6.43	127	7500.5	.279	
DNA phenotyping image-based report	6.23	124	6.69	126	6879.0	.097	
How influential	·	<u>`</u>		<u>`</u>	·		
DNA evidence statistical report	7.71	130	7.89	123	7599.5	.489	
DNA phenotyping text-based report	6.34	128	6.06	127	7484.5	.268	
DNA phenotyping image-based report	6.30	124	6.30	126	7770.5	.941	
How trustworthy							
DNA evidence statistical report	7.12	130	7.72	123	6683.5	.022	
DNA phenotyping text-based report	5.62	128	5.57	127	7998.0	.810	
DNA phenotyping image-based report	5.77	124	6.07	126	7301.5	.367	
Narrow focus of inquiries							
DNA evidence statistical report	7.12	130	7.69	122	6719.5	.034	
DNA phenotyping text-based report	5.13	128	4.97	127	7780.5	.552	
DNA phenotyping image-based report	5.75	124	5.97	126	7468.0	.544	

* Statistically significant, p<.05

Ratings for different types of DNA evidence/intelligence

Overall, on scales of 1 to 10, participants rated DNA evidence statistical reports as the most reliable, most influential, most trustworthy and with the greatest ability to narrow the focus of enquiries compared to the two DNA phenotyping reports (Figure 2 and Table 4).

Ranking of evidence and intelligence capabilities

When asked to rank each of the scenarios in order from most reliable to least reliable, 69.9% of respondents ranked the DNA evidence statistical report (Scenario 1) as most reliable, but only 43.9% rated it easiest to understand. Image-based DNA phenotyping (Scenario 3) was ranked most reliable by 14.8% of respondents, but easiest to understand by 37.1% of respondents.

Table 5 shows the highest ranked report broken down by occupation group. A chisquare test for independence indicated an association between occupation group (where declared) and whether respondents rated the DNA evidence statistical report highest for reliability, X^2 (2, n = 202) = 9.06, p = .011.

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Table 4: Mean ratings

Criterion	Mean	Ν	Std. Dev	Std. Error
How reliable				
DNA evidence statistical report	7.50	253	2.25	.14
DNA phenotyping text-based report	6.54	255	1.93	.12
DNA phenotyping image-based report	6.46	250	2.09	.13
How influential				
DNA evidence statistical report	7.79	253	2.00	.13
DNA phenotyping text-based report	6.20	255	2.08	.13
DNA phenotyping image-based report	6.30	250	2.03	.13
How trustworthy				
DNA evidence statistical report	7.41	253	2.15	.14
DNA phenotyping text-based report	5.59	255	2.29	.14
DNA phenotyping image-based report	5.92	250	2.22	.14
Narrow focus of inquiries				
DNA evidence statistical report	7.40	252	2.25	.14
DNA phenotyping text-based report	5.05	255	2.56	.16
DNA phenotyping image-based report	5.86	250	2.44	.15

A similar association was observed between declared occupation group and whether respondents rated the DNA evidence statistical report as easiest to understand, X^2 (2, n = 198) = 12.05, p = .002. A higher proportion of respondents who were police or related professionals or legal professionals rated DNA statistical evidence as the most reliable, or the easiest to understand, compared to the other occupation group.

Figure 2: Mean responses to questions for each scenario by occupation group. Error bars represent standard errors





Table 5: Rankings of reliability and ease of understanding by occupation group

Characteristic - N (%)	Legal Professionals)	Police and related professionals	Other	Prefer not to say occupation
Report ranked as most reliable	N =20	N =37	N =145	N =7
DNA evidence statistical reports	15 (75.0%)	33 (89.2%)	93 (64.1%)	5 (71.4%)
DNA phenotyping image-based reports	2 (10.0%)	3 (8.1%)	26 (17.9%)	1 (14.3%)
DNA phenotyping text-based reports	3 (15.0%)	1 (2.7%)	26 (17.9%)	1 (14.3%)
Report ranked as easiest to understand	N =17	N =36	N =145	N =7
DNA evidence statistical reports	9 (52.9%)	25 (69.4%)	55 (37.9%)	1 (14.3%)
DNA phenotyping image based reports	5 (29.4%)	9 (25.0%)	58 (40.0%)	4 (57.1%)
DNA phenotyping text based reports	3 (17.6%)	2 (5.6%)	32 (22.1%)	2 (28.6%)

Occupational background

Analysis was undertaken to compare the ratings given for each question, based on the respondent's declared current, or most recent, occupation (Figure 3).

A Kruskal-Wallis H Test was conducted across occupation groups to predict whether occupation group impacted on the mean. Statistically significant differences were observed in all four questions relating to the DNA statistical evidence report. The differences in the mean between occupation groups are shown in Table 6. Of note, the mean for police officers and related professionals was .93 higher than for legal professionals in their assessment of reliability of the DNA statistical evidence report, and 1.32 higher when compared to individuals who declared an occupation other than in legal or policing fields.

Figure 3: Individual ratings, by scenario and occupation group, for reliability, influence, trustworthiness and ability to narrow suspects).









