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Spatial Behaviour, Modus Operandi and Memory Recall

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Child Molesters and Children as Witnesses: Spatial Behaviour, Modus Operandi and Memory Recall

Jessica Ebberline

Institutionen för psykologi, 2008

LUND UNIVERSITY

AKADEMISK AVHANDLING

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Abstract
Offenders who target children are a negative phenomenon in our society. These offenders are often seen as the worst of the worst of criminals and are therefore a priority for investigators trying to solve these crimes as fast as possible. The purpose of this dissertation is to see if there is a common denominator among these offenders in their modus operandi (MO) and their spatial patterns. If similar patterns emerge amongst these offenders, that would be of investigative importance for those who work with crimes against children.

In Study I, a group of child molesters and their MO were studied in order to see how they found their victims and where they committed their crimes. The results were consistent with previous studies on child molesters in that they all committed their crimes at home or close to their home. In Study II, a geographical profiling tool was tested in order to see if such a program could be used to find an offender who made obscene phone calls (OPC) to children. The results showed that the geographical software based on spatial behaviour, was able to narrow down the search area in which the offender actually lived when he committed his crimes. In Study III, the focus is on the potential witnesses/victims and how much a child could remember correctly of a staged event simulating a potential child molester on the prowl for new victims. The results showed that the children event memory were comparable with an adult control group.

The combined results could be summarized as follows: offenders who target children usually commit their crimes at home or close to home (or base), they tend to lure children to go with them by using bribes or the recruitment of former victims. Girls seem to be the preferred sex over boys. Children could be used as accurate witnesses in these types of crimes.

Key words
Modus operandi, spatial behaviour, geographical profiling, child molesters, Dragnet, child witnesses, accuracy, confidence.

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Child Molesters and Children as Witnesses:

Spatial Behaviour, Modus Operandi and Memory Recall

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Department of Psychology, 2008

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Dedicated to Sylvia, always in my heart.

In memory of Maud Andersson,
for seeing things I couldn't.

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List of Papers

The present doctorial thesis is based on the following studies and will hereafter be referred to by their Roman numerals.
(*Note*: Holmgren was the author's maiden name)

I. Ebberline, J., & Holmberg, U. (2008). *Modus operandi and spatial behaviour of a random sample of non familial child molesters in Sweden.* Manuscript submitted for publication.

II. Ebberline, J. (in press). Geographical profiling obscene phone calls—A case study. *Journal of Investigative Psychology and Offender Profiling.*

III. Holmgren, J., Allwood, C M., & Innes-Ker, Å. (2006). Accuracy and the realism in confidence in children's and adults' event recall in response to free recall and focussed questions. In K. Nixon (Ed.), *Forensic recall and Eyewitness testimony* (pp. 27–37). London: IA-IP Publishing.

Introduction

It seems like crimes are as old as man. People have committed crimes in all societies, countries and times, and there are as many crimes as there are criminals. A field within the discipline of psychology, called *forensic psychology*, has its focus on studying the minds of criminals, attempting to answer questions like why, how, what, where and when. Many people see crimes against children as the worst of all crimes, and when children's innocence is violated we all want to catch the person responsible for the heinous act as quickly as possible. This is why research on sexual offenders who target children is so important. If we are to catch these offenders quickly, we need to understand how they operate and where they tend to commit their crimes. In this context, it is also important to know whether a child could be a reliable witness, if the child has seen or experienced such crimes.

The purpose of the present thesis is to try to elucidate the *how* (the modus operandi), the *where* (the crime site) and the *what* (the offence) of offenders who target children, as well as to test children's reliability as witnesses. The thesis begins with an introduction to the field of profiling, followed by geographical profiling theories and strategies, and a section on sexual offenders. Finally children's performances as witnesses will be examined.

Offender Profiling

"Dear Boss,
I keep on hearing the police have caught me but they wont fix me just yet. I have laughed when they look so clever and talk about being on the right track."
(Jack the Ripper, *Dear Boss letter*, 27/9 1888, the Central News Agency, London).

This is an excerpt from one of the letters claimed to have been written by Jack the Ripper. It has been said that one of the first known offender profiles (based on crime scene behaviour) was made on the murders in Whitechapel, by a Dr. Thomas Bond, who wrote a letter to the London CID Chief Robert Anderson in November 1888. In this letter, Dr. Bond gives a profile of what kind of a man the murderer was thought to be as regards his personality (Canter, 2000a).

Offender profiling has been heavily debated in modern times, especially the question of whether it is an art or a science. Profiling is also called offender profiling, criminal profiling, criminal personality profiling or psychological profiling (Ressler, Burgess & Douglas, 1988). The basic idea behind profiling is

that one can draw conclusions about a criminal's personality characteristics by looking at a crime scene (more specifically the *modus operandi*, which is the specific way a crime has been committed), and based on this information, narrow down the number of suspects (e.g., Alison, Bennell, Mokros & Ormerod, 2002; Canter, 2000a, b; Pinizzotto & Finkel, 1990; Ressler et al., 1988; Rossmo, 2000; Turvey, 1999).

Most approaches to offender profiling lack references to psychological theories and principles (Alison & Canter, 1999a). If a psychological perspective is used in offender profiling, it is usually based on a trait perspective (e.g., Alison et al., 2002; Canter, 2000b). Traits cannot be observed, but rather inferred from behaviour (Mischel, 1999). In offender profiling, traits are inferred from crime scene actions (Alison et al., 2002).

