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Human versus technology: comparing the effect of private security patrol and crime prevention information system over the crime level and safety perception research in progress

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HUMAN VERSUS TECHNOLOGY:

COMPARING THE EFFECT OF PRIVATE SECURITY PATROL AND CRIME PREVENTION INFORMATION SYSTEM OVER THE CRIME LEVEL AND SAFETY PERCEPTION

Research in Progress

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Abstract

Crime reduction became one of the major issues of the modern society. In order to achieve public reassurance, police forces all over the world are undertaking actions to involve citizens in crime prevention through community policing. In parallel, technological platforms were deployed in order to share crime-related information with the public and to support the development of problem-solving strategies. However, the impact of these initiatives in terms of crime reduction and perception has not been sufficiently investigated yet. Furthermore, up to now, no previous studies compared the effectiveness between the traditional approach of preventive patrolling and technology-based crime prevention solutions. Therefore, we present a study design which aims at assessing the effectiveness of the two aforementioned crime prevention measures. The goal is to evaluate and compare their effects over the local criminal activity and citizen's safety perception measured by Fear of Crime (FOC) and Perceived Risk of Victimization (PRV) constructs. Preliminary results show a rather low level of FOC across the whole sample, paired by a high level of PRV. Furthermore, potential explanatory background factors for the previous constructs have been identified and will be explored in future work.

Keywords: Crime Prevention IS, Private Security Patrol, Fear of Crime Reduction, Safety Perception.

Introduction

Technology is taking over more and more aspects of our daily lives (Kurzweil, 2006). In this paper, we ask the following bold question: Can a technology based crime prevention solution offer comparable results to law enforcement patrols? Is a crime prevention information system (CPIS) effective in reducing the crime levels and increasing the public's safety perception?

High crime levels remain one of the major issues our society faces today, even in countries with a high standard of life (Bendler et al., 2014). For instance, in Switzerland, the Swiss Federal Statistical Office reported 526'066 criminal incidents in 2014, with 70% of these incidents being crimes against property. In more detail, 14% of the property crimes were cases of household burglary (Bundesamt für Statistik, 2014), making the country one of the top targets for burglars on the continent (Bradley, 2013). At a macro scale, also the European Union experienced an increase of 14% in property crimes between 2007 and 2012 (Eurostat, 2014).

Next to the hard financial effects of property crime on individuals and industries, there is also a set of social and psychological effects to be considered. The negative emotional reaction to crime, known as fear of crime (FOC), was found to result in a significant decrease in the quality of life (e.g. Doran and Burgess, 2012). Not only do individuals fear crime, but their subjective evaluation of the likelihood of being a future victim, commonly referred to as perceived risk of victimization (PRV), was shown to be significantly higher than the actual criminal exposure (e.g. Duffy et al., 2008; Kemshall, 1997). These two concepts have emerged as standards for measuring psychological effects of crime and for quantifying the effectiveness of crime prevention initiatives (Jackson, 2006; Kreis, 2012).

To achieve public reassurance, the police have initiated community policing initiatives to actively involve citizens in the crime prevention process (Kreis, 2012; Ratcliffe, 2002). An emphasis has been placed on face-to-face contacts with citizens in a context that is not primarily aiming at crime detection, but at reducing the FOC and PRV levels (Winkel, 1986). In addition, technological platforms were deployed in order to share crime-related information with the public, with the goal of facilitating the development of problem-solving strategies, which place a high value on engagement of the community and the private sector in the process of deriving new and more effective strategies for crime reduction (Buslik and Maltz, 1998). Still, most of these approaches were adopted because “somebody had a hunch that they might meet a pressing need” (Pate et al. 1986, p. 5). Thus, in order to fully understand the magnitude of the effect these approaches have over the crime level, as well as over the safety perception, measured through FOC and PRV, further academic research is needed.

In this work-in-progress paper we present an experiment performed to compare the two crime prevention approaches introduced above. Their effect on the property crime level and on the citizens’ FOC and PRV is compared and contrasted. At the time of writing, the experiment is still running, so this work concentrates on presenting the study design and a preliminary analysis of the collected data.