Legend

DNA svidence statistical report DNA phenotyping text-based report DNA phenotyping mage-based report

Table 6: Kruskal-Wallis H Test analysis by occupation group

Criterion	Legal Pro	fessionals	Police and related professionals		Other		Prefer not to say occupation		Sig.
	Mean	N	Mean	N	Mean	N	Mean	N	
How reliable					-				
DNA evidence statistical report	7.64	25	8.57	47	7.25	174	6.00w	7	.000*
DNA phenotyping text-based report	6.72	25	6.45	44	6.57	178	5.75	8	.492
DNA phenotyping image-based report	6.56	25	6.52	44	6.47	173	5.50	8	.828
How influential									
DNA evidence statistical report	8.20	25	8.55	47	7.55	174	7.43	7	.007*
DNA phenotyping text-based report	6.32	25	5.91	44	6.22	178	6.88	8	.358
DNA phenotyping image-based report	6.76	25	5.95	44	6.35	173	5.75	8	.361
How trustworthy									
DNA evidence statistical report	7.68	25	8.51	47	7.12	174	6.29	7	.000*
DNA phenotyping text-based report	5.80	25	5.52	44	5.58	178	5.63	8	.914
DNA phenotyping image-based report	5.92	25	5.82	44	5.97	173	5.50	8	.890
Narrow focus of inquiries									
DNA evidence statistical report	8.00	24	8.11	47	7.11	174	7.57	7	.020*
DNA phenotyping text-based report	5.20	25	4.48	44	5.13	178	6.00	8	.325
DNA phenotyping image-based report	5.56	25	5.43	45	5.99	173	6.25	8	.395

* Statistically significant, p<.05

Similar trends were observed across influence, trustworthiness and ability to narrow the focus of an enquiry, for DNA statistical evidence reports.

There was no similar trend observed for either the DNA text-based phenotyping report or the DNA image-based phenotyping report, with means not showing any significant differences across occupation groups.

Prior exposure to DNA reports

A Mann-Whitney U Test was conducted to determine whether prior exposure to different types of reports (whether through employment, study, media or fiction), was associated with the ratings respondents provided to each question (Table 7). There was a statistically significant difference between how respondents with and without prior exposure answered all four questions with respect to DNA evidence reports, with those with prior exposure showing higher ratings of reliability ($M_{\text{diff}} = 1.37, p < .001$), how influential ($M_{\text{diff}} = 1.33, p < .001$), trustworthiness ($M_{\text{diff}} = 1.46, p < .001$) and narrowing the focus of inquiries ($M_{\text{diff}} = 1.17$, p < .001).

There was no corresponding effect with respect to the DNA phenotyping text-based report and the DNA phenotyping imagebased report responses, with differences in means not statistically significant across exposure groups for these scenarios.

Conclusion

This study observed several statistically significant differences in participant responses to the DNA reports, based on occupation and prior exposure.

While the ordering of scenarios also had a statistically significant effect on two questions, trustworthiness and ability to narrow the suspect pool, these differences were not observed with varying the orders of scenarios for any other questions. Further research may be required to assess whether prior exposure to text or imagebased DNA phenotyping reports has a systematic, positive effect on respondents' later assessment of more traditional forms of DNA evidence. As this was only observed in two questions, this study does not allow for an attribution of causation.

Overall, nearly three quarters of respondents rated the DNA statistical evidence report as the most reliable report. But over a third rated the image-based DNA phenotyping report as easiest to understand. A higher proportion of police officers and related professionals rated the DNA statistical report as both most reliable and easiest to understand, but responses from individuals who did not indicate employment in policing or legal professions had a more even distribution, particularly for ease of understanding.

It can be argued that the ability of stakeholders in the criminal justice system - whether investigators, lawyers or potential jurors - to understand different forms of DNA report is critical to effective justice outcomes. As discussed, forensic DNA phenotyping is intended as an input to intelligence, rather than meeting the threshold requirements for admissibility of evidence. Overall, just over 30 per cent of respondents observed either of the DNA intelligence products as more reliable than a DNA statistical evidence report.

A greater understanding of the use of DNA in investigations and in the courts will come as newer technologies are more widespread. The survey results do tend to support increased training and awareness for individuals involved in the criminal justice system, particularly lawyers and police, in the capabilities of forensic DNA phenotyping.

There is a statistically significant difference in the ratings, on a scale of 1 to 10, between occupation groups. Individuals whose current or immediate past occupation was as a police officer or related professional tended to rate the DNA statistical evidence

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Table 7: Analysis for previous exposure to DNA evidence or intelligence reports

Criterion	Prior ex	posure	No prior exposure		Mann-	Asymp. Sig	
Cintenon	Mean	N	Mean	N	Whitney U	(2-tailed)	
How reliable							
DNA evidence statistical report	8.19	129	6.82	109	4524.0	.000*	
DNA phenotyping text-based report	6.62	97	6.63	140	6788.5	.998	
DNA phenotyping image-based report	6.71	102	6.47	135	6335.0	.284	
How influential							
DNA evidence statistical report	8.44	129	7.11	109	4307.0	.000*	
DNA phenotyping text-based report	6.29	97	6.21	140	6648.5	.782	
DNA phenotyping image-based report	6.40	102	6.41	135	6881.5	.995	
How trustworthy							
DNA evidence statistical report	8.12	129	6.66	109	4155.5	.000*	
DNA phenotyping text-based report	5.69	97	5.61	140	6598.5	.710	
DNA phenotyping image-based report	6.12	102	5.99	135	6597.0	.577	
Narrow focus of inquiries							
DNA evidence statistical report	7.96	128	6.79	109	4873.0	.000*	
DNA phenotyping text-based report	5.19	97	4.99	140	6482.0	.550	
DNA phenotyping image-based report	6.14	102	5.88	135	6356.5	.308	

* Statistically significant, p<.05

report higher in each question than other respondents. There was a smaller effect observed with legal professionals but, with smaller differences and a small sample size, this effect is not statistically significant. Further analysis of how legal professionals view this technology would be worthwhile.