Alison et al. (2002, p. 116) used five arguments to highlight why inferences of personality characteristics from crime scene actions constitutes poor methodology, which is unlikely to be valid and reliable. First, they argued that most current profiling methods are based on a naïve and outdated understanding of personality. Second, global traits or broad personality types are not likely to be good predictors of criminal behaviour. Third, it is unlikely that the classification of offenders into broad personality types will enable the profiler to relate clusters of sociodemographic characteristics to different personality types. Fourth, a theoretical framework emphasizing the importance of Person X Situation interactions in generating behaviour (Endler & Magnusson, 1976) may lead to a more productive research endeavour. Fifth, Alison et al. argue that profiling should be used with caution in investigations and that it should not be allowed as evidence in court, not until research has shown its predictive validity.

The traditional trait perspective has been criticized for the lack of empirical support of the existence of behavioural consistency among individuals with the assumed traits. Critics have argued that offender profiling in which global traits are derived from specific actions may not be possible, because there is not enough evidence to support the traditional trait perspective. Profilers also infer characteristics that are not appropriate as regards the psychological definition of traits. Some examples of this are the offender's age, gender, ethnicity, marital status, sexual maturity, etc. These are inappropriate because they are too general to draw specific conclusions from (e.g., Alison et al., 2002; Canter 2000a; Grubin, 1995).

According to some researchers (e.g., Alison et al., 2002; Canter, 2000b), the term *profiling* has been misused by the media, which have presented an inaccurate idea of what profiling really is. The media's attention to violent crimes has created the false impression that there is a unique area of expertise called psychological profiling or offender profiling – an area separate from the main currents of psychological thinking and research (Santtila, Häkkänen, Canter & Elfgren, 2003); this, of course, is not true. Offender profiling is an investigative tool and should be used in combination with all other aspects of an investigation, such as forensic evidence, etc. (e.g., Canter 2000a, b; Ressler et al., 1988). One should take all important aspects into account before making inferences about a person's general characteristics, otherwise they could be misleading (e.g., Alison et al., 2002; Canter, 2000b). Inferring characteristics from crime scene actions is in most cases based on the opinions and beliefs of one individual, and thus a profile is at best a subjective opinion (even if it was based on experience) or common sense, and at worst deliberate deception (Alison & Canter, 1999a; Rossmo, 2000). Alison and Canter (1999a) suggested the likeness to psychics and astrologers, who also provide information based on instincts and intuition rather than systematic observations and research. They summed up their opinion by saying "we have to ask whether we would prefer a poet or a scientist to represent us in court" (p. 9).

Offender Profiling as an Investigative Tool

An offender profile, in its original sense, is a very one-sided tool and it is difficult to find any conclusive data on the reliability of such profiles. As Kocsis (2003) wrote, "the accuracy of a profile could be in the eye of the beholder", by which he suggests that it is very subjective work and can easily reflect one person's opinions and beliefs instead of a more objective view. Alison, Smith and Morgan (2003) conducted a study to test the accuracy of profiles. Their results showed that 50–75 % of the participants (police officers) thought a profile was correct when it was not, and without having any true knowledge about whether it was correct or not. Studies like Alison et al. show that it is easy to believe that something is true, when it could just as well be false. Just because it is called a profile and was made by a psychologist for example, does not necessarily mean that it is in any way correct.

One of the problems with classic offender profiling (i.e., making inferences based on experience and opinions) is the risk for biases that are associated with decision-making. As an example of such a bias, one can mention the 'hindsight'

bias (Fischhoff, 1975), which refers to when a person underestimates how much they have learned and then claims to have known the outcome of a situation all along (Alison & Canter, 1999b). According to Alison and Canter (1999b), explorations of the accuracy of probability judgements have shown that there is a tendency to overestimate one's judgements (Fischhoff, Slovic & Lichtenstein, 1977), which would suggest that a profiler is likely to be overconfident in his/her predictions. These biases, which are based on inappropriate heuristics in decision-making, could possibly be prevented by employing statistical procedures that many researchers have attempted to apply (e.g., Alison & Canter, 1999b; Canter & Gregory, 1994; Rossmo, 2000; Santtila, Häkkänen, Canter & Elfgren, 2003; Santtila, Canter, Elfgren & Häkkänen, 2001).

It should be noted that some researchers regard classic offender profiles as a valuable investigative tool, which has been proven to be useful in several investigations (e.g., Ressler et al., 1988).

Offender profiling has been criticized for lacking a proper theoretical basis, and there is thus a need for validity and reliability (Rossmo, 2000). This controversy about classic offender profiling and whether or not it is a useful and accurate tool, has generated a new field, which has evolved more and more during the past decade with the intention to be more accurate and easier to use for investigators. This new field has developed out of environmental criminology (Brantigham & Brantigham, 1991), as well as environmental psychology and social psychology, and is called *geographical profiling* (Canter, 2000a, 2003; Godwin, 2001; Rossmo, 2000).

