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Stress management as a part of police work

Mari Koskelainen

In recent years, there has been an increased interest in stress and its impact on the police workforce. The topic is important because there is an established connection between stress and health, and also the ability to perform during work-related situations that evoke a strong stress response. This paper focuses mainly on stress responses experienced in operational police work. Other potential sources of stress, such as organisational stress, are outside of the scope of this paper. The topic is approached by reviewing research findings on police-related stress research and the practices that are utilised by the Finnish national police. The scenarios encountered as a part of police work evoke both psychological and physiological stress responses. These stress responses either assist or hinder the ability to function in a situation.

The paper describes a training method that has been developed in cooperation between Police University College, Finland and the University of Toronto, Canada, to moderate stress responses.The main themes of other research work completed between the two parties are summarised. This includes the police workforce's perceptions on the interaction between stress and health, and the preferred interventions for addressing the symptoms of stress. Not all stress responses and their potential subsequent impact can be avoided by training and careful preparation.

This paper also summarises the practice of aftercare procedures in the Finnish national police. In an optimally functioning organisation, both preparation and aftercare procedures are thought through and put into practice. The training of the workforce also has an

important role to play. The paper summarises the training method that is based on research findings and is utilised as a part of the training of police students in Police University College, Finland.

A solvability-based case screening checklist for burglaries in Ireland
Stephen Shannon and Barry Coonan

Burglary case screening is a way to sort burglaries with a checklist to identify those that police are most likely to detect. In this report for policing professionals, we summarise the development of the first solvability-based case screening process for burglaries in Ireland. This analysis was based on 49 534 burglaries reported to the Irish police force over 2014 and 2015. We whittled down a list of about 100 factors to a final case screening checklist of 17 questions with big data analysis, including text mining with R, variable creation with Excel formulae and regression with SPSS.

A scrutiny of the police's operating environment in Finland
Vesa Muttilainen, Vesa Huotari and Pauliina Potila

The attention of the police has turned increasingly to the question of how to become smarter in accomplishing their tasks and in fulfilling their duties in society. The police services in most Western countries appear to follow the same path; the faith is invested in better strategies and approaches built upon systematically collected and thoroughly analysed data, which provide intelligence and result in more knowledge-intensive and thus also smarter policing. The various trends and tendencies in the police's operating environment are an obvious target for such a scrutiny. This article describes experiences from Finland in accomplishing such an analysis.

The community policing evaluation in the Croatian urban and rural communities
Ksenija Butorac and Irena Cajner Mraović

Community policing has been one of the contemporary models of policing implemented in Croatia. It was accepted in the early 2000s, within the framework of reforms that were planned to bring the Croatian police closer to the European standards of modern democratic policing after the war and post-war circumstances of the 1990s. The aim was to rebuild police legitimacy and, through citizens' trust in the police, to promote collective efficacy and informal social control. There are serious concerns as to whether this model achieves results regarding implementation-related issues that are common across the world, but particularly typical for post-socialist central and south-east European countries. In the first place, some improvisations of community policing are likely to occur, because the community policing model is more or less adopted on a declarative level, without the

substantial understanding of its fundamental principles and lack of basic requirements. Starting from one of the central premises of community policing — that not police alone, but the whole community is responsible for community safety — community policing strategy in Croatia includes several projects aimed to improve relations between the police and the public and to bring together all relevant stakeholders in managing security and safety concerns.

Therefore, in this study, the level of implementation of community policing has been analysed from the point of view of four sets: quality of police contact, perception of the level of crime and disorder, fear of victimisation and level of community cohesion. Considering dilemmas about the effectiveness of the community policing model in different social contexts, one urban and one rural community in Croatia have been compared. Due to small samples being the main limitation of this study, the results are representative for specific communities only and cannot be generalised, but could serve as a good foundation for future research.

Not all cops are bastards — Danish football supporters' perception of dialogue policing
Jonas Havelund, Mickel Lauritsen, Lise Joern and Kristian Rasmussen

The Danish police have changed their tactics in relation to their policing of football supporters. The changes have involved the development of a dialogue-based approach to the policing of football supporters. The changes seem to have contributed to a reduction in the number of arrests and football supporters detained.

This article presents the first e-survey that involves football supporters' perception of the dialogue approach and thus adds an 'end-user' perspective on the police work delivered by the Danish police.

The results underline that the changes in police tactics have increased a sense of legitimacy among the football supporters that is in sharp contrast to the 'ACAB' notion (All Cops Are Bastards) used by football supporters all over Europe. The results from the survey indicate that a change towards a dialogue-based approach can be beneficial in relation to the police fulfilling core strategic goals like conflict reduction and creating a more peaceful atmosphere at football matches.

Police decision-making at major events: a research programme
Lúcia Gouveia Pais and Sérgio Felgueiras

The Major Events Laboratory (MEL) started functioning in 2011. Its primary objectives are to develop research in what concerns the security of major events and to contribute to

modernising police activity and the definition of good practices. One of MEL's research lines tackles decision-making in police activity. Police decision makers face the limits of the human mind when making choices or solving problems. Facing time pressure, lacking complete knowledge and with information processing capability, they are prone to attaining acceptable and satisficing solutions under challenging and uncertain scenarios. Descriptive studies have been conducted using the naturalistic decision-making approach: on the field — at major political and sports events — at MEL's simulation room, during traffic control and during monitoring operations. The initial results are presented and implications for the learning and training process are discussed.

Part-time leadership in the Baden-Württemberg police force: a qualitative study
Lara Jablonowski and Sibylle Schieck

Similarly to changes in the social work environment, the police force is faced with the request of its police officers to improve the combination of work and family life. This is accompanied by the request to take a family break or the request to work part-time.

This study analyses the question of whether the existing frameworks are useful to the police of Baden-Württemberg in Germany to successfully implement part-time leadership positions. This was done by a qualitative semi-structured interview study. The sample included six experts from Lower-Saxony interviewed about their experience in part-time leadership at their police force, where part-time arrangements in leadership positions are already systematically organised. The sample also included six experts from Baden-Württemberg where systematic implementation does not yet exist.

The current stage of development of part-time leadership is described and recommendations are given for successfully developing this instrument as a positive and reasonable way to accomodate personal or family needs with career and work life in the police.

Understanding distance shooting and the type of firearm from the analysis of gunshot sounds
Nikolaos E. Tsiatis

In order to study gunshot sounds, experimental shootings were conducted in an open shooting range to record the sound of gunshots. The results were tabulated for a total of 168 gunshots. Shots were fired using pistols, revolvers, submachine guns, rifles and shotguns in different calibres from selected distances relative to the recording devices. Both a conventional sound level meter (SLM) and a measurement microphone were used. These were placed at selected points behind the shooting position and the sound of each shot was recorded. At the same time, the signal received by the microphone was transferred to a computer connected through an appropriate audio interface with a pre-amplifier. The

peak amplitude of the gunshot was calculated in the accepted engineering units (dB) of sound pressure level. The shortest distance for the recordings was 9.60 m and the furthest was 38.40 m.

The experiment was carried out by using the following calibres: 6.35 mm, 7.62 mm Tokarev, 7.65 mm, 9 mm Short, 9 mm Makarov, 9 mm Parabellum, .45 Auto, .22 LR, .32 S&W, .38 S&W, .38 Special, .357 Magnum, 7.62 mm Kalashnikov and 12 GA. A decrease of the peak amplitude, equivalent to the increasing of the distance, was observed as expected.

Values appeared to follow the inverse square law.

By analyzing a recorded gunshot sound it is possible to calculate the distance between that discharged firearm and the recording device. In addition, we noted the possibility of determining the sound amplitude of the gunshot coming from a certain type of weapon.

Note from the editors

Peter Neyroud
Institute of Criminology, Cambridge, United Kingdom
Eduardo Viegas Ferreira
Escola Policia Judiciara, Portugal
Antonio Vera
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This winter 2016 edition of the bulletin comes shortly after the CEPOL 2016 Research and Science Conference in Budapest, which was focused on global trends in law enforcement training and education. For this edition, we have picked some papers that focused on global law enforcement issues — crime solvability, community policing, stress management and leadership. The other articles address national security versus privacy in the European Union's Member States, police relations with football supporters in Denmark, police decision-making at major events in Portugal, police part-time leadership in Baden-Württemberg (Germany) and forensics research in Greece (on approaching distance shooting and the type of discharged firearm). There will be a special edition bulletin in 2017, along with other papers on training and education that were presented at the conference.

The 2016 Budapest conference was, like the 2015 Lisbon conference before it, a major international police conference, with speakers from across the world alongside European police leaders, practitioners and academics. The conference emphasised the important role that European police science can and does play in the development of policing across the globe. Moreover, the presentations by the Director-Generals of Interpol and Europol, which will feature in full in the special edition, highlighted that the most significant current and future challenges for policing — terrorism, people trafficking and cyber-crimes — are challenges that require international collaboration and international research.

The CEPOL conferences have become an increasingly important meeting place for ideas and an event which brings practice and academia together. The growth and development of the conference since the early days of a much smaller group meeting in an airport hotel is an important sign of the wider developments in international networks to link police practitioners, researchers and policymakers. A number of these are worth highlighting:

- The Society of Evidence-Based Policing (SEBP): This started in the UK and has now spread to the USA, Canada and Australasia. The society is a free membership organisation, with each branch run by a mixture of practitioners and academics (http://www.sebp.police.uk/home). There is an opportunity to extend it into Europe either with a European SEBP or nationally-based SEBPs.
- The Campbell Collaboration on Crime and Justice: The Campbell Collaboration is a network of academics and practitioners focused on building knowledge and better practice through systematic reviews of evidence. The Campbell Library (https://www.campbellcollaboration.org) now has more than 25 systematic reviews on police strategies (for example, hotspots policing, restorative justice, problem-solving and forensics) and 'plain language summaries' (which are being translated into a range of languages) of the full reviews.
- Policing networks in the major international criminology societies: The European Society of Criminology Policing Network, the British Society of Criminology Policing Network and the American Society of Criminology — Division of Policing have all been created within the last decade as networks to bring academic researchers in policing and practitioners involved in research together.
- As the Budapest conference highlighted, police education and training in Europe has been changing rapidly over the last decade. More police officers are completing postgraduate and even doctoral studies and, thereby, producing more practice-based research. Not enough of this is published to the international policing community. The bulletin provides one such opportunity and the networks above provide a further means of sharing. Particularly where the problems police are faced with are transnational or international, there is a professional duty on all of us involved in police practice and police research to share and contribute to our global knowledge about better policing.

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The collision of national Security and Privacy in the age of information technologies

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Abstract
Potential transatlantic privacy standards for surveillance in the context of national security are analysed in this article. Dynamic EU-US relations concerning the opportunity for data exchange are scrutinised. A review has been made regarding the key features of a human rights compliant legal framework, and producing a joint set of principles.

Keywords:
national security, privacy and protection of personal information, data exchange, surveillance, tapping

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Introduction

The boom of technologies and communications radically changed the world we live in. Information technologies completely redesigned the nature of interpersonal interactions. Social media allow every individual to share information anywhere around the globe within seconds, and the global network offers us digital storage in which everyone can store personal or professional information at a low price or for free. Apart from the effects on trading and international relations, these changes had an unprecedented influence on human rights.

On the one hand, communication technology innovations created possibilities for protecting fundamental human rights and freedoms by giving activists a louder voice, as they were given new means of documenting abuses and new ways of promoting their ideas. Just like experience from previous events shows us — events like the uprising of the 'Arab Spring'; the attacks that took place on European territory in Bulgaria (Burgas) in 2012, in France (Paris, Nice) and in Belgium in 2014, 2015 and 2016; the latest events in Turkey (the acts of terrorism

in Istanbul and the military coup attempt on 15 July); the armed uprising in Armenia and the events in Kazakhstan (the attempted mutiny ([1])) in 2016 — smartphones and social media improved access to information for all members of society; they provided greater freedom of expression and encouraged citizen participation in political processes. On the other hand, however, digital revolution also brought up great new challenges in the area of human rights protection. The internet assists and facilitates terrorist networks like those of Al-Qaeda and ISIS ([2]) in spreading their beliefs and planning destruction of life and property.

Discussion

In the context of fighting against terrorism, the advance of telecommunications and the rise of digital technologies brought up unprecedented challenges concerning privacy and protection of personal information. After the terroristic attacks on 11 September 2001 in the United States, in Spain in 2004, and in the United Kingdom in 2005, governmental institutions considerably extended their abilities for the surveillance and monitoring of individuals in order to enhance national security and to prevent potential threats of terrorism. These are obtained in two ways — in a direct way, by giving their own security and law enforcement agencies the ability to monitor and tap electronic communications, or by delegation of these tasks to the private sector (e.g. obliging internet and telephone services providers to retain electronic communications traffic data for long periods of time and to supply law enforcement and special agencies with these data when needed). Governments of different countries greatly enhanced their abilities to find and monitor individuals by tapping their communications. Despite the reasonable concerns about national security, and state and supranational institutions' duty to provide security for their citizens and protection from terrorism, the implementation of this all-embracing surveillance method raised concerns about privacy.

Privacy and protection of personal information are deeply rooted in national constitutions, as well as in many international agreements concerning human rights. Article 12 of the Universal Declaration of Human Rights of 1948, Article 8 of the European Convention on Human Rights of 1950, and Article 17 of the International Covenant on Civil and Political Rights of 1966 are all such examples. In the case of justice in countries with older constitutions, recognition of privacy is a result of decisions made by supreme and constitutional courts in particular legal cases. Such an example is the decision of the Supreme Court of the United States, which recognises the right to privacy with the Fourth Amendment to the United

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([1]) Mutiny is a criminal conspiracy among a group of people (typically members of the military or the crew of any ship, even if they are civilians) to openly oppose, change, or overthrow a lawful authority to which they are subject. The term is commonly used for a rebellion among members of the military against their superior officer(s), but can also occasionally refer to any type of rebellion against an authoritative figure.

([2]) The Islamic State of Iraq and the Levant (ISIL), also known as the Islamic State of Iraq and Syria (ISIS), Islamic State (IS), and by its Arabic language acronym Daesh, is a Salafi jihadist militant group that follows a fundamentalist, Wahhabi doctrine of Sunni Islam.

States Constitution (³) that prohibits unreasonable searches and seizures. It is necessary to observe that Articles 7 and 8 of the Charter of Fundamental Rights of the European Union (⁴) include the right to respect for private and family life and protection of personal data concerning the individual. Despite the disputes and debate between international law experts, there is a consensus on the idea that privacy should at least protect the area of intimate relationships from state bodies' interference.

The recent disclosures about state bodies of the United States and some EU Member States' regular practice of phone calls, emails and text messages bulk data collection prove that the right to privacy is under considerable pressure for the sake of fighting against terrorism. Restrictions on personal rights in relation to national security are further complicated by some factors. For example, there is no existing possibility for adequate and objective monitoring over some of the surveillance programmes that have been created and are being practiced in top secret conditions. Because of the extremely great abilities of modern digital communications through which data transfer anywhere in the world is achieved within seconds, surveillance programmes provide national security agencies with the opportunity to monitor people's actions worldwide.

Developed countries that have highly developed technological intelligence services are capable of practicing mass surveillance and tapping their own borders. As a result of the increasing collaboration between intelligence and law enforcement agencies both at local and at international level, the information collected through surveillance programmes becomes their basic exchange value.

Despite the various levels of protection of personal data that most legal systems provide to their citizens, the reality of the transnational collaboration practically allows governments to circumvent constitutional protections of citizens' privacy, while foreign bodies are relied on for embarking on illegal surveillance of the local citizens. It should be observed that disclosures (that is, data leaked by Edward Snowden, former National Security Agency agent) about governments' existing massive programmes for surveillance, in combination with increasing awareness about the negative impact that these measures have on privacy rights, started an international debate about whether there is a balance between privacy and security in the age of information technology. Following a proposal by Brazil and some of the EU Member States, in December 2013 the United Nations General Assembly adopted a resolution restricting the execution of programmes for control over citizens. It should be observed that a great number of the US government members were occupied

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(³) The right of the people to be secure in their persons, houses, papers and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue, but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

(⁴) The Charter of Fundamental Rights recognises the range of personal, civil, political, economic and social rights of the citizens and residents of the EU, by combining them in EU law.

with reconsideration of legality and efficiency concerning data collection and tapping by security agencies that use surveillance technologies.

In turn, the US Congress took measures for amending the legislation in that direction. The European Parliament responded with a resolution in March 2014, which strictly criticised the US programmes for surveillance and tapping of EU members. Following this, with a resolution of 8 April 2014 the Court of Justice, in extended composition, invalidated Directive 2006/24/EC of the European Parliament and of the Council of 15 March 2006. The Court of Justice's decision was motivated by the lack of plain and precise rules in the directive for setting the scope of and minimum requirements for interference in fundamental rights, and the lack of sufficient measures that would provide efficient protection of retained data, guaranteeing that there would be no abuses, no illegal access and use of traffic data. These flaws have motivated the Court to invalidate the directive concerned despite the existing legitimate aim, namely, enhancing public security and international peace and security by providing efficiency in fighting against grave offences and acts of international terrorism.

The Court stated the following:

> '… data … are particularly important and therefore a valuable tool in the prevention of offences and the fight against crime, in particular organised crime. It must therefore be held that the retention of data for the purpose of allowing the competent national authorities to have possible access to those data, as required by Directive 2006/24/EC, genuinely satisfies an objective of general interest.'

New threats and challenges in relation to the protection of national security on the one hand and protection of personal correspondence on the other hand compelled the governments on both sides of the ocean to work on developing privacy standards. A significant step in that direction would be to guarantee efficient control of surveillance and tapping activities of national security agencies. There are several EU-US agreements allowing bulk data sharing of air passenger and financial transaction records, and a Mutual Legal Assistance Treaty ([5]) (MLAT) allowing a case-by-case sharing of law enforcement information. The two parties have been attempting to negotiate an overarching data protection agreement, as urged by the European Parliament, but have so far found their differences insurmountable. The EU-US Mutual Legal Assistance Treaty (Agreement on mutual legal assistance between the European Union and the United States of America, OJ L 181, 19.7.2003, pp. 34-42) was agreed in 2003, but not concluded until November 2009. It allows the use of shared data for the purpose of criminal investigations and proceedings, and for preventing an 'immediate and serious threat to … public security'. Both non-governmental organisations (NGO) and industry have called for all future US foreign data collection to take place through such MLATs, and that the Unites States 'desist from any and all data collection measures which

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[5]   A mutual legal assistance treaty (MLAT) is an agreement between two or more countries for the purpose of gathering and exchanging information in an effort to enforce public laws or criminal laws.

are not targeted and not based on concrete suspicions' (Reform Government Surveillance campaign principles).

In response to the final report from the High-Level Contact Group, the European Data Protection Supervisor ([6]) (EDPS) suggested a number of principles that should guide an EU-US sharing agreement. Most are at least partially included in the European Commission negotiating mandate, but some remain controversial with the US government ([7]):

- Clarification as to the nature of the instrument, which should be legally binding in order to provide sufficient legal certainty.

- A thorough adequacy finding, based on essential requirements addressing the substance, specificity and oversight aspects of the scheme. The EDPS considers that the adequacy of the general instrument could only be acknowledged if combined with adequate specific agreements on a case-by-case basis.

- A circumscribed scope of application, with a clear and common definition of law enforcement purposes at stake.

- Precisions as to the modalities according to which private entities might be involved in data transfer schemes.

- Compliance with the proportionality principle, implying exchange of data on a case-by-case basis where there is a concrete need.

- Strong oversight mechanisms and redress mechanisms available to data subjects, including administrative and judicial remedies.

- Effective measures guaranteeing the exercise of their rights to all data subjects, irrespective of their nationality.

- Involvement of independent data protection authorities, especially in relation to oversight and assistance to data subjects.

Internationally, not only governments, but also civil society groups have identified some key features of the human rights compliant legal framework, and produced a joint set of principles that have been endorsed by over 200 organisations. These include the following:

([6]) The EDPS is an independent supervisory authority whose primary objective is to ensure that European institutions and bodies respect the right to privacy and data protection when they process personal data and develop new policies.

([7]) Opinion of the EDPS on the final report by the EU-US High Level Contact Group on information sharing and privacy and personal data protection, 8 November 2011.

- Intelligence agencies should only have targeted, limited access to data. The Electronic Frontier Foundation (EFF) [8] suggests 'a specific person or specific identifier (like a phone number or email address), or a reasonable, small and well-cabined category (like a group on the terrorist list or member of a foreign spy service)' (Cohn and Timm, 2013), 'What Should, and Should Not Be in NSA Surveillance Reform Legislation'). European Digital Rights (EDRi) [9] suggests a ban on 'all data collection measures which are not targeted and not based on concrete suspicions.'

- Agency access should be to specific records and communications. They should not be authorised to undertake bulk, pervasive or systematic monitoring, which has the capacity to reveal private information far in excess of its constituent parts. Any data access should trigger legal protections — this should not come only when data are picked out of a large data stream already collected by an agency.

- Data collected using special national security powers should be completely blocked from use for other government purposes, including law enforcement. They should be retained for limited periods and deleted once no longer required.

- Metadata (communications data) can be extremely revealing about individuals' lives, and currently receives very low levels of legal protection. This was highlighted by the Court of Justice in its judgment invalidating Directive 2006/24/EC, which required the retention of such data for a period of up to 2 years (Digital Rights Ireland Ltd v Minister for Communications, Marine and Natural Resources and others (C-293/12), and Karntner Landesregierung, Michael Seitlinger, Christof Tschohl and others (C-594/12)). The EFF has called for the requirement of a probable cause warrant for agencies to access previously non-public information, e.g. revealing identity, websites and info accessed, 'who with/where/when' people communicate.

- The incorporation of privacy-protective technologies and limitations within surveillance systems.