The remainder of this paper is structured as follows. Section 2 introduces the related body of work in crime reduction and public reassurance via preventive policing and technologies, respectively. Section 3 lists the research questions we intend to answer, while Section 4 explains the applied methodology with the three phases: design, experiment, and evaluation. We present preliminary results of the ongoing study in Section 5. Finally, we conclude and introduce the future steps in Section 6.

2 Related Work

The study presented in this paper aims at evaluating and comparing the effects of a preventive patrol and crime prevention technology over the crime level and safety perception. To justify our approach and derive the research questions, we build upon the previous work from psychology, sociology, victimology, policing, human-computer interaction (HCI), and IS. In the continuation we provide an overview of the related work and identify the research gap.

2.1 Crime Reduction via Preventive Patrolling

Preventive patrolling has been a primary task of the police for centuries, building upon the hypothesis that visible police presence prevents crime and increases safety perception of individuals (Kelling et al., 1974; Salmi et al., 2004). In particular, foot patrolling has been perceived as a “proactive, non-threatening, community-oriented approach to local policing” (Wakefield, 2007, p. 342). One of the first and most complex experiments ever conducted by police with a goal of addressing the question of police effectiveness was the Kansas City preventive patrol experiment (Braga et al., 2014; Zhao et al., 2002). For duration of one year, the effect of three levels of police activity was measured: “reactive”, “proactive,” and “control” vehicle patrols. The results of this study revealed no effect of vehicle patrols over the crime level and FOC (Kelling et al., 1974). This view was further supported by the Houston and Newark foot patrol experiment, showing again that various levels of police presence had no impact on crime levels (Pate et al., 1986). Realizing that mere presence of the police in a form of car or foot patrol does not lead to the desired outcome, other forms of police visibility were taken in consid-

eration. Examples of such activities include a police officer doing house-calls (Winkel, 1986), police crackdowns (Sherman, 1990), street activity in the form of moving citations (Wilson and Boland, 1978), or juvenile warning citations (Currey et al., 1983). A literature review conducted by Zhao et al. (2002) reveals that over time police practices have changed, moving from vehicle patrols to community policing and that these initiatives had positive effect over the safety perception by reducing FOC. Still, few cases reported an increase of FOC, which followed shortly after the introduction of the police intervention (Holmberg, 2002; Winkel, 1986).

With the shift towards community policing, foot patrol became the most popular and widely implemented practice (Rosenbaum and Lurigo, 1994) with a potential to improve the relations with the community and to address the FOC (Cordner, 1986; Winkel, 1986). Moreover, new theories were derived to explain the spatial and temporal context of criminal behavior. For example, the routine activity theory (Felson, 1987) and the crime pattern theory (Brantingham and Brantingham, 1984) both identified the place as a fundamental component of the requirements of a crime, leading to a new concept, i.e. crime hotspots. A crime hotspot can be defined as a “geographical area of higher than average crime [...] an area of crime concentration, relative to the distribution of crime across the whole region of interest” (Chainey and Ratcliffe, 2005). As such, crime hotspots became the focus of police activity (Ratcliffe et al., 2011), based on the hypothesis that crime problems can be addressed more efficiently by mainly targeting these deviant places (Braga and Weisburd, 2010; Eck, 2002). This hypothesis was supported by the meta-analysis conducted by Braga et al. (2014) which also revealed that problem-oriented policing interventions, such as the Kansas City Gun Project (Sherman and Rogan, 1995) are more effective compared to increased levels of traditional policing tactics.

With the growing crime levels, a need for additional models for self-protection, such as security guards or usage of security technology such as surveillance cameras, was identified (Noaks, 2000; Zimmerman, 2014). Empirical results of previous studies in the direction of new patrolling approaches suggest that the presence of private security guards is well perceived by the public (Noaks, 2000). Yet, the effect of different initiatives over crime levels was shown to vary across crime types (Zimmerman, 2014). Thus, further research in the direction of perception of new patrolling approaches and their effectiveness for reducing FOC and increasing safety are needed (Zimmerman, 2014).