Geographical Offender Profiling

Geographical offender profiling is based on studies of criminal spatial behaviour which can be traced back over the past 150 years (Canter & Youngs, 2008a). As an example of this, it is worth mentioning Guerry (1833, cited in Canter & Youngs, 2008a), who found that criminals lived in distinct areas and did not travel far from these areas to commit crimes, a phenomenon that has been discovered and rediscovered over the years. This phenomenon has been known as the *distance decay* pattern and suggests that the risk of crime decreases with distance away from the offender's base (e.g., Canter, 2000a, b; Laukkanen & Santtila, 2006; Santtila, Laukkanen & Zappalà, 2007).

Studies of non-criminals have supported the notion that there are similarities in their behavioural patterns. Examples of such studies are on street traders

(Bromley, 1980) and on a cholera outbreak in London in 1855 (Snow, 2008). In the latter case, it was found that cholera was water borne and that the decease seemed to spread out from different wells. The implication here is that the spatial behaviours of criminals are not unique to them, but are similar to non-criminal activities in humans (Canter & Youngs, 2008a).

The discovery that criminals do not travel far to commit crimes was later applied to individuals and not just seen as a group phenomenon. Thus, this makes broad criminological assumptions about spatial behaviour applicable to individual criminals as well, which shifts criminology over to psychology.

Criminal Spatial Behaviour and Cognitive Maps

When a crime has been committed, there is always an interaction between time and space, which makes psychology and geography a logical combination in all forensic research. Behavioural and geographical aspects of crimes are considered to be of great value to the progress of criminal investigations, as well as to the development of new models of the offending process (Beauregard, Proulx, Rossmo, Leclerc & Allaire, 2007).

There are two theoretical models that are the most commonly cited in the current research on spatial behaviour. The first theory is the *rational choice approach*, which stresses the adaptive nature of human behaviour, such as in interactions and transactions between people (Beauregard & Leclerc, 2007; Beauregard, Proulx & Rossmo, 2005; Clarke & Cornish, 1985). This theory suggests that there is a decision to be made at every step of the crime process. Furthermore, this theory assumes that criminals commit crimes because crime has proven to be the easiest way of obtaining desired rewards, such as excitement, money or sexual gratification (Beauregard et al., 2007). Beauregard et al. (2005) used date-rape as an example, where the decision to commit a rape only arises in the heat of the moment when the victim refuses to go along with the demands to engage in sexual contact. A criminal makes a decision as to whether he/she should commit a crime or not, by weighing the pros and cons (effort, cost and reward) involved in the criminal action *per se* (Beauregard et al., 2007; Canter & Youngs, 2008a). The rational choice approach emphasizes situational factors that could influence an offender's choices and behaviour (Leclerc, Beauregard & Proulx, 2008).

The second model is *routine activity theory* which has its emphasis on the daily activities of offenders and potential victims (Beauregard et al., 2005; Cohen & Felson, 1979; Rossmo, 2000). These activities include identifying where to find a

suitable victim and where a 'good' crime site would be (e.g., if it is easy to get away without detection). Brantigham and Brantigham (1993a) argued that most offenders choose to commit their crimes near their usual major pathways, such as to and from work, but they will explore the vicinity around those paths as well. Thus, exploration seems to be somewhat limited to places that are known or easy to access. Although it may seem hard to believe, offenders do tend to spend most of their time conducting non-criminal activities. A criminal is most likely to know a city or an area on the basis of non-criminal routine activities, and in most cases they seem to stay in these areas even when they commit crimes (Brantigham & Brantigham, 1991, 1993a). Brantigham and Brantigham (1993a) argued that there seems to be no difference between criminals' and non-criminals' ways of learning pathways or between how they create mental maps (see below) of our surroundings.

The main differences between routine activity theory and rational choice theory are that routine activity deals with the ecological context to a greater extent than does rational choice theory. Basically, this means that a certain ecological context gives rise to more options from which choices can be made (e.g., the focus is on the surroundings such as where a 'good' crime site would be). Rational choice theory, however, focuses more on the content of the decisions *per se* (Beauregard et al., 2005; Felson, 1986, 1998).

It is important to note that these theories can be viewed separately or in combination, that is, one can study an offender's routine activity from a rational choice perspective (e.g., Beauregard, Rossmo & Proulx, 2007). Canter and Youngs (2008a) suggested that our understanding of criminal spatial behaviour can only benefit from a combination of these two views.

There are two important aspects of criminal spatial behaviour that enable geographical profiling (Kind, 2008). The first is the short average distance that offenders travel, and the second is the possibility that most offenders have some kind of base within an area that is circumscribed by the crimes they have committed. Such findings on criminal spatial behaviour have indicated that perceptual processes and environmental psychology are involved in this type of behaviour. This, in turn, led to research on criminal range (i.e., the distances a criminal travels in order to commit crimes) and the notion that this range could be determined using rather simple geometrical calculations in order to find the offender's base (Canter & Youngs, 2008a).

In Study I in the present thesis, the phenomenon of criminal spatial behaviour is analysed. A sample of Swedish child molesters were studied to see if they lived (or had their base) close to their victims' homes, as well as to determine what kind of modus operandi (MO) they used to lure their victims to them.