- Illegal surveillance should be criminalised, with effective remedies when individuals' rights are breached. Illegally gathered material should be inadmissible as evidence, while whistle-blowers should be protected for revealing illegal behaviour. EDRi has demanded 'that any foreign data collection measures include provisions giving all affected individuals, at the very least, equal rights to US citizens at all stages of an investigation, rights that are not significantly lower than any democratically approved safeguards in

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[8] The EFF is an international non-profit digital rights group based in San Francisco, California. The EFF provides funds for legal defense in court; presents amicus curiae briefs; defends individuals and new technologies from what it considers abusive legal threats; works to expose government malfeasance; provides guidance to the government and courts; organises political action and mass mailings; and supports some new technologies which it believes preserve personal freedoms and online civil liberties.

[9] EDRi is an international advocacy group headquartered in Brussels, Belgium. EDRi was founded in June 2002 in Berlin by 10 NGOs from seven countries. In March 2015, the European Council adopted a proposal that may compromise net neutrality, a major concern of EDRi.

their country of residence.' The European Commission is also pushing for this in their negotiations with the United States over a data sharing privacy agreement.

The referendum conducted on 25 September 2016 in the Swiss Confederation should be observed as an indisputable argument in favour of enhancing the competences of intelligence agencies concerning protection of national security through restriction of personal freedom and privacy.

During this referendum nearly 60 % of Swiss citizens responded positively to the proposal for providing the Swiss intelligence agency with legal rights so that the agency can enhance the monitoring of phone calls and internet correspondence, and use tapping devices for the fight against terrorism and grave offences, which would restrict personal freedom.

Here a conclusion could be reached that the content of the collision of national security stability and state system protection, in the context of implementing temporary restrictions on particular individuals' privacy, is too variable in today's circumstances. Competent state agencies are to enhance their abilities for preliminary surveillance and monitoring of events, occurrences and processes that could be a potential threat to national security, while minimising the impact on privacy.

A non-secret treaty basis for exchanging information, approved by the US Congress and EU Parliament and which meets European Convention on Human Rights standards is the best long-term enabler of bringing intelligence data collection and sharing within a transparent and genuinely human rights compatible framework.

The greatest area of EU-US disagreement is over the remedies available to non-US citizens and permanent residents when their privacy rights are breached. As a matter of policy the US Department of Homeland Security applies the protections in the US Privacy Act of 1974 to both citizens/permanent residents and visitors, giving everyone the right to access and correct their own personal data (US Department of Homeland Security, Privacy Policy Guidance Memorandum 2007-1). However, because the privacy act's definition of 'individual' applies only to the former, the latter has no right of judicial review. Obtaining this is a key goal of the EU and has been promised by the US administration.

Conclusion

As a conclusion, it should be pointed out that a range of potential transatlantic privacy standards for surveillance have been developed by civil society groups, courts and watchdogs such as the European Data Protection Supervisor. These cover data sharing, surveillance activities and oversight of intelligence agencies. The principal opportunities for implementing them are in EU-US negotiations over a data sharing privacy agreement. The Council of Europe and state-state negotiations over intelligence sharing are also possible venues.

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Stress management as a part of police work

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Abstract

In recent years, there has been an increased interest in stress and its impact on the police workforce. The topic is important because there is an established connection between stress and health, and also the ability to perform during work-related situations that evoke a strong stress response. This paper focuses mainly on stress responses experienced in operational police work. Other potential sources of stress, such as organisational stress, are outside of the scope of this paper. The topic is approached by reviewing research findings on police-related stress research and the practices that are utilised by the Finnish national police. The scenarios encountered as a part of police work evoke both psychological and physiological stress responses. These stress responses either assist or hinder the ability to function in a situation. The paper describes a training method that has been developed in cooperation between Police University College, Finland and the University of Toronto, Canada, to moderate stress responses. The main themes of other research work completed between the two parties are summarised. This includes the police workforce's perceptions on the interaction between stress and health, and the preferred interventions for addressing the symptoms of stress. Not all stress responses and their potential subsequent impact can be avoided by training and careful preparation. This paper also summarises the practice of aftercare procedures in the Finnish national police. In an optimally functioning organisation, both preparation and aftercare procedures are thought through and put into practice. The training of the workforce also has an important role to play.

The paper summarises the training method that is based on research findings and is utilised as a part of the training of police students in Police University College, Finland.

Keywords:
police, stress management, police training, resilience, aftercare

Introduction

In recent years, there has been an increased interest in stress and its impact on the police workforce. There are many definitions of stress and what causes it. This paper focuses mainly on stress responses evoked by operational police work. Other potential sources of stress, such as organisational stress, are outside the scope of this article.

Figure 1

In principle, every police officer has an opportunity to manage and control stress responses evoked by work-related duties.

This can be done by preparing duties to be carried out, moderating stress responses during the event and applying stress-relieving methods after the event. Paying attention to stress responses is important since there is an established connection between stress and health. There is also a connection between the ability to perform optimally during work tasks and the level of stress response they evoke. These themes are approached by reviewing research findings on police-related stress research and the practices that are utilised by the Finnish national police.

What is stress?

Figure 2

There is no simple definition of stress. One way to conceptualise stress is to view it as a situation in which the challenges and demands are higher than the person's experienced ability to deal with them. The situation experienced as stressful may be short or long lasting, and the impact of stress may be felt physically and psychologically.

Separating stress into physical and psychological symptoms is not straightforward. There are clearly physiological symptoms of stress, for example, the changes in the body's hormone levels. Physiological changes are, however, connected to sensory perceptions, thoughts and emotions. Psychological responses can equally lead to physiological changes. In other words, there is a constant interplay between physiological and psychological responses to stress.As noted, the demanding scenarios encountered as a part of police work evoke both psychological and physiological stress responses. These stress responses can either assist or hinder the ability to function in a situation; the level of sensory perception, the ability to make decisions and the actions carried out become better or worse.

In this article, the demanding work-related scenario, or a critical incident, can, for example, be a situation in which use of force becomes necessary. The use of the term critical situation is not, however, only reserved for operational police work in the field. Work-related scenarios, such as interrogations of suspects of sexual crimes, can also be considered examples of demanding police work. In other words, a demanding, and therefore a stressful work-related scenario, can be any policing task that requires the ability to make difficult decisions and manage emotions. In essence, a critical situation is a situation that evokes strong physical and psychological stress responses. Although stress is often regarded as

a negative phenomenon, stress responses are nevertheless essential and useful, even in everyday functioning. In situations that occur in police work, it is evident and essential that stress responses are evoked and experienced. People can usually manage stress in everyday life by utilising their coping mechanisms. The scenarios that police officers encounter in their work, may, however, be very different from everyday life situations and require different coping mechanisms (Rantaeskola et al., 2015).

Police officer stress and health

Police work is demanding work. Police officers face stress via exposure to sudden, critical and even life-threatening situations throughout their careers. Situations that are not sudden, for example, those faced in criminal investigations, may also evoke stress responses, which in turn may lead to cumulative stress. Previous research has shown that exposure to critical situations and cumulative stress has an impact on police officers' health and well-being. It has been shown that police officers have a higher risk than those in comparison groups to get ill, either mentally or physically (Violanti, 2010). In a study conducted in Finland, 40 % of the participants reported that one-fifth of their work time consists of duties they regarded as challenging and demanding.

In the same study, more than half of the officers felt that their job was demanding and stressful (Andersen et al., 2015a).

Can stress responses be avoided?

The elevation of, for example, cortisol and adrenalin levels in the body help the body and mind prepare for a challenging situation. Overly increased levels of cortisol are, however, counterproductive to a good performance. Being able to cope gets worse, if the stress levels remain high and the task is experienced as too demanding. The ability to make relevant observations and to think rationally decreases as a result of continuing stress. The attention also shifts focus on perceived threat and danger instead of a challenge that can be managed. (Andersen et al., 2015c). The stress experienced may cumulate in jobs in which challenging and critical situations are constantly encountered. Constant and repetitive stress that has not been dealt with may result in cumulative stress. This may decrease mental and physical well-being. The constantly high levels of, for example, cortisol in the body may have an adverse impact on the person's health (Violanti, 2010).

Current research has shown that situations encountered in police work can be prepared in such a way that the stress response and, for example, the levels of cortisol, remain optimal (Andersen et al., 2015b). Police University College, Finland has been working with the University of Toronto, Canada since 2013 in conducting police work stress-related studies.

The training method referred to in this article is based on research findings on increasing the ability to manage stressful situations in police work. Resilience is a term now often used to refer to the overall ability to manage such stress. Good resilience means, for example, the ability to face a challenging scenario mentally prepared with an optimal level of arousal. Resilience also refers to the feeling of being in control and viewing the situation to be encountered as a challenge rather than as a difficulty (Violanti, 2010).

Increasing overall resilience can be achieved by including the following elements in the training:

- **Understanding stress and stress reactions**
  Psychoeducation about the physiology and psychology of stress is provided: this includes information about the impact of stress on ability to perform in work-related tasks. The link between a critical incident and potential traumatisation is also explained. The information given aims to normalise responses caused by stress. It is emphasised that the reactions caused by stress are a part of human physiology and psychology, but it is possible to learn to manage them in a different way (Andersen et al., 2015c).

- **In-depth understanding of what working as a police officer entails**
  The process of identifying what work as a police officer entails is facilitated. The person receiving the training needs to reach a point of clarity on whether he/she is ready, prepared, willing and committed to do what the job requires. (Rantaeskola, 2015, 211).

- **Practical exercises**
  Managing stress responses, for example, the correct breathing technique, is practiced as part of police work scenarios that are as challenging and authentic as possible. The exercises conducted aim to simulate real situations in police work. Mental preparation is practiced — which forms an essential part of managing stress reactions and is a crucial part of decision-making, situational awareness and maintaining the ability to act (Andersen et al., 2015c).

The optimal mental state enables an optimal state of arousal. This in turn facilitates the ability to think and make accurate observations that lead to the best possible ways of acting in a situation, (Andersen et al., 2015c). It is also possible that learning about mental preparation during training, and practising it as a part of working life, prevents later traumatisation caused by events experienced at work (Papazoglou and Andersen, 2014).

Does resilience training work? Research evidence

As part of the partnership between the University of Toronto, Canada and Police University College, Finland, a randomised controlled trial was conducted to evaluate whether resilience training improved performance and safety during highly realistic critical incident scenarios. The participants were police officers in the Finnish Federal Special Response Police Teams (SRTs). Participants were trained to use mental focus and visualisation to enhance sensory perception and situational awareness, which in turn increases personal resilience and improves job performance (Andersen and Gustafsberg, 2016).

The elements of the training were:

- controlled breathing exercises that aim to enhance physiological control of body and mind;

- imagination exercises within the mind and learning the ability to focus attention on the essential during slow-motion critical incident scenarios.

Participants were trained to utilise the techniques before, during and after the scenarios. The scenarios used in the study were developed by the trainers of the Finnish Federal Special Response Police Team. The aim was to create the most threatening scenarios as possible. The results of the study showed that psychophysical reactions (e.g. cortisol levels, heart rate reactivity and recovery times) were better in the experimental group than in the control group. The overall performance, situational awareness and ability to make decisions, as evaluated by blind trainers of the Special Response Police Team, were also better in the experimental group (Andersen and Gustafsberg, 2016). The results of the study therefore give a positive indication regarding the effect and suitability of the training given in the context of police work.

Finnish national police board order on procedures following critical incidents

Research evidence suggests that mental preparation prior to police-related tasks is beneficial both in terms of managing psychophysical responses and achieving the goals of the assigned tasks. The training model described above assists, for example, in recognising emotions experienced during and after the situation. This helps to understand the emotions as normal experiences that are evoked by a stressful situation. It is also possible that normalising responses to stress prevents negative after-effects (McCraty and Atkinson, 2012). It is, however, unlikely that mental preparation beforehand will always protect against longer-lasting psychological impact, or even the occurrence of post-traumatic stress symptoms. For this reason, the procedures following critical incidents are also an important pathway in processing the stress responses evoked by police work.

The Finnish National Police Board gave an order in 2012 regarding mandatory procedures following critical incidents. The order instructs police units to arrange debriefing sessions, which are carried out by specifically trained police officers. In addition to this, national post-trauma workshops are arranged yearly. The order also gives direction regarding the services that the occupational health and private sector can offer in terms of psychosocial and physical support (Poliisihallitus, 2012).

Debriefing sessions and post-trauma workshops share common themes with the resilience training described above. All include information sharing about critical incidents, the burden they cause and responses they may evoke either physically or mentally. Good experiences and feedback has been received from both debriefing sessions (Järvenpää and Äikäs, 2015) and post-trauma workshops (Järvelin, 2012). It is therefore hoped that these procedures are becoming more and more acknowledged and adhered to in the entire Finnish police organisation.

There is also an ongoing peer support pilot (Kaiku-hanke) in the Ostrobothnian police district that shares similarities with the debriefing practices described in the previous paragraph. Peer support was reported as a desired form of support in a study conducted amongst Finnish police officers (Andersen et al., 2015). The aim of the peer support pilot was to create a model that can be utilised following the immediate debriefing and prior to attending, if needed, a post-trauma workshop.

What is happening in police training now?

Some elements of the above-mentioned training are now utilised as part of the basic higher education degree of police studies at Police University College, Finland. Mind–body coherence and resilience training is incorporated into use of force training (Mikkola, 2015). As a part of understanding the variety of stress responses, the students are also given information included in the order of the procedures following critical incidents. Many Finnish police officers report being aware of the impact that police work may have on their physical heath (e.g. sleep problems and heart symptoms).

The majority of the officers, however, also report that they have had no training regarding the potential consequences on their physical or mental health. This is an issue that the current training aims to address. A study on police officers' knowledge of health and police work showed that officers were willing to learn about managing the symptoms of stress.

The preferred method was peer support, but the procedures already in place in the police organisation, such as debriefing practices and post-trauma workshops, were also considered acceptable. (Andersen et al., 2015a). To assist the access to support provided, it

is therefore important that all who work in the organisation are aware of what is offered and know how to seek this support when necessary.

Figure 3

The application of resilience training

The author of this article has used elements of resilience training in a variety of training contexts and with different professional groups (Rantaeskola et al., 2015). Examples of these groups include police personnel other than police officers, emergency call dispatchers, traffic wardens and the crime investigation detectives' supervisory group. Based on these experiences, training that includes elements of resilience training can be utilised across many contexts. It is important to note that many of the elements included in the training are not new discoveries. The value of structured resilience training, however, comes from learning a set of skills and being able to apply them as a part of everyday work. Further scientific research is required to support the effectiveness of the training method proposed in different fields of work. As part of this work, it is essential to develop standardised, evidence-based resilience training manuals, which are tailored specifically to a particular group of employers.

Summary

This article has introduced a model of resilience training, research findings regarding it and experiences of utilising the model as a part of police training. Understanding stress responses and successfully processing these experiences is an essential part of the well-being of the workforce. It is important to acknowledge this, since dangerous aspects of police work can never be completely removed. As noted in the order issued by the National Police Board in Finland, it is crucial to prepare the workforce to face critical situations, and in this way prevent potential traumatisation (Poliisihallitus, 2012). The training method and the debriefing procedures described in this article aim on their behalf to fulfil this goal, and are therefore a part of modern police organisations' operating environment.

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A solvability-based case screening checklist for burglaries in Ireland

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Abstract

Burglary case screening is a way to sort burglaries with a checklist to identify those that police are most likely to detect. In this report for policing professionals, we summarise the development of the first solvability-based case screening process for burglaries in Ireland. This analysis was based on 49 534 burglaries reported to the Irish police force over 2014 and 2015. We whittled down a list of about 100 factors to a final case screening checklist of 17 questions with big data analysis, including text mining with R, variable creation with Excel formulae and regression with SPSS. After taking multiple factors into account, the top five predictors of whether a burglary will be detected after 1 day of investigation are: CCTV availability, suspect name availability, the motive is vandalism, a description of the offender's vehicle and a description of the suspect. We recommended that officers should continue to investigate burglaries with 5 or more of the 17 factors on the case screening checklist. If officers had used this checklist in 2014 and 2015, we estimate that they would have continued to investigate 49 % of burglaries after 1 day and that the detection rate would have increased by 50 % (from 9 % to 14 %). Identifying which burglaries are most solvable and allocating the most resources to those is a promising opportunity for An Garda Síochána to deliver a more cost-effective service and boost detection rates. The next step is to conduct a pilot study to test the checklist.

Introduction

Burglary is one of the most common crimes in Ireland with 3 % of households burgled each year (Central Statistics Office, 2010) and 26 259 burglaries reported in 2015 (Central Statistics Office, 2015). An Garda Síochána, Ireland's national police force, implemented a national anti-crime strategy named Operation Thor to tackle this problem in November 2015. To date the operation has achieved a reduction in the number of burglaries by 34 % in comparison to the previous equivalent period. However, detection rates have dropped by 21 % during Operation Thor and currently 85 % of burglaries go undetected in Ireland each year.

Burglary is an area of concern for politicians and it attracts considerable media attention. The 2015 national public attitudes survey found that over three quarters of respondents want police to prioritise burglary. One of An Garda Síochána's goals for 2016 is to improve detection rates for burglary specifically. As police numbers are only beginning to improve after a recruitment embargo that resulted from the global financial crisis, there is a clear need for efficiency gains particularly in terms of staffing levels and investigative efforts. Case screening can help us achieve various organisational goals and address stakeholder concerns.

Case screening aims to increase detection rates by focusing on burglaries that we are most likely to detect. Burglary case screening typically involves three stages:

1. investigate all burglaries;
2. sort undetected burglaries into solvable and not solvable;
3. investigate solvable burglaries.

The proportion of cases investigated after statistical screening varies across jurisdictions. For example, Danish police investigate 20 % of cases after screening and police in Denver, Colorado investigate 77 % (Garda Síochána Inspectorate, 2014). This variation could partially be due to differences between when investigators screen cases. Some may screen a case after receiving basic information from the reporting party while others may not conduct screening until they complete a specified list of investigative actions. In this report for policing professionals, we summarise the development of the first solvability-based case screening process for burglaries in Ireland.

Method

Ultimately, we whittled down a list of about 100 factors to a final checklist of 17 questions. We summarise the methodology in terms of four main steps as follows:

Step one

We listed and described all of the factors that might make a burglary more detectable. We achieved this by discussion between experienced crime and policing analysts, a review of the research literature and critical reflection.

Step two

We extracted as many of these listed factors as possible from 53 494 reported incidents across 2 years of burglary data from our main policing database named PULSE. We used formulae in Excel and text mining with R to produce variables formatted for analysis in SPSS. We could only extract some factors from text data that officers wrote into the narrative field in PULSE. This open text box has no restrictions on the text that officers can enter. As there were at least 49 000 incidents linked to individual narratives, it was not feasible to explore all narratives individually, so a text mining approach was required. Our first aim was to identify specific word strings linked to a particular factor contained anywhere in the narrative in any order that were associated with an increase in detection rate. Our second aim was to categorise incidents according to the presence or absence of those words in a meaningful way. We started by searching through narratives to identify keywords that were clearly relevant to the factor. Then we produced word association lists with the R software across three categories of case selection: detected, not detected and random selection. This enabled us to compare association lists across categories to determine which words were uniquely and strongly associated with an increased detection rate. We then used Excel formulae to identify the optimal word strings based on the association lists that produced the largest increase in detection rate in comparison to cases with none of the keywords. Finally, we assigned incidents to meaningful categories based on careful interpretation of results from the previous phases (i.e. the words chosen to describe the particular factors).

Step three

We used univariate analysis to describe basic characteristics of the data set in terms of key individual variables of interest. We used bivariate analysis to determine if there were significant differences between detected and not detected incidents in terms of key variables of interest.

We conducted bivariate analysis between all of the identified variables to identify which variables to include in the multivariate analysis. The criteria for including a variable in the multivariate analysis were:

1. it was significantly associated to the outcome variable (detected or not detected);
2. it was not collinear with other independent variables (i.e. it does not describe the same information as other variables);
3. there was not an alternative variable in the data set that measured the same construct and was more suitable for analysis.

We conducted logistic regression because the outcome variable was dichotomous (Detected = 1, Not Detected = 0). We conducted standard multiple regression using dummy variables in SPSS to calculate multicollinearity diagnostics. We excluded variables with tolerance of less than 0.20 or 0.10 and/or a variance inflation factor of 5 or 10 from the analysis. We tested the model for interaction effects to inform the development of the screening checklist.

Step four

We tried three different ways of translating these statistics into a checklist for use by investigating officers. In the first, we gave higher scores to factors that had more predictive power than other factors. In the second, we counted how many factors were present with a long list. In the third, we counted how many factors were present with a short list. We decided to use the third way (counting factors from a short list) as this option had the best balance between usability and predictive power. We view usability as key to police officers taking the case screening methodology on board and using it as part of their routine investigative activity. If the end users find the tool too difficult or unwieldy to use then they are unlikely to take it on board however strong its predictive power.

Results

Table 1 shows that An Garda Síochána detected almost half of detected burglaries within 1 day after they started investigating them in 2014 and 2015. We decided to exclude cases from the analysis that were detected within 1 day of the start of the investigation because we felt a solvability checklist would not be helpful to an officer who was either on their way to a burglary in progress or who had already identified the suspect and would soon apprehend them. We believe these situations account for most if not all of the cases that police detected within 1 day of investigation.

Table 1
Burglaries reported in 2014 and 2015 by detection status,
time period and inclusion in solvability analysis

Included/Excluded	Time period	Count	% of detected burglaries
Excluded	Offender caught red handed	2193	26%
Excluded	Not caught red handed but within one day	1767	21%
Included	After one day	4338	52%
Included	Not detected	45196	-

The top five most powerful predictors of detection after 1 day of investigation were:

1. CCTV is available (+ 363 % more likely to be detected);
2. suspect name is available (+ 305 % more likely to be detected);
3. motive is vandalism (+ 290 % more likely to be detected);
4. registration number of the offender's vehicle is available (+ 286 % more likely to be detected);
5. a description of the suspect is available (+ 275 % more likely to be detected).

While most of the solvability factors that we identified were unsurprising, there were some counterintuitive results. For example, we found that investigators were significantly more likely to detect burglaries with a motive of vandalism in comparison to other motives such as monetary gain or jealousy. A potential explanation for this could be that the vandalism occurred in the context of an ongoing interpersonal dispute, so the victim knew the offender. One way to test this hypothesis would be to examine the availability of the suspect's name and the motive of vandalism. Graph 1 shows that the suspect's name was available in 7 % of vandalism cases versus 3 % of cases with another motive. These differences in proportions were statistically significant, so the hypothesis that the offender's name is more likely to be available when the motive is vandalism is supported. However, further research would be required to determine if the victim knew the offender's name due to an ongoing dispute.

