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ELECTRONIC MONITORING AS AN ALTERNATIVE FORM OF PUNISHMENT: AN EXPLORATORY STUDY BASED ON EUROPEAN EVIDENCE

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ABSTRACT

Electronic monitoring is a relatively new tool in the field of criminal justice, invented in the late 1960s. Due to overcrowding of prisons and the expense of the daily maintenance per inmate, its use and implementation is growing worldwide. To date, academia and practice lack data to quite a significant extent, interdisciplinary approach and more robust information and experience related with the implementation and exploitation of electronic monitoring across European countries.

The scientific objective of the paper is to analyse and evaluate an approach towards electronic monitoring in European countries as an alternative form of punishment based on evidence drawn from a holistic interdisciplinary approach.

Based on this European evidence, and by using several mathematical and statistical methods (descriptive statistics and linear regression), this paper produces original research results. This exploratory study results in several practical implication and policy recommendations, and opens enormous scope for further research.

Key Words: Electronic European Evidence, Alternative Form of Punishment. Monitoring.

INTRODUCTION

Academic interest in electronic monitoring (EM) originated at Harvard University in the 1960s with an early emphasis on positive reinforcement regarding juvenile and young adult offenders, i.e. with the aim of eliminating recidivism (Gable, 2011). The work carried out by a small group of researchers in the field of psychology led to the granting of the first patent for an EM system in 1969. This was based on very heavy (*circa* 1 kg) devices attached to the waist (Gable, 2015, p. 4). The first practical applications in penal law were implemented using much smaller devices attached to offenders' ankles in the US state of New Mexico in 1983, and in Florida in 1984 (*Ibid.*, p. 5-6). The first massive application of EM took place in the US, and a little later in the United Kingdom in the late 1980s, with the aim of responding to growing problems arising from prison overcrowding and the escalating costs of incarceration (DeMichele and Payne, 2009; Paterson, 2007; Renzema and Mayo-Wilson, 2005). The discussions held in the UK in the late 1980s concluded with a presumption that the primary goal of EM implementation should be to reduce the prison population, and that the EM scheme should be cost effective (Ardley, 2005). The aims of EM implementation in the UK were set out clearly. "Firstly, to reduce the use of custody without increasing the risk to the public. Secondly, to avoid the 'contamination factor' in imprisonment, when first offenders mix with more experienced offenders and learn the 'tricks of the trade'. And

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finally, to avoid the stigma of prison and the dislocation of family ties” (Whitfield, 1997, p.18). “In 1987, with the Conservative Government under considerable pressure about the prison population, the Commons Home Affairs Committee recommended that the use of EM on offenders in the US should be examined to see if it had any possible application in the UK” (Lockhart-Miramis, Pickles and Crowhurst, 2015, p. 17). In this context, it was taken into account that “fear has been expressed in the US about using EM as an extra punishment rather than an alternative to custody” (Berry, 1985, p. 42, In: Ardley, 2005, p. 6). Despite this, “reducing the prison population was considered to be the main benefit [of introducing EM in the UK]; therefore [it was envisaged that EM] would be used as an alternative to custody” (Mair and Nee, 1990, p. 8, cited in Ardley, 2005, p. 5).

The above very briefly outlines the historical context influencing scientific discourse on EM, which became narrowly focused on the effectiveness of EM programmes in reducing recidivism, the cost-effectiveness of EM programmes (in comparison with imprisonment), and the impact of EM on prison overcrowding. The effect of increasing the number of individuals controlled by the criminal justice system in consequence of developing and applying EM and other alternatives to incarceration is so-called widening effect of EM. Within the context of the research project entitled ‘Interdisciplinary approach to the EM of accused and convicted persons in Slovakia’, the authors of this paper sought to determine whether a more holistic interdisciplinary approach to EM could be applied in the scientific discourse on EM (see, *inter alia*, Renzema and Mayo Wilson, 2005; Henneguella, Monnery and Kensey, 2016).

THEORETICAL BACKGROUND OF EM

EM was designed to prevent the need for offenders to remain in custody, whether in pre-trial detention or during their entire sentence length, thereby allowing governments to reduce costs. The main benefits of EM are often mentioned as reducing costs for prison functioning, reducing reoffending through increased deterrence, acting as a rehabilitative tool by providing structure to offenders’ lives and giving them the opportunity to work, and even sometimes as a form of punishment in community sentences (Belur et al., 2017; Garland, 2002; Hucklesby and Holdsworth, 2016).

EM, known also as offender tagging, typically refers to a device attached to an offender’s ankle or wrist to track his or her whereabouts, which can be monitored remotely to establish whether the individual is violating a set of pre-established conditions determined by the courts (Di Tella and Schargrotsky, 2009, cited in Nellis, Beyens and Kaminski, 2013). “Unlike probation and community service, EM is used for adults or juveniles at three stages of the criminal justice process: as a condition for bail, as part of a community sentence or suspended sentence order (curfew orders), or to allow for the early release of prisoners (home detention curfews)” (Hucklesby, 2008). Curfew orders vary, but they generally require offenders to be present at a curfew address for a fixed number of hours per day for a pre-determined period. The decision to recommend monitoring usually depends on a competent authority’s assessment of offender suitability for EM (Nellis, Beyens and Kaminski, 2013).