While there are differences in the way DNA statistical evidence reports are perceived, there is no statistically significant difference in the occupation groups' assessment of newer text or image-based forensic DNA phenotyping reports.

Police and related professionals had the highest prior exposure to DNA evidence statistical reports compared to other groups, but the lowest exposure to DNA phenotyping text-based reports and DNA phenotyping image-based reports. While nearly a third of police respondents had exposure to these newer technologies, the ratings could indicate investigators are still learning about these capabilities. A police officer who has seen DNA evidence presented in court may increase their ratings for that capability, but forensic DNA phenotyping may be too new to have delivered clear operational outcomes to investigators at this time.

Individuals who had previously seen DNA evidence statistical reports also tended to provide higher ratings on the 1-10 scale.

Given nearly three quarters of police and related professionals had prior exposure to this type of report, this could help account for the increase in the mean for ratings by this occupation group.

No corresponding increase was observed for individuals who had previously seen either text- or image-based forensic DNA phenotyping reports. Again, this result could arise because the technology is so new. It may also be that the role played by phenotyping in an investigation is overshadowed by the subsequent use of a DNA statistical report, taken once a suspect is identified.

This study observed some statistically significant differences between occupation groups and in relation to prior exposure to DNA statistical evidence. Given these same effects were not observed for phenotyping, and yet a portion of respondents viewed the new capabilities as highly reliable, there is an argument to support further training and awareness in this area, as this technology continues to evolve. However, it is reassuring to see that DNA statistical reports (for identity) are still held as the most reliable form of evidence by all groups as the generation of such a report should be the ultimate goal of an investigation, regardless of any intelligence leading to a suspect (in the form of phenotype reports, for example).

Further study of the impact of forensic DNA phenotyping, and other DNA intelligence capabilities, is also warranted, to assess any impact on investigations, on judicial decision-making, and on court outcomes.

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Developing police-public crime prevention

A challenge for policing is selecting and implementing activities that enhance community safety while minimising impact on budget, time or resources. In Queensland, an estimated three million random breath tests (RBT) are conducted annually as part of an extensive strategy to reduce road related harm (Papafotious Owens & Boorman, 2011). This represents a significant investment of resources by the Queensland Police Service (QPS). While these efforts have a clear impact on detecting and deterring drink driving, road injuries and fatalities (Ferris, Mazerolle, King, Bates, Bennett, & Devaney, 2013), there is great potential to enhance these high volume public encounters to achieve additional community benefits.

Policing research consistently finds that directed and focused policing strategies around a clearly defined crime problem have positive and cost effective impact on crime and disorder (Sherman & Weisburd, 1995; Weisburd & Green, 1995). Research also shows that when police engage with the public in a procedurally just manner, their encounters transform into additional crime control benefits through willing cooperation and compliance with police directives and the law (Murphy, Mazerolle & Bennett, 2013; Jackson, Bradford, Stanko & Hohl, 2012; Tyler, 1990; Tyler & Huo, 2002).

The current research intertwined these two rigorously tested theoretical concepts into an operationalised police-public crime prevention dialogue that promotes awareness and partnerships. The project advances on the foundational Queensland Community Engagement Trial (QCET) that identified that police could impact public perceptions of trust, confidence, satisfaction and willingness to comply with police directives (Mazerolle, Bennett, Antrobus & Eggins, 2012).

The research intervention adopted an operationally orientated dialogue framework as the means by which to transform routine police encounters with the public in a way that made each encounter impactful. The research tested the impact of procedurally just policing encounters during RBTs on individual victimisation and compliance with the law.





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Sarah Bennett¹, Bruce Peel² and Darren Green²

Conceptual Framework and Research Aims

The research's conceptual framework (see Figure 1) advanced two significant bodies of policing research - procedurally just policing (Mazerolle, 2012) and hotspot policing (Eck & Weisburd, 1995; Braga, 2002; Kochel, 2011) - with a focus on individual and community level outcomes.

The intervention consisted of two core parts:

- 1. Identify a target crime Message. The crime should be one where there are explicit actions for the public to assist police in crime prevention efforts.
- 2. Create an opportunity to communicate this message to the public with Purpose, Acknowledgement, Crime prevention action and Thanks (PACT).

The PACT encounter (Purpose, Acknowledgement, Crime message and Thanks) captured all components of procedural justice with a crime message that targeted property theft (theft of licence plates, theft from/of car and theft of home contents).

The research was built on the idea that making a simple procedurally just PACT with the public could impact public perceptions of trust and confidence with police and foster a willingness to partner with police to prevent crime. Specifically, through increased police legitimacy and crime messaging, this trial aimed to determine whether IM-PACT RBTs lead to:

- reduced property victimisation (e.g., reduced theft of/from motor vehicle and home property),
- reduced offending and traffic violations (e.g. drink driving, speeding, dangerous driving), and
- increased reporting of crime.

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Project Context and Design

The IM-PACT trial was initiated in response to a significant rise in unlawful theft of/from motor vehicles (including thefts of vehicle registration plates) in and around shopping centres in the Ipswich Policing District. The estimated cost from this target crime in one financial year was approximately 2.5 million dollars (Smith, Jorna, Sweeney and Fuller 2014). The QPS identified that the majority of these offences could be prevented if drivers locked their vehicle, stored valuables out of site (or out of vehicle) and installed anti-theft licence plate screws.