The general findings (such as criminal range) indicate that criminals might have underlying schemata they use to make sense of their environment (Bartlett, 1932; Canter & Youngs, 2008a; Santtila, Korpela & Häkkänen, 2004). Mental representations like these are often referred to as cognitive or mental maps, although the word itself, 'map', has been debated, because it makes reference to actual geographical maps (Canter, 2003; Kitchin, 1994). Basically, a cognitive map can be called a construct that is used to help understand and know our environment (Kitchin, 1994). Cognitive maps can be said to be a result of the 'reception, coding, storage, recall, decoding and interpretation of information' (Rossmo, 2000, p. 89). Furthermore, cognitive maps contain information about spatial relations and environmental data that exist within a space-time context, and such maps allow the person to manoeuvre in the environment and to employ environmental and geographical data (Kitchin, 1994).

Cognitive maps are believed to exist because people store information about the environment, which is then used to make spatial decisions. These decisions, in turn, guide their behaviour and could be said to be responsible for geographical 'survival' knowledge (Kitchin, 1994). One could claim that a cognitive map is involved in answering four vital questions: (1) whether to go somewhere, (2) why to go there, (3) where the destination is, and (4) how to get there (Kitchin, 1994).

Cognitive maps are dynamic and change over time as we evolve and learn more about our environment (Brantigham & Brantigham, 1991; Canter & Youngs, 2008a; Kitchin, 1994). According to Brantigham and Brantigham (1993a, b), cognitive maps consist of subjective images of the environment, which in turn are crucial for the criminal in determining the places where the crime could be carried out. These spatial perspectives have important functions with respect to geographical behaviour linked to crimes, such as directing attention to where the offender lives and where the crime scene is, and perhaps most importantly the relation between these places (Canter, 2003; Godwin, 2001). Research has shown that the properties of cognitive maps change depending on the characteristics of an individual (Brantigham & Brantigham, 1993a, b) and that cognitive maps are influenced by the relationship between offender characteristics and criminal

mobility (i.e., how the offender moves in his/her surroundings) (Beauregard et al., 2005).

The practical implications of geographical profiling have been more explored than its theoretical basis. There are implicit assumptions about how we create cognitive maps of our environment. There are two rather different fundamental models that are based on the debate within psychology over how cognitive processing of our surroundings works. The first model was proposed by Hull (1943, cited in Canter & Youngs, 2008a, p. 13), who argued that learning is based on the construction of a series of habits derived directly from experience. The second model, proposed by Tolman (1948, cited in Canter & Youngs, 2008a), "argued for the development of internal representations ('mental maps') that allowed the individual to make choices that go beyond his/her immediate experience" (p.13). Canter and Youngs simplified the two models by saying one is 'habit' learning and the other is 'map' learning, regarding how people learn about their environment. They also pointed out that Hull's model has its similarities with routine activity theory, which states that criminals travel along familiar paths and see opportunities for criminal activity along these paths. The focus here is more on the journey to the crime. The Tolman model adds to the more complex strategies of spatial behaviour, e.g., by indicating that the offender makes choices/decisions based on his/her cognitive map of the crime opportunities. This model focuses more on overall knowledge of an area.

The routine activity theory can be 'taken one step further', if one assumes that an offender moving about in an area or along a path builds up mental images of the areas, not just learning a pathway with criminal opportunities along it. In other words, rather than just knowing a linked set of road networks, the assumption is that the offender has some notion of an area of activity, more in line with the Tolman model of choices (Canter & Youngs, 2008a).

Canter and Youngs argue that one can assume that offenders do have some influence over decisions about where to commit the crime, and the implication is also that the crime location is not chosen totally at random.

Basic Assumptions behind Geographical Profiling

There are a number of fundamental assumptions underlying criminal spatial behaviour that are important to know about before making inferences about where to look for an offender. The first assumption is *locatedness*, which assumes that all crimes have a distinct location (Canter & Youngs, 2008a). This may seem

basic in most crimes, but it should also be considered in crimes with no physical location such as Internet crimes or obscene telephone calls. Crimes with no physical location could be said to exist in a cognitive (or 'virtual') space that offenders move about in (Canter, 2003).

The second assumption is *systematic crime location choice*, which suggests that the locations chosen for a crime are not random. It is reasonable to assume that the behavioural patterns are not just a function of opportunities for crime that have arisen (Canter & Youngs, 2008a). Canter and Youngs argued that there are some internal aspects that influence an offender's choices regarding where to commit the crimes. Thus, there seems to be some decision-making occurring within the offender with regard to selection of the crime site (Canter & Shalev, 2008; Cornish & Clarke, 1986). Cognitive processes, such as decision-making, are likely to be biased and to use heuristics that affect cognitive representations of our environment, which probably influence 'what we do where'. One fundamental assumption is that criminals are aware of all the potential risks involved in the offences they commit, such as risk of detection, and that their actions involve strategies to control such risks (Canter & Shalev, 2008).

Routine activity theory, for example, suggests that the criminal's cognitive maps over his/her crime locations are connected to the areas in which he/she performs non-criminal activities (Canter & Hodge, 2008). This suggests that the criminal has a passive role in relation to his/her environment, in the sense that the criminal can become aware of criminal opportunities by walking about doing non-criminal activities (Canter & Youngs, 2008a). There are two interacting psychological processes that may influence an individual's internal model of the environment. The first is the process of encoding information, which could lead to different variations of distortions in the mental representations (e.g., biases and heuristics). The second is how an individual makes use of his/her surroundings (Canter & Hodge, 2008; Canter & Youngs, 2008a). Canter and Youngs concluded that the more that is understood about the environmental psychological processes (such as cognitive maps), the more one will be able to predict criminal spatial behaviour.