2.2 Public Reassurance via Crime Prevention Technology

Apart from adjusting the traditional approach of preventive patrolling, community policing introduced new technological initiatives with a goal of increasing the transparency and improving the public’s perception of police efforts (Buslik and Maltz, 1998; Kreis, 2012; Ratcliffe, 2002). One approach in this direction is crime mapping, a practice which consists of sharing crime-related information with the citizens on a map, by showing the locations of previous incidents (Ratcliffe, 2004). While crime-mapping has already been a part of the internal police practices for revealing patterns in criminal activities, the proliferation of geographical information systems (GIS) and the development of mapping services, such as Google Maps (Google Maps, 2015), created an opportunity for digitalization of these maps, leading to emergence of many online and publicly accessible crime-tracking platforms (Weisburd and McEwen, 1998). Moreover, research in the direction of data aggregation and analysis provided a possibility for automatic identification of crime hotspots (Eck et al., 2005), and prediction of potential future incidents, a practice commonly known as predictive policing (Perry, 2013).

After the initial success of crime mapping platforms deployed by police departments, the technology based approach for crime prevention gained great popularity, leading to emergence of numerous commercial CPIS as well (Ratcliffe, 2002). Among others, CrimeReports (CrimeReports, 2015) and Crimemapping (Crimemapping, 2015) provide the possibility for individuals to obtain insights into the official criminal statistics. In addition, platforms were created which enable individuals to actively participate in the safety co-creation by sharing their personal crime-related experiences with other platform users or officials, with examples such as WikiCrimes (WikiCrimes, 2015) and CrimePush (CrimePush, 2015).

Apart from platforms based on the principles of crime mapping, recent development of sensor technologies introduced systems which perform automatic collection of risk information. Previous studies in this domain looked into the possibility for utilization of surveillance cameras for household protection (Brush et al., 2013). In addition, solutions for increasing personal safety have been studied, such as using wearable computers to decrease fear among elderly (Blythe et al., 2004) or to increase children's through parental surveillance (Czeskis et al., 2010). Similarly, the effectiveness of a hand-held device that automatically records and shares the location of an individual, as an approach towards increasing the safety of individuals in large cities at night, was investigated (Satchell and Foth, 2011). Finally, as a simpler and more accessible approach, researchers started investigating the possibility for utilization of smart phones for crime prevention. In particular, Blom et al. (2010) proposed a mobile application that would allow individuals to tag unsafe city areas on a virtual map, while Garbett et al. (2015) investigated the potential of cross-referencing safety information with user check-ins on Four-square, in order to derive personally contextualized risk information.

While previously listed solutions exploit different technological platforms, they all build upon the victimization theory, which assumes that providing crime related information to individuals is positive and socially beneficial since it increases feelings of safety and decreases risk of victimization (Lewis and Salem, 1981; Wallace, 2009). However, these premises have not been thoroughly investigated in academic studies and thus lack a theoretical confirmation (Chainey and Tompson, 2012). In addition, research in the direction of the effectiveness of technology based solutions in crime prevention is still very limited (Kounadi et al., 2014). Finally, to the best of our knowledge, no previous studies conducted a comparison of effectiveness between the traditional approach of preventive patrolling and utilization of technology-based platforms for crime prevention.

3 Research Questions

To address the above identified research gaps, the current study aims to measure and compare the effect of preventive patrolling and CPIS over the crime level and citizen's safety perception, measured by FOC and PRV, defined in the Introduction section. As outlined in the previous sections, the effect of different types of preventive patrol over the crime level and safety perception is not yet fully understood. In particular, the effect of private security patrol has hardly been studied. Likewise, there is a lack of studies addressing the effect of CPIS over the crime perception and prevention, leading to a large research gap in the direction of potential implications of CPIS. Furthermore, to the best of our knowledge, no studies have compared the effectiveness of the preventive patrol with the technology-based prevention. Building upon these research gaps, this study aims to answer the following questions:

- RQ1.** What is the effect of private security patrol over (a) crime level, (b) FOC and (c) PRV?
- RQ2.** What is the effect of crime prevention technology over (a) crime level, (b) FOC, and (c) PRV?
- RQ3.** Which background factors (socio-demographics, housing conditions, neighborhood integration, and crime level) influence the results of RQ1 (b and c) and RQ2 (b and c)?