By targeting drivers at thoroughfares to these high crime shopping areas and by utilising the existing functions of RBT operations there was potential to simultaneously contribute to efforts to reduce drink driving and foster partnerships with the public to engage in crime prevention behaviours.

The IM-PACT trial was conducted in the Ipswich Policing District between October 2017 and April 2018. Analysis identified that there existed hotspots of unlawful theft of/from motor vehicle and also identified thoroughfares to these hotspots where high visibility RBT sites could be accommodated for the trial in order to reach a high number of police-public encounters during the trial period.

The six month field trial involved 94 separate RBT sites where randomly assigned RBT encounters consisted of either the business-

Figure 2: LOCK Messaging

as-usual control RBTs or the PACT experimental RBTs, with a total of 9,302 driver encounters.

Data Collection and Measures

Researchers from the University of Queensland (UQ) observed all RBT operations and recorded a sample of encounter times to confirm that police were conducting encounters as per the assigned group.

Control RBTs. QPS officers communicated a mandated message to drivers to provide a specimen of breath by blowing through a disposable tube into the alcoholmeter, an encounter which lasted for approximately 25 seconds.

Experimental RBTs. Officers were trained to communicate the target crime messages through the PACT dialogue and provide drivers with a postcard containing LOCK reminders (Lock, Out of sight, Contact Police, Keep a look out; See Figure 2). PACT was conducted in addition to the required breath test.

At the conclusion of the RBTs, drivers in both groups were provided with a research information sheet, a survey (online survey option outlined in information sheet), and a reply-paid envelope. The surveys sought feedback regarding perceptions of police (satisfaction with encounter, trust, confidence, opportunity to express views, felt listened to), awareness of target crime, intent to take crime prevention action,



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LOCK

Lock up (cars and property) Out of Sight (valuables and money) Contact Police (crime or information) Keep a Look Out (community awareness)

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prior victimisation and perceptions of the effectiveness of partnering with police to reduce specific crime problems, including speeding and the target crime. Police also recorded registration plates of vehicles involved in the trial to conduct longitudinal analyses on the impact of the IM-PACT intervention on behaviours (see *Future Research*).

Results and Conclusions

The conceptual framework is that a procedurally just PACT will impact on perceptions of trust and confidence in police and in turn facilitate crime prevention and road safety behaviours. Therefore, analysis aimed to firstly establish perceptions of procedural justice, awareness of crime, and intent to take action.

A total of 1,183 surveys were completed representing a 13% response rate with no significant difference in the return rate between the PACT and control groups.

Perceptions of police: Overall, drivers who had PACT RBTs reported that officers were significantly more trustworthy (p=.048), gave drivers more opportunities to express their views (p<.001), and listened more to the participants (p=.002) than the officers in the control group.

Awareness of crime: Drivers who received a PACT RBT reported significantly higher levels of awareness of crime than the control group (p<.001). This included vehicles number plate theft (p<.001), theft from vehicles (p<.001), theft of vehicles (p<.001), and theft from homes (p=.012).

Intentions towards to crime prevention: PACT RBT respondents expressed significantly decreased desire to speed again when compared to the control group (p=.005). Additionally, PACT drivers reported significantly higher likelihood of locking their car (p<.001), securing their home (p<.001), and reporting a crime to the police (p<.001) than the control group.

Attitudes toward partnering with police: PACT drivers reported greater levels of support for partnering with police to reduce theft from vehicles (p=.006), theft of vehicles (p=.019), and theft from homes (p=.042). The total attitudes towards partnering with police was not significantly different across the two groups (p=.10), however, there was significantly greater levels of support for partnering with police in the areas of crime targeted by the intervention (p=.032).

RBT engagements during the controlled conditions took an average of 38 seconds, while encounters during the experimental (PACT) conditions took an average of 77 seconds. The RBT encounter utilising the PACT message added an average of 39 seconds to each intercept.

The findings show that the QPS and other law enforcement agencies nationally and internationally, would benefit from embedding the IM-PACT model into everyday policing practice. The procedurally-just encounters associated with the IM-PACT model in this research intervention led to substantial social benefits for victims, police and justice regarding crime and community safety (Bennett, Mazerolle, Peel, & Green, 2018).

Future Research

Future longitudinal research will advance the understanding of how the procedurally just PACT message impacted crime prevention behaviour, particularly for the target vehicle and personal property crime. Without the involvement of the survey, it is assumed that the actual PACT delivery alone would be quicker in normal operating conditions, further demonstrating the advantages of the PACT interaction and its minimal impact on resources to gain such multi-objective benefits.

End Notes

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Developing Police Leaders: Does experience in isolated areas build leadership capacity and what role does mentoring play?

2000

Dr Shane Doyle; Associate Professor Olav Muurlink; and Associate Professor Linda Colley (CQUniversity)

1.1

Abstract

The scant scholarly attention to how police leaders develop is surprising, given the critical importance of a cadre of capable police leaders to maintain public confidence and deal with challenges in an increasingly complex policing environment. There is some consensus amongst scholars that police acquire most key skills in the field, as opposed to the classroom. Establishing relationships, including mentoring, particularly from superiors, also plays an important role in learning. However, this paper questions how this can occur when leaders are removed to rural and remote postings.

Policing in Queensland produces its own diverse set of challenges, none the least being a state so geographically dispersed. Physical isolation, from resources and support, brings with it its own set of policing challenges, which can, in theory, make or break an officer's leadership. The literature remains largely silent on how experiences in isolated areas can build good police leaders. Mentoring, as the other important piece in the leadership development puzzle, has similarly escape scholarly interest – in terms of how it mediates the process.