“Electronic monitoring might be used at all stages of the criminal justice process; as a pre-trial, as a sentence, as early release from prison and on completion of a prison sentence, potentially providing the only universal mechanism for reducing prison populations. Furthermore, electronic monitoring is a flexible tool, which may be used in many ways in the criminal or civil justice context. For example, it can be used as a standalone measure or alongside other requirements or conditions and EM regimes are infinitely flexible so monitoring periods may be tailored to the intensity required and changed during the lifetime of orders” (Hucklesby et al., 2016, p.8). Besides the above-mentioned utilisation, EM has been extended to cover adult and juvenile offenders, terror suspects, persons suspected of

breaching immigration laws, alcohol and drug abstinence maintenance requirements, and potentially monitoring those refusing to pay child support (Paterson, 2007), as well as monitoring prolific offenders on a voluntary basis (Hucklesby and Holdsworth, 2016). A large number of jurisdictions all over the world, including Europe (see *inter alia* Boone, van der Kooij and Rap, 2016; Hucklesby and Holdsworth, 2016; Marklund and Holmberg, 2009), Argentina (Di Tella and Schargrodsy, 2013), Australia and New Zealand (Black and Smith, 2003; Gibbs and King, 2003) and the US (Jones and Ross, 1997; Lipner, 1993) use EM. In the next part of our paper, we focus on European countries only.

DATA AND METHODOLOGY

The scientific objective of this paper is to analyse and evaluate an approach towards EM in European countries as an alternative form of punishment by applying a holistic interdisciplinary approach. A broad comparative and exploratory study of this issue would need consistent information. There is not much of a system behind the definition and collection of relevant data, leave aside in the form of quantitative data related with EM across Europe. Data inspection and mining for this particular paper has been undertaken through Eurostat and various reports (for example from project SPACE; reports on EM implementation in the Netherlands, Germany, England and Wales, and Sweden; a survey of EM in Europe; data from the Ministry of Justice in the Slovak Republic; etc.). For more detail, see the overview presented in Table 1. In bold letters, we highlight the countries that have implemented EM as a pre-trial sentence, as an alternative to imprisonment or as supervision after sentencing. The data and results differ from country to country; while some countries implement the system of EM efficiently into their jurisdictions (for example France, Sweden or the UK), several countries are only at the very beginning of its implementation (e.g. Slovakia) or haven't yet started (for example Croatia). Huge differences between European countries are reported on indicators related to the exploitation of prison capacity, the mortality rate of inmates and the daily expense of inmates.

In the attempt to apply as robust scientific methods as possible, the primary research presented in this paper has been carried out using regression analysis of the 'hard data' available from Eurostat. Secondary research focusing on the historical and theoretical background of EM has been carried out to ensure that the results of the primary research are correctly contextualised and interpreted. The objective of linear regression is to model a relationship between a dependent variable y and one or more independent variables x by linear function (e.g. Sachs, 1984). In case of one independent variable, it is called simple linear regression. For two and more independent variables, it is called multiple linear regression.

Table 1: Comparison of indicators related to classical and alternative forms of punishment

	Indicators of classical form of punishment				Pre-trial detention or forms of probation/supervision before the sentence				Forms of probation/supervision after the sentence			
	Number of persons held in prison in 2014	Exploitation of prison capacity	Mortality rate per 10,000 inmates (2014)	Average daily expense per inmate (in €) (2014)	Alternatives to pre-trial detention with supervision by probation agencies	Custodial suspension of criminal proceedings	EM	Home Arrest	Fully suspended custodial sentence with probation	Partially suspended custodial sentence with probation	EM	Home Arrest
European countries												
Austria	8 692	100,3%	23,70	112,97 €	203	4,078			4,587	1,279	277	
Belgium	NA	NA	23,90	137,28 €	2,556		62		13,508		1,674	
Bulgaria	7 870	100,0%	36,80	13,68 €							183	
Croatia	3 763	93,6%	42,50	7,29 €	0	15	0	0	274		0	0
Cyprus	532	N/A	44,10	75,00 €	192						NA	NA
Czech Republic	18 658	93,2%	15,50	45,00 €	836	131			11,552		0	176
Denmark	3 583	N/A	11,20	191,00 €					1,611	273	301	
Estonia	3 034	102,4%	27,00	39,36 €	9		9		2,613	295	0	
Finland	3 148	N/A	29,10	175,00 €							51	
France	66 270	114,6%	17,00	102,67 €	3,619	1,644		234	123,803		9,429	NA
Germany	63 228	N/A	23,10	129,35 €							26	
Greece	11 798	119,3%	24,20	28,16 €	4,430	715	2	2	2,947		0	22
Hungary	17 890	139,0%	36,70	26,57 €		3,836			6,138		NA	
Ireland	3 777	91,1%	20,90	189,00 €					1,055	884		
Italy	54 745	108,5%	17,00	141,76 €		6,557			6,165		NA	9,491
Latvia	4 745	81,1%	58,20	22,58 €					2,927		27	
Lithuania	8 636	91,9%	47,90	16,05 €				1113	2,845		70	2,939
Luxembourg	626	44,0%	15,20	206,52 €	18				349		24	
Malta	581	93,4%	NA	NA					114		NA	NA
Netherlands	11 934	81,4%	25,40	273,00 €			1,402				NA	NA
Poland	78 358	88,3%	NA	NA								
Portugal	14 198	111,0%	52,10	41,22 €	874	6,599	299	348	13,574		187	81
Romania	30 156	104,3%	38,60	19,79 €					30,575			
Slovakia	10 020	84,7%	17,70	39,39 €	278				129		15	9
Slovenia	1 522	112,7%	39,40	60,00 €								3
Spain	65 017	N/A	23,80	59,72 €					11,256	1	1,829	NA
Sweden	5 702	88,1%	27,30	354,00 €			3,087		42,225		786	
UK: England and Wales	83 678	93,3%	28,40	115,75 €			5,917				5,825	
UK: Northern Ireland	7 731	N/A	5,40	112,20 €								
UK: Scotland	1 709	89,3%	30,50	125,00 €							600	