Graph 1 — Vandalism and suspect named status in burglaries 2014/2015
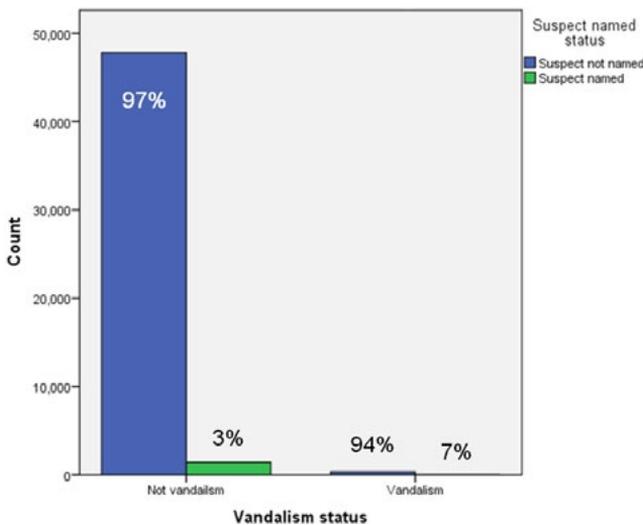
Source: ????, 2017

We also found that investigators were significantly less likely to detect burglaries after an alarm was activated in comparison to when an alarm was not activated. One potential explanation for this could be that the alarm deterred the offender from entering the property so that less evidence was available for investigation. One way to test this hypothesis would be to examine property stolen and alarm activation status. Graph 2 shows that property was stolen in 40 % of burglaries in which an alarm was activated, versus 67 % when an alarm was not activated. These differences in proportions were significant, so the hypothesis that offenders were less likely to steal property when an alarm was activated is supported. However, further research would be required to determine if this was due to a deterrent effect resulting in less evidence available for investigation.

Graph 2 — Alarm and property stolen status in burglaries 2014/2015
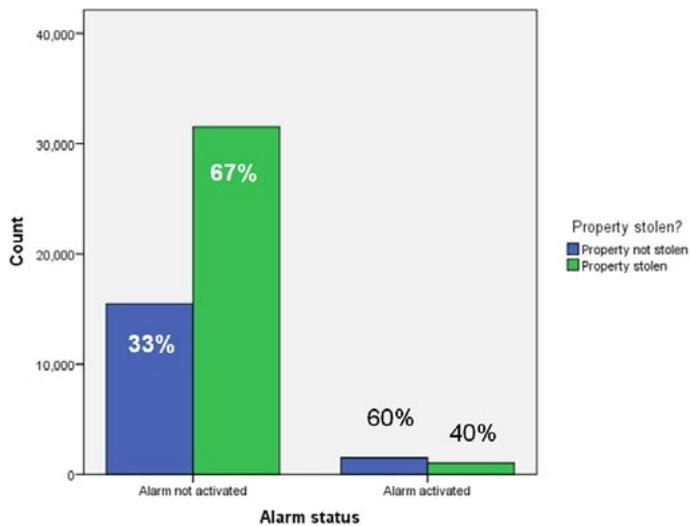
Source: ?????, 2017

Table 2 shows the final solvability checklist. Investigators should use the checklist by reading the statement in the first column and then selecting the value in the adjacent cells depending on whether the statement is true or false. After investigators score all of the statements they should then add each value to yield a total score.

Table 2

Solvability factor checklist for use by investigators to screen burglary cases

Statement	True	False
CCTV of the burglary is available for circulation	1	0
A description of the suspect is available	1	0
A name of the suspect is available	1	0
The offender used a vehicle to arrive at and/or depart from the burglary that was not stolen from the scene of crime and a description of that vehicle is available	1	0

Statement	True	False
The offender was disturbed by another person during the incident	1	0
At least one person who witnessed the crime is available	1	0
A separate incident has occured at the same address within the past twelve months	1	0
Property was stolen from the scene of crime	1	0
Evidence is available for forensic analysis	1	0
An alarm was activated	0	1
The scene of crime was ransacked	0	1
Offender's motive was monetary gain	0	1
Burglary occured during October to March between 1500 to 2300	0	1
The offender's exit method was through a door with bodily pressure or unknown	1	0
The offender's entry method was by forced window, slipped lock or through a door with bodily pressure	0	1
The injured party reported the burglary to Gardai	0	1
The burglary was reported by alarm activation or phone call to 999 or any othe rnumber	0	1

After scoring the checklist, the investigator will need a cut-off score to identify cases they are likely to detect with further investigative efforts. To determine this, we aimed to achieve a 50 % improvement in burglary detection rates and then worked backwards from this goal. Graph 3 shows that in 2014/2015, the detection rate of burglaries with five or more solvability factors from the checklist in Table 2 was 14 %. This is a 50 % increase from the detection rate of burglaries with 0 or more solvability factors (9 %). Therefore we recommend a cut-off score of 5.

Graph 3 — Detection rate and number of factors by number of incidents 2014/2014 based on the solvability checklist
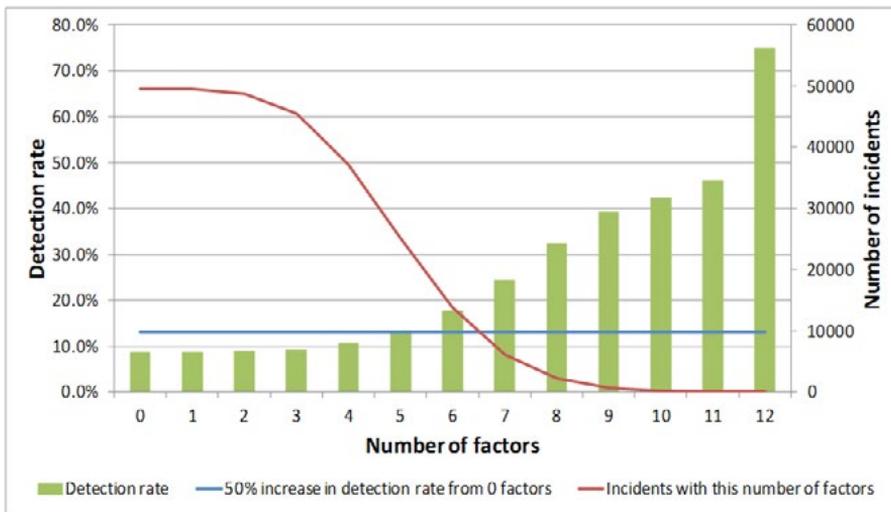

Source: ?????????, 2017

Graph 4 shows what would have happened in 2015 if An Garda Síochána only investigated burglaries with a cut-off score of 5 or more on the solvability checklist after 1 day of investigation. This graph shows that officers would have screened 93 % of burglaries with the solvability checklist and that they would have continued investigating 49 % of those burglaries.

It is important to note that An Garda Síochána should investigate some burglaries regardless of how likely they are to detect them. These include burglaries in which offenders steal ammunition, firearms, explosives or other dangerous materials or burglaries that threaten state security or are of interest to intelligence services. Investigating police officers should have a final say on whether to continue an investigation irrespective of how likely they are to detect the burglary.

Graph 4 — Process flow chart based on 2015 data if An Garda Síochána only investigated burglaries with a cut-off score of 5 or more on the solvability checklist after 1 day of investigation
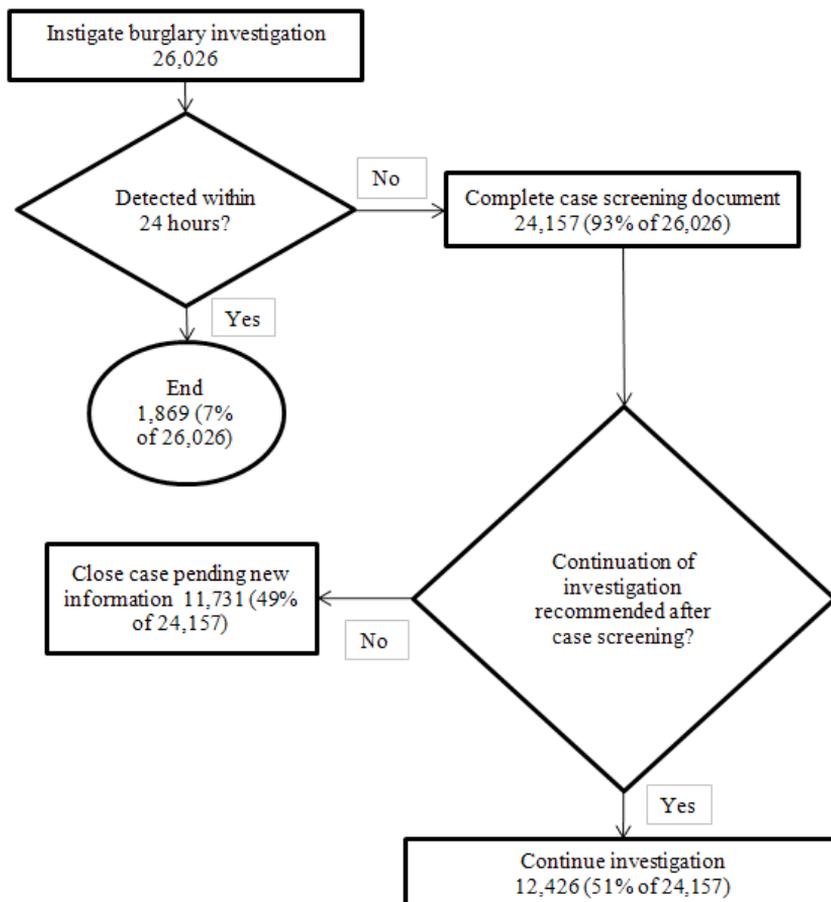
Source: ??????, 2017

Discussion

Summary of results

After taking multiple factors into account, the top five predictors of whether a burglary will be detected after 1 day of investigation are CCTV availability, suspect name availability, a motive of vandalism, a description of the offender's vehicle and a description of the suspect. We translated all of the predictors into a checklist to help police officers decide whether they should continue to investigate a burglary based on how likely they are to detect it. If officers had used this checklist in 2014 and 2015, we estimate that they would have continued to investigate about 50 % of burglaries after 1 day and the detection rate would have increased by about 50 % (from 9 % to 14 %).

Comparison with previous literature

A fundamental assumption of this analysis is that An Garda Síochána can achieve the optimum cost-effectiveness ratio by allocating the most investigative resources on burglaries that they are most likely to detect. Coupe (2014) supports this assumption by showing that police detected 30 % of burglaries that were highly solvable and had maximum resources allocated to them, versus less than 5 % of burglaries that were highly solvable but had minimum resources allocated to them. Therefore, resources matter because they 'enable the unlocking of the solvability information which is the source of the evidence that leads to case detection' (Coupe, 2014, p. 2). Identifying which burglaries are most solvable and allocating the most resources to those is a promising opportunity for An Garda Síochána to deliver a cost-effective service and boost detection rates.

In general, we found that An Garda Síochána is most likely to detect burglaries with more evidence linked to the suspect(s) than burglaries with weak or no evidence. This is highly consistent with previous research, as many studies investigating solvability factors have demonstrated that police are more likely to solve cases with better evidence across a variety of crimes such as burglary, violent assault, rape and homicide (Coupe, 2014). In addition, many of our solvability factors were similar to those previously found in burglary solvability studies. For example, Paine (2013) also found that police were more likely to detect residential burglaries in Thames Valley, UK if a description of the offender was available, if the offender was disturbed and if police recovered forensic evidence such as DNA. There were also some differences between factors identified in the current study and in the study by Paine (2013) but these are largely due to differences in data quality, database features and recording practices. Coupe (2014) reported that many solvability factor studies for burglary have found that factors related to suspect identity information are most likely to lead to detection and this is highly consistent with the current analysis.

Experienced officers in Ireland probably have an intuitive sense of whether they are likely to detect a burglary. Previous focus groups with Irish police officers found that some were investigating over 250 crimes each and they expressed a view that over 200 of those would

never be solved (Garda Síochána Inspectorate, 2014). So it could be that officers are already pretty good at rating how solvable a burglary is and that there is no need for a formal statistical screening process. However, Coupe (2014) reports a large variation between cases that police screen out across jurisdictions for the same crime based on officer perceptions. This suggests 'the potential of some solvable cases may not be fully exploited, while resources may be wasted on less solvable ones' (Coupe, 2014, p. 4). Therefore, a formal screening process based on statistics could enhance any informal screening process that officers use already.

Strengths and limitations

This is the first solvability-based case screening process for burglaries in Ireland. We included almost 100 factors from roughly 50 000 cases across a 2-year period in the analysis. As with many solvability-based studies, the data we analysed was not originally constructed for research purposes. This led to a series of data quality challenges and a need to balance the requirements for conducting statistical tests with the demands of real-world analysis in an operational environment. We responded to this challenge by using big data text-mining techniques, using various quality checking procedures throughout the analytic process, evaluating the reliability of factors, excluding poor quality variables when possible and proposing a pilot test of the checklist.

Practical implications

An Garda Síochána should test this case screening process. To date, we are not aware of any randomised controlled trials to determine the effectiveness of solvability-based case screening that have been published in Ireland or elsewhere. A randomised controlled trial would be the most scientific way to find out if this case screening process works but it would be extremely challenging to conduct in an operational context. An Garda Síochána should use other ways to test the case screening process if a randomised controlled trial is not feasible, such as introducing the screening process in one or more An Garda Síochána areas with similar areas used as controls. This pilot study would also be a good opportunity to address many of the data quality issues that we identified in the current analysis.

Ensuring the best possible likelihood of police officers using the case screening checklist as part of their normal routine is also part of the development of this tool. Feedback from An Garda Síochána as to their views on the reasoning behind the screening product, how they find the usability of the developed checklist and changes that might make it more likely to be used routinely by them could be derived from focus groups with these potential end users.

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A scrutiny of the police's operating environment in Finland

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Abstract

The attention of the police has turned increasingly to the question of how to become smarter in accomplishing their tasks and in fulfilling their duties in society. The police services in most Western countries appear to follow the same path; the faith is invested in better strategies and approaches built upon systematically collected and thoroughly analysed data, which provide intelligence and result in more knowledge-intensive and thus also smarter policing. The various trends and tendencies in the police's operating environment are an obvious target for such a scrutiny. This article describes experiences from Finland in accomplishing such an analysis.

Keywords:
police, operating environment, education

Introduction

In recent years the Police University College of Finland has provided analyses of the development of the police's operating environment. The analyses were intended to increase awareness and provide knowledge of trends and tendencies to be used in the development of internal security, policing and police education in a variety of ways (cf. Cohen McGullough, D. and Spence, 2012; Policing for a Better Britain, 2013). However, it is important to notice that the police's operating environment does not solely refer to the

outside world, but also covers functions, features and practices that are internal to the police (e.g. Bryson, 1995).

We have asked a number of experts to write a brief analysis of a police-relevant theme reflecting their field of expertise. In the last 5 years this request has produced three published reviews comprising of about 80 articles altogether (Muttilainen and Potila, 2016; Muttilainen and Huotari, 2014; Honkonen and Muttilainen, 2012). The authors represent the Police University College, other universities and research institutions, the police administration and other areas of the public administration.

The editors have faced a difficult problem in seeing the forest for the trees, i.e. in figuring out the larger or more encompassing picture transcending individual analytic contributions and insights. However, there seem to be eight themes cross-cutting the latest two reviews.

Content of individual contributions

The articles in the reviews are based on research and statistics, other source material and personal expertise in the respective field of action. Most of them address a police-relevant topic directly, but others open up a more general view to a trend or tendency. The authors of the articles have been asked to describe the current state of the area of their interest, to comment upon it and draw out likely risks and challenges in it in terms of police work and policing.

The latest police's operational environment review was published in November 2016 (Muttilainen and Potila, 2016). The framework for the review reflects the division of research areas in the Police University College, i.e. police work and organisation, policing and the police in society. However, the review begins with a chapter outlining the framework of policing: the problems of the public administration; changes in the security architecture; reforms of the police organisation in Finland and other countries; and the development of the internal security agenda in the EU. A chapter on the theme of police work and organisation mainly analyses police competences and police education.

The articles describe ethical leadership, intelligence-led policing, stress management at police work, the use of simulations and work-based learning in police education.

The articles under the policing theme focus on surveillance and emergency response operations, crime investigation and various other forms of policing. The use of force by the police, uniformed police control and violence in close relationships are scrutinised in this chapter. The analyses also include topics such as: the control of secret information acquisition; the status of economic crime investigation; the investigation of sexual crimes against children; traffic safety measures; license services; and interaction in tactical

negotiations. The police within society theme consists of reviews describing security forecasting, criminal phenomena and the perspective of citizens. First, the prevention model for crime is examined, in addition to campus security in higher education institutions and the regional isolation of immigrants. The criminal phenomena scrutinised include the characteristics of hate crime, homicide trends and the risks posed by money laundering. The final two analyses deal with statutory mediation and citizens' assessments of the police.

Trends in the police's operating environment

This chapter contains reflections based on themes that either bring the articles together or intersect them. The 2016 review is not considered as a separate or independent compilation of articles on the operating environment of the police, but merely complements the previous reviews. The review published in 2014 concluded with making the four following points:

- **New competences to be used by the organisation:** Continuous change in the organisation, the legislation and the tools, requires a new kind of learning and an ability to adapt. The new bachelor-level degree for police officers, which expects both individual and communal capacity for critical reflection, and competences in research and development work, is also likely to raise expectations regarding the life and practices of police work. Competence requirements are increasing both vertically (special expertise in one's own area) and horizontally (wider sphere of cooperation, work in partnerships). The new competences possessed by police officers with a bachelor's degree must be put to proper use in their work organisations and by the work organisations too.

- **Slimming resources — new forms of operation:** The public economy is living through a time of scarcity and the police's own resources will suffice for increasingly less. This requires a new way of thinking in the definition of tasks perceived as essential to the police and in the attitude towards cooperation with other agencies and organisations. Once the police administrative structures have been reformed, this path cannot be expected to provide significant efficiency benefits in the future. Attention must be turned to police work and police employees. If the police are to fulfil their service obligations to civil society, they need to greater appreciate the assistance and expertise from it too in solving its security issues and problems.

- **Global information networks — threats and possibilities:** A considerable amount of people's time is currently spent using internet-based services. Developments in technology will produce increasingly new crime phenomena in data networks and increase the number of potential crime victims. Also, traditional crimes will be carried out via data networks and using new technology. This line of development will inevitably lead to an increasing part of policing taking place online. At best, technology can help enhance operations in a variety of ways. It facilitates the mining of register data and the

tracing of criminals' cash flows. The police can also receive help from online communities or citizens using mobile devices for resolving crimes.

- **A complex operating environment — a challenge to unity:** The environment in which the police operate is becoming increasingly transparent. The police will become more subject to debate, real-time evaluation and open criticism. Citizens are becoming increasingly aware of their own rights and the limits of the legal authority of the police. It is unlikely that the unity that has been a trademark of the police in Finland, will survive in its traditional form. Instead of every police officer representing a unitary bureaucratic stand on every issue, the approaches will provide for more professional, personal and situational ways in dealing with security problems.

These rather general conclusions described above have not lost their relevance. In fact, many of the articles in the 2016 review emphasise them too. However, the latter review highlights some issues unforeseen in the previous compilations:

- **Adaptability to complex problems:** In recent years, discussion of the security environment has often included references to the adaptability of organisations and individuals under the idea of resilience. The challenges requiring resilience have been described, for example, as difficult to resolve, scalable, complex and hybrid. The uncertainty can be compensated for with the ability to adopt new forms of operation; the use of technology; the creation of cooperative relationships; and the development of competences, expertise, the use of information and a service principle.

- **Information accumulated through operation to be put into use:** Police education and police practice utilise the information that derives from practical experience and the information that accumulates in operational police registers. The latter is used in descriptive statistics, research and development work, and as a source of intelligence in managing police resources and directing policing. However, the use of this data source is less advanced than, for example, in healthcare, where recommendations for professional practice are given on the basis of analysis of data from various registers.

- **The ethical foundation of police work within a constitutional state:** Ethics is one of the first principles in policing and the police provide an ethical role model in society. In Finland, the police are both trusted and respected. This partly reflects the strength of the rule of law, democratic principles and functioning of the justice system. The importance of the rule of law should be emphasised, especially when the conditions within the society become increasingly demanding. However, excessive control of public order may jeopardise basic human rights and individual freedoms that are the backbone of civil society.

- **New trends of immigration:** During the second half of 2015, the number of immigrants in Finland multiplied compared to the previous year. Mass immigration is a good example of a sudden and extensive phenomenon that forces authorities and other operators to

seek quick solutions in cooperation with each other. Authorities in Finland were criticised for being unable to predict the scale and schedule of immigration. However, these kinds of incidents, which unveil unpreparedness and lack of imagination, call for resilience, and will be a dimension in the police's operating environment that we are unlikely to fully exclude. Therefore, we must prepare ourselves for their arrival in a versatile manner by developing competences, forms of operation and cooperation, and partnerships with others that are suitable for a variety of situations.

Conclusions

The reviews of the police's operating environment already cover several important and police-relevant themes and issues, while new themes and dimensions are likely to emerge in the future. The articles cast light on a number of essential aspects of the context, which put the police's strategic and operational skills under a severe test currently and in the near future. Most of the insights are based on recent research and development projects or publications on topics that are important in society. The analytical scrutiny of the changes in the operating environment is functionally significant for the police. In addition to the themes that have been under public discussion, it is good to also pay attention to what is not discussed or is only discussed minimally. For example, license services and traffic safety measures are an aspect of policing that are easily overlooked when compared with terrorism, cyber threats, mass immigration and organised crime. Besides, external risks and threats often receive more attention in the field of security work than issues, risks and threats related to the internal operating environment of organisations. The objective of the reviews on the police's operating environment and, more widely, forecasting, is to describe the probable future in a way that prepares us to face it or increases our potential to avoid undesired chains of events through actions performed today (e.g. Dufva, 2015). Not everything, however, can be anticipated; chance always has an impact on the development of the operating environment. The security of the future must, to some extent, be built on the basis of uncertain information.