The current research, situated in the Queensland Police Service (QPS), presents a case study to address this focus. In-depth interviews were conducted with a highly representative group of 20 commissioned officers, who, when faced with a step pyramid organisation, had managed to successfully navigate a slow and at times arduous climb into senior leadership positions. Officers describe commanding major incidents and natural disasters in isolated areas and how their leadership blossomed, or was hindered, as a result. The role mentoring played in their development, against the backdrop of isolated outposts, where support and resources could be hours away, were also highlighted in officers' narratives.

The 'thin blue line' is a popular metaphor used to highlight the relatively narrow band of law enforcement officers who stand between chaos and criminality and honest citizenry. No-where is this blue line stretched thinner than in remote and rural communities. In geographically isolated areas, community expectations are not necessarily scaled back commensurate to resources. While other agencies can provide support to police operations in larger provincial or metropolitan areas, here police are often the sole respondent agency-and are required to respond 24-7 (Allen, 2010). The crises they face, the questions they are asked and the decisions they need to make do not magically readjust to the scale of their support networks. Inexperienced officers thrust into unfamiliar isolated environments can benefit from mentoring from officers experienced in such locations.

There is some consensus in the literature that police learn leadership primarily through on-the-iob experiences, together with mentorship and formal training (Doyle, 2018; Pearson-Goff & Herrington, 2013; Schafer, 2010; Schafer, 2009). Building 'social capital' through trusted relationships (including mentoring), particularly with superiors, has long been recognised as a means of advancing one's police career (Campbell, 2009; Chan, Devery, & Doran, 2003). When officers lack suitable mentors, their leadership progression falters (Murphy, 2005) and this lack of mentoring to develop future leaders reflects poorly on the organisation (J. A. Schafer, 2009). Traditionally, learning through mentoring has steadfastly relied upon face to face interactions. However, new forms of technology make it possible for police agencies to increasingly utilise long distance or remote forms of mentoring (Valencia, 2009).

There has been relatively little study of police leadership development in remote areas. Does experience in isolated postings build leadership capacity in police officers? And what role does mentorship play when emerging leaders are removed from the

Introduction

relatively 'cosy' police culture of larger regional or metropolitan police stations to physically remote locations. This study addresses these questions, drawing upon interviews conducted with senior police and provides a rare opportunity for those voices to be heard. It explores whether policing in isolated and remote communities builds leadership and the extent to which mentoring mediates this experience. Put simply - how do police build leadership capacity in remote areas?

1.2 Method

The study is based on the Queensland Police Service (QPS). Geographically, Queensland is only the second largest state in Australia, but more than twice the size of Texas (USA). Over half the state's population of 5 million live outside the state's capital and it takes 6 hours to travel on a commercial flight from Torres Strait in the state's far north to police headquarters in Brisbane. This makes Queensland a valuable case study on remote experiences.

The upper echelons of the QPS are represented by commissioned officers who comprise only about 2.5% (or about 300) of the total sworn strength of nearly 12,000 officers. The hierarchy of the QPS is compressed in rural and remote locations, with a single officer often representing the entire cadre of commissioned officers.

This research is based on face-to-face interviews with 20 commissioned officers, comprising the ranks of inspector, superintendent and chief superintendent. The 100% response rate together with a systematic stratified sampling method meant that results reflected the population to a greater degree than is common in qualitative research. Respondents have been de-identified and assigned numbers based on rank. Most officers were men whose careers had not just survived, but thrived, with each averaging over three decades in the one organisation. Now in the twilight years of their chosen vocation, officers provided deeply reflective accounts of their lived experiences.

1.3 Results

Officers zeroed in on challenges confronted in rural and occasionally extremely remote postings, which comprised a significant part of their early career trajectory, reliving some trying experiences where their leadership was tried, tested and occasionally broken. Compelling accounts of commanding major incidents - including murders, riots and sieges - were common place. Emergency responses to major floods and cyclones also figured prominently, so much so that spending time out of the 'big smoke' effectively 'rounded' off an officer's leadership. As one officer noted:

When you go to a small community ... you guickly learn how to ... lead. I don't know whether I would have gotten that if I stayed in the big city (In: 8).

This small band of officers who had risen to senior positions placed considerable weight on such experience in terms of 'promotability', to the point where it was considered a rite of passage to senior ranks.

I was thrown in the deep end...we had massive floods ... it was hard and very difficult...but I learned a lot ... how to be a leader, a decent leader...it put me in a very good stead for getting promoted (ln: 12).

Officers pinpointed such experience as a turning point in their development as leaders, reflected in following account:

Leadership really started for me ...when I was first in small country towns... and it wasn't leadership to other police, it was leadership to the community...so I learned to identify how different people can best led...and do what I need them to do (In:8).

Interviewees identified that the "opportunities" that rural and remote postings offered were characterised by isolation and a lack of support. This exacerbated the 'natural' isolation that other scholars have identified as being inherent in police roles (see Hess, Orthmann, & LaDue, 2015; Perez & Barkhurst, 2012). Geographical isolation and lower population density within isolated communities results in resources being spread thinner and police response times slowed compared to urban areas (Wood, Rosay, Postle, & TePas, 2011).

The calculation of 'resources', however, rarely includes the human support that officers have to abandon in order to take up postinas.

I was away from my family ... I had no family support with me at the time ... I'm

in a house by myself with no support, trying to deal with the significant disaster. I just felt very isolated" (In: 12).

These feelings of isolation and the thrown in the 'deep-end' training that ensued did not necessarily translate into negative developmental outcomes for participants. For instance, officers who commanded major incidents in remote or rural areas found the experience of isolation built or fortified their leadership.