A third assumption underlying geographical profiling is *centrality*, which implicates the familiarity of the surroundings around the places we are likely to go to (Canter & Youngs, 2008a). This implication is related to routine activity theory as well (Brantigham & Brantigham, 1991). A greater emphasis on internal representations within an individual might give more weight to where the offender

lives, as this is more likely to be of significance to his/her cognitive maps (Canter & Youngs, 2008a). Canter and Gregory (1994) tested the centrality of offenders using the 'circle hypothesis', which supposes that the two crimes that are furthest away from each other act as the outer perimeter of a circle. It could then be hypothesized that the offender's base would be within that circle, and this type of offender is called a 'marauder'. It is a simple but effective way of indicating the area that makes up an offender's cognitive map over criminal opportunities. Another type of offender is called a 'commuter'. Here the offender travels from his/her home to an area where he commits his crimes, and then returns to the home area (Canter, 2000a).

In the marauder style, the offender uses his home as a base, to which he returns after each committed crime. In cases of marauder style offenders, it is possible to calculate where their home is, as they tend to use this as a fixed base, given that one knows the location of their crimes. This is in contrast to the commuter style offenders, where it is more difficult to model the location of their home because they travel (Canter 2000a, b).

In Sweden, a rapist known as the "Haga man" (after the area in which he tended to commit his crimes) committed eight gruesome rapes and attempted murders on women in northern Sweden. A geographical profile was made over his crimes, and it turned out that he lived 25 kilometres from the city in which he committed them. But, his workplace was almost in the middle of his crime sites. Besides the home, there can therefore be another fixed point, which is frequently visited by the offender, such as a workplace (Canter, 2000a, b).

The linking of crimes (or *comparative case analysis*) is the fourth important underlying principle of geographical profiling (Canter & Youngs, 2008a, b; Santtila, Junkkila & Sandnabba, 2005; Santtila et al., 2004). Even though the assumptions underlying geographical profiling can be applied to single crimes, it provides stronger applications the more crimes and information there is (Canter & Youngs, 2008a). If crimes can be linked to one offender, this knowledge can be of crucial importance in creating a geographical profile. It is based on this background that geographical profiling software (such as Dragnet) has been developed with the intention of reducing biases (e.g., if crimes have wrongly been connected with an offender, it could distort the spatial interpretation of the data) (Canter & Youngs, 2008a). Canter and Youngs proposed a very interesting possibility of linkage. They suggested that if offenders tend to commit crimes close to their home/base, then this means they also commit their crimes close to

each other. This assumption, if true, implies that crimes that are committed close to each other may very well have been committed by the same offender. There has been some research support for this suggestion (e.g., Bennell & Canter, 2008; Bennell & Jones, 2005; Ewart, Oatley & Burn, 2005; Grubin, Kelly & Brunsdon, 2001).

Geographical Profiling in Practice

The linking of separate incidents is an important investigative tool, as it can reduce the number of suspects and thereby lead to more effective, centralized investigative processes (Canter & Youngs, 2008b; Godwin, 2001; Santtila et al., 2004). Canter (2000a) argued that locating where the offender lives is the cornerstone of any detective work and that this information can provide the essential details from which the offender's identity can be discovered.

The spatial mean and standard distance of the crime sites in a series of crimes are used to establish the most likely region for next offence occurrence or where it is most likely that the home or base is located (Canter, 2003; Levine, 2002; Rossmo, 2000). In combination with available knowledge about land use, street networks, proximity to freeways and other relevant landscape characteristics, the results are even better (Canter, 2003; Rossmo, 2000). Travelling distance varies across offence types, for example burglary studies have shown varied distances, from 0.89 km to 3.87 km (Canter & Youngs, 2008b; Santtila, Laukkanen, Zappalà & Bosco, 2008). Crimes against property usually occur farther away from the home or base of an offender than do crimes against the person, which usually occur close to the base (Brantigham & Brantigham, 1991; Canter & Youngs, 2008a). Moreover, offenders who commit crimes in rural areas usually travel farther than do those who commit crimes in urban areas (Canter & Youngs, 2008b).

In general, a geographical profile can determine the location of offender's residence within 5 % of the total hunting area, and this performance is significantly better than what could be expected by chance (Canter, Coffey, Huntley & Missen, 2000; Rossmo, 2000). A geographical profile should be seen as a 'decision support tool' for criminal investigations, and it does not solve cases on its own. It rather provides a search strategy and can help in managing large quantities of data (Canter, 2003; Rossmo, 2000).

Most studies within this area have been on physical crime sites, where the term physical crime site means that there has been an interaction between a

victim, an offender and a location. To my knowledge, only one researcher has used geographical profiling software on a hands-off offence. Canter (2003) used geographical profiling in a case of obscene phone calls in England, and this profiling made a direct contribution to solving the case by narrowing down the search area for the police. But more research is needed on hands-off crimes. In Study II in the present thesis, a hands-off offence was analysed. The aim was to test whether the same principles of spatial behaviour apply even in cases where there has been no physical contact between the victim and the offender.