Sources: Aebi and Chopin (2016), Beumer and Øster (2016), Hucklesby and Holdsworth (2016), Statistical Yearbook of the Slovak Ministry of Justice (2016)

Let us suppose we are given data of n statistical cases, then the model of simple linear regression is:

$$y_i = b_0 + b_1 \cdot x_{i1} + e_i,$$

where b_0 is the intercept,

b_1 is the linear regression coefficient for independent variable x_1 ,

and e_i is an error (residual) of the model, it is the difference between the real and predicted value of y_i .

We use two simple linear regressions for the dependence of mortality rates and suicide rates (per 10,000 inmates; these are dependent variables y) on the average daily expense per inmate (independent variable x). All statistical reports and graphs were made by statistical software IBM SPSS, version 19. The next part of the paper summarises and discusses the most important research results.

RESEARCH RESULTS AND DISCUSSION

The available evidence suggests that EM could be an effective deterrent to crime and could have enormous social and economic benefits, especially if applied early, saving what might otherwise be habitual offenders from a life of crime (DeLisi and Gatling, 2003). In the first two sections of the paper, we presented the results of the secondary research on the historical background (Introduction) and the theoretical background of EM. In the following sections, we combine the results of both primary and secondary research in a common structure used in interdisciplinary studies, based on a division of results into three core aspects of EM: legal aspects, economic aspects and social aspects.

Economic Aspects of EM

From the economic point of view, one of the main reasons for initial implementation of EM is the need to decrease the cost of the prison system. In an era of austerity, cost cutting in public spending and ensuring value for money assume greater importance. There are several studies assessing the cost effectiveness of EM (National Audit Office, 2006; Dodgson et al., 2001; Mair, 2005; Mair and Nee, 1990; Mair and Mortimer, 1996; Shute, 2007; Sugg, Moore and Howard, 1991). A National Audit Office (2006) study showed that a 90-day curfew period with a tagged offender is around £5,300 cheaper than a custodial sentence of the same length. As can be seen in Table 1, many countries in Europe have enormous daily costs per inmate, and the annual costs of the prison system can therefore reach dizzying numbers. EM, including home arrest and home detention, could be very effective in terms of cost reduction (see Křištofík et al., 2017) and in ending the criminal career of individuals who would otherwise settle into a pattern of habitual offending. In terms of cost efficiency, EM produces positive externalities that influence the cost efficiency of the whole jurisdiction system. EM decreases the following:

- the cost to society arising from rehabilitation counselling and the treatment services required when convicts exit prison;
- the excess cost to society of the personnel, resources and facilities required to arrest, detain, try, convict, and supervise offenders, beyond the cost of incarcerating convicted offenders for the terms of their sentences; and
- costs relating to the intergenerational transfer of crime, due to the fact that children whose parents are career criminals are likely to be at high risk of becoming criminals themselves (Cohen and Piquero, 2009).

Besides the above-mentioned costs, it needs to be taken into consideration that electronically monitored person are usually allowed to work. This means that they pay taxes,

health and social insurance and enjoy the usual consumption of goods and services that favour the local economy. In several countries (for example Slovakia), electronically monitored person are obliged to contribute to costs of their EM from their own resources. All these savings and cost related externalities have to be considered by evaluation of EM cost-efficiency. Based on European evidence, our research results show that the daily costs of EM are approximately 75% lower than daily expenses per inmate (for more information, see Kristofik et al., 2017). A more robust and interdisciplinary approach is needed in this area.

Legal Aspects of EM

In terms of law, crime and justice, different approaches have been taken in Europe and different aspects can thus be observed. At a general level, EM has been used for offenders committing a range of crime types, mostly less serious ones. However, specific attention has been paid to research on, legislation regarding and the application of sentences in relation to domestic violence offenders, other violent offenders and sex offenders (Erez et al., 2012; Finn and Muirhead-Steves, 2002; Payne and DeMichele, 2011). There is some evidence that drug and/or sex offenders on EM are more likely to complete treatment programmes than other (non-tagged) offenders, which might be related to better re-offending outcomes of programmes based on EM (DeMichele and Payne, 2009; Crowe et al., 2002).