This is consistent with findings by Crank (2014, p. 252) that the nature of police work can foster a sense of solidarity, and with Herrington and Colvin (2015) observation that officers adept at dealing with crisis events receive elevation to higher leadership positions. One officer (Is: 3) summed this up: "I think for the first time you realise that you were the meat in the sandwich and not the bread on either end". However, officers also realised that the community was part of the support matrix: "...when you go to a small community ... help is a couple of hours away, you ... quickly learn how to ... lead people within a community ... That was the key" (In: 8). 'Community policing' is something that evolves out of necessity in remote locations.

References to the value of mentorship were relatively rare in officers' narratives. Descriptions about the quality of mentoring on offer was 'mixed'. The timing of such support was singled out for special attention. Timing, in terms of having mentors 'on tap' to assist was considered critical particularly when officers were asked to 'step-up' and shoulder greater challenges - a message amplified in the following comment:

... if someone is trying to be super professional they'd go, 'right, here we go, you're now promoted and this superintendent or someone will be your mentor'. Some people have gone off and had that but there are too many people who have gone and done it themselves unless you've got some particular guidance (X:3).

Officers' highlighted that, during crises, their effectiveness as leaders was often blunted by unrealistic demands from headquarters. Officers admitted engaging mentors surreptitiously, aimed at running interference to stymie such requests, highlighted in the following indicative account:

We were lucky we had [superiors name] ... the support came in not being scared to ask a question, and hold your hand-up and say, "look they're driving me mad down in Brisbane. Can you run some interference"? (Is: 3).

Cultural constraints limited the potential benefits of mentoring, preventing officers from reaching out to superiors for fear of feeling weak or incompetent. This permeated officers' accounts, as echoed in the following comment.

I'm not confident enough within our culture that if I were to go to a particular leader and talk about how I ought to deal with something, that they wouldn't then put that into a tick against the boss with saying "That's a weakness. He's unable to deal with this himself and do that," and I think we do that a lot in this organisation" (I:3).

This culture is exacerbated in remote settings, where guidance is less readily available compared to the typical headquarters meal room, and must be actively sought.

The mixed quality of mentoring support provided was reflected in a description of two major crisis that one officer commanded in quick succession. The initial incident involved the officer bravely reaching out for assistance.

... they realised I was only fairly new in the job...they did the right thing and sent someone to give me a hand ... that was fantastic, which really helped me learn ... their support was great (I:12).

However, this mentoring was not part of the regular system of support for officer leadership development, and the officer quipped that the severity of the disaster forced the organisation to act: "If it hadn't been to the extent [size of the emergency] ...I don't think I would have gotten the same support. (In: 12). When the second crisis hit, the officer reported receiving similar levels of support, although the officer's account was not without gualification and over-shadowed by a tinge of irony:

The support as far as that part of it was good...it would have been better to send someone out do my normal role... probably something they could have done a little bit better, but I didn't ask for it, so they didn't do it (In:12).

1.4 Conclusion

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The extreme challenges that officers encountered when posted to isolated areas proved effective in developing them as leaders. The breadth and depth of experience acquired in rural and remote areas taught officer's valuable leadership skills that arguably could not have been acquired in heavily populated areas, particularly in the fledgling stages of their careers.

The remote-area police leader is not given an opportunity to specialise, or focus, let alone share the burden with a team. Surprisingly, the role of mentorship did not figure prominently in officers' narratives, despite the extreme remoteness and self-reliance that characterises isolated postings, and partly explained by the cultural constraints against seeking help.

It is clear that officers are developing leadership despite the lack of resources. both human and otherwise, that remote and rural posting offers. There are two ways to interpret this finding. Firstly, it is widely accepted that informal learning plays a dominant role in learning complex tasks in general, and leadership in particular (Clardy, 2018). It is likely that rural and remote postings amplify informal learning by presenting relatively inexperienced officers with complex challenges in the absence of formal support and structure. The second interpretation is that in such situations the prevailing culture makes it difficult for officers to ask for help, as they do not want to appear weak or incompetent. The merits of mentoring, particularly for freshly minted officers in isolated areas, appears obvious. However, in practice, this approach presents as either being under-utilised and/or underrecognised. Therefore, it is recommended that officers (regardless of rank) who are posted in isolated areas be automatically assigned an experienced mentor, particularly during times of crises when sage support, advice and counsel, is critical. Further, a formal mentoring relationship where the mentors initiate regular contact would alleviate cultural constraints, which stymie inexperienced officers from enlisting

help. The lack of appropriate and timely mentoring could culminate in failures in police leadership. Any such failures can have serious ramifications for public safety - particularly in isolated communities, where potential negative outcomes of such failures are magnified.

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Biography



Dr Shane Dovle

About 6 years ago, and after a policing career spanning over 3 decades, Shane plucked up enough courage to plunge head-first into the world of academia. For Shane the gamble paid off. He is now a full-time lecturer at CQ University and holds a PhD (CQU), a Bachelor of Business Degree (QUT), a Graduate Certificate in Applied Management (AIPM) and a Master of Business Degree (QUT).

Shane's sworn experience in the Queensland Police Service (QPS) included 15 years at the senior rank of Inspector. His operational postings included stints as a criminal investigator, general duties officer, regional duty Inspector and district Inspector, in country and city areas.

Shane also possesses significant experience in police education and training, project management and policy roles. His corporate experience includes senior leadership positions in Drug and Alcohol. State Traffic Support. Education and Training, Counter Terrorism and Information & Communications Technology (ICT).