Finally, in order to compare the effectiveness of the two proposed prevention measures, the following question, which combines the results obtained regarding the RQ1 and RQ2, is stated:

- RQ4.** Is human presence more effective in crime and fear reduction compared to technology?

In the continuation we provide details regarding the study methodology.

4 Methodology

As depicted in Figure 1, the study is divided into three phases: (1) design phase, (2) experimental phase, and (3) evaluation phase. Building upon the justificatory knowledge from the relevant research fields outlined in the previous section, during the design phase the CPIS and the preventive patrolling, as well as the survey planned for evaluation of the safety perception, were conceptualized. Further-

more, the field study location and timing were determined, based on historical crime data. In the experimental phase, the actual field study has been carried out by implementing the CPIS and preventive patrolling at two different sites in Uster, the third largest city in the Swiss Canton of Zurich. These two sites are denoted as *CPIS* and *Patrol* in Figure 1. An additional site, denoted as *Control*, serves as comparison and thus does not comprise any preventive treatments. During this phase, two surveys are distributed, before and after the treatments, in order to capture the effect of the deployed preventive treatments. Finally, in the evaluation phase, the safety perception of citizens will be evaluated based on the self-reported FOC and PRV obtained via the surveys, whereas the property crime rate will be determined by analyzing the crime data provided by the local police. It should be noted that the focus of the study lies on property crimes, as the most common crime category in Switzerland (Bundesamt für Statistik, 2014) and among the most frequently reported crime categories worldwide (Erete, 2013). Moreover, domestic burglary was shown to be a crime category which causes the highest level of fear because it makes people feel vulnerable in their homes, where they ought to feel most safe (Hough, 1995; Skogan and Maxfield, 1981), and therefore it has considerable psychological impact over an extended period of time (Beaton et al., 2000). In addition to domestic burglary, personal theft, bike and car theft were also investigated. In the continuation, each phase is explained in greater details.

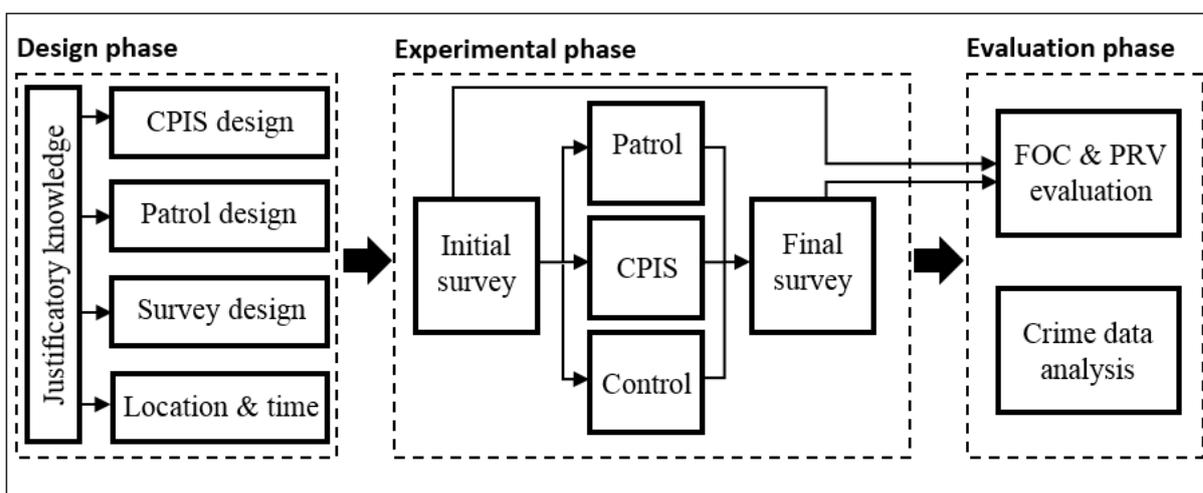


Figure 1. The overall study methodology with three phases: design, experiment and evaluation.