Without doubt our interpretations of the challenges ahead reflect national policy initiatives and strategies in policing. Perhaps it is challenging to see it from some distance, and to provide a comprehensive, coherent, synthetic picture of it from there (e.g. Fyfe et al., 2013). While the main challenges analysed in this article are typical to Finland, they are also trends and tendencies that are shared by other national and local systems of policing too. No country is an island when it comes to global challenges and international crime. Actually, a joint international effort is needed to paint an adequate picture of the challenges ahead. This article is thus also an initiative for increased cooperation in analysing the operating environment of the police in a less local framework and, perhaps, manner too.

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The community policing evaluation in the Croatian urban and rural communities

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Abstract

Community policing has been one of the contemporary models of policing implemented in Croatia. It was accepted in the early 2000s, within the framework of reforms that were planned to bring the Croatian police closer to the European standards of modern democratic policing after the war and post-war circumstances of the 1990s. The aim was to rebuild police legitimacy and, through citizens' trust in the police, to promote collective efficacy and informal social control. There are serious concerns as to whether this model achieves results regarding implementation-related issues that are common across the world, but particularly typical for post-socialist central and south-east European countries. In the first place, some improvisations of community policing are likely to occur, because the community policing model is more or less adopted on a declarative level, without the substantial understanding of its fundamental principles and lack of basic requirements. Starting from one of the central premises of community policing — that not police alone, but the whole community is responsible for community safety — community policing strategy in Croatia includes several projects aimed to improve relations between the police and the public and to bring together all relevant stakeholders in managing security and safety concerns. Therefore, in this study, the level of implementation of community policing has been analysed from the point of view of four sets: quality of police contact, perception of the level of crime and disorder, fear of victimisation and level of community cohesion. Considering dilemmas about the effectiveness of the community policing model in different social contexts, one urban and one rural community in Croatia have been compared. Due to small samples being the main limitation of this study, the results are representative for specific communities only and cannot be generalised, but could serve as a good foundation for future research.

Keywords:

community policing, evaluation, urban community, rural community, Croatia

Introduction

Many scholars (Champion and Rush, 1997; Edwards, 2000; Brogden and Nijhar, 2005; den Heyer, 2011; Kempa, 2012) claim that the community policing model is best suited to achieving democratic policing principles because of various community policing goals, such as problem solving; police collaboration with various public and private organisations; decentralisation; and the commitment to democratising all public institutions, including the police. As in many other post-socialist countries (Goldsmith, 2003; Meško and Lobnikar, 2005; Meško, 2009; Lobnikar and Meško, 2010), in Croatia the police have adopted community policing philosophies and practices within the framework of the democratisation process and the transfer of policing notions from the West after the sociopolitical changes in the 1990s. The beginnings of community policing in Croatia date back to 2003, when experts from the Ministry of the Interior developed a new strategy for police activities and launched its implementation.

That process of transformation can be summarised in six projects that were implemented in order to achieve the successful transformation of the police, from individual police officers to the organisation as a whole. The projects were: (1) reform of the uniformed police; (2) development and enhancement of crime prevention; (3) organisation of preventative measures in local communities; (4) reform of public relations; (5) reform of police education and the professional development system (Ministry of the Interior, 2004); and (6) internal democratisation of the police (Ministry of the Interior, 2009). The new posts of 'contact police officer' and 'police officer for prevention' were introduced, representing the backbone of the reform of uniformed police. The police were given the opportunity to establish coordinating bodies, consisting of representatives of both citizens and the police. Together, they identify problems in the community and highlight priorities for their resolution. First, such bodies known as prevention councils were established in 2004 and since then a total of 167 prevention councils have been established. There were lot of issues regarding the implementation of community policing in Croatia, due to its rapid introduction and deficient understanding of its fundamental philosophy and basic requirements, but primarily because of legislative regulations that failed to provide the police with such extensive discretion as in countries from which the modern philosophy of community policing originated. Problems are largely related to a lack of flexibility in solving problems in complex situations and a rigid and legalistic mentality amongst the majority of police officers. Despite the fact that a lot of individual enthusiasm as compensation for system deficiencies has been invested and lots of good work has been done during almost 15 years, which has resulted in many positive changes in the police and in the community, without such insights we cannot know anything about the sustainability of these changes.

This is a substantial risk because, as Kappeler and Gaines (2011: 91) are warning, history shows 'that change takes time and that, at any given moment, the past and the future coexist' and 'signs of the past can often repeat themselves and reformers must be concerned that history finds well-meaning solutions to the problems of crime, policing and accountability

stifled and abused by institutional and social forces'. At the moment, we know that community policing is an acceptable policing model for the Croatian police and Croatian citizens, but we do not know how serious such threats could be to its implementation in the future. The purpose of this research was to examine the impact of implementation of community policing on citizens' perceptions and to compare the level of implementation on community policing between a specific urban community in the city of Zagreb and the rural community in Međimurje County in Croatia.

Methodology

Sample description

Data was collected from citizens of Zagreb, the capital of Croatia, and Međimurje County (the capital is Čakovec). Statistical analysis included 99 citizens from New Zagreb, which is one of the most urbanised parts of Zagreb, and 161 citizens from Međimurje County. Međimurje County is demographically also one of the most developed counties in the Republic of Croatia. With a population density of 156 residents per square kilometre, Međimurje County is among the most densely populated Croatian regions. Only the city of Zagreb has a higher population density. The population density in the city itself is 1 200 people per square kilometre. Data was collected from citizens on a voluntarily basis in public places. The smallness of the sample size is a major limitation of the present study. The results are representative of the specific community only and cannot be generalised, but could serve as a good foundation for research in other Croatian regions. In the following tables, the main demographic data of the sample are presented.

Instrument

The question of the measurement of community policing implementation was analysed by Adam J. McKee (2001), who published the article entitled 'The community policing evaluation survey: reliability, validity and structure' and defined the measurement of community policing implementation with four interrelated concepts. These were: (1) quality of contact between the police and local residents; (2) the perception of the level of crime and disorder; (3) fear of victimisation and; (4) level of community cohesion.

The first part of the questionnaire consists of questions referring to the quality of contact between the police and citizens. The second part of the questionnaire includes questions on the perception of crime and disorder, and the third part refers to fear of victimisation. The fourth set consists of questions on community integration. The last part of the questionnaire refers to demographic data. Respondents rated their satisfaction with community policing using a Likert scale from 1 to 5. The claims made by the authors were adjusted to suit the Croatian cultural environment. A higher value in the first set of questions (quality of contact between the police and the citizens) means that the respondents believe the police have good quality contact with citizens; in the second set of questions (perception of crime and

disorder) a higher value means that respondents do not see crime and disorder as a problem in their community; in the third set of questions (fear of victimisation), a higher value means that respondents are not afraid of victimisation in their community; in the fourth set of questions (community integration) a higher value means a higher level of community integration.

Table 1
Quality of police contact

	Place (seat of county)	N	Mean	Std. Dev.	STAT. SIG. DIFF.
How good of a job do you think the police in this area are doing in helping people out after they have been victims of crime?	Čakovec ZG - Novi Zagreb	161 99	2.94 **3.08**	1062 1158	YES t = 43.00; p= .015
In general, how polite are the police in this area when dealing with people around here?	Čakovec ZG - Novi Zagreb	161 99	3.35 **3.57**	.831 1.080	YES t = 31.455; p = .020
In general, how helpful are the police in this area when dealing with the people around here?	Čakovec ZG - Novi Zagreb	161 99	2.99 **3.47**	1.055 1.142	YES t = 13.458; p = .047
In general, how fair are the police when dealing with people around here?	Čakovec ZG - Novi Zagreb	161 99	**3.09** 3.01	.869 1.035	YES t = 76.250; p = .008
How good a job are the police doing in keeping order on the streets and in public places?	Čakovec ZG - Novi Zagreb	161 99	3.17 **3.35**	1.062 1.043	YES t = 36.222; p = .018
Quality of police contact scale	Čakovec ZG - Novi Zagreb	161 99	15.54 **16.48**		YES

1-low; 5-high; min 5; max 20;
a higher value means that the respondents believe that the police have good quality contacts with citizens.

Results and discussion

The differences are clearly statistically significant in respondents from Zagreb and Međimurje County with regard to all variables, as p is below 0.05 (Table 1). The respondents from Zagreb evaluated the quality of contact with police officers significantly higher statistically. In all cases (except regarding the fairness of police when dealing with people), the average is above 3 on the 5-point scale. Contact between the police and local residents is important as well — what the local residents think of the police has a direct impact on the possibility of a partnership between the police and the community and can influence the willingness of the population to act in conformity with the law. The respondents from Novi Zagreb evaluated the contact with the police significantly higher statistically in four out of five questions.

Namely in Novi Zagreb the respondents think the police are more helpful when dealing with the people and that the police are better at keeping order on the streets and in public places in Zagreb than in Međimurje County. These also have significant influence on the 'quality of police contact' scale, where the score is significantly higher in Novi Zagreb than in Međimurje County.

Table 2
Perceptions of crime and disorder scale

	Place (seat of county)	N	Mean	Std. Dev.	STAT. SIG. DIFF.
How big of a problem is people breaking windows out of buildings in the area?	Čakovec ZG - Novi Zagreb	161 99	**2.99** 3.16	1.275 1.243	YES t = 36.76; p= .018
How big of a problem is people drinking in public places in this area?	Čakovec ZG - Novi Zagreb	161 99	**2.99** 3.06	1.196 1.276	YES t = 86.429; p = .007
How big of a problem is people being attacked or beaten up by strangers in this area?	Čakovec ZG - Novi Zagreb	161 99	**3.67** 3.77	1.161 1.132	YES t = 74.400; p = .009
How big of a problem is people being robbed or having their money, purses or wallets taken?	Čakovec ZG - Novi Zagreb	161 99	**2.80** 3.43	1.208 1.099	NO t = 9.889; p = .064
How big of a problem is vacant lots filled with rubbish and junk in this area?	Čakovec ZG - Novi Zagreb	161 99	2.88 **2.20**	1.242 1.229	NO t = 7.471; p = .085
Perceptions of crime and disorder scale	Čakovec ZG - Novi Zagreb	161 99	**15.33** 15.62		

1-low; 5-high; min 5; max 20;
a lower value means that respondents see crime and disorder as a problem in their community.

The level of crime and disorder, as perceived by the population, has a direct and strong impact on the quality of life in a community. There are significant differences between two samples in three variables (Table 2). The Međimurje County respondents think that problems with people breaking windows or drinking in public places is bigger than in Zagreb, and their perception is the same regarding the problem of people being attacked or beaten up by strangers. All of the averages in the case of Međimurje County respondents are below 3. There are no significant differences between two samples — the perception of the problem of being robbed or having money taken, and the problem with rubbish.

Table 3

Personal fear of victimisation scale

	Place (seat of county)	N	Mean	Std. Dev.	STAT. SIG. DIFF.
How worried are you that someone will try to rob you or steal something from you when you are outside in this area?	Čakovec ZG - Novi Zagreb	161 99	**3.30** 3.45	1.234 1.288	YES t = 45.000; p= .014
How worried are you that someone will try to break into your home while someone is there?	Čakovec ZG - Novi Zagreb	161 99	3.48 **3.44**	1.146 1.303	YES t = 173.000; p = .004
How worried are you that someone will attack you or beat you up when you are outside in this area?	Čakovec ZG - Novi Zagreb	161 99	3.87 3.87	1.050 1.157	ISTE AR.SREDINE Sd. = 0.00
How worried are you that someone will try to steal or damage your car in this area?	Čakovec ZG - Novi Zagreb	161 99	3.58 **3.32**	1.223 1.316	YES t = 144.000; p = .004
How worried are you that someone will try to break into your house while no one is there?	Čakovec ZG - Novi Zagreb	161 99	**2.86** 2.90	1.297 1.329	YES
Personal fear of victimisation scale	Čakovec ZG - Novi Zagreb	161 99	17.09 **16.98**		

1-always; 5-never, min 5; max 25;
a lower value means that respondents are afraid of victimisation in their community.

The fear of victimisation weakens community cohesion, which consequently loosens and annuls informal mechanisms of social control. One of the main premises of community policing is that informal control mechanisms, and not the police, assure order in the neighbourhood/community. There are significant differences between two samples: the respondents from Međimurje County are more worried that someone would try to rob them/steal something from them/someone would try to break into their house while no one is there than inhabitants from Zagreb (Table 3). The respondents from Zagreb are more worried that someone would try to break into their home while someone is there and that someone would try to steal or damage their car. Both samples of respondents are equally worried that someone would attack or beat them up when they are out of their home.

Table 4
Community cohesion scale

	Place (seat of county)	N	Mean	Std. Dev.	STAT. SIG. DIFF.
If I were sick I could count on my neighbours to shop for me at the supermarket, go to the drug store, etc.	Čakovec ZG - Novi Zagreb	161 99	**3.73** 3.56	1.341 1.387	YES t = 42.882; p= .015
When I am away from home, I can count on some of my neighbours to keep their eyes open for possible trouble.	Čakovec ZG - Novi Zagreb	161 99	**3.80** 3.71	1.293 1.416	YES t = 83.444; p = .008
If I had to borrow EUR 25 for an emergency, I could turn to my neighbours.	Čakovec ZG - Novi Zagreb	161 99	**3.73** 3.26	1.355 1.489	YES t = 14.872; p = .043
The people in this area work together to solve problems.	Čakovec ZG - Novi Zagreb	161 99	2.75 **2.81**	1.221 1.353	YES t = 92.667; p = .007
I know several people in this area well enough to ask a favour.	Čakovec ZG - Novi Zagreb	161 99	**3.64** 3.44	1.217 1.387	YES t = 35.400; p = .018
Community cohesion scale	Čakovec ZG - Novi Zagreb	161 99	**17.65** 16.78		YES

1-strongly disagree; 5-strongly agree; min 5; max 25;
a higher value means a higher level of community integration.

For the fourth and final factor (community integration), a higher value of the variable means strong community integration. If community cohesion is weak, the community cannot act as a control agent. Therefore, if we seriously want to study the possibility of community policing, we also have to focus some attention on community cohesion. In Table 4 we can see that there are statistically significant differences between two samples in all items. Community cohesion is rather high in Međimurje County, except in the case of joint problem solving. Neighbourhood watch and mutual aid are more present in the case of Međimurje County residents. They are more convinced that when they are away from home, they can count on some of their neighbours to keep their eyes open for possible trouble.

Concluding remarks: are the differences between the urban and the rural community fading away?

Considering that community policing has been the officially accepted model of policing in Croatia for more than a decade, we are interested in the effectiveness of the model in both social settings — urban and rural ones. These differences stem from the substantial changes in lifestyles, social organisation and political and economic conditions that have occurred over the past 10 years.

Due to small samples being the main limitation of this study, given results are representative for specific communities only and cannot be generalised, but could serve as a good

foundation for future research. However, they indicate the quality of contact between police and citizens in both observed areas, and the most important safety problems of their inhabitants.

In Međimurje County there is a lack of contact with the police, a high level of perception of crime and disorder, existence of personal fear of victimisation and a high level of community cohesion. Although they are living in detached houses, there is a high level of population density in Međimurje County. They gravitate towards the bigger cities in the surrounding areas and their lifestyle has developing urban features. There is an ongoing urbanisation process in rural societies, which on the one hand have strong links with a typical rural lifestyle, and at the same time enjoy the benefits and disadvantages of urbanisation.

Due to the homogeneity of the population, there is a high level of social cohesion; however, they recognise that only when they are in distress and/or left on their own. They are not involved in joint problem solving for the benefit of the community. Therefore, other rural areas in Croatia must be researched. In addition, our understanding of the rural community must be explored, as the rural lifestyle has changed.

In the city of Zagreb, the main fear is that someone would break into their home or would steal their car. However, there is the perception that there is good communication with the police and a preference for joint problem solving. Due to a more heterogeneous population, migration and an acceptance of the differences in the immediate social surroundings, the residents of Zagreb have higher levels of bonding both among themselves and with the police. One should take into account that societal values tend to change as the community grows more complex, more heterogeneous and more connected to the world. Societies and individuals thus have reciprocal impacts on value systems.

The personal fear of victimisation is equally represented in both samples. We can partially attribute this fear to the 'culture of fear' and sense of insecurity that is induced into people through the mass media and the current 'culture of violence'. Nowadays, the media represents an important source of information on all the problems that do not represent the everyday experiences of average people. The studies show that the reasons for this skewed perception on crime lie in the way it is presented in the media, because more space is devoted to extreme and atypical crime, mostly crime involving vulnerable victims and non-vulnerable perpetrators, and they are pessimistic about the criminal and legal systems (Dubois, 2002).

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Not all cops are bastards — Danish football supporters' perception of dialogue policing

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Abstract

The Danish police have changed their tactics in relation to their policing of football supporters. The changes have involved the development of a dialogue-based approach to the policing of football supporters. The changes seem to have contributed to a reduction in the number of arrests and football supporters detained. This article presents the first e-survey that involves football supporters' perception of the dialogue approach and thus adds an 'end-user' perspective on the police work delivered by the Danish police. The results underline that the changes in police tactics have increased a sense of legitimacy among the football supporters that is in sharp contrast to the notion 'ACAB' (All Cops Are Bastards) used by football supporters all over Europe. The results from the survey indicate that a change towards a dialogue-based approach can be beneficial in relation to the police fulfilling core strategic goals like conflict reduction and creating a more peaceful atmosphere at football matches.

Introduction

The vast majority of football matches require a police presence. The approach of the police has a direct influence on the behaviour of football supporters. During the last few years Danish police have changed their tactics in relation to their policing of football supporters. The changes have involved the development of a dialogue-based approach to the policing of football supporters. The changes seem to have contributed to a reduction in the number of arrests and football supporters detained. This article presents the first e-survey that involves football supporters' perception of the dialogue approach and thus adds an 'end-user' perspective on the police work delivered by the Danish police.

Background

In 2008, the Danish national police distributed the 'National handbook on police work in association with football matches' (translated title). The handbook strongly emphasises flexibility and tolerance towards all football supporters. The handbook's intentions represent an innovation in the handling of Danish football fans compared with the less dialogue-based practices of the past, where high-risk matches were policed through the so-called 'mobile deployment concept'.

This involved the use of police vehicles and squads of police officers with protective equipment to achieve strategic objectives through rapid mobility and the use of force. However, the years following the handbook's publication revealed a number of obstacles in implementing a dialogue-based approach (Rasmussen and Havelund, 2010). As a consequence East Jutland Police (one of Denmark's 12 police districts), and researchers developed the so-called 'event police concept' with the primary focus on a dialogue that reflects the research in crowd dynamics (Havelund et al., 2011). The concept was evaluated by the Danish national police. One of the evaluators has elsewhere described the concept in these terms:

> 'By having specially trained police who can undertake dialogue or exertion of physical force respectively, one can both minimise the use of physical force and make it more effective because it is possible to target it at those individuals representing the core of the problem, rather than taking a scattergun approach and ending up in a confrontation with the whole crowd' (Diderichsen, 2011, p. 138, our translation).

The 'event police concept' was adopted nationally and implemented from 2012 as the 'dialogue deployment concept'. The concept has been developed within the framework of football matches but has since been used for protests and large crowd events. The primary role of the dialogue police officers is to facilitate legitimate behaviour of the visiting supporters. Prior to a match day the head of the operation or the commander of the

dialogue unit seeks to establish contact with key persons from the visiting supporters, both from official and unofficial supporter groups, including known violent supporter groups. This is done with the help of the police department's 'football contact person' and the police department where the supporters come from. Often the visiting football club and especially their supporter liaison officer (UEFA, 2011) facilitate the communication and give valuable input to the policing operation in the planning process. The police often help find a suitable pub for pre-match drinking and collaborate on the organisation of marches. The supporters often arrive by train or by bus several hours before kick-off. If they arrive in the town centre away from the stadium they are met by the dialogue police officers. The dialogue police officers will follow the supporters throughout the day except inside the stadium (Havelund et al., 2011). Their main focus will be on establishing contact with supporters and be open to engage in dialogue, thereby following a key strategic objective of the concept by delivering a precise dynamic risk assessment throughout match day in order to secure a quiet and peaceful event. One of the primary aims of the dialogue-based approach is thus to gain a better understanding of the different supporters' groupings and their intentions for the day. In case things start escalating, more precise and differentiated interventions will be possible on the basis of the dialogue-based approach thereby indirectly supporting legitimate behaviour. During this first contact of the day the main task is to gather information on the group and feed the information into the overall operation in order to update the risk assessment and maybe do some adjustments depending on the mood of the supporters and intelligence from other parts of the operation (see Havelund et al., 2013 for a detailed description of the concept). The concept seems to have contributed to a positive development regarding arrest figures in Danish football where the number of arrests or detained has gone from record high 714 in the season 2008/2009 to 99 in the season 2014/2015 for the 198 matches played in the Danish Superliga. The Danish police have emphasised the introduction of the dialogue concept as one of the primary reasons for the decline in the number of arrests and people detained. It is exemplified by the Danish national police's press release following the publication of the arrest figures from the 2011/2012 season:

> 'The police's concept of dialogue police officers in connection with matches was implemented last season … We believe that it helps ensure that matches can be played without a large number of arrests.' (our translation)([1])

Football supporters have indirectly contributed to the evaluation of the event police training programme via interviews conducted by researchers (Havelund et. al., 2011). But the results shown below represent the first survey done in Denmark with a focus on football supporters' perception of the dialogue approach.

([1]) - 'Lavt antal anholdte ved superliga-kampe', politi.dk, https://politi.dk/da/aktuelt/nyheder/ Lavt+antal+anhold te+ved+superliga-kampe.htm?WBCMODE=PresentationUnpublis

Methodology

An internet survey was developed for the purpose of data collection. Web-based research is increasingly being used to reach a wide variety of sports fans (Manfreda and Vehovar, 2008; Jansen, Corley and Jansen, 2007).