The Practical Geographical Tools at Hand

Geographical profiling is, as mentioned, a useful tool in crime solving, but it involves some mathematical components that can be hard to keep in mind. Therefore, several geographical computer programs have been developed, all of which are based on mathematical calculations, which in turn are based on empirical research on spatial behaviour (Canter et al., 2000; Levine, 2002; Rossmo, 2000). These programs are designed to help the police or researchers manage large amounts of data (i.e., spatial coordinates, etc.) and to calculate in what area it is most likely that an offender lives or has his/her base (Canter, 2000, 2003). The advantages of such programs are that they are more reliable and consistent, and less likely to be biased.

The three most commonly used programs are *Dragnet* (Canter et al., 2000), *CrimeStat* (Levine, 2002) and *Rigel* (Rossmo, 2000). These programs are based on distance decay functions, which incorporate the notion that the frequency of crimes decreases with distance away from the home or base of the offender (Bernasco, 2007; Brantigham & Brantigham, 1991; Canter et al., 2000). The bottom line is that most crimes are committed close to home (e.g., Canter & Gregory, 1994; Santtila et al., 2004; Sarangi & Youngs, 2006).

A distance decay function is basically a mathematical formula that describes a curve showing a rapid drop-off in frequencies, i.e., the farther away a crime has been committed from the base, the greater the distance has to be for a similar reduction in frequency (Canter & Youngs, 2008b). The decay functions imply that a simple averaging of the distances between offences (which is the location that is the average minimum distance from all the crime sites) will put too much emphasis on those offences committed at longer distances. The decay functions lead to the hypothesis that the locations nearer a crime should be given more weight than those farther away (Canter & Youngs, 20008b).

Essentially, these mathematical calculations (distance decay functions) are based on the coordinates from a series of crime sites, and from this a 'map' is produced showing different colour circles. These circles represent how likely it is that the offender is based in a certain area on the map (Bernasco, 2007; Canter et al., 2000). To break it down even further, the decay function is converted into probabilities around each crime site, which indicate the likelihood that any crime site location around a crime contains the home or base of the offender. All of these probabilities are then combined at each point in the total search area represented by the map (Canter et al., 2000; Canter & Youngs, 2008a). This is illustrated in Figure 1 below.

In Study II in the present thesis, Dragnet (developed at the Centre for Investigative Psychology at the University of Liverpool by Canter et al., 2000) was used to test whether the spatial software was able to narrow down the search area in a case of obscene phone calls as well as it has been shown to do in cases of crimes with an actual physical crime site (e.g., Bernasco, 2007; Canter & Hammond, 2006; Canter et al., 2000), and in one case with no physical crime site (Canter, 2003). Dragnet was chosen because it is user-friendly and has been designed for individuals with little background training.

The process of learning the pathways of a place and how cognitive maps are developed, and the relationship between perception, cognition and behaviour are important, and more research from a forensic perspective is needed within these areas. More specifically, how this knowledge changes as a function of age, socioeconomic or cultural background, and how these perceptions can influence the behaviour and spatial choices of criminals are also important topics (Brantigham & Brantigham, 1993a). Studies based on a race and criminal mobility approach, such as Warren et al. (1998) and Canter and Gregory (1994), have found that Caucasian rapists travelled farther than did non-Caucasian rapists. This could be a reflection of cultural differences in cognitive mapping (Beauregard et al., 2005) or of economic and other circumstances. Cultural differences as well as differences in sexual preference could be important pieces of the geographical puzzle when it comes to solving sexual crimes. Davies and Dale (1995) suggested that sexual fantasies can be linked to longer travel distances in sexual crimes. Sex offenders can spend a very long time searching for potential targets and fantasizing about crimes to be committed, which could make them more willing to travel farther in order to act out their fantasies (Beauregard et al., 2005).

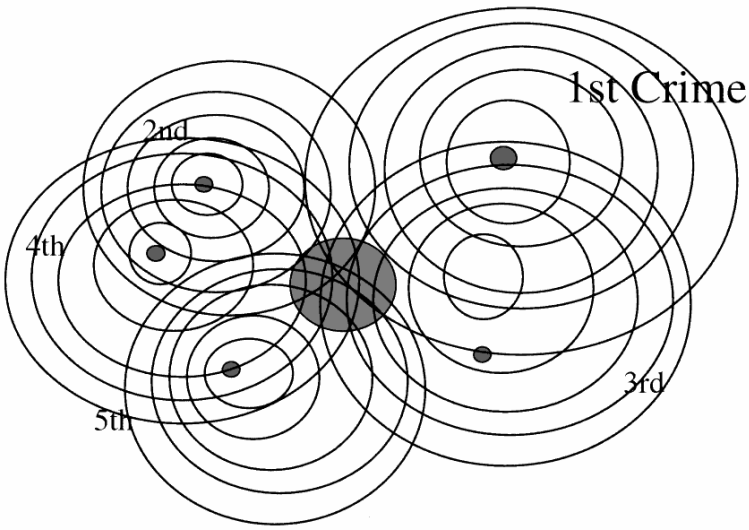

Figure 1. Illustration of what Dragnet does in effect, calculating the probabilities from each crime site (Canter & Youngs, 2008a, reprinted with permission).

Sex Offenders Who Target Children and Their MO

Some researchers (e.g., Beauregard et al., 2007) have argued that there is a need for more research on sex offenders' geographical behaviour. They feel that the research lacks studies on the relationship between sex offenders' criminal behaviour and geographical behaviour, and also that these studies should be developed in a way that enables use of multivariate statistical analyses that can give a more detailed and full view of all relationships involved. Also, crimes involving strangers (i.e., the offender and victim are unknown to each other prior to the crime) are the most difficult crimes to solve, and this is why research on stranger crimes are of the essence, and the study of such offenders can help in the development and refinement of geographical profiling tools (Beauregard et al., 2007; Rossmo, 2000).