4.1 Design Phase

CPIS design. The crime prevention technology has been designed and implemented based on the results of our previous study on crime prevention IS (Pletikosa Cvijikj et al., 2015). It is implemented as a mobile application, which builds upon the principles of crime mapping and digital neighborhood watch. As such, this CPIS supports the following features: (1) information provision about the crime level from an official source, (2) community involvement, i.e. sharing of personal experiences and the possibility for communication and discussion among the users, (3) provision of preventive tips, and (4) targeted notifications, i.e. real-time and proximity based notifications in times of increased risk. For more details regarding the selection of design principles please refer to Pletikosa Cvijikj et al. (2015).

Patrol design. Foot patrols were shown to be most effective in increasing the safety perception, irrespective whether the patrol is conducted by the police or by private security guards (Doyle et al., 2015). After the coordination with the local police and experts from a security company, we have chosen to conduct the patrol by a private security company. Moreover, the patrol has been carried out by a single person using a Segway (i.e. a two-wheeled, self-balancing and battery-powered vehicle) in order to achieve better visibility, while covering a relatively large area, thus combining the best features

of foot and vehicle patrol. The patrol takes place each day between 3pm and 8pm, a decision based on historical data, as explained in the next section.

Field study location and timing. The census data over the past five years from the Swiss Federal Office for Statistics indicates an elevated burglary activity during the shorter days of the winter months (Bundesamt für Statistik, 2014). We therefore decided to conduct the study starting on October 1st, and for a duration of 10 weeks. Furthermore, the selection of experiment sites was conducted in two steps. First, the communes with highest level of crime were chosen based on the census data. Second, crime hotspots within these communes were identified, based on the dataset obtained from a large insurance company, consisted of claims over the period of the past five year. Finally, after extensive discussions with the local police and experts from the private security company to avoid any overlap with existing crime prevention initiatives, two large sites within a single Swiss city were chosen, in order to achieve comparable results in terms of demographic distribution and crime level. In addition, a comparable site was selected for the control group. Participants in all sites were recruited by contacting each household of the selected sites by letter, as described further below.

Survey design. The survey has been designed to assess the potential change in the safety perception, by measuring the established constructs of FOC and PRV before and after the treatments. Operationalization of the FOC was based on the following three questions (Ferraro and LaGrange, 1987): “How safe do you feel walking alone in your area after dark?” (FOC1), “A relative or close friend of yours walks alone in your area after dark. How safe do you think this is?” (FOC2) and “How safe do you feel when you are home alone after dark?” (FOC3), each measured on a four-point Likert scale (from 1-“very safe” to 4-“very unsafe”). The PRV was measured for different types of victimization, over a binary answer scale (“yes” or “no”) as follows: “Do you think it is probable that over the next 12 months you will be a victim of the following offences? If “yes”, which of the following type of victimization: (a) Personal theft, (b) bike theft, (c) car theft, (d) burglary, and (e) other.” (Killias et al., 2011; LaGrange et al., 1992). Finally, to evaluate the potential effect of prior victimization (PV) over FOC and PRV, the following question has been integrated in the survey: “Over the past 5 years, have you been a victim of the following offenses?” (a) Personal theft, (b) bike theft, (c) car theft, (d) burglary, and (e) other.” (PV). All questions and response scales were chosen in line with the International Crime Victims Survey, allowing us to compare our study outcomes on a national respective international level and to draw conclusions about the generalization of our study outcome (ICVS, 2015). Apart from the safety perception, the pre-study survey contained questions regarding socio-demographic data, i.e. age, gender, residential situation and neighborhood integration.