Shane's current research focus lies in the area of police leadership, including his completed PhD titled: "How senior police leaders learn the art of leadership". Recently Shane was appointed as chair of the social innovation working party, School of Engineering and Technology (SET) at CQU.

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Optimising parameter selection for predicting volume crime using hotspot mapping



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i. Introduction

The location of crime is not evenly distributed, however it is also not random (Boba Santos, 2013). Rather, some locations seem to attract more crime than others, acting as either 'crime generators' or as 'crime attractors' (Clarke & Eck, 2016). Hotspot mapping is a widely used technique for identifying areas with a high volume of crime (Chainey & Ratcliffe, 2005). These locations can then be analysed to understand why the hotspots exist, and identify opportunities to reduce crime through various efforts including targeting known offenders, proactive patrols, and other crime prevention activities such as target hardening or crime prevention through environmental design (CPTED) (Hill & Paynich, 2014).

There are several methods for identifying crime hotspots, including grid thematic mapping, choropleth shading, spatial ellipses, kernel density estimation (KDE), or local indicators of spatial association (LISA) (Chainey et al, 2008). Of these, KDE is the most widely utilised across policing agencies (Eck et al, 2005). KDE takes a number of parameters, for which intelligence practitioners usually either accept the default values suggested by the software, or may experiment with varying parameter values until they achieve a visually satisfying result (O'Sullivan & Unwin, 2003).

Whilst hotspot maps display concentration of past crimes, they are usually produced in order to predict *future* events - i.e. the location of past crimes indicates the likely location of future crimes (Kennedy & van Brunschot, 2009). Research by Spencer Chainey (2008, 2013) has sought to test the predictive capability of hotspot techniques, including KDE, with results indicating that the selection of parameter values can impact on the accuracy of the predictions.

Newer techniques have been developed which specifically attempt to predict future crime, including prospective hotspotting (ProMap), self-exciting point processes (PredPol), and risk terrain modelling (RTM). Research has shown that these can modestly outperform KDE for predicting future crimes (Johnson et al, 2009; Mohler et al, 2011; Kennedy et al, 2010), however the software is often considered cost prohibitive or too complex for widespread use. Therefore the application of KDE on retrospective crime data remains a common process across policing agencies.

Since KDE is so widely used, it is important that intelligence practitioners are using it correctly in order to best direct limited resources. In particular, we need to know which parameters have the biggest impact on KDE's predictive capability, and how to determine the optimised values for these parameters.

ii. Kernel Density Estimation

a. KDE parameters

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- KDE works using the following process:
- 1. A grid is overlaid on the study area.
- 2. From each grid cell, a search radius is applied.
- 3. The points falling within the search radius are identified. Each point contributes a weighted score, depending on its proximity to the centre of the search radius.

- 4. The weighted scores are summed for each grid cell.
- 5. The grid cells are shaded according to their total score.

Figure 1: Calculating a KDE score for a grid cell. The points are weighted according to their proximity to the centre of the search radius.



There are a number of parameters which affect the output of KDE. These include:

- Grid cell size
- Bandwidth (search radius size)
- · Kernel function (how the points are weighted according to their distance from the centre of the search radius)
- Thematic ranges (how the values are divided up in order to be shaded)
- The amount of input data (e.g. 1 week, 4 weeks, 12 months)

Of these parameters, cell size, kernel function and thematic ranges primarily affect the look of the output surface, however have minimal impact on the calculated values.

The choice of bandwidth however strongly affects the resulting cell values in the grid surface (O'Sullivan & Unwin, 2003). Bandwidth size is often auto-suggested by KDE software, however the user can still choose this value based on their requirements. Chainey (2013) demonstrated that bandwidth has an influence on KDE's predictive capability, finding that smaller bandwidths produced better predictions than larger ones.

The amount of input data is chosen by the analyst before running KDE. This decision may be based on their goal (e.g. target recent or long term crime patterns), or by the availability of the data. Research by Mohler et al (2011) compared a self-exciting point process (which uses 52 weeks' data) to prospective hotspotting (which uses 8 weeks' data), finding that the point process provided better predictions.

However, when a longer input period (39 weeks) was applied to the prospective hotspotting, it achieved comparable results. This suggests that the amount of input data has an impact on the predictive capability of hotspot techniques.

This research seeks to examine the effect of two KDE parameters - bandwidth and input time period - as these have been shown to have an impact on the predictive capability of KDE, and they are both required to be selected by the user when applying KDE. These parameters will not be tested independently, but rather in combination to assess any interdependence between them.

b. Measuring KDE predictive capability

Measuring the predictive accuracy for a geospatial process is not as straightforward as reporting "it predicted X% of crimes". The size of the area predicted is also important, since police cannot be everywhere at once and thus are seeking to best direct their limited resources.

In line with the continuous nature of the KDE grid output, an incremental measurement methodology was applied which calculated the prediction hit rate for the top 2% of KDE grid values, then the top 4% etc, incrementing up to the top 20%. Johnson et al (2009) applied a similar methodology in their research (referred to as 'accuracy concentration curve'), however their charts plotted up to 100% of the area. This would not be considered practical for policing, as limited resources would prohibit the entire area from being targeted by police. Therefore this study only considers up to the top 20% of the area, representing a realistic maximum area which could be targeted by local policing resources.

iii. Methodology

In order to measure the effects of KDE parameters (bandwidth and input time period) on its ability to predict future offences, a process was designed to test a variety of combinations and measure the predictive results. This was applied at the Response Zone (RZ) level, which would provide the most practical output for directing resources (e.g. divisional van patrols). It was run retrospectively for each Monday during 2018, with the results measured for how well it predicted offences over the next 7 days.