Sentences concerning the application of EM can be made in several different legal forms and contexts. “An important policy debate has been taken place about its use as a stand-alone punishment (commonplace in England and Wales, but less so elsewhere in Europe) versus its use as a component in intensive supervision and treatment programmes, although even in regard to the latter there have been arguments as to whether it is included simply as a punitive element in the package, or whether it serves to support other, more rehabilitative components” (Nellis, Beyens and Kaminski, 2013, p. 2). Since 2016, EM can also be applied as an autonomous standalone sentence in Belgium (Beyens and Roosen, 2016, p. 2). It can be applied for long period sentences; the longest sentence under EM applied so far in Belgium was approximately 3.5 years (Ibid., p. 25).

A different approach from that taken in Belgium (and England and Wales) has been taken by the authorities in the Netherlands, perceiving the key value of EM “in terms of rehabilitation, provided that EM would be combined with an intensive support program and meaningful activities’ such as schooling or work” (Boone, Van der Kooij and Rap, 2016, p. 1). EM has been applied in the Netherlands for only very short, unconditional prison sentences up to 90 days in length, and for offenders without a ‘security risk’ who report themselves to the prison without coercion (the so-called ‘self-reporters’: *Ibid.*, p. 2). In the Netherlands, EM is considered a proper alternative to incarceration for short prison sentences. In France, “under EM, offenders are compelled to respect strict home curfews for long hours, with permission to leave only for work or other rehabilitative activities” (Henneguelle, Monnery and Kensey, 2016, p. 30). In Norway, EM can be applied to any short-term sentence, with the exception of sentences imposed in default of paying a fine (EM also cannot be used to monitor persons under preventive detention in Norway).⁶ The first Eastern European country to apply EM home arrests as an alternative to imprisonment was Poland (in 2007). Originally, persons sentenced to imprisonment not exceeding one year were eligible, but there were several legal changes adopted in 2015 and 2016, some of which were considered “the result of the resignation from EM as a one of the forms of the penalty of restriction of liberty. After these changes, there has been significant reduction in the number of judgements regarding the electronic monitoring” (Jaskóła and Szewczyk, 2017, p. 11).

⁶ See *Execution of sentence with electronic monitoring* [Online]. Available from: <http://www.kriminalomsorgen.no/getfile.php/3934108.823.qnwb7zwwjuzaa7/Electronic+Monitoring+%28EM%29+-+information+to+the+offender.pdf> [Accessed 19 October 2017], p. 2.

In contrast to all the above-mentioned European countries (especially Norway), legislation and practice at the federal level in Germany does not allow application of EM as an alternative to imprisonment. After a long period of reluctance, federal German authorities allowed EM to be used only as a result of the decision of the European Court of Human Rights no. 19359/04, which abolished 24-hour police surveillance of the most dangerous offenders after their release from prison. EM has been introduced as an alternative (Dünkel, Thiele and Treig, 2016).

Another important advantage of EM can be seen in its preventative role. According to Padgett *et al.* (2006), a key result of EM is in preventing offenders from committing new offenses while they are monitored. Monitored offenders are 94.7% less likely to commit new offence than offenders who were not monitored. Marklund and Holmberg (2009) conducted an extensive comparative study on the recidivism of groups of prisoners and group of convicted persons using EM. They found that 26% of offenders in the EM group were convicted of new offenses during the three-year follow-up period, while the corresponding proportion of the group of prisoners was 38%. The EM group relapsed into serious crime at a lower rate of 14% (compared to 26% of the second group). This suggests that EM has a significant effect in reducing criminality during the three-year period after monitoring ends, in addition to the substantial effect found by Padgett *et al.* (2006) and during the period of monitoring (Yeh, 2010).

Social Aspects of EM

According to Yeh (2010), EM and home detention could be effective to reduce crime and produce large-scale social benefits.

EM may impact on the mortality and suicide rates of persons entering the penal system. Below, we present the results of the regression analysis of the mortality rate and the suicide rate (per 10,000 inmates) and the average daily expenses per inmate.