4.2 Experimental phase

During the experimental phase, a quasi-experimental field study was conducted, indicating a non-randomized assignment of the treatment and control groups. Therefore, the participants were divided in three major groups: (1) the patrol group, which includes the participants exposed to the previously described patrol, (2) the technology group, referring to participants being provided with the proposed CPIS, and (3) the control group without any treatments. All participants have been contacted using a standard letter, briefly describing the aim of the experiment in their area. In addition, they were asked to complete a survey, as described above. Additionally, the participants addressed in the technology group, have been asked to download and use the mobile app. At the end of the study, all participants will be contacted again to fill in the post-study survey.

4.3 Evaluation Phase

The evaluation phase will be conducted in three steps as described in the continuation. In the first step, the responses from the initial survey will be evaluated to understand the situation regarding the citizen’s safety perception before the experiment and to assess whether the three participant groups are comparable. Therefore as a first step, the data quality of the initial survey will be assessed. Due to a

self-selection bias, the resulting sample may not be representative of the Swiss population. Citizens with certain demographic characteristics could rather be drawn to respond to the survey than other citizens. Hence as soon as the complete sample is available, the sample will be weighted according to the demographic representation of the Swiss population.

In the second step, the results of the final survey will be analyzed and compared to those of the initial survey. In particular, to answer RQ1 and RQ2, we plan to measure the effect of the treatments as follows. First, we will estimate whether the effect of the treatments is significant by comparing the crime level before and after the treatments, using a two-tailed separate variance t-test for means. Further, to evaluate if the effect over the crime level is sustainable, a pretest and a posttest period of two months will be taken in consideration. Second, we will use a non-parametric matched group test for ordinal data to analyze the effect of the treatments on FOC, i.e. Wilcoxon signed rank test (Field, 2013, p. 886), and a non-parametric matched group test for nominal data to analyze the effect of the treatments on PRV, i.e. McNemar test (Field, 2013, p. 879). Finally, in order to answer RQ3, we will examine the background factors, which influence the effect over FOC and PRV, by applying a two-tailed speared variance t-test for means. Finally, RQ4 will be addressed, by comparing the results of RQ1 and RQ2. For that purpose, following an evaluation of how comparable the two groups are, we will conduct a more profound analysis over the treatment effects over each group.

5 Preliminary Results

At the time of writing, the field study is still ongoing. Therefore, we hereby present the descriptive and bivariate analysis of the initial survey for the patrol and the technology group as first results.

Descriptive analysis. A total of 563 participants completed the survey, with 511 belonging to the patrol group and 52 to the technology group. Among those, 48.1% are women and 51.9% men between the ages of 15 to 91 (with 54.2% being over 50). The majority of the participants are of Swiss nationality (89.9%), living in an apartment (74.1%), with their family with children (37.7%), or without children (33.9%). In addition, the majority of respondents did not report any PV (66.3%).

The first results about the level of FOC and PRV before the treatments indicate that respondents overall feel very safe. The majority of respondents feel “very safe” or “fairly safe” over the three different questions related to FOC. In particular, the majority of the respondents feel “very safe” (41.6%) and “fairly safe” (44.5%) for themselves, outside of their home (FOC1). Similarly, 33.6% feel “very safe” and 52.1% feel “fairly safe” for others when being outside (FOC2). Finally, the respondents feel the safest when they are alone at home, i.e. 60.7% feel “very safe” and 34.1% feel “fairly safe” (FOC3). Figure 2 provides an illustration of these results. In contrast, the percentage of respondents reporting PRV by at least one of the listed crime types during the next 12 months is 44.2% (PRV), thus indicating a high discrepancy between FOC and the overall PRV (i.e. PRV aggregated over all crime types). The composition of the overall PRV is depicted in Figure 2 with PRV for personal theft and bike theft representing the largest categories.