Study I in the present thesis, where the modus operandi and geographical behaviour of non-familial child molesters were studied. The relationship between geographical behaviour and criminal behaviour (modus operandi) were analysed using a multivariate statistical analysis method: multidimensional scaling (MDS). MDS is a method that shows the relationship between several variables over dimensions. It is similar to cluster and factor analysis and allows one to see and

explore the relationship between behaviour and geographical components in an easy manner through its outputs, which could be described as perceptual maps.

Studies on the MO of sex offenders who target children have shown that these offenders show some sort of rationality (in line with rational choice theory) in the sense that they have strategies they adopt along a temporal continuum, such as how to gain trust, how to gain cooperation from the victim, etc. (e.g., Elliott, Browne & Kilcoyne, 1995; Kaufman, Holmberg, Orts et al., 1998; Leclerc et al., 2008; Leclerc, Proulx & McKibben, 2005). According to Beauregard et al. (2005), there is a lack of research regarding the relationship between the distances travelled and the MO of offenders, especially regarding sexual offenders. This is studied in Study I in the present thesis, where the MO and the distances travelled are explored in relation to non-familial child molesters.

Research on the spatial behaviour of child molesters (e.g., Beauregard, Rossmo & Proulx, 2007; Ouimet & Proulx, 1994) has indicated that most child molesters tend to offend near their homes. The explanation for this is that the home of the child molester is the best possible location for committing the crimes, because it has several advantages over other locations (Leclerc et al., 2008), e.g., the child might feel more secure in a home setting and thus more easily persuaded to engage in sexual activities. Beauregard et al. (2007) found in their study on sex offenders that offenders who used manipulative strategies to lure victims were more likely to commit their crimes indoors in places familiar to them, such as their home or workplace. In Study I in the present thesis, where child molesters tend to offend was investigated.

Studies on the spatial behaviour of pedophiles have found a high risk of recidivism for offenders whose routine activities occurred around places with children, such as schools, parks and playgrounds (Ouimet & Proulx, 1994). Beauregard et al. (2005) argued that the factors mentioned above (advantages such as the child possibly feeling more secure in a home setting) could explain why most child molesters are looking for children nearby their homes. This phenomenon could also be explained by the distance decay pattern, or the *least-effort* principle, which states that an individual who can choose among several possibilities to do something is most likely to choose the one requiring the least effort (Canter, 2003; Rossmo, 2000).

The child molester can be said to make four choices about where and how he plans to commit his crimes. The first choice involves the hunting ground (i.e., areas or places where there is likely to be potential victims), such as the workplace,

the victim's home or parks, etc. The second choice regards what time he/she should commit his crimes (e.g., children are not out alone at night). The third choice is that of the victim, which is usually based on the child molester's sexual preferences (e.g., age, gender of the victim) in combination with how vulnerable the victim is. The fourth and final choice a child molester makes is the approach strategy (i.e., how to make contact and then proceed to initiate sexual actions) (Proulx & Ouimet, 1995). The most common strategies used by pedophiles and child molesters are manipulation, threats, seduction and bribes (such as money). This four-step choice model is a good example of the rational choice approach, as every step or decision involves a risk assessment, as to what consequences each choice would generate (Beauregard et al., 2005). It is difficult to say whether or not these four choices are employed by all child molesters and/or pedophiles, but it seems plausible that at least some of them are on the offender's mind, and obviously they may be carried out in varyingly rational fashions.

Research (Beauregard et al., 2005) found a positive relationship between the level of violence used and the distance travelled from the home of the offender to the victim. This could be explained by the fact that many children are unwilling to get into a car with a stranger, and thus it would be easier for the offender to lure his victim home if the child also lives nearby. If the child molester has to travel a distance to find a target, he may be compelled to use more violence than he would need to use close to home, thus an attack away from the home base needs to be swift and more direct, perhaps more of an ambush style, which in turn may lead to increasing the level of violence of the crime.

Fischer and McDonald (1998) argued that past research on the differences between intrafamilial and non-familial sexual abuse has focused on the use of physical or verbal aggression, the gender of the victim, the age of the victim, the duration of the abuse and how serious the behaviours were. Researchers have found different results regarding the seriousness of sexual offences. Some researchers have claimed that intrafamilial abuse involves more serious offences, such as more repetitive abuse and a more gradual transition from touch to penetration (e.g., Erickson, Walbek & Seely, 1988). Other researchers have found contrary results, showing that non-familial abuse involves more serious sexual behaviours (e.g., Russel, 1983). And still others have found no differences between the two (e.g., Gomes-Schwartz, Horowitz & Cardarelli, 1990). Sexual offenders, including child molesters, are twice as likely to have previous convictions for non-sexual offences as for sexual offences. This also seems to be true even after

imprisonment (Broadhurst & Maller, 1992; Smallbone & Wortley, 2004; Soothill, Francis, Sanderson & Ackerley, 2000; Soothill, Harman, Francis & Kirby, 2005). According to Smallbone and Wortley (2004), this indicates that sexual offenders seem to be more consistent in their nonsexual crimes than in their sexual crimes. Hood, Shute, Feilzer and Wilcox (2002) found in their study on 97 child molesters' recidivism, that among non-familial offenders who were followed up for six years, one-fourth (25 %) were reconvicted of a child sexual offence. This high rate of recidivism among child sexual offenders is one reason why research is of great importance to our ability to catch these offenders.