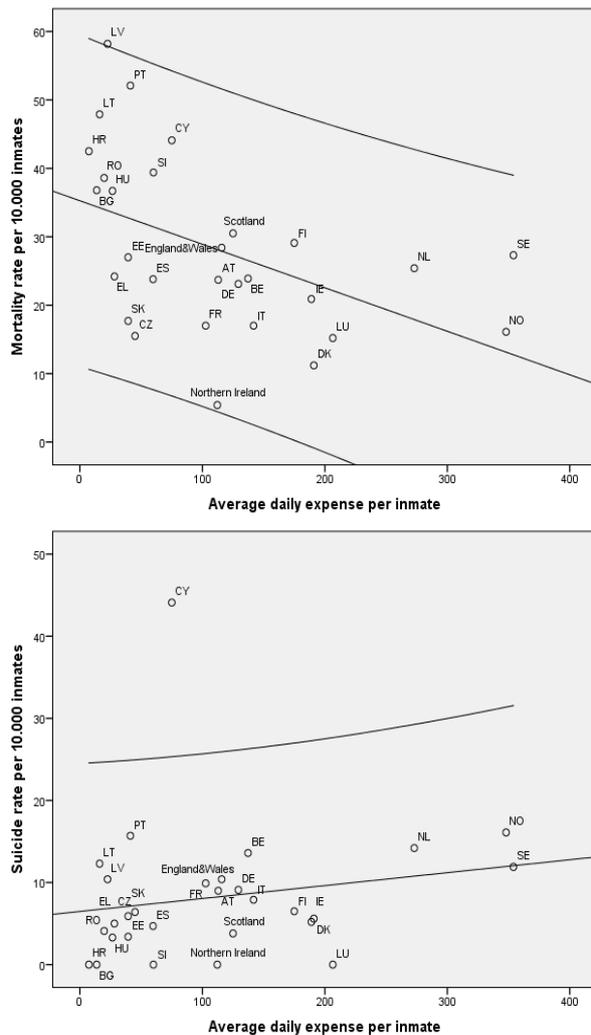


Fig. 1: Dependence of the mortality rate (per 10,000) and the suicide rate (per 10,000) on the average daily expense per inmate in 2014

Figure 1 illustrates a scatter plot of the empiric dependence of the mortality rate on the average daily expense per inmate. The research results shows that the mortality rate decreases with a higher daily expense per inmate. The dependence is significant according to a linear regression model (linear regression coefficient = -0.064 ($p = 0.009$), coefficient of determination = 0.200). The regression equation is: Mortality rate = $35.3 - 0.064 \cdot \text{average daily expense}$.

If the average daily expense increases by one Euro, then the mortality rate decreases on average by 0.064 per 10,000 inmates. In other words, if the average daily expense is larger than 100 Euros, the mortality rate is smaller on average by 6.4 per 10,000 inmates.

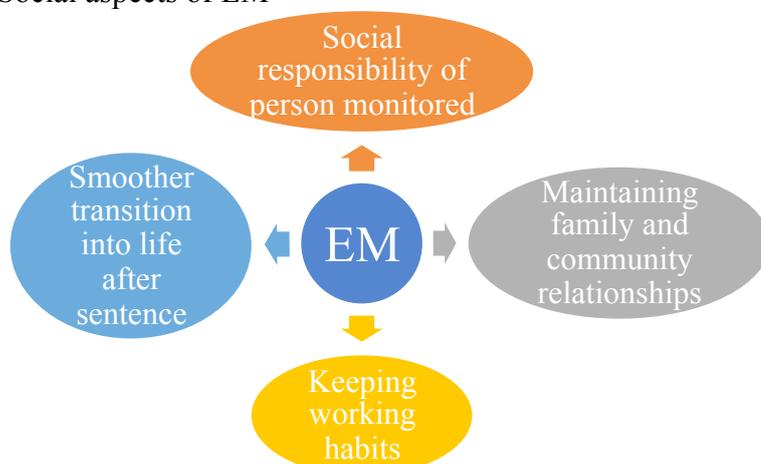
In the case of the suicide rate, the dependence on the average daily expense is not significant (linear regression coefficient = 0.016 ($p = 0.355$)) (see Figure 2). This means that the suicide rate is not dependent on the average daily expense. This is surprising, but the lack of dependence between the suicide rate and the average daily expense may be meaningful. It tells us more about the qualitative viewpoint of inmate life, e.g. human relations between inmates and/or between inmates and custodians.

We lack similar data for EM completely. We may expect that the mortality rate and the suicide rate of electronically monitored persons will be very low, if it exists at all. As EM is based on approval and cooperation of person monitored and is performed in the domestic environment, by respecting all family and community relationships, there is a low assumption of mortality due to performance of EM. We would in any case recommend national

jurisdictions start collecting data on the mortality rates associated with EM with the aim of verifying this assumption.

EM shows the potential to achieve the difficult balance between punishments and therefore meet the public desire for a just punishment. (Gainey and Payne, 2000; Gainey et al., 2000, White et al., 2000). Martinovic (2002) provides further targets for EM programmes, such as the reduction of the tax burden to the public by removing the high costs associated with traditional performance penalties and the protection of the offender in terms of corruption or the stigmatic effects of institutional origin (as well as the need to maintain family and community ties). Finally, all EM programs are aimed at suppressing crime through increased accountability and monitoring. This increases public safety by using more traditional approaches or community supervision, based on probation supervision, parole and the hope that this approach will reduce the number of repeat offenders in the long term (Renzema and Mayo-Wilson, 2005). The following figure illustrates the possible social benefits of EM.

Fig. 2 Social aspects of EM



Electronically monitored persons do not rely on the state, but take responsibility for their actions and participate personally in the costs related to the execution of the sentence. Usually, electronically monitored persons are allowed to work. We can assume that these individuals will not lose the habit of working during their sentence, and the transition back to a normal life should therefore be relatively smooth. Electronically monitored employed persons pay mandatory contributions to the social system. We can assume that this situation also raises consumption, creating additional revenue for the state budget. Maintaining social and family ties, reducing the risk of imprisonment and forming undesirable new ties, and keeping working habits are the main positive effects at the social level.