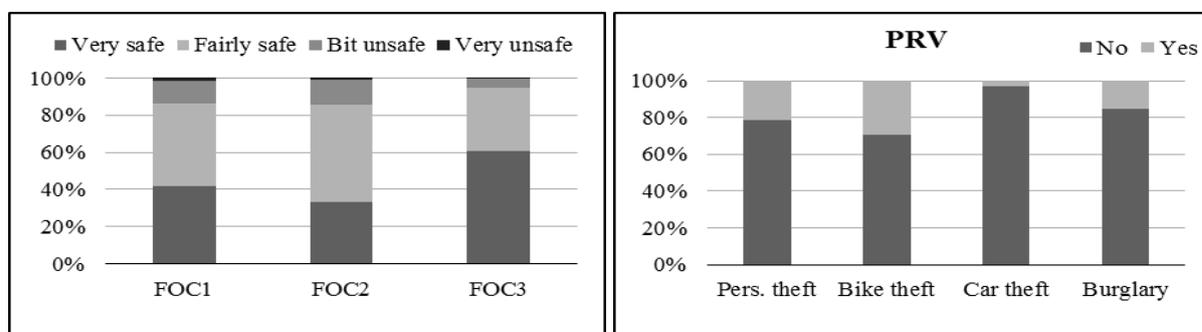


Figure 2: Distribution of FOC (left) and of PRV (right) across different crime types.

Bivariate analysis. In order to answer RQ3, we analyzed the factors which influence FOC and PRV. Non-parametric correlation tests, i.e. Spearman's rho (Field, 2013, p. 271), have shown that the overall FOC and PRV can be linked to the participant's background factors. FOC1 correlates significantly with participants living in a single-family house ($r=0.120$, $n=557$, $p=0.005$). In the same way, FOC2 significantly correlates with neighborhood integration, i.e. participants who interact on a regular basis with their neighbors report lower FOC2 ($r=0.093$, $n=555$, $p=0.029$). Furthermore, in contrast to FOC1, FOC2 ($r=0.094$, $n=557$, $p=0.027$) and FOC3 ($r=0.101$, $n=557$, $p=0.017$) significantly correlate with the overall PV. Similarly, the overall PRV correlates with the participants living in a single-family house ($r=0.084$, $n=556$, $p=0.047$) and with the overall PV ($r=0.359$, $n=556$, $p<0.001$). In more detail, PRV for personal theft ($r=0.222$, $n=559$, $p<0.001$), bike theft ($r=0.350$, $n=560$, $p<0.001$) and burglary ($r=0.129$, $n=557$, $p=0.002$) significantly correlate with the overall PV. Moreover, each type of PRV except for car theft strongly correlates with the same type of PV: personal theft ($r=0.421$, $n=559$, $p<0.001$), bike theft ($r=0.375$, $n=560$, $p<0.001$) and burglary ($r=0.223$, $n=557$, $p<0.001$). Additionally, only PRV for burglary correlates significantly with the following background variables, namely living in a single-family house ($r=0.128$, $n=557$, $p=0.002$), owning the property ($r=0.129$, $n=557$, $p=0.002$) and living in the same location for more than five years ($r=0.097$, $n=557$, $p=0.021$).

6 Summary and Future Work

In this paper we present a design and the preliminary results of a study which aims at assessing the effectiveness of two common crime prevention measures undertaken as a part of community policing, preventive patrolling and CPIS. Our goal is to evaluate and compare their effects over the crime level and citizen's safety perception, measured via FOC and PRV. The field experiment conducted as a part of this study is still ongoing at the time of writing, thus we descriptively present the FOC and PRV level of the treatment groups recorded during the pretest period. Our results show that the FOC level of the samples is very low, meaning that the majority of the respondents feel safe. However, a substantial part of the respondents reports PRV by at least one of the listed items during the next 12 months, indicating a high discrepancy between FOC and PRV.

In the next step, the factors influencing FOC and PRV will be evaluated on a multivariate level by applying Multivariate Nominal Scale Analysis (MNA), a method suitable for assessment of the controlled effects of a set of nominal or ordinal explanatory variables on a categorical dependent variable (Andrews and Messenger, 1973). After the field study is completed, the participants will be contacted and asked to fill out the final survey to assess the effect of the undertaken prevention measures and to fully answer the stated research questions. Furthermore, future work aims at enhancement of the investigated crime prevention IS and optimization of the design of private security patrols, with a goal of improving the crime perception and achieving crime reduction, thus contributing to the fields of IS and policing, but also to criminology by providing empirical insights into the traditional victimization theories.

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