Child molesters are excellent manipulators and very good at keeping the victim from telling anyone about what has happened (Leclerc et al., 2005; Leclerc et al., 2008; Proulx & Ouimet, 1995). In Study II in the present thesis, this was shown to be true even in cases of obscene phone calls. Here, police interviews with the victims showed that many of the children were reluctant to tell their parents or the police about what had happened. In Study II, the police were able to deduce much of what had been said between the child and offender even if the child was reluctant to tell, because the offender had kept meticulous records of all the calls he had made.

The different approach strategies used by child molesters are called *grooming strategies* (Singer, Hussey & Strom, 1992). The whole purpose of the grooming is to seduce the child. Elliott et al. (1995) studied the different grooming strategies used by child molesters and how they maintain the children as victims (in the cases of repeated crimes). In their interview study on 91 child molesters, the offenders were asked questions about these issues (e.g., how they chose a victim, the age range, how they maintained the children as victims). The result showed that most of the offenders were strangers to their victims, and that the offenders frequently visited places with a high number of children (e.g., schools, amusement parks, parks, playgrounds or beaches). Almost one-fifth of the offenders tried to 'recruit' new victims by having their current victims bring new children home. Recruitment consisted of encouraging by giving bribes and gifts or, the opposite, by threatening the newly recruited victims. In Study I in the present thesis, all of the offenders were strangers to the victims, and the grooming techniques they used on the victims were explored.

Innocent children have always seemed to be easy targets for some offenders, whether this comes from sexual desires (pedophiles, i.e., psychopathological sexual deviation) or by chance or easy access (child molesters, i.e., opportunists

who see children as easy targets). Therefore, both children's and perpetrators' cognitive processes must be studied.

Children as Targets—How Reliable are they as Witnesses?

Unfortunately, children have been a part of forensic processes in many cases, either as witnesses or victims. Children's role in the courtrooms has generated a great deal of research on how reliable they can be as witnesses, whether they are victims or observers of a crime. This research has mainly focused on the question format, that is, on how one should question a child so as to obtain the most correct information. Previous research has found that, in event memory eyewitness situations, both adults and children are usually too confident that they remember correctly, that is, they show *overconfidence* (the opposite of which is *underconfidence*) (e.g., Allwood, Granhag & Jonsson, 2006; Allwood, Jonsson, Granhag, 2005; Juslin, Olsson & Winman 1996). Perfect realism in confidence judgements implies a perfect match over many items between the level of the participants' accuracy and the level of their confidence, e.g., all items rated as "100 % sure that the answer is correct" should be correct.

Studying the realism of child witnesses' confidence in their memory assertions is of great importance, as research has shown that jurors tend to see confident witnesses as more accurate and credible, regardless of age (Cutler, Penrod & Stuve, 1988; Luus & Wells, 1992).

What Question Format is Preferred?

Studies (e.g., Lamb, Sternberg, Orbach, Esplin, Stewart & Mitchell, 2003; Pezdek & Roe, 1997; Quas & Schaaf, 2002; Quas, Malloy, Melinder, Goodman, D'Mell & Schaaf, 2007) have shown that children are sensitive to suggestibility. This is why the question format is of great importance in child interviews. Pezdek and Roe (1997) showed that it was easy to make 4- and 10-year-old children report that they had been touched in a way that they did not experience during the experiment. Generally, the 10-year-old children were more accurate than the 4-year-olds. Quas and Schaaf (2002) found that the children in their study (3- and 5-year-olds) had a low accuracy in reporting correct body touching. In their study on physical examination involving genital touching, Saywitz, Goodman, Nicholas and Moan (1991) only found an age difference in free recall for the children in the

condition with no genital touching. Both 7-year-old and 5-year-old children in the genital-touch condition performed at the same level of accuracy. Results also showed that 5-year-olds were more open in free recall about their genital touch experiences than the 7-year-olds were. Poole and Lindsay (2001) found similar results in their study on five age groups (3 – 8 year old children), and also found that 8-year-olds were just as likely to mention fictitious events as the younger children were.

Interviewing children and adults in the forensic process involves asking different kinds of questions. These include open free recall questions, focussed open questions (i.e., questions that ask for some specific information, such as "Did the man wear a coat?" - a so-called yes/no question), and focussed questions with more than one provided answer alternative (Was her jacket blue or black?). The proportion of these different types of questions in an interview may be dependent, at least to some extent, on the type of forensic interview. In Study III in the present thesis, the performance of children and adults was analysed in relation to free recall questions and focussed questions with two response alternatives.

Completeness refers to the amount of information recalled about an event and accuracy refers to the proportion of the recalled information that is correct. A great deal of research has been done on children's performance level in free recall and in relation to focussed questions and the factors that determine these outcomes (for reviews see Milne & Bull, 1999; Peterson & Grant, 2001; Pipe, Lamb, Orbach & Esplin, 2004). Children's recall in forensic contexts is partly determined by factors