CONCLUSIONS, POLICY IMPLICATIONS AND FUTURE RESEARCH PERSPECTIVES

Based on the example of our primary research on mortality and suicide rates in prisons, we have shown how an interdisciplinary approach to scientific research related to the EM of offenders could better incorporate the social aspects of punishment. By means of integrating the results of our own research in this field into the secondary research results (i.e. work by other authors), we outline how a more holistic approach could be applied in this field.

The results of our secondary research suggest that national programmes of offender EM in Europe resemble ‘live organisms’ in that they adjust their aims, intentions and methods to respond to a changing ‘social climate’. For example, in Poland, the researchers asked whether the national legislation had already been “given the final shape of electronic

monitoring, or should we expect further legislative changes” (Jaskóla and Szewczyk, 2017, p. 12). From our research, we observe that Poland is one of the very few countries for which data on mortality and suicide rates was unavailable in the Eurostat Crime and Criminal Justice Database, and we consider this an impetus for both policy implications and further research.

The results of our research have to be perceived in the context of the first decade of the 21st century. The key research question dealt with by academics was whether EM has a future in Europe or not. The researchers responded to this question in an “affirmative way: EM has had a future in Europe, both West and East, and seems likely to continue to have one” (Nellis et al., 2013, p. 2). Thus, the question of whether EM has a future in Europe has been replaced by the question of how EM will be used in future (Nellis et al., 2013, p. 2; Beyens and Rosen, 2013). More knowledge on the relationship between mortality and suicide rates in prisons and the approaches towards EM in different European countries could also have some influence on how both the scientific discourse and the political agenda on the future of EM should be shaped.

Drawing from the results of our secondary research, the key question for future discussion is whether EM should be primarily perceived as a standalone instrument of punishment as an alternative to incarceration (primarily to deal with prison overcrowding and/or to save public funds), or whether EM should be perceived primarily as a technical instrument supplementing various other non-technical instruments in national programmes of probation, custody, surveillance of dangerous offenders released from prison, etc. As we have outlined, there are different approaches taken in this regard by different European countries, and no generalisations can yet be made.

Nellis et al. (2013, p. 2) state that “once EM has been adopted, its use in each country tends to increase”. As we have outlined in the section devoted to the legal aspects of EM, this is not the case in Poland, where a decline in EM was reported in consequence of legal amendments made in 2015.

As is evident from the data in Table 1, every European country is able to implement or expand the utilisation of EM. As advocated and discussed throughout the paper, implementation of EM may have several significant benefits at the economic and social level, as well as for crime and justice. Implementation of EM, its efficiency and interdisciplinary scope open enormous scope for future research. Each of the aspects discussed in the paper (economic, legal and social) creates space for future research projects and studies. From our point view, an interdisciplinary approach considering the different aspects of EM would be a significant contribution to this research area. On the other hand, we lack a significant amount of data necessary for thorough research. The available data often does not have sufficient scope and/or quality. We would recommend that national jurisdictions collect and store data on EM, including home arrest, which might be made available as a result of penal and civil process and through probation and mediation officers. It would be very helpful if data relating to the cost ratio of EM, the data on recidivism during and after EM, and the reporting of incidents during EM, were to be included. EM produces a significant amount of data. GPS technologies collect considerably more detailed data on individuals’ movements, 24/7. In case of optimal settings of collection and exploitation of data reached during implementation of EM and by respecting the privacy of the persons monitored, it creates scope for further research, analysis and the evaluation of EM systems. We would recommend that the EU, especially Eurostat, should compile data from member countries to assure its comparability and availability for research. This could significantly help national jurisdictions evaluate the implementation and functioning of EM.