The questionnaire included questions with the purpose of gathering information about the supporters and their attitudes towards dialogue-based approaches such as stewards, train stewards and dialogue police officers. The questions were formulated based upon experience from a previous interview study and observations made during training events (Rasmussen and Havelund, 2010; Havelund et al., 2011). The questionnaire included sections with statements about the concepts, which were answered on a 5-point Likert-format scale. The Likert scale included two grades of satisfaction and dissatisfaction and a 'neither nor' category. The respondents were also given the opportunity to give the answer 'don't know'. The results of the survey were analysed through the use of cross-tabulations and frequencies. An opportunity for open-ended comments was also provided. The input from the open-ended questions was analysed as qualitative data, however the input did not reach a point where coding was made possible.

Invitation to participate in the survey was distributed to the members of Brøndby Support. The supporter club has a total of around 3 600 members. The questionnaire was online for a 7-day period with a reminder sent after the first 5 days. The respondents were given no incentives for their participation. Brøndby Support is one of Denmark's most active official supporter clubs, which supports Brøndby IF. The supporters can best be characterised as non-risk supporters and thus resemble the vast majority of supporters in Denmark. However, matches in Denmark with Brøndby as the away team are treated by the police as some of the matches with the highest level of risk. In that sense, and due to the number of respondents, findings cannot be extrapolated from all Danish supporters as many matches with a low level of risk are handled without the presence of police officers, which certainly will influence supporters' experiences of the police operation. These results therefore need to be interpreted with caution (Gerring, 2007, p. 65ff).

Results

The questionnaire was completed by 623 persons and the completed questionnaires form the basis of the results presented below (see Table 1). The average age of the respondents was 40.9 years old. 18 % of the respondents were women and 82 % were men. The respondents frequently visit the home matches, with one third of them attending at least 75 % of the club's home matches (national league and Europa league) in 2015.

Since the early 1990s, football crowd disorder has been perceived as a significant problem in domestic Danish football. Football matches often attract a large number of supporters and therefore inherent safety risks need to be recognised by organisers and the police.

The primary role of the police in relation to football matches is to ensure the balance between the highest degree of freedom for the supporters and the best possible safety standards. However, until the implementation of the dialogue-based approach the police were mainly associated with repression and restrictions, and the football supporters often resented the presence of the police forces (Havelund et al., 2006; Joern, 2006). From time to time supporters around Europe use the notion ACAB to show their dissatisfaction with the police (Armstrong and Young, 1999; Testa, 2009). ACAB is short for 'All Cops Are Bastards' and is also occasionally used in Denmark.

However the statement does not reflect the general perception among the respondents since 49.4 % of the respondents were either satisfied or very satisfied with the police's way of handling football matches. 17.5 % displayed dissatisfaction and only 3.3 % were 'very unsatisfied' with policing operation. The remaining 33.1 % answered that they were neither satisfied nor dissatisfied or that they didn't know.

This result reflects the low level of disorder in the Danish context over the last few years, with a decline in the numbers of arrests and people detained. To some extent the results also mirror data from the European Social Survey where the Danish population, despite a minor decline from 2012 to 2014, is placed second when it comes to the population's trust in the police (Ministry of Justice, 2016).

Table 1

Respondents' attitudes towards statements

Statement	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Don't know (%)
Dialogue police officers contribute to a more peaceful atmosphere at football matches	38	44	11	2	2	3
The behaviour of the dialogue police officers is conflict reducing.	31	46	12	3	3	4
The behaviour of the dialogue police officers has strengthened the dialogue between police and fans	36	38	15	1	2	7
Dialogue police officers contribute to a reduction in the number of arrests.	22	29	21	5	2	21
The behaviour of the dialogue police officers has given me a more positive perception of the police in general	27	30	30	4	5	4
Dialogue police officers have minimised my respect for the police	5	6	19	13	53	4
Dialogue police officers have given me a better understanding of the police's work in relation to football matches	16	27	39	6	5	6

The Danish 'dialogue deployment concept' is mainly used for away supporters. Of the 623 respondents 295 answered that they had had experiences with dialogue police officers.

The vast majority of the supporters (82 %) recognised that the behaviour of dialogue police officers contributed to a more peaceful atmosphere at football matches. This result contrasts with previous findings where police in riot gear had been seen as part of the reason for disorder (Havelund et al., 2006). The result thus supports the assumption by the Danish police that the change in police behaviour has contributed to a more peaceful atmosphere at football matches. This is supported by the perception shared by 77 % of the respondents that the behaviour of the dialogue police officers can be characterised as conflict reducing. As a reflection of that around half of the respondents agreed or strongly agreed with the statement that dialogue police officers contribute to the reduction in the number of arrests.

One of the main tasks for the dialogue police officers is to seek dialogue with supporters and to be approachable. This seems to have been achieved with 74 % agreeing or strongly agreeing that the officers have strengthened the dialogue between police and fans. Dialogue has for a part of the respondents (43 %) resulted in a better understanding of the police's work in relation to football matches.

At the same time the strengthened dialogue between supporters and police does not seem to have a negative impact on the supporters' respect for the police. On the contrary, the majority (57 %) of the supporters answered that dialogue police officers have improved their perception of the police in general and that they respect the police. One of the respondents gave the following input that reflects the results:

'The dialogue police officers are always very professional. … They build relationships between supporters and police so that we can see that they are not all bastards (sorry for my language). They are 'down to earth', show us respect and actually want to listen to us. … They solve 9 out of 10 situations without speaking loudly or using any repressive measures.'

Conclusion

The study is based upon responses from Brøndby supporters. Data has not been gathered from football supporters supporting different teams in Denmark and the results therefore need to be interpreted with caution.

Only very few of the respondents that have been policed by dialogue police officers expressed any negative attitudes toward the concept. Instead, the dialogue police officers were generally and to a very large extent positively evaluated by the supporters.

This supports the perception expressed by the Danish national police that the 'dialogue police concept' has contributed to fewer arrests and confrontations (see Note 1). The results underline that the changes in police tactics have increased a sense of legitimacy among the football supporters that is in sharp contrast to the ACAB notion (Armstrong and Young, 1999; Testa, 2009). On the contrary the results from the survey, based upon responses from Brøndby supporters, indicate that a change towards a dialogue-based approach can be beneficial in relation to the police fulfilling core strategic goals like conflict reduction and creating a more peaceful atmosphere at football matches and other crowd events. However, due to the limited number of respondents it is necessary to conduct large scale and nationwide surveys to extrapolate the results for the Danish context.

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Police decision - making at major events: a research programme

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Abstract

The Major Events Laboratory (MEL) started functioning in 2011. Its primary objectives are to develop research in what concerns the security of major events and to contribute to modernising police activity and the definition of good practices. One of MEL's research lines tackles decision-making in police activity. Police decision makers face the limits of the human mind when making choices or solving problems. Facing time pressure, lacking complete knowledge and with information processing capability, they are prone to attaining acceptable and satisficing solutions under challenging and uncertain scenarios. Descriptive studies have been conducted using the naturalistic decision-making approach: on the field — at major political and sports events — at MEL's simulation room, during traffic control and during monitoring operations. The initial results are presented and implications for the learning and training process are discussed.

Keywords:

major events policing; police decision-making; naturalistic decision-making; learning and training.

Introduction

Everybody makes decisions, constantly, all day long. In an uncertain world, with higher complexity and a greater amount and diversity of information flow, decision-making is even more demanding, whether it be simple or complex. The human being, unable to know everything about a certain subject and in order to process all the available information, permanently faces situations demanding urgent answers and time pressure, and is conditioned by stress, and political, institutional and social constraints. He therefore uses simplification strategies to achieve satisficing solutions (Simon, 1956), thus assuming non-optimised decisions because of the impossibility of predicting all the possibilities/ alternatives/courses of action (Gigerenzer and Selten, 2001).

Working in a complex, uncertain, demanding and changeable environment, which is at times hostile, the police officer is confronted with the same constraints, besides media scrutiny and social and organisational accountability (multilevel scrutiny).

In major events, security planning implies the anticipation of scenarios in order to design alternative solutions with regard to the changing of events on the field. So, any plan benefits from knowledge coming from different scientific areas, from available intelligence and from the decision makers' experience.

On the other hand, major events are unique moments to develop new security solutions, regarding the quantity, complexity and singularity of identified problems, and the willingness of the host countries to invest important amounts of resources.

According to Todd and Gigerenzer (2000: 737), 'if we want to understand how real human minds work, we must look not only at how our reasoning is 'limited' compared to that of supernatural beings, but also at how our minds are adapted to real-world environments'. It is therefore important to observe the human being in a naturalistic context and his behaviour in real-world situations, which are surrounded by inherent limitations (Gonçalves, 2014).

Naturalistic decision-making theory appears to be an attempt to understand how people make decisions in the real world. Naturalistic decision-making (NDM) is acknowledged to be based on practical processes, aiming to explore the way people really make decisions, by learning about the strategies decision makers use, instead of using formal decision-making models (Nemeth and Klein, 2010).

The core aim of this theory is to investigate how people make complex decisions in front of instable situations, ill-defined tasks, time pressure, uncertainty, risk and major consequences in case of error (Lipshitz, Klein, Orasanu, and Salas, 2001; Nemeth and Klein, 2010). In many domains decision makers have to deal with high-risk situations. Having multiple available decision alternatives but being confronted with time pressure, they have to use their

experience to rapidly identify the typical solution (Schraagen, Klein and Hoffman, 2008). It should be noted that NDM also tries to evaluate the real environments and demands the decision maker faces when trying task-performing in an efficient and secure way. As Nemeth and Klein (2010) point out, Simon's (1956) notion of 'satisficing' enables people and organisations in complex environments to find solutions that satisfy and suffice when better answers cannot be obtained. Simple options are evaluated sequentially by using the results of mental simulations and are taken into account if they lead to satisficing results instead of optimal ones (Orasanu and Connoly, 1995).

On the other hand, considering Klein's (1989, 1999) research, it is known that decision makers do not behave accordingly with the traditional theories, because much effort is dedicated to the situation assessment or the discovery of the problem's nature. So, NDM research: 'is mainly distinguished from traditional decision-making research by its emphasis on studying experienced people such as fireground commanders, airline pilots and police officers, and using realistic task settings, such as traffic accidents, burning buildings and problems in airplane cockpits. The focus is on situation assessment rather than comparison of options. Traditional decision-making research has generally focused on static, well-defined tasks while NDM, on the contrary, focuses on more realistic dynamic, complex, ill-defined decision problems to be solved in real time and under time pressure'. (Rake and Njå, 2009, pp. 667-668).

Considering the decision maker experience and the environment characteristics, NDM is 'the way people use their experience to make decisions in field settings' (Zsambok, cit. in Lipshitz et al., 2001, p. 334), and aims to 'specify the link between the nature of the task, person and environment on the one hand and the various psychological processes and strategies involved in naturalistic decisions on the other' (Cannon-Bowers et al., cit. in Lipshitz et al., 2001, p. 347).

The question that arises is: which methods should be used to obtain this kind of knowledge? Lipshitz et al. (2001) indicate, besides real-time field observations (involving ethnographic techniques), the use of simulation and laboratory techniques.

Specifically, these authors mention: structured and unstructured interviews; retrospective analysis of critical incidents; expert drawing of domain maps; think-aloud protocols; videos of task performance; and cognitive task analysis. 'The tasks and materials may be taken from the actual or simulated work environment, may be generated by the analyst or domain expert, and may be designed to be typical or anomalous, easy or challenging, constrained or unconstrained' (Lipshitz et al., 2001, p. 343).

In short, moving away from the cognitive bias theories, NDM allows improved understanding of the decision makers' cognitive performance under uncertain conditions in specific real

environments, because it understands the use of heuristics as a result of the evidenced experience of the decision makers (Nemeth and Klein, 2010).

At MEL we have been developing some research about experienced/expert police officers' decision-making in different environments of police activity, tackling topics linked with major events policing with regard to different ranks and police specialities. Specifically, two kinds of studies have been developed. Some field studies were conducted, in real time, with accompanying commanders and team leaders involved in large police deployments. This enabled us to compare results between what happens in political and sports events (demonstrations and football matches). On the other hand, a specific branch of the overall security activity was explored — traffic control operations. A simulation study was developed by means of a multiple case study approach (Yin, 2001).

Using the MEL simulation room, some scenarios were presented to traffic patrol officers, allowing us to get some insight into the features involved in the decision-making process during traffic control operations.

Police decision-making at major events: field studies and simulation room

The structure of the following presentation will make use of the above approach, in order to highlight the different typology of studies conducted in the research programme. First, the field studies (A) are presented, describing both sports and political events in terms of method, procedure and results. Then, the simulation study (B) will also be described, informing about the methodological approach, procedure and results.

A — Field studies

Method
The field studies were conducted during large police deployments, at major sports events (football matches) and at major political events (demonstrations). The police commanders and team leaders involved were accompanied in order to collect data in real time, aiming to understand their decision-making process throughout all of the planning and operational work, and its outcome (final report).

Basically, the field studies have followed the same methodological procedure. In Table 1, the information about the method is presented in a comparative way, considering both major sports events and major political events.

**Table 1**
Field studies' methodological description

Major events	Sports	Political
Events	10 football matches (Portuguese League and UEFA Champions League)	Three political demonstrations (two of them promoted by labour unions and the other one a university students' protest)
Participants	Commanders and EIR chiefs (rapid intervention team with nine police officers and one chief)	
Corpus	Commander's strategy and tactical planning procedures Final reports (before and after the events) Naturalistic observation and think aloud written data (policing activities during the events)	
	Operation orders	Practical guidelines for public order policing
Instruments for data collection	Naturalistic observation and think aloud technique	
Instruments for data analysis	Content analysis	
Procedure	Before the events: accompanying the decision-maker — field recognition, information search and collection, preparation of meetings and briefings, and analysis of the operation orders (football matches) and of the practical guidelines for public order policing (demonstrations) During the events: accompanying the decision-maker — direct observation and think aloud registering After the events: analysis of final reports All data content was analysed and codified in categories and subcategories which were designed especially for the purposes of this research, and derived directly from the collected data, following an open or exploratory content analysis procedure. Data was then submitted for a descriptive statistical analysis	

Results: Police decision-making in sports versus political events

Results are presented using a comparative approach between major sports and political events, while considering two different sets of results: one derived from the documents' analysis and the other from the analysis of the data collected on the field.

In Figure 1 the results of the content analysis of documents are first presented. The documents were: the commander's strategy and tactical planning procedures, the operation orders (football matches), the practical guidelines for public order policing (demonstrations) and the final reports.

Figure 1 — Content analysis results of documents: major sports events (A) and major political events (B)

A   B
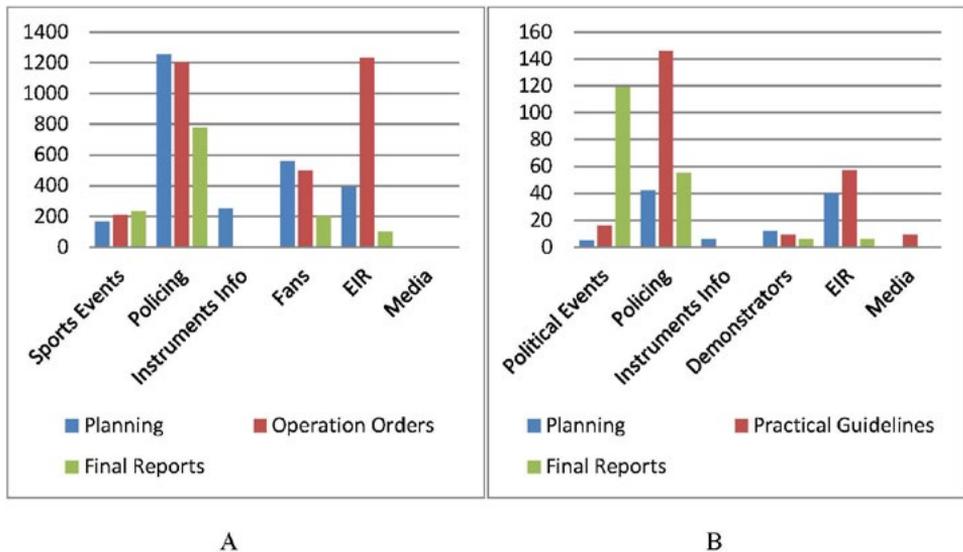
Sports events — the emphasis is on policing (in the three types of documents), where the importance of setting goals in the commander's strategy and tactical planning procedures, and their formalisation in the operation orders becomes evident. In addition, the information regarding the EIR (rapid intervention teams) is of major importance, specifically in the operation orders, where their modus operandi is established, mainly regarding the actions to be taken and respective locations. Also, the information about the fans deserves highlighting, particularly the information concerning their characterisation/description, the entrance procedures to adopt, the specific routes to be taken and policing procedures. The final reports only consider the fans' behaviour, their localisation and the measures taken by the police to control or support the fans' activities. In fact, the final reports are mainly centred on describing the policing goals and evaluation of results.

Political events — policing procedures are clearly the most relevant issue. It seems that everything has been defined in the practical guidelines for public order policing, as far as policing goals, expectations and resources are concerned. Specifically, policing goals assume a huge relevance. Also, the information about the EIR teams deserves some attention, particularly the tasks to be performed and their deployment, but everything seems to be planned in the public order terms of reference (Lisbon police). Finally, it must be stressed that final reports are mainly concerned with the political events themselves and with the operations' results. Considering the data collected on the field, by means of naturalistic observation and the think aloud technique, the results are presented in Figure 2.

Figure 2 — Content analysis results of naturalistic observation and think aloud: major sports events (C) and major political events (D)

C

D
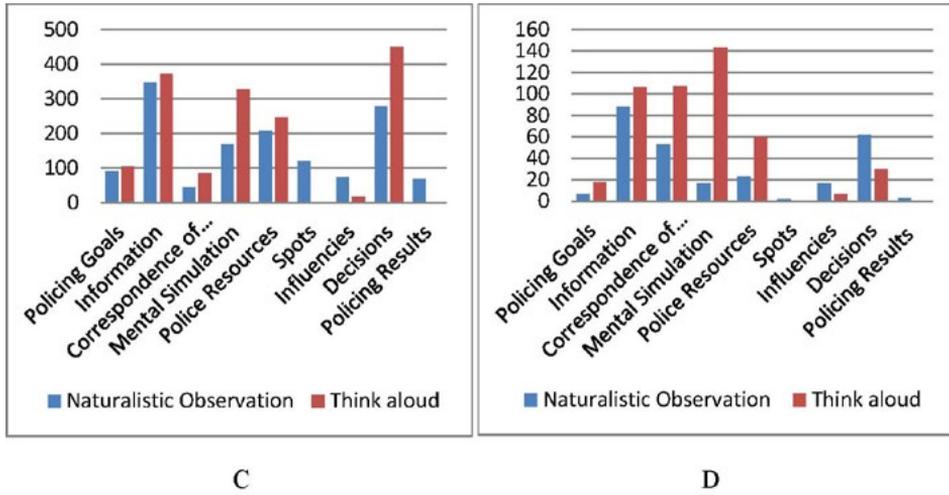
Sports events — the focus is on the information flow, mainly its transmission, considering the available and searched information (though less so with the latter). Also, the mental simulation plays an important role, for the decision makers make systematic assessments of the field operations, with the support of expectations and effort coordination. Of course, the decisions are predominant on the field (mainly focused during the think aloud process). In addition, the police's own resources are a matter of concern (with less worry about the police's equipment). It must be mentioned that the focus on the policing goals is not so relevant on the field. In the opposite direction, information flow assumes a higher weight, which can be understood because of the situations' dynamics.

Political events — the information flow is a major issue on the field, mainly the transmission of information, using searched and available information and also referring to previous knowledge. Additionally, emphasis is given to the correspondence/matching of patterns, where standard or typical situations are addressed. The mental simulation is also a relevant issue. A systematic assessment of field operations is made, also with the support of expectations and memory recalls. The fact that the political events studied occurred peacefully and/or according to the previously defined planning, may have led police to simply manage their course, thus explaining why decisions are less emphasised. Information about policing goals is not so relevant; instead, prominence is given to the information flow because of the situations' dynamics.

Discussion: Comparison between police decision-making at sports versus political events

It is evident that sports events are more predictable. The space, the numbers of fan groups present, and the time, are predetermined. Besides, fan groups present at sports events are usually fewer than the groups present at political demonstrations. Also, it is possible to know how many people will be attending an event, for the sports venues have a specific capacity and there are security controls at entrances (body search and alcohol tests). Ticket policy is fundamental for distributing the different groups throughout the stadiums: preferably, fans should be zoned considering their group identity. Ticket policy itself may introduce individual fan identification mechanisms, thus reducing anonymity by the constraining of inadequate behaviours and facilitating the social formal control exercise (ticket selling by means of identification). These are the reasons that can be at the basis of a more detailed policing planning, which is found in this research.

For major political events there is an attempt to find an adaptive pattern based on the practical guidelines for public order policing, more so than on planning procedures. Comparing these with sports events, this search for patterns assumes another relevance, for it is mandatory that police officers stay more alert in less routinised and less predictable situations.

This is also reflected in the planning goals: at sports events predictability is higher (there is already a pattern). Apparently, it is easier to conceive policing planning for sports events. Furthermore, the fact that sports events are much more frequent than political ones allows for greater procedure automation and coordination. Space is also important. It matters to consider if the events are local, national or international.

The symbolic transformation of space and consequent attribution of specific characteristics by the different groups present at different occasions, in general, is not attended to by authorities. Policing typically stays focused on territory, with police deployment very much 'attached' to the space, and also being determined by it. However, public order policing does not consist in merely defending the space. It consists in warranting free exercise of democracy and individual rights in that particular space; so the behaviour of people present at the venues matters. Attention should then be focused on behaviours, not on specific individuals.

Regarding sports events, fans feel like they belong to that space — 'our' stadium. And, if police just defend the space, they don't focus on conduct. On the other hand, that symbolic liaison is reinforced by a physical one, through the specific ticket seat number. The problems emerge when clubs offer tickets without considering fan group identities, running the risk of mixing them up with home club fans and enhancing aggressive/violent behaviour in situations where they collide with other groups' social identity (e.g. Stott and Reicher, 1998).