Southern Metro Region Division 2 (SD2) was chosen as a study area for the research. This division includes 6 response zones (RZ), providing a manageable number of areas in which to calculate the results. SD2 is mostly urban/residential, providing a fairly uniform opportunity backcloth i.e. offences could occur 'anywhere'. Theft from Motor Vehicle (TFMV) was chosen for the offence type, as it is a volume crime which would provide sufficient data to measure, and it is a crime which can occur in various location types e.g. residential areas, shopping zones, industrial areas. 93% of the TFMV data was able to be geocoded to 'property' level, providing sufficient accuracy for measuring the predictive results (Ratcliffe, 2004).

A variety of bandwidths (search radius distance) were selected for testing. Minimum and maximum values were first determined which could be considered practical at the RZ level. The minimum bandwidth tested was 150m, as the geocoding process for the crime data includes interpolation methodologies which limit the scale at which reliable results can be determined. The maximum bandwidth tested was 1km, as beyond this would result in large areas which could not be patrolled by a local unit. Intermediate values of 300m and 500m were also selected.

For testing the input time periods, a minimum value of 2 weeks was selected as this represents a common period utilised by intelligence Figure 5: Southern Metro Region Division 2 (SD2) within Melbourne's metropolitan area.



analysts for creating patrol maps. Further increments of 4 weeks, 12 weeks, 26 weeks (6 months), 39 weeks (9 months), and 52 weeks (12 months) were also tested.

A program was written to automate the testing process in GIS software. The result of each test was recorded to a table, so that the results per parameter combination (bandwidth/time period) could be averaged and compared to answer the question: "If these KDE parameters had been run weekly for RZ's across the Division during 2018, how well would it have predicted the TFMV crime each week?"

iv. Results

The results demonstrated that overall, a longer time period for the input data will produce better predictions. In particular, utilising only 2 weeks data (which is common practice for intelligence practitioners) generated the worst predictions, particularly when a small bandwidth was applied. This is likely explained by the limited information available when such a short time period is input - the predictions actually 'maxed out' at the top 6%-10% of the cells, and selecting further cells produced no further predictions as there was no more information available to do so. The highest predictive results were achieved when 52 weeks of input data was utilised, although similar results were observed once 26 weeks or more data were input.

Regarding the bandwidth (search radius) parameter, the results showed that a smaller value produced better predictions when applied to the longer-term input period (e.g. 52 weeks). This was consistent with Chainey's research (2013). However, the results further demonstrated that when a limited time period was input (e.g. 2-4 weeks), better predictive results were achieved when a larger bandwidth was applied. This observed result is likely due to the fact that a larger bandwidth will 'catch' more points and therefore increase the amount of information available. However once a longer time period is input (e.g. 3-6 months or more), a smaller bandwidth provides better predictions.

Figure 6: percentage of crimes predicted by area, for varying time input periods (150m bandwidth)



Table 1: Optimised bandwidths for varying time input periods

Time input period	Optimised bandwidth
2 weeks	500m
4 weeks	500m
12 weeks	300m
26 weeks	150m
39 weeks	150m
52 weeks	150m

It was thought that the observed phenomena where longer time period input data produces better predictions is likely to plateau at some point, for example it is unlikely that using 20 years' data will produce markedly better predictions, as changes to the landscape over this time (e.g. urban development) would make the results less valid.

It was felt that 12 months' data would likely maximise predictions as it accounts for seasonal factors, whilst using 2+ years would simply be repeating the same patterns in the data. To verify this, the test process was run for 2, 3, 4 and 5 years' data, using a fixed bandwidth of 150m. However, the results indicated that the predictions did actually improve as the time period was extended, all the way up to 5 years. This result was unexpected, however it demonstrates the predictive power in long term patterns.

v. Discussion

This study has demonstrated that KDE provides better predictions when longer term input data is utilised, with the results improving all the way up to 5 years' data input. Whilst the use of such large volumes of data may be impractical for regular usage by intelligence practitioners (especially when manual handling of the data is required), it shows that using a short amount of input data (e.g. 2 weeks) is limited in its ability to predict future crimes. The results also show that a smaller bandwidth is better when using longer input time periods (3+ months), however larger bandwidths provide better predictions when using shorter time period (e.g. 2-4 weeks).

Further aspects of KDE could be tested in order to improve on the predictive results. This study showed that longer time period produced better predictions, however it did not consider whether the time elapsed since the event has an impact. For example, the input data (crime events) could be weighted according to how recently they occurred, similar to prospective hotspotting (Johnson *et al*, 2009) but





with a longer focus. Seasonality may also be a factor, so that crimes which occurred 12 months ago could be weighted higher.

It is also acknowledged that while overall predictions are improved by long term data input, this would likely miss short term patterns, such as an active offender targeting an area. These patterns would be 'drowned out' by the long term data, and the weekly predicted areas would change very little from week to week – this effect was demonstrated in research by Mohler *et al* (2015) which utilised long term data input. Therefore it would be worthwhile examining whether a mix of long term and short term input periods can improve on the overall predictions.

Findings from this research may influence intelligence practitioners in their selection of parameter values (bandwidth and input time period) when running KDE processes. Since the resulting maps are used to direct limited policing resources, it is important that these predicted areas are as accurate as possible in order to deter crime through proactive measures.

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