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REFERENCES

- Aebi, M. and Delgrande, N. (2014) *Council of Europe Annual Penal Statistics. SPACE I. Survey 2013*. [Online]. Available from: <http://wp.unil.ch/space/files/2015/02/SPACE-I-2013-English.pdf> [Accessed 20 October 2017].
- Aebi, M.F. and Chopin, J. (2016) *Council of Europe Annual Penal Statistics SPACE II*. Switzerland: Unit of Criminology School of Criminal Justice University of Lausanne.
- Ardley, J. (2005) The Theory, Development and Application of Electronic Monitoring in Britain. [Online]. *Internet Journal of Criminology*. Available from: www.internetjournalofcriminology.com. [Accessed 19 September 2017].
- Belur, J. et al. (2017) *A Systematic Review of the Effectiveness of the Electronic Monitoring of Offender*. What Works Crime Reduction Systematic Review Series. London: University College London.
- Beumer, S. and Øster, M.K. (2016) Survey of Electronic Monitoring in Europe: Analysis of Questionnaires 2016. [Online]. In: *10th CEP Electronic Monitoring Conference*. Available at <http://cep-probation.org/wp-content/uploads/2016/04/CEP-EM-Analysisquestionnaire2016.pdf> [Accessed 11 October 2017].
- Beyens, K. and Roosen, M. (2013) Electronic monitoring in Belgium: a penological analysis of current and future orientations. *European Journal of Probation*, 5 (3), 56-70.
- Black, M. and Smith, R. (2003) *EM in the Criminal Justice System*. [Online]. Australian Institute of Criminology No. 254. Available from: <http://www.aic.gov.au/publications/current%20series/tandi/241-260/tandi254.html> [Accessed 07 July 2017].
- Bonta, J., Wallace-Capretta, S. and Rooney, J. (1999) Electronic monitoring in Canada. [Online]. *Ottawa, ON: Public Works and Government Services Canada*. Available from: <https://www.securitepublique.gc.ca/cnt/rsrscs/pblctns/lctrnc-mntrng-cnd/lctrnc-mntrng-cnd-eng.pdf>[Accessed 20 October 2017].
- Boone, M., Van der Kooij, M. and Rap, S. (2016) Electronic Monitoring in the Netherlands. [Online]. *EMEU Project Report, Utrecht: Utrecht University*. Available from: <http://emeu.leeds.ac.uk/reports/>. [Accessed 18 October 2017].
- Cohen, M.A. and Piquero, A.R. (2009) New evidence on the monetary value of saving a high-risk youth. *Journal of Quantitative Criminology*, 25, 25–49.
- Crowe A., Sydney L., Bancroft P. and Lawrence B. (2002) *Offender Supervision with Electronic Technology*. Kentucky: American Probation and Parole Association.
- DeLisi, M. and Gatling, J.M. (2003) Who pays for a life of crime? An empirical assessment of the assorted victimization costs posed by career criminals. *Criminal Justice Studies*, 16(4), 283–293.
- DeMichele, M. and Payne, B. (2009) *Offender Supervision with Electronic Technology: Community Corrections Resource*. 2nd ed., Bureau of Justice Assistance, US Department of Justice. Washington DC
- Di Tella, R. and Schargrodsky, E. (2009) *Criminal recidivism after prison and electronic monitoring*. [Online]. NBER Working Paper No. 15602. Available from: <http://www.nber.org/papers/w15602.pdf> [Accessed 12 October 2017].
- Di Tella, R. and Schargrodsky, E. (2013) Criminal Recidivism after Prison and Electronic Monitoring. *Journal of Political Economy*, 121(1), 28-73.

- Dodgson, K. et al. (2001) EM of Released Prisoners: an evaluation of the Home Detention Curfew Scheme. [Online]. *Home Office Research Study 222*. Available from: http://www.antoniocasella.eu/nume/Dodgson_electronic_2001.pdf [Accessed 07 December 2017].
- Dünkel, F., Thiele, C. and Treig, J. (2016) Electronic Monitoring in Germany. [Online]. *EMEU Project Report, Greifswald: University of Greifswald*. Available from: <http://emeu.leeds.ac.uk/reports/> [Accessed 19 October 2017].
- Erez, E., et al. (2012) GPS Monitoring Technologies and Domestic Violence: An Evaluation Study. [Online]. *NCJRS Report*, June 2012. Available from: <https://www.ncjrs.gov/pdffiles1/nij/grants/238910.pdf> [Accessed 07 December 2017].
- Finn, M.A. and Muirhead-Steves, S. (2002) The Effectiveness of Electronic Monitoring with Violent Male Parolees. *Justice Quarterly*, 19(2), 293-312
- Gable, R.S. (2015) The Ankle Bracelet Is History: An Informal Review of the Birth and Death of a Monitoring Technology. *Journal of Offender Monitoring*, 27 (1), 4-8.
- Gable, R. S. (2011). Tagging—‘an oddity of great potential’. *The Psychologist*, 24 (11), 866-867.
- Garland, D. (2002) *The Culture of Control. Crime and Social Order in Contemporary Society*. Oxford: Oxford University Press.
- Gainey, R. and Payne, B. (2000) Understanding the Experience of House Arrest with Electronic Monitoring: An Analysis of Quantitative and Qualitative Data, *International Journal of Offender Therapy and Comparative Criminology*, 44(1), 84-96.
- Gibbs, A. and King, D. (2003) Home Detention with EM: The New Zealand Experience. *Criminal Justice. Sage Journals*, 3(2), 199-211
- Henneguelle, A., Monnery, B. and Kensey, A. (2016) Better at Home than in Prison? The Effects of Electronic Monitoring on Recidivism in France. [Online]. *St-Étienne/Ecully: GATE Lyon St-Étienne*. Available from: <ftp://ftp.gate.cnrs.fr/RePEc/2016/1603.pdf> [Accessed 23 October 2017].
- Jones, M. and Ross, D.L. (1997) Electronic House Arrest and Boot Camp in North Carolina: Comparing Recidivism, *Criminal Justice Policy Review*, 8(4), 383-403.
- Hucklesby, A. et al. (2016) Creativity and Effectiveness in the Use of Electronic Monitoring: A Case Study of Five Jurisdictions EMEU Project Report. [Online]. *EMEU Project Report, Leeds: University of Leeds*. Available from: <http://emeu.leeds.ac.uk/reports/> [Accessed 18 October 2017].
- Hucklesby, A. and Holdsworth, E. (2016) Electronic monitoring in England and Wales. [Online]. *EMEU Project Report, Leeds: University of Leeds*. Available at: <http://emeu.leeds.ac.uk/reports/> [Accessed 22 October 2017].
- Jaskóła, A. and Szewczyk, P. (2017) Evolution of the electronic monitoring in Poland. *World Scientific News*, 85 (1), 4-12.
- Krištofik, P. et al. (2017) Classical and Alternative Methods of Punishment: Economic Comparison based on European Evidence. [Online]. In: *ICISSS & AICBMM Conference Proceedings*. Available from: https://www.researchgate.net/profile/Samuel_Korony/publication/322721390_CLASSICAL_AND_ALTERNATIVE_METHODS_OF_PUNISHMENT_ECONOMIC_COMPARISON_BASED_ON_EUROPEAN_EVIDENCE/links/5a6b2640aca2725b1c1c39e7/CLASSICAL-AND-ALTERNATIVE-METHODS-OF-PUNISHMENT-ECONOMIC-COMPARISON-BASED-ON-EUROPEAN-EVIDENCE.pdf [Accessed 14 October 2017].
- Lipner, S. L. (1993) *Performance Audit of the use of EM within the community Control Programme Administered by Department of Corrections*. FL: State of Florida Office of the Auditor General.