Therefore, considering what learning and training is about, the observation of individual and collective behaviour should be highlighted, in addition to territorial and material aspects.

However, it should be noted that the law only imputes responsibility to individual and objective disruptive behaviours. Even if it applies to group behaviour, group dynamics and identity are given less importance in the face of the indictment processes undertaken regarding each group element. It would, then, be important to adopt a multilevel approach, both at individual and collective levels.

Another interesting finding regarding sports events is the amount of information concerning the fans, which is more prevalent when compared with the information regarding political demonstrations. In political demonstrations we are dealing with fundamental rights, which is different to what happens with sports events — they have a specific legal framework allowing for greater control measures. Before the events, during policing planning, the fans' and demonstrators' characteristics are taken into consideration in order to design the suitable police measures, and specifically to establish the main routes to take and design the entrance procedures of the fans in sports venues. This emphasis may have to do with the presence of the spotters and their information gathering functions, and so the need of spotters in political demonstrations should be thought about to foster the knowledge about the protesters and their action repertoire. Furthermore, there are some routines that allow greater predictability: fans are at the same stadiums, at the same gates, every 2 weeks, at least. As sports events occur in controlled environments, it seems to be easier to implement situational prevention measures.

On the other hand, fans' and protestors' behaviour is only mentioned in the final reports, besides other kinds of information like banners and slogans at political events, and streamers and chants at sports events. However, it should be mentioned that during the naturalistic observation and think aloud on the field, more information regarding the fans and the demonstrators enters. This happens when decision makers mentally simulate situations, access memories and mention expectancies as a result of past events, as they try to anticipate some occurrences (Klein, 1999), and also make patterns correspond or match (Klein and Calderwood, 1991) with events that present a certain similarity or are typical. This clearly demonstrates the importance of the decision makers' experience (e.g. Rake and Njå, 2009; Zsambok, 1997) in planning and conducting policing operations, and, so, the need to embed that knowledge, which is more practical and life-experienced, in the learning and training curricula of police officers (and senior police officers). Finally, at sports events there is a command post room in the main stadiums, which allows the commanders to be present and manage a huge quantity of information in a designated environment. On the other hand, at Portuguese political demonstrations, commanders are on site with all the possible consequences: a greater quantity and diversity of stimulation, greater dispersion of information and greater requests from their subordinates, which makes them less protected and deprived of a calm environment where they can make decisions, and where they are subject to situation volatility.

B — Simulation room

Participants: 20 expert male police officers (more than 5 years of work experience in traffic control/surveillance; age range: 30-55 years old).

Corpus: First moment — Data collected with the stimulated retrospective think aloud technique (SRTA; Ericsson and Simon, 1984, 1987; Guan, Lee, Cuddihy, and Ramey, 2006). Second moment — Data collected by interviewing with a previously designed script for further information.

Instruments for data collection: three videos of city traffic in usual spots for traffic control/surveillance, 5 minutes each, presented at the simulation room of the MEL; stimulated retrospective think aloud recording; interviews recording.

Instruments for data analysis: content analysis.

Procedure

Each police officer accepted to participate in the study and gave their written consent. After a warm-up period they watched three videos, one at a time, and received SRTA technique training in order to understand the features that would lead them to refer to specific vehicles to be stopped for verification.

The presentation of videos was randomised for each participant so that contamination effects could be prevented. Then, an interview was conducted in order to clarify some content and cover issues that hadn't been mentioned during the SRTA, and that could be complementary and pertinent to the widening of the diversity and thoroughness of the information. All of these procedures were voice recorded; the materials were transcribed verbatim and then submitted for a content analysis procedure. All data content was analysed and codified in categories and subcategories, which were designed especially for the purposes of the research, and derived directly from the collected data, following an open or exploratory content analysis procedure. Data was then submitted for a descriptive statistical analysis.

Results

At a first glance, it can be said that in 26.83 % of the situations, two main cues are used by police officers in the decision-making process during a traffic control/surveillance operation. One regards the driver and the other regards the vehicle: a behavioural indicator of failure to comply with the traffic regulations (mainly the absence of manoeuvre signalling) and the characteristics of the vehicle, respectively. However, a deeper analysis of the data (Figure 3) gives some more insight into the information used during the decision-making process.

Figure 3 — Content analysis results of the simulation study
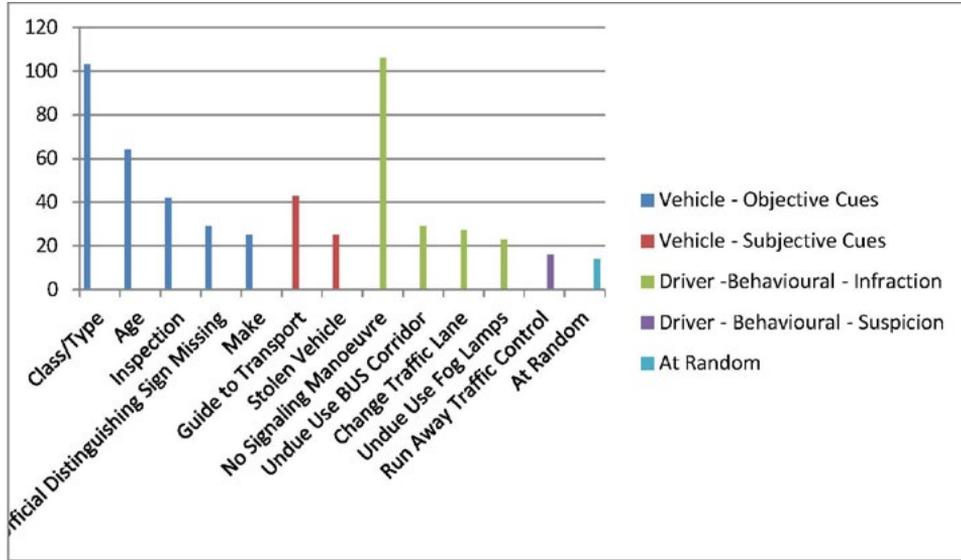
Police officers predominantly use information about the vehicle rather than information about the driver when making the decision to give an order to stop during a traffic control/ surveillance operation. Specifically, they tend to use objective cues like the vehicle's characteristics, which are more obvious and easy to detect. So, the visual cues they typically use are those they can immediately see and, because of that, require less cognitive effort. And they are, for instance, and in this order: the type, age, registration plate date, official distinguishing sign and the vehicle make.

Subjective cues are also used, namely those that can be linked to illegal transportation of goods, or to vehicle makes that are typically stolen to enter illegal networks. These cues involve additional cognitive effort, as they appeal to memory storage of past events, revealing the major importance of the decision maker's experience to detect them.

As far as concerns the information about the driver, police officers tend to point to behavioural indications of failure to comply with traffic regulations, mainly the absence of manoeuvre signalling. It is, of course, important for other drivers to anticipate their own manoeuvres and therefore prevent crashes. Other behavioural indicators mentioned by police officers were, in this order: undue use of bus lanes, change of traffic lane and undue use of fog lamps. Again, the visual cues are those immediately seen and, because of that, require less cognitive effort. Other more cognitively demanding cues were less signalled and required the police officers to anticipate the real intentions of the drivers, such as the effort some drivers were making to avoid being stopped by driving very close to the next car.

Discussion

During traffic control/surveillance operations, police officers tend to make use of decision-making strategies that involve less estimation and thus try to simplify the selection process. Fast and frugal heuristics (Gigerenzer and Selten, 2001; Gigerenzer and Todd, 1999) have been employed. For instance, the availability heuristic (Tversky and Kahneman, 1974), which relies on how easily some information is recalled from memory, and the recognition heuristic (Goldstein and Gigerenzer, 2002), which allows you to infer that the recognised object, out of two, has the higher value regarding the criterion, seem to have been utilised as a shortcut to making the decision to stop a vehicle. Clearly, these shortcuts allowed you to make fast and frugal decisions, enabling decision makers to be more precise, without the need to use multiple mathematical equations.

On the other hand, specialised knowledge and experience stood out as important characteristics of the decision makers, as they used accumulated knowledge gathered from direct experience on the field to make fast categorisations of new situations (Klein, 2008). They used their memory repertoire of patterns to establish some correspondence with the simulated situations. The participants showed better memory regarding the specific knowledge domain and refined perceptive capacities (Glaser and Chi, in Elliot, 2005), which is also important to detect subjective cues for decision-making. And this has to do with the recognition-primed decision model (Klein, 1989, 2008), which says that decision makers use their past experience in order to rapidly categorise new situations.

Conclusion: some outcomes from MEL's research programme

Decision-making is also a major issue for those working in police forces. MEL's research programme was designed to gain better knowledge about the individual cognitive processes involved in police decision-making, specifically during major events policing. The different studies presented, and their initial results, clearly illustrate the centrality of the subject and the need to deepen the research. Having worked in different environments, with experienced police officers with different specialities, it became evident that experience and expertise are fundamental characteristics for decision-making when planning and conducting police operations. Also, the information structure of the environment plays an important role in what the decision mechanisms concerned are. Clearly, by exploiting the decision-making processes and the structure of the information in the environment, decisions can be better understood and evaluated. These results must also come into contact with those working in the field.

So, in practical terms and to sum up, the following should be taken into account as effective means of transferring research findings to professionals:

1. bringing police practitioners to simulated environments;
2. involving tutors during initial phases of police careers;
3. police operations should also be assessed by practitioners;
4. engaging police practitioners in change programmes;
5. experience-based knowledge instead of (just) academic-based knowledge.

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Part-time leadership in the Baden-Württemberg police force: a qualitative study

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Abstract

Similarly to changes in the social work environment, the police force is faced with the request of its police officers to improve the combination of work and family life. This is accompanied by the request to take a family break or the request to work part-time. This study analyses the question of whether the existing frameworks are useful to the police of Baden-Württemberg in Germany to successfully implement part-time leadership positions. This was done by a qualitative semi-structured interview study. The sample included six experts from Lower-Saxony interviewed about their experience in part-time leadership at their police force, where part-time arrangements in leadership positions are already systematically organised. The sample also included six experts from Baden-Württemberg where systematic implementation does not yet exist. The current stage of development of part-time leadership is described and recommendations are given for successfully developing this instrument as a positive and reasonable way to accomodate personal or family needs with career and work life in the police.

Introduction

The aging population, the increasing scarcity of young, skilled and talented people, and the late family formation phase are modified factors that businesses and the public administration, and therefore also the police force, are faced with. In order to remain competitive and attractive for employees, flexible solutions for work organisations are needed. In this context, working part-time plays an increasingly important role. This is reflected in the constantly growing proportion of part-time employment in the labour market. In 2000, a total of 19 % of the workforce were in part-time employment in Germany;

this figure already amounted to 26 % in 2010. The proportion of women grew from 38 % to 45 %, and the proportion of men from 5 % to 10 % (Brenke, 2011). The increase is the result of the desire of workers and a process of rethinking in organisations. Policy is a crucial initiator for the realisation of part-time work since it has promoted the enhancement of work–life balance in recent years. Employers value the flexibility of part-time employment because they are able to respond quickly to personnel requirements and to changes in operating times (Wanger, 2011). Among employees, the reasons for taking it differ according to gender. Most of the women identify personal aspirations that include not only a useful and productive career but also a healthy family life. Among men, continuing professional development or the lack of appropriate full-time positions are responsible for part-time employment (Brenke, 2011). Furthermore, men also want to participate in family life more fully today and feel estranged from it by the all-encompassing demands of their work. These trends are also apparent in occupations such as the police force.

Childcare concerns have become a major issue, putting the subject of flexible and part-time work schedules, also among leadership positions, on the agenda. For years, the proportion of women in the police has continuously increased (11 % in higher intermediate and 6.1 % in higher grades of the civil service). As in the general labour market, part-time work in the police service is primarily associated with the employment of women (e.g. Silvestri, 2007). The introduction of part-time schedules was part of an employer strategy to attract and retain a female presence in the workforce and to comply with equality legislation (Edwards and Robinson, 1999).

Due to the developments it is expected that part-time arrangements are going to play an increasingly important role within the police service because they have to be aware of pressures mounting around lifestyle issues, which have been placed on the agenda by the growing numbers of young talented employees.

A current study (Jochmann-Döll, 2016), 'Part-time leadership: opportunities and limitations in the police service', is based on data regarding part-time leadership, which was collected in all of the federal states of Germany. The number of female executives in the state of Baden-Württemberg is very low (5.7 %) compared to the rest of the country. The same applies to the proportion of female executives working part-time to the overall number of executives at 2.3 %. The high proportion of male executives working part-time (nearly 60 %) is remarkable. The fact that executives in the police service in Baden-Württemberg are now able to delay the maximum working age limit for 1 year and thus gain 10 % more income is a possible reason for the high amount of male part-time leaders. Many civil servants use this opportunity to earn the same money and reduce their working hours without any loss. The possibility of reducing the working hours is practiced at all hierarchic levels. The fact that the Baden-Württemberg police force enables the reduction of working hours for any employee shows a high will to change. This great will should be used positively in the next few years.

Different definitions for the term leadership can be found (e.g. Walenta and Kirchler, 2008). Following Yukl (1998, p. 14) these can be summarised as follows: 'Most definitions share the assumption that it (leadership) involves a social influence process whereby intentional influence is exerted by one person over other people in an attempt to structure the activities and relationships in a group or organisation'. Within this study the only positions considered are those which are referred to in police organisations as management functions and are also entrusted with personnel responsibility. Similarly to the general labour market, a significant proportion of employees make use of part-time arrangements. An employee is engaged in part-time work when the regular weekly working time is shorter than that of a comparable worker in full-time employment. Work packages are usually designed in particular for full-time job positions, therefore part-time employment often leads to the division of a position or a workplace by two or more employees — this is referred to as job sharing (e.g. Baillod, 2000). Job sharing can be configured in such a way that the tasks that are applied in a particular position are divided between employees. Each incumbent is responsible for their allotted tasks during their work schedule; another possibility could be that all tasks that arise when present are carried out by the employees who share a position. This requires a division of the attendance times instead, thus separating a full-time job purely by time and not by content. This is meaningful when a task needs to be implemented through shared responsibility. Intense and constant coordination between the partners is indispensable (Bordet, 2009).

A study shows that 94 % of female and 78 % of male managers wish for the opportunity to reduce their weekly working hours or make them more flexible (Coffman and Hagey, 2010). Despite the fact that this flexibility is offered in most companies, just a few of them use it. This is often due to the executives' lack of trust in the company or in the organisation.

Fears prevail that exploiting a reduction in or the flexibility of working time could have negative effects on their career. In many cases there are no role models in comparable positions that are not limited in their career despite a reduction in or the flexibility of working schedules. However, even working time models such as flextime can be proposed as an argument to recruit qualified and talented people and motivate them in the long term (Coffman and Hagey, 2010). Quantitative and qualitative data indicate the significant effects of a shared leadership initiative in a police department through improvements in employees' perceptions of work conditions, labour-management relations, commitment, community-orientated policing, and increases in discretionary police productivity (Steinheider and Wuestewald, 2008).

Police forces are exposed to ever-increasing challenges within their human resources. On the one hand, they have to cope with demographic change and expected large-scale retirements. On the other hand, a more liberal human resources policy is added that facilitates and promotes part-time work in terms of work–life balance. Low birth rates with a simultaneous increase in life expectancy, an expected shortage of skilled workers

but also gender equality demands need to successfully meet joint efforts at all levels. It is important that equal opportunities are no longer associated with women but that 'diversity management' in companies and organisations arrives and is practiced.

Diversity management aims at the many specific and different experiences of employees and adjusts and emphasises the value of individuality in order to make it available for organisational success (Hasebrook, Dohrn and Jablonowski, 2011). Working for the police can be difficult and its leadership could make demands upon physical and mental capacities, but 'although the 'natural' capacity to lead varies from individual to individual, the qualities required by police leaders can be developed by proper education and professional training' (Adlam and Villiers, 2003, p. 14).

In this study, an answer to the question should be found as to why part-time work is only marginally applied within leadership positions and to what extent the existing framework conditions in the police force are appropriate to successfully implement part-time leadership. The main emphasis will be, independent of gender, on the specific characteristics, substantial organisational demands and requirements of the framework of part-time leadership. Furthermore, an answer should be found to the following questions. What are the critical success factors for part-time leadership? Who desires this model and who is it promoted or rejected by? Are positions in the higher intermediate and higher grades of the civil service basically suitable for part-time work in the occupation? And is the acceptance of part-time leadership essential for their success? A lack of framework conditions and necessary organisational changes will be discussed and suggestions for improvements worked out. To answer the above-mentioned questions twelve experts from two police forces (from Lower-Saxony and Baden-Württemberg) were consulted about the framework for the management of part-time work in the police service, using a qualitative semi-structured interview method.

Method

Sample and data collection

The questions relating to part-time leadership positions address individual experiences; therefore this issue has been studied with the use of a qualitative method of semi-structured problem-centred interviews with experts (Helfferich, 2009).

This interview technique allows, depending on the course of the conversation, a flexible ordering of the written questions. Twelve experts were selected; each one has comprehensive experience in part-time leadership in their police work and different perspectives.

In the selection of experts it was noted that both part-time leaders and their supervisors were included in the sample in order to get multiple perspectives. The sample included six experts

from Lower-Saxony, interviewed about their experience with part-time leadership at their police force where part-time arrangements in leadership positions are already systematically organised and six experts from Baden-Württemberg where systematic implementation does not yet exist. Among the experts (35-58 years of age), there are seven men and five women. Three female and four male experts are police officers of the higher grade, and two female and three male experts are of the higher intermediate grade of the civil service.

The experts were initially contacted by phone to find out whether they were willing to participate in the interview study. During this call, an appointment for the implementation of the interview was agreed. Beforehand, the experts were prepared for the subject with a cover letter sent by email and asked to complete the social data sheet and return it before the appointment. The interviews were conducted with the help of the software Skype for internet telephony and electronically saved with the recording tool 'MP3 Skype Recorder 3.1'. The duration of the interviews amounted to 40-92 minutes, added to the time of the preliminary talk. The interviews followed the sequence of the primary questionnaire guidelines. Consequential and deeper questions were flexibly installed at appropriate points in the interview. Any comments and questions of the experts and the interviewer beyond the questionnaire were allowed at any time.

Instrument

The interview guidelines contain 11 concrete questions with follow-up and deeper questions about part-time leadership in their police force (e.g. 'To what extent has the need and demand for part-time leadership changed in your organisation in recent years?'; 'Does part-time leadership influence the performance of the organisation?'; 'What, in your opinion, are the most critical success factors for part-time leadership?').

The experts' personal data were queried with the help of the social data sheets. After the interviews, an interview postscript sheet was filled out (there, the essential core elements and specificities of the interviews were noted). The interview instruments were pilot tested beforehand by another expert. Therefore, pilot results were analysed to improve the clarity and readability of questions.

Analyses/transcription

The transcription was done by the verbatim transcript of the spoken word. Long breaks or other interruptions, such as by laughter or by disturbances in the physical environment, were marked in the text. Anonymity was assured to the experts prior to the interview. The contents of the interviews were reproduced under the thematic codes in their original wording with the corresponding reference number and the respective underlying interview number (1-12). A systematisation and reduction of information was supported by the software MAXQDA 11. MAXQDA 11 is a programme for computer assisted qualitative data analysis by means of which the interviews were analysed with a code system (Gläser und Laudel, 2010). The code system was created after the evaluation of the first four

interviews and adjusted or extended with every interview when needed. After evaluating all interviews, the code system was retested on validity of all 12 interviews. The 631 codes were assigned to 18 codes, separated by codes and exported to Microsoft Excel. These were then verified for validity and completeness. Falsely interpreted statements were reassessed. At the end, the correct allocation of all interview segments could be ensured.

Results

Assessment and application procedures

The respondents from Baden-Württemberg indicated that the existing assessment procedure will be questioned in that order if a comprehensible performance feedback is delivered. Agreement exists among experts from Baden-Württemberg and Lower-Saxony that part-time workers are disadvantaged in the evaluations of their performance compared with full-time workers. Therefore awareness-raising activities were initiated to curb discrimination and disadvantages in both federal states. The interviewed experts of the higher intermediate and higher grades of the civil service that employed part-time employees in leadership positions were all of the opinion that a suitably qualified candidate could prevail against candidates in full-time arrangements in an application process. In contrast, the employees with a part-time management position held differing views. According to the experts from Baden-Württemberg, the application for a part-time leadership position a priori hardly has any chance. Regarding the implementation of targeted procurements for leadership positions, even part-time leadership, experts from Lower-Saxony expressed positive experiences about the chances in their own federal state. The meaningfulness was emphasised by the majority of part-time leaders. In Baden-Württemberg the existing lack of human resources as a barrier to part-time leadership was repeatedly commented on, especially with regard to smaller departments. Part-time leadership is often the result of family-related time-outs (parental leave, care leave) of executives in full-time employment, who then carry out their tasks part-time. It is essential for the experts to generate role models in order to increase the implementation of part-time leadership. Clear signs and targeted communication of the organisation regarding part-time leadership cannot be recognised, which is why a claim to leadership of part-time workers is not often invoked.

Suitability of positions for part-time leadership

Part-time positions are more likely to have been carried out in Lower-Saxony, therefore the following findings mainly relate to these experts. The answers from Lower-Saxony on the question regarding the suitability of positions is characterised overall by a great openness with respect to different work schedules, flexibility and creativity. For example, there is the possibility to adapt the monthly allotment of hours to the volume of work. In general, the majority of experts estimate that almost all positions are appropriate for part-time leadership. It is therefore necessary to allocate such functions into work packages and the

delegation of work packages, which are not originally managerial responsibilities, into the organisation.

Nearly all experts were in agreement that the suitability of a position does not depend on the number of employees. Part-time experts in leading departments have 4 to about 100 employees. On the other hand, departments with many duties of representation and functions with ad-hoc operations are judged as less suitable for part-time leadership. The experts have considered all kinds of shift work as very well suited for part-time leadership. In demand-driven shift-work models, which partly apply in Lower-Saxony, the fixed work arrangements are dissolved. Therefore the distribution of different allotments of hours is easily possible.

The effect of part-time leadership on the performance of an organisation
The experts agreed that part-time leadership does not affect the performance of an organisational unit. However, this assessment was linked to various conditions. The deputy in particular plays a key role, without whom it is difficult to implement part-time leadership successfully.

The communication, delegation and high level of motivation of the leadership partners compensates for the reduced presence at the workplace. It was further noted by all experts that accessibility, even outside office hours, plays a central role. Before entering into part-time leadership, intensive preparation of executives for their future responsibilities should be ensured. All experts who work part-time considered that they have a more effective way of working, that they are able to distinguish between important and unimportant things very well and can recognise and eliminate redundant processes.

Operational aspects of the implementation of part-time leadership
For the parent who is primarily responsible for childcare, it is essential to find a workplace that is compatible with childcare hours. For most of the experts, the collaboration of the police force with on-site childcare facilities would be an important signal to actually encourage work–life balance. To successfully implement part-time leadership, further flexible working measures on the part of the organisation are required, but also flexibility on the part of the executives. In some parts, the departments already allow very flexible work schedules, for example, the possibility to change the hourly rate monthly, depending on workload. The results of the interviews showed that permanent presence at the workplace is not associated with higher efficiency and performance. In contrast, flexible work schedules using demand-driven shift-work are evaluated more positively. Likewise, there is agreement that it is necessary on the part of the part-time leaders to be approachable and accessible beyond the regular office periods.

Regarding the issue of job sharing, experts have different opinions. A number of respondents have an open attitude toward this type of part-time work, even in leadership, or have

already worked in such a model. Other respondents evaluate this model very critically. Key points of criticism are the different abilities of supervisors who cannot be competent in all main subject areas in the same way; therefore achieving a uniform approach within a police department is ultimately not possible. In contrast, an expert considered that job sharing results in better management decisions because outside of ad-hoc operations a vote may be taken under both incumbents. In addition, no one was able to contribute his/her specific expertise at the appropriate point. However, the following disadvantages were mentioned: high communication and coordination efforts; positions with corresponding external visibility; additional costs in terms of equipment and training; and an increased amount of time for the necessary arrangements.

There is agreement that compensation measures are required to fulfil the tasks in changed work schedules such as job sharing. The part-time experts agreed that regular and intensive communication with their employees but also with the deputy is important. Despite the intensive involvement of the deputy, the part-time leaders emphasise that they have acquired a more rapid and effective way of working. Nevertheless, the majority of experts emphasised the necessity of consequently allocating responsibilities or work packages.

Organisational culture

The majority of experts mentioned there being a strongly pronounced presence at the workplace in police forces. Looking at work performance, four experts stressed that there was a culture of mistrust against part-time employees or employees who claim flexible working hours or telework.

According to one expert, the police are very well positioned to implement part-time leadership positions because of the legitimately regulated right, the good technical equipment, the necessary size of the organisational unit and the political commitment to work–life balance; however, traditional role models complicate the implementation or simply appear as barriers.

An unbiased approach to part-time leadership (especially by men in part-time work) would be desirable in terms of a cultural change. Openness and communication and establishing role models are essential elements to successfully implement part-time leadership.It was noted that physical presence is not dependent on the acceptance of leadership performance. The competence would not be limited by part-time work. Important frameworks for part-time leadership were the accessibility and flexibility of executives at significant events and explicit deputation regulations in the organisation.

Most of the experts made the clear positioning of supervisors and the organisation responsible for the acceptance of part-time leadership. Two experts indicated that they had the impression that the acceptance of part-time leadership was higher than for part-time work without managerial responsibilities.

Discussion

The present study concludes that according to the experience of experts from the police service in Baden-Württemberg, there is currently no comprehensive concept for part-time leadership in the Baden-Württemberg police. From the interview study it can be deduced that it was never clearly postulated on the part of the management that part-time leadership is a desirable or at least possible option; consequently it was not experienced in the workforce and thus seemed to be impossible and was accepted by the organisation and the immediate supervisor only in exceptional cases. In contrast, positive remarks about developments in human resources are mentioned from experiences in the police service in Lower-Saxony where part-time arrangements in leadership positions are already systematically practiced. In the case of the situation in the police service in Baden-Württemberg, these changes in Lower-Saxony could be seen as a motivating role model for the inevitable developments in the police service in Baden-Württemberg. Therefore, working part-time is no longer an atypical or non-standard form of employment (e.g. Brewster, 1996; De Grip, Hoevenberg and Willems, 1997). The study shows that part-time executives are perceived differently. According to experts, awareness activities are sufficient to counteract the disadvantage of part-time employees.

The experts agreed that being present at the workplace is not considered to be a suitable measure of performance. Nevertheless, the prevailing presence culture in the police was emphasised. Ultimately this is because good performance does have a better chance of being perceived in the organisation if more time is spent at the workplace. The part-time leaders' great organisational skills and effective work methods are witnessed. Although these are important characteristics for the smooth operation of organisations, their effect is less visible and often unnoticed.

While supervisors think that good applicants can be successful in the application process for part-time leadership positions, the potential applicants are more sceptical, and often do not dare to apply because of actual or invisible barriers (e.g. Charlesworth, Keen and Whittenbury, 2009). Female officers often lack the confidence and question their ability to fill a leadership position with a reduced amount of work. This could be a reason for them not to apply for such a position. Furthermore, it is argued that successful role models to which one can orientate oneself are missing (e.g. Silvestri, 2006). Although the occupation of part-time positions is unusual today, the experts agree that almost all management positions can be occupied part-time. Only specific departments are excluded, such as equestrian or dog units (because of the relationship between the dog and the dog-handler, also living together at home); positions in the highest hierarchical level with a large amount of representation duties; and positions with ad-hoc operations. A good organisational foundation and a division of positions in fixed and flexible work packages appear as particularly important, which may optionally be displaced away from the leadership to representatives or to other departments in the organisation.

The study reveals that the performance of an organisational unit does not suffer with part-time leadership. Rather, special organisational and coordination skills and the role of the deputy are emphasised, with accessibility outside regular working hours deemed essential. In order to bring back primarily female police officers after parental leave as quickly as possible, organised childcare seems indispensable. Since part-time leadership is often taken in the context of family circumstances and home care situations, they mostly deal with a double burden. But even minor reductions in working hours can be satisfactory in order to cope with this double burden. Flexibility is necessary for successful performance in part-time work, both by the executives and the supervisors, for example through adaptable weekly working hours or demand-driven shift-work models. On the operational level, part-time leadership can be organised through job sharing or the reduction of weekly working hours with the use of other compensatory opportunities. Nevertheless, a readiness to be accessible in case of emergencies outside actual working hours must exist in part-time leadership positions, as already applies to full-time leadership positions.

Handling the work-life balance of the employees as well as the increasing number of well-trained young talented people in the police is a major challenge that requires further studies. It would be worthwhile to look at (some) police forces where part-time leadership has already been institutionalised and examine whether the desired effect has (already) been achieved there. Quantitative studies would complement this study and deepen the findings obtained. In order to successfully implement changes in an organisation, a range of barriers have to be broken and resistance has to be overcome. Should part-time leadership be implemented in the police service to help employees combine work and family life, a consistent concept has to be developed. There must be a clear commitment from the head of the organisation, combined with a broad communication on this issue. Based on the results of this study, the concept should contain the following issues: which positions are suitable for conversion into part-time? how a specific change in the performance of tasks can be optionally reacted to by shifting work packages; how working time and work organisations can be configured more flexibly; how successful role models could be created; how calls for tenders can be indicated; and how personnel planning must be adapted.

Based on a well thought-out concept and modern circumstances there will be the chance that the issue of part-time work in leadership positions as a key component for a better work–life balance will be a feasible vision instead of an illusion. This is because such evaluation means that not only a tiny proportion of police officers will see part-time work as positive and as a reasonable way to accommodate personal or family needs with their career within the police force.

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Understanding distance shooting and the type of firearm from the analysis of gunshot sounds

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Abstract

In order to study gunshot sounds, experimental shootings were conducted in an open shooting range to record the sound of gunshots. The results were tabulated for a total of 168 gunshots. Shots were fired using pistols, revolvers, submachine guns, rifles and shotguns in different calibres from selected distances relative to the recording devices. Both a conventional sound level meter (SLM) and a measurement microphone were used. These were placed at selected points behind the shooting position and the sound of each shot was recorded. At the same time, the signal received by the microphone was transferred to a computer connected through an appropriate audio interface with a pre-amplifier. The peak amplitude of the gunshot was calculated in the accepted engineering units (dB) of sound pressure level. The shortest distance for the recordings was 9.60 m and the furthest was 38.40 m. The experiment was carried out using the following calibres: 6.35 mm, 7.62 mm Tokarev, 7.65 mm, 9 mm Short, 9 mm Makarov, 9 mm Parabellum, .45 Auto, .22 LR, .32 S&W, .38 S&W, .38 Special, .357 Magnum, 7.62 mm Kalashnikov and 12 GA. A decrease of the peak amplitude, equivalent to the increasing of the distance, was observed as expected. Values appeared to follow the inverse square law. By analyzing a recorded gunshot sound it is possible to calculate the distance between that discharged firearm and the recording device. In addition, we noted the possibility of determining the sound amplitude of the gunshot coming from a certain type of weapon.

Keywords:
firearms, gunshot sound, decibel, distance, sound level meter.

Introduction

The purpose of this study is to take measurements of gunshot sounds under close to real conditions in order to define and measure the change of the sound intensity relative to the distance. This was accomplished from the audio recording and the calculated peak amplitudes of the gunshot sounds. In addition, this study provided us with the opportunity to determine whether the type of firearm could be recognised from the sound of its gunshot.

The recording was done with a sound level meter (SLM) and the calculations were carried out using a microphone through the sound intensity, which is defined as the sound power per unit area as measured at a listener's location (Nave, 2009).

The most common approach to sound intensity measurement is to use the decibel scale which is logarithmic (Dater, 2002). The decibel (dB) units are based on the equation: the power to which 10 is raised to get x. The logarithm to the base 10 used in the equation is the power of 10 of the quantity (x) according to the basic definition of the logarithm. The factor of 10 multiplying the logarithm makes it decibels instead of bels, and is included because about 1 decibel is the just noticeable difference (JND) in sound intensity for the normal human ear.

Another consideration that prompts the use of powers of 10 for sound measurement is the rule of thumb for loudness: it takes about 10 times the intensity to sound twice as loud. Decibels provide a relative measure of sound intensity and measure the ratio of a given intensity (I) to the threshold of hearing intensity.

Methods and materials

The equipment consisted of the following devices, which were used for the experimental shootings:

- sound level meter (SLM), model 'CEL-440', with the 'CEL-250' electret microphone. The 'CEL-284/2/ England' calibrator was used for its calibration;
- measurement microphone, 'BERINGER model ECM800', Spezielle Studiotechnik GmbH/ Germany;
- audio interface, with pre-amplifier 'MOTU Ultralite'/England;
- a laptop (HP, model Compaq Presario/Intel Core 2 Duo);
- the 'Audacity-Win-1.2.6' and 'Pratt5032-winsit' software;
- digital Altimeter 'CANYON model CNS-DC2 Explorer', for the environmental conditions;
- digital Vernier Caliper 'Mitutoyo model CD-15DC'/(UK)Ltd/England;
- range finder 'LEICA model GEOVID 7 X 42 BDA'.

Shots were fired using various types of firearms (seven pistols, five revolvers, two submachine guns, one rifle and one shotgun) in different calibres, from selected distances relative to the recording devices. The firearms used and the respective ammunition for each calibre were the following (the barrel lengths for the firearms are written as they were measured and the brand, type of bullet and weight in grains/gr are written for the ammunition):

- semi-automatic pistol Walther, Model 8 (Germany) 6.35 mm (.25 auto) calibre, with barrel 7.375 cm (apr. 3 in.). Cartridge from 'GFL' (Italy), with FMJ bullet 50 grains (3.24 gr);
- semi-automatic pistol Tariq Ipak, licensed by 'Beretta' 7.65 mm (.32 auto) calibre, with barrel 8.985 cm (apr. 3.5 in.). Cartridge from 'Sellier and Bellot', with FMJ bullet 73 grains (4.75 gr);
- semi-automatic pistol Tokarev, TT33 (Russia) 7.62 mm Tokarev (7.62X25 mm) calibre, with barrel 11.582 cm (apr. 4.5 in.). Cartridge from 'Seller and Bellot', with FMJ bullet 85 grains (5.5 gr);
- semi-automatic pistol P. Beretta, Model 'MO1934' (Gardone V.T. 1937-XVI- Italy) 9 mm Short (.380 Auto) calibre, with barrel 8.650 cm (apr. 3.4 in.). Cartridge from 'MAGTECH' (USA), with FMC bullet 95 grains (6.15 gr);
- semi-automatic pistol Baikal 'AP 1631 1978' ('Izhevsky Mechanevsky' ex. USSR) 9 mm Makarov (9X18 mm) calibre, with barrel 9.340 cm (apr. 3.7 in.). Cartridge from 'Sellier and Bellot', with FMJ bullet 95 grains (6.10 gr);
- semi-automatic pistol Smith and Wesson, Model '5906' (USA-Springfield Mass.) 9 mm Parabellum (9X19 mm) calibre, with barrel 9.910 cm (apr. 4 in.). Cartridge from 'Sellier and Bellot', with FMJ bullet 124 grains (8 gr);
- semi-automatic pistol Colt 'M1911A1' (COLT'S PT.F.A. MFG.CO. USA), .45 auto calibre, with barrel 12.370 cm (apr. 4.9 in.). Cartridge from PMP (Pretoria Metal Pressings), with FMJ bullet 220 grains (14.26 gr);
- revolver Smith and Wesson, Model '34-1' (USA-Springfield Mass.) .22 LR calibre, with barrel: 5.025 cm (apr.2 in.). Cartridge from GFL (Italy), with lead bullet, ultrasonic;
- revolver Smith and Wesson, Model '30-1' (USA-Springfield Mass.), .32 SandW long calibre, with barrel 7.580 cm (apr. 3 in.). Cartridge from Remington (USA), with lead bullet, 88 grains (5.7 gr);
- revolver Smith and Wesson, Model '33-1' (USA-Springfield Mass.) .38 SandW calibre, with barrel 10.060 cm (apr. 4 in.). Cartridge from Magtech (USA), with LRN bullet 146 grains (9.46 gr);
- revolver LLAMA (Spain) .38 Special calibre, with barrel 5.365 cm 2.1 in.). Cartridge from Sellier and Bellot, with lead point bullet 158 grains (10.25 gr);
- revolver Smith and Wesson, Model '686-2' (USA-Springfield Mass.) .357 Magnum calibre, with barrel 10.477 cm (apr. 4 in.). Cartridge from Federal (USA), with semi wad cutter bullet 158 grains (10.25 gr);
- submachine gun Scorpion (ex-Yugoslavia) 7.65 mm (.32 auto) calibre, with barrel 11.200 cm (apr. 4.4 in.). Cartridge from Magtech, with FMC bullet 71 grains (4.60 gr);

- submachine gun Heckler and Koch, Model 'MP-5' (Germany, 'EBO'-Greece), 9 mm Parabellum (9X19mm) calibre, with barrel 22.4 cm (apr. 8.8 in.). Cartridge from Sellier and Bellot, with FMJ bullet 124 grains (8 gr);
- assault rifle (copy of type 56 /Albania, possibly) 7.62 mm Kalashnikov (7.62X39) calibre, with barrel 41.6 cm (apr. 16.4 in.). Cartridge from Sellier and Bellot, with FMJ bullet 123 grains (8 gr);
- semi-automatic shotgun Beretta Model 'ES 100' (Italy) 12GA calibre, with barrel 63.2 cm (apr. 25 in.). Cartridge from Jordan (Greece), with shot cells no 9 (35.5 gr).

Procedure

The experimental shootings were conducted in 2008, in an open shooting range, in the north-east of Athens. The altitude was measured to be 382 m (1253.28 ft) above sea level. During the shooting, as the environmental conditions were recorded, the temperature increased from 33.3 °C to 39.3 °C (91.94 °F to 102.74 °F), the humidity decreased from 45 % to 38 % and the barometric pressure remained almost constant from 990.6 to 991.1 mbar/ hPa (equal to 0.978 atm).

Both devices, the SLM and the measurement microphone were used.

They were placed at selected points behind the shooting position. The distances for the recordings were 9.60 m (31.5 ft), 14.40 m (47.25 ft), 19.20 m (63 ft) and 38.40 m (126 ft).

The calibration of the devices employed

Before starting any measurements, it was necessary to calibrate the microphone associated with the sound level meter. This was done in the laboratory in order to avoid the possible interference of external sounds (Tsiatis, 2010). As shown in Diagram A, we ultimately produced a continuous sound, with a constant volume of 90 dB while the SLM remained stabilised.

Diagram A. — The procedure that followed is depicted: the calibration of the microphone associated with the sound level meter
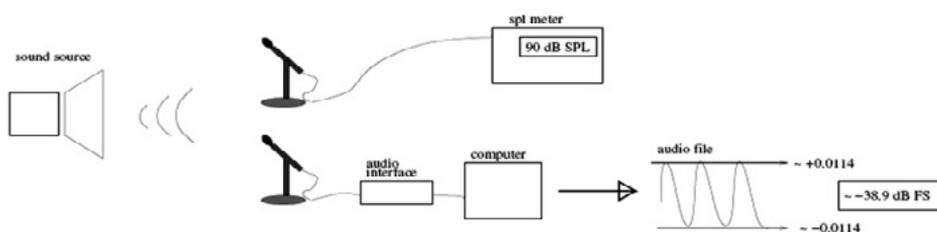
As shown from the wave depiction (in Diagram B), when the SLM gives a sound intensity of '90 dB' in the audio file, this corresponds with a deviation of '0.0114 V', which is converted to '-38.9 dB (FS/full scale)'. According to this, the maximum peak of the wave depiction (recorded by the microphone) in '1', is equivalent in volume (90-(-38.9)) dB = 128.9 dB (Diagram B). In these (5) blue colour diagrams the voltage measurement appears on the yy axis and the time in msec. on the xx axis.

Diagram B — Sequential magnifications of the original wave depiction (visible part 3.268521 seconds).
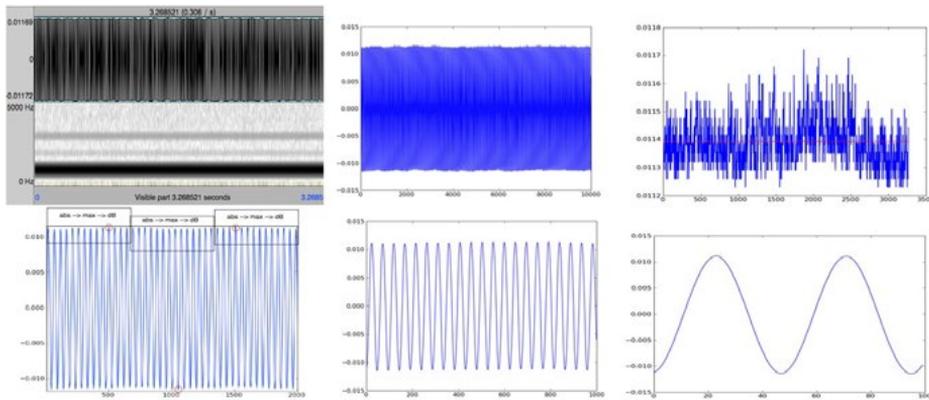
Measurements and recordings

The sound of each shot was recorded by the SLM. The results were tabulated for a total of 168 gunshots. The average value for each set of shots by a particular firearm was calculated. At the same time, the signal for each gunshot received by the microphone was transferred to a connected computer through an appropriate audio interface with a pre-amplifier. Each sound wave was stored and depicted as a wave function (Diagram C).

Diagram C — Pistol 9 mm Makarov, fourth shot, from 19.20 m (63 ft), total time (xx axis): 198.9 msec., max of the peak (yy axis): 0.4479 V. Recorded gunshot sound from the SLM: 123.5 dB.
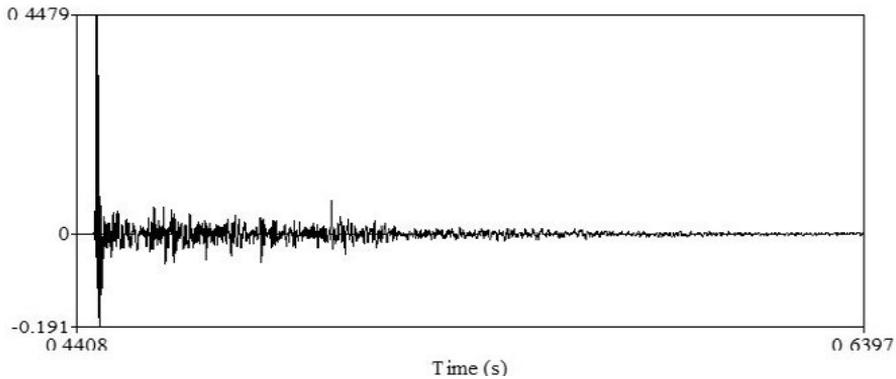
Since audible sound consists of pressure waves, one of the ways to quantify the sound is to state the amount of pressure variation relative to atmospheric pressure caused by the sound (Beranek, 1954, 1993). The standard threshold of hearing can be stated in terms of pressure and the sound intensity in dB can be expressed in terms of the sound pressure from the following equation (1):

$$I(dB)=10\log_{10}\left[\frac{I}{I_0}\right]=10\log_{10}\left[\frac{P^2}{P_0^2}\right]=20\log_{10}\left[\frac{P}{P_0}\right]$$

Where:
I0 = 1 pW/m2=10-12 W/m2, is the standard reference sound intensity, which is equivalent to the reference sound intensity level SIL= 0 dB. (Powell, Forrest, 1988).

P0 =2x10-5 Newton/m2: threshold of hearing (Hass, 2003).

The pressure, P, is to be understood as the amplitude of the pressure wave. The power carried by a travelling wave is proportional to the square of the amplitude. The factor of 20 comes from the fact that the logarithm of the square of a quantity is equal to two times the logarithm of the quantity. Since common microphones such as dynamic microphones produce a voltage which is proportional to the sound pressure, changes in sound intensity incident on the microphone can be calculated from equation (2): dI (dB) = 20 log10 [V2 / V1] (2)

Where (V1) and (V2) are the measured voltage amplitudes and (dI) gives the variation of the sound intensity in (dB) units.

Results

The shortest recording distance was 9.60 m (31.5 ft) =d. The next distance was 19.20 m (63 ft) =2d and for the furthest distance, 38.40 m (126 ft) =4d. The next step was to calculate the decreasing of the gunshots' sound intensities from d to 2d and from 2d to 4d. The results are shown in the following Table 1 and are depicted in Diagram D.

Table 1
Decrease in dB level with distance doubling (for all firearms used in the tests)

TYPE OF GUN / CALIBER		Derived from the Sound Level Meter		Derived from the Microphone	
		from d to 2d	from 2d to 4d	from d to 2d	from 2d to 4d
Pistol 6.35mm		6,1	4,67	11,62676399	4,023059387
Pistol 7.62mm TOKAREV		6,1	4,97	3,580653794	5,457293161
Pistol 7.65mm		4,94	3,76	6,372715908	7,391923353
Pistol 9mm SHORT		5,6	4,93	5,249248585	9,200935514
Pistol 9mm MAKAROV		7,2	6,24	7,880103206	9,393404581
Pistol 9mm Para		8,97	4,13	10,91138202	3,59843449
Pistol .45 AUTO		5,03	5,2	4,071345597	7,016220694
Revolver .22LR		5,3	7,8	5,603078472	9,793652905
Revolver .32 S&W LONG		4,8	7,5	6,972442461	7,530506363
Revolver .38 S&W		7,26	6,6	10,45155053	4,60105622
Revolver .38SPL		5,24	6,53	6,742177607	7,848551616
Revolver .357 MAG		5,3	6,64	0,990755622	4,737193786
Revolver .357 MAG (with cartridge .38SPL)		5,97	5,8	5,099718837	6,544444711
Submachine gun MP-5 9mm Parabellum	Single shots	7,3	5,5	8,238961234	6,611733968
	3-round bursts	4,3	6	7,759219255	5,917370808
Submachine gun SCORPION	Single shots	6,83	5,14	8,872326637	4,478183114
	3-round bursts	6,9	6,7	6,733453337	10,49201999
Assault Rifle 7.62mm Kalashnikov	Single shots	4,8	4,97	8,158351349	3,084281553
	3-round bursts	6,9	3,2	8,632749666	3,740469242
Semi-automatic shotgun 12 GA		4,8	6,2	5,522268365	5,816513895
AVERAGE :		5,982	5,624	6,973463≈ 6,973	6,363≈ 6,364
ERROR:		0,266	0,268	0,533830≈ 0,534	0,45721≈ 0,457

Diagram D — Decrease in dB level of the sound intensity, from both devices
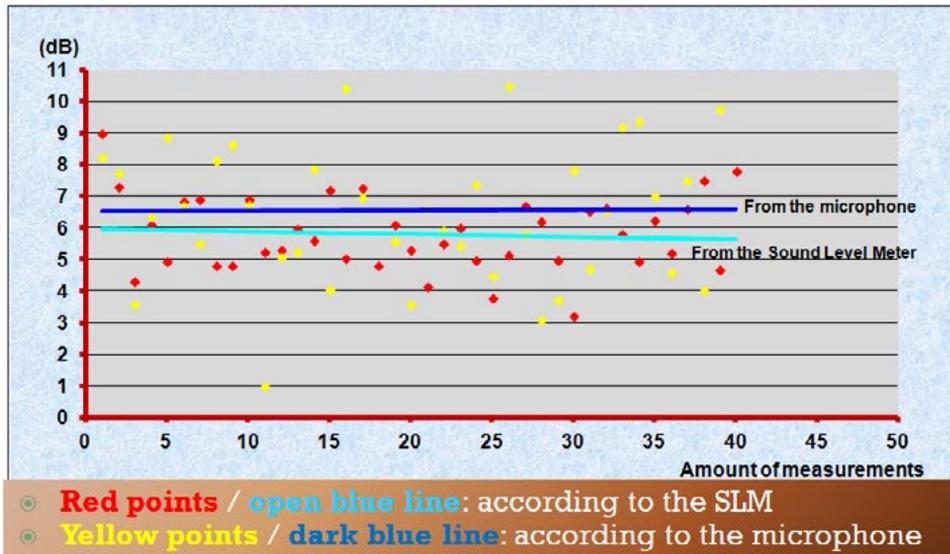
Application of the inverse square law for the sound intensity

Over the distances employed in this study, the sound intensity from a point source of sound will obey the inverse square law if there are no reflections or reverberations. As a sound wave is transmitted in a spherical pattern, the sound energy is distributed over the ever-increasing surface diameter of the wave front surface. According to the inverse square law doubling of the distance from the sound source (in a free field situation), the sound intensity will drop by about 6 dB (Drumm, acc.2009). This acoustical phenomenon follows equation (3):

$$\frac{I_2}{I_1} = \left[\frac{d_1}{d_2} \right]^2$$

If we measure a sound level I1 (dB) at distance d1, then at distance d2, the inverse square law predicts a sound level I2 (dB), (Nave, 2009). It can also be calculated that 10 times the distance drops the intensity by 20 dB.

Fourier transform analysis for the sounds

Studying the wave depictions from the recorded gunshot sounds, we realise after their fast fourier transform (fft) analysis that there are similarities between gunshots produced from the same type of firearm and also differences when comparing gunshots produced from different types of guns. In the following diagrams one can indicatively see the results from fft. In these diagrams the frequency (Hz) is on the xx axis and the amplitude is on the yy axis.

Similarities between the same type of firearm

Comparing (i.e.) the following diagrams E-1 and E-2, we can observe the similarities between two shots from the same firearm (a semi-automatic pistol in 9 mm Parabellum) from the same distance.

Diagram E-1 — Semi-automatic pistol in 9 mm Parabellum calibre. Shot from a distance of 14.40 m (47.25 ft) in front of the recording microphone
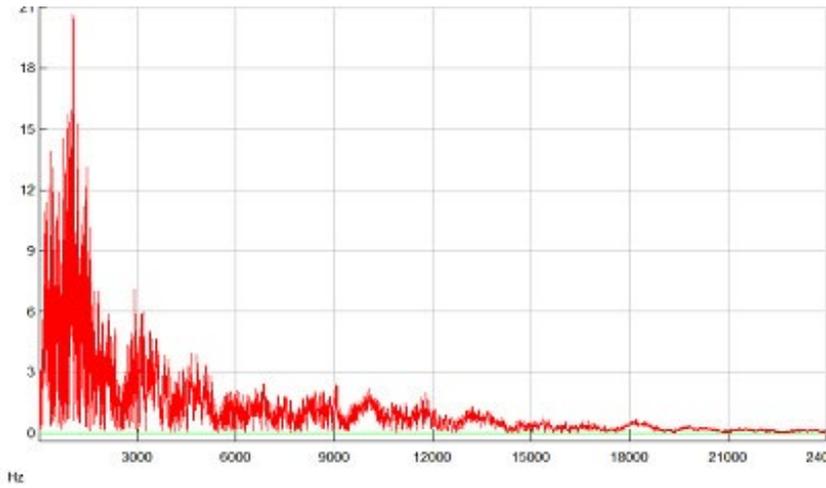

Diagram E-2 — Semi-automatic pistol in 9 mm Parabellum calibre. Another shot from the same distance 14.40 m (47.25 ft) in front of the recording microphone
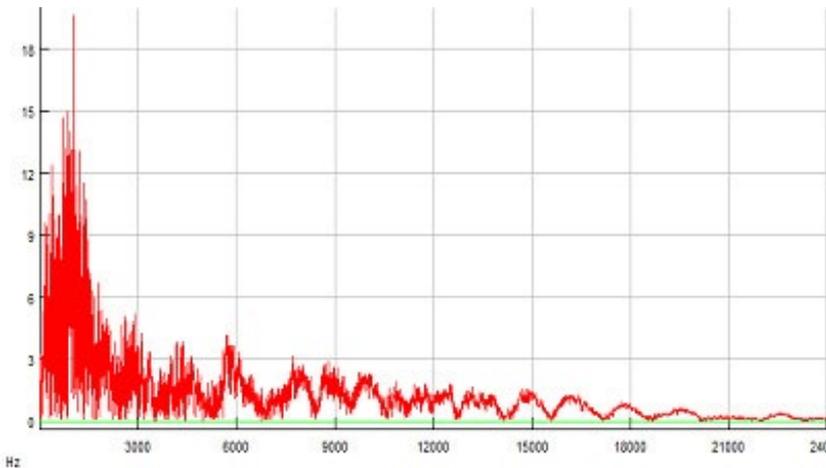
Differences when comparing gunshots produced from different types of guns
Recorded gunshot sounds after their fast fourier transform (fft) analysis show differences after comparing gunshots produced from different types of guns, as it appears for instance, in diagrams F-1 and F-2, between a revolver in .38 SandW calibre (F-1) and a revolver in .22LR (long rifle) calibre (F-2) for two shots from the same distance (19.20 m (63 ft) in front of the recording microphone). In these diagrams the frequency (Hz) is on the xx axis and the amplitude is on the yy axis.

Diagram F-1 — Revolver in .38 SandW calibre. Shot from a distance of 19.20 m (63 ft) in front of the recording microphone
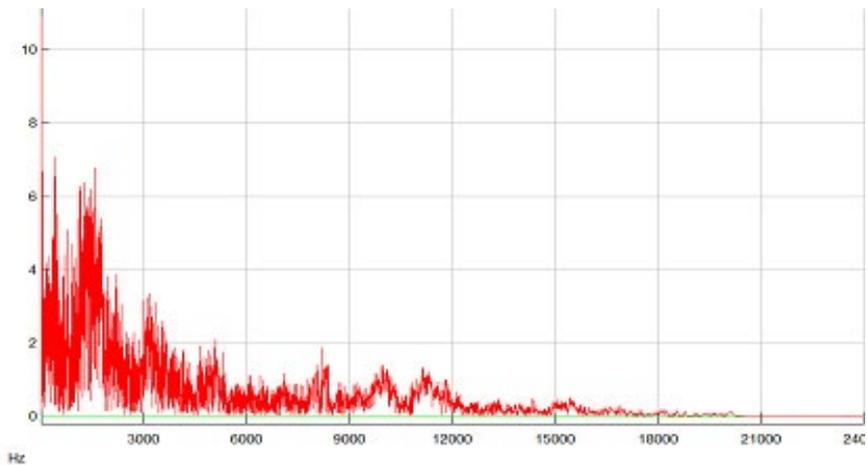
Diagram F-2 — Revolver in .22LR (long rifle) calibre. Shot from the same distance 19.20 m (63 ft) in front of the recording microphone.
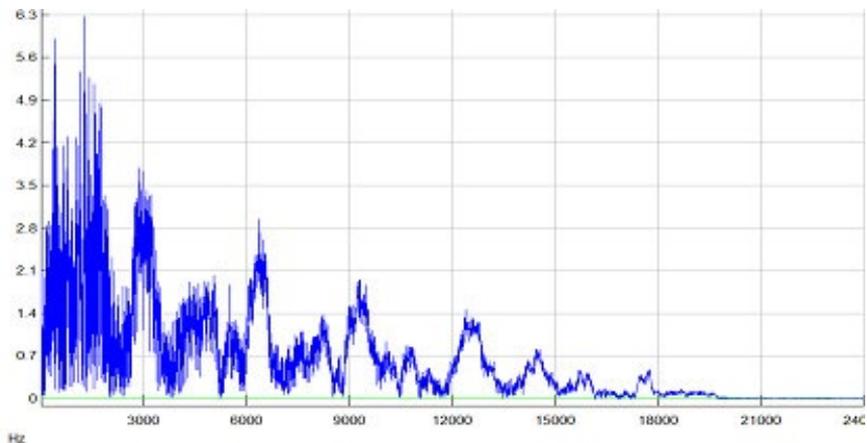
Discussion

During these experimental shootings, we tried to simulate real conditions, supposing that somebody who fires a handgun is in a standing position, holding the handgun with the hands forward, with a gun height from 1.60 m (5.25 ft) (for pistols and revolvers) to 1.25 m (4.1 ft), (for submachine guns, rifles or shotguns).

The person taking the measurements was positioned directly behind the shooter with the measuring device at a nominal height of 1.2 m (4 ft), (in Dater, 2000 a height of 1.6 m above ground is mentioned). It should also be mentioned that the test area was not completely flat. Some obstacles existed in the field.

The total variation of the sound intensity (dl) was calculated (as the estimated value on average) by equation (4), (Papageorgopoulos, 1994):

$$x = \frac{\sum \dfrac{\overline{x_k}}{\sigma^2(\overline{x_k})}}{\sum \dfrac{1}{\sigma^2(\overline{x_k})}}$$

Where xk : average values, σ(xk) : standard deviation of xk, k = 1, 2, 3, …N (N= the amount of measurements)

and its standard deviation (Sx) was calculated by equation (5):

$$S_X = \pm\left[\frac{\sum \dfrac{\left[\left(\overline{x_k}\right)-x\right]^2}{\sigma^2(\overline{x_k})}}{(N-1)\sum \dfrac{1}{\sigma^2(\overline{x_k})}}\right]^{\frac{1}{2}}$$

Where x: the value calculated from equation (4), xk : average values, σ(xk) : standard deviation of xk, k = 1, 2, 3, …N, N= the amount of measurements.

For every doubling of the distance from the sound source, the sound intensity diminished by dl= 5.9904±0.2325 decibels (on average).

Diagram G — Total calculated variation of the sound intensity
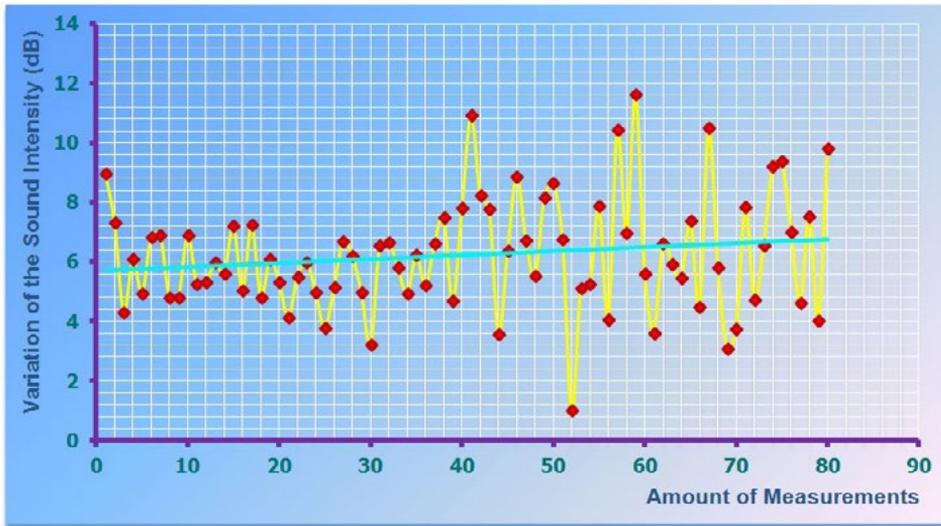
Applications

We have taken the measurements from the SLM for the peak values for the sound intensity for gunshots from the nearest distance d=9.60 m (31.5 ft). Decreasing (d) by half four times, we will have a calculated increase of dB level equal to 23.96 dB, approaching the source at 0.60 m (2 ft) (Table 2).

Table 2
Gunshot sounds (dB) for all guns used from SLM 0.6 m behind gun

Type of gun	Pistol 9 mm Para	Pistol 7.62 mm Tokarev	Pistol .32 Auto	Pistol .380 Auto	Pistol Makarov	Pistol .45 Auto	Pistol .25 Auto
Gunshot sound (dB)	154.9	154.4	152.2	154.9	154.1	156.9	149.2
Type of gun	Revolver .38SPL	Revolver .357MAG	Revolver .357 MAG with ammo .38 SPL		Revolver .38 SandW	Revolver .32 SandW L	Revolver .22LR
Gunshot sound (dB)	154.9	161.9	156.7		149.7	148	148

Type of gun	Shotgun 12GA	Submachine gun Scorpion .32 Auto		Submachine gun MP-5 9 mm Parabellum		Assault Rifle AK47 7.62 mm Kalashnikov	
Gunshot sound (dB)	154.5	single shot 154.7	burst 154.1	single shot 149.1	burst 148.7	single shot 153.6	burst 154.7

Calculation of the distance from a discharged firearm

A further application could be the calculation of the distance from a discharged firearm if one has access to a suitable audio recording. For example, we can calculate the distance from a 9 mm Parabellum semi-automatic pistol (Diagram H), as well as for any other type of gun from those we used in the tests (experimental shootings) by the same method.

Diagram H — Calculation of the distance from a discharged pistol in 9 mm Parabellum calibre
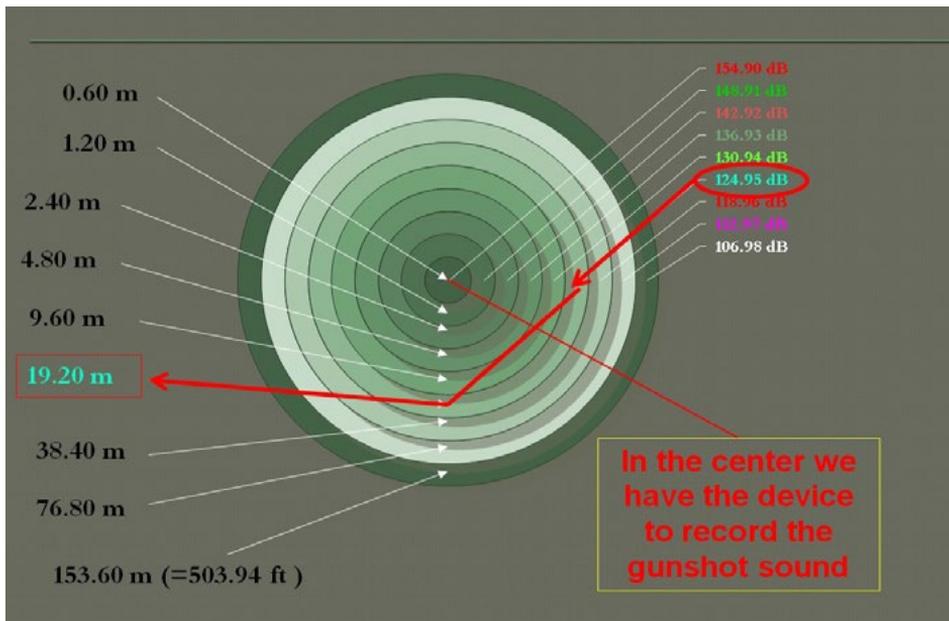
A suggestion about comparing gunshot sounds from two firearms

The idea is based on a Matlab code, which was produced by Dr Mahesha MG to record sound and displays the wave form in both time domain and frequency domain (Mahesha, 2012).

Through a fast fourier transform code in Matlab we can input two (2) recording gunshot sound depictions (in a .wav file format) and compare them.

It is acceptable that there are several different factors that stand to influence the dB level of a gunshot. Included among these factors are the length of the gun barrel (the shorter the barrel, the louder the sound), the powder charge in the ammunition and the speed/direction of any wind at the time of the shot. So an application could be the next example (Tsiatis, 2013): we recorded the gunshot sounds (dB) for a SandW revolver in .357 Magnum calibre, using two different ammunition (.357 Magnum/.38 Special) for the distances: 9.60 m (31.5 ft)/14.40 m (47.25 ft)/19.20 m (63 ft)/38.40 m (126 ft). The results were as follows:

- .357 Magnum calibre: 137.9/134.25/132.6/125.36

- .38 Special calibre: 132.7/126.15/126.73/120.93.

By using the above-mentioned fast fourier transform code in Matlab for the shots from 14.40 m (47.25 ft) we have the following results (Diagram I):

Diagram I — The fft depicts the single-sided amplitude spectrum of y(t). On the xx axis there is the frequency (Hz) and on the yy axis there is the amplitude (/Y(f)/)
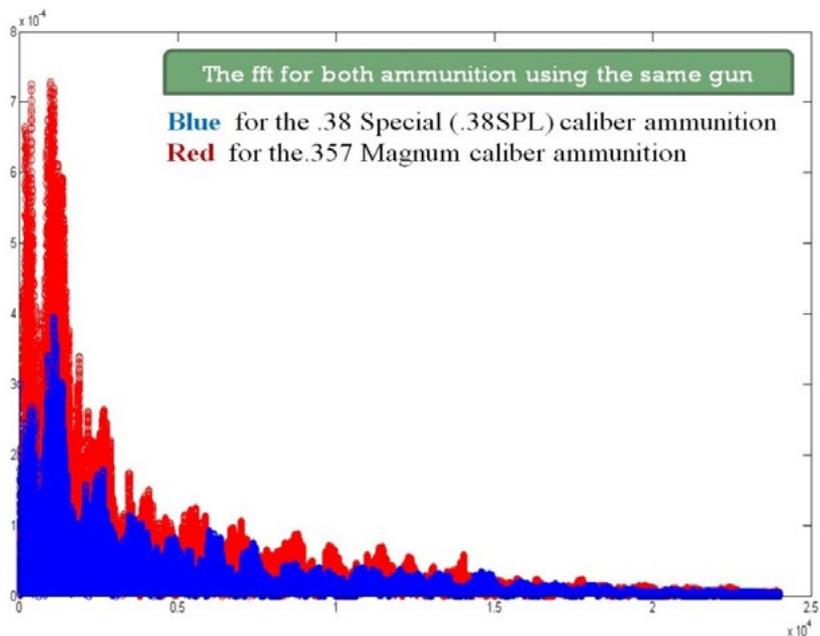
As it appears, the powder charge in the ammunition stands to influence the dB level of a gunshot. The .357 Magnum is higher in powder charge than the .38 Special.

An aim originating from this study is for further data to be collected using other types of firearms, different brands of ammunition and bullet types. In addition, a further operation could be the creation of a database with .wav files including sound wave depictions and their mathematical analysis according to the fast fourier transform.

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