- Lockhart-Miramis, G., Pickles, C. and Crowhurst, E. (2015) Cutting Crime: The Role of Tagging in Offender Management. [Online]. London: Reform. Available from: http://www.reform.uk/wp-content/uploads/2015/09/Tagging-report_AW_WEB.pdf [Accessed 18 October].
- Mair, G. and Nee, C. (1990) *Electronic Monitoring. The Trials and their results*. HomeOffice Research Study No. 120, The Stationary Office, London.
- Mair, G. (2005) EM in England and Wales. Evidence based or not? *Criminal Justice*, 5(3), 257-277.
- Mair, G. and Mortimer, E. (1996) *Curfew Orders with EM*. London: Home Office.
- Marklund, F. and Holmberg, S. (2009) Effects of Early release from Prison using Electronic tagging in Sweden. *Journal of Experimental Criminology*, 5(1), 41-61.
- McDougall, C. et al. (2008) Benefit-cost analyses of sentencing. [Online]. *Campbell Systematic Reviews, Crime and Justice*, 4. Available from: <https://campbellcollaboration.org/library/systematic-review-benefit-cost-analyses-of-sentencing.html> [Accessed 15 October 2017].
- McKenzie, D.L. (2006) *What Works in Corrections: Reducing the Criminal Activities of Offenders and Delinquents*. Cambridge: Cambridge University Press.
- National Audit Office (2006) The EM of Offenders [Online]. Available from <https://www.nao.org.uk/report/the-electronic-monitoring-of-adult-offenders/> [Accessed 26 October 2017].
- Nellis, M., Beyens, K., and Kaminski, D. (2013) *Electronically Monitored Punishment: International and Critical Perspectives*. Oxon: Routledge
- Nellis, M. (2013) Survey of electronic monitoring (EM) in Europe: Analysis of questionnaires 2013 .[Online]. *Strasbourg: Council of Europe*. Available from: <https://rm.coe.int/16806f9833> [Accessed 20 October 2017].
- Nellis, M., Beyens, K. and Kaminski, D. (eds.) (2013) *Electronically Monitored Punishment. International and Critical Perspectives*. Oxon: Routledge.
- Paterson, C. (2007) Commercial Crime Control and the EM of Offenders in England and Wales. *Social Justice*, 34 (3-4), 98-110.
- Payne, K. B. and DeMichele, M. (2011) Sex offender policies: Considering unanticipated consequences of GPS sex offender monitoring. *Aggression and Violent Behavior*, 16(3), 177-187.
- Renzema, M. and Mayo-Wilson, E. (2005) Can EM Reduce Crime for moderate to high risk offenders? *Journal of Experimental Criminology*, 1(2), 215-237.
- Sachs, L. (1984) *Applied Statistics. A Handbook of Techniques*. New York: Springer-Verlag.
- Shute, S. (2007) *Satellite Tracking of Offenders: A study of the Pilots in England and Wales*. [Online]. Ministry of Justice Research Summary 4. <http://webarchive.nationalarchives.gov.uk/20100512164217/http://www.justice.gov.uk/publications/docs/satellite-tracking-of-offenders.pdf> [Accessed 13 October 2017].
- Sugg, D., Moore, L. and Howard, P. (2001) *Electronic Monitoring and Offending Behaviour - Reconviction Results for the Second Year of Trials of Curfew Orders*. GB: Home Office, Research, Development and Statistics Directorate.
- Whitfield, D. (1997) *Tackling the tag: the electronic monitoring of offenders*. Winchester: Waterside Press.
- Yeh, S. (2010) Cost-benefit analysis of reducing crime through electronic monitoring of parolees and probationers. *Journal of Criminal Justice*, 38(5), 1090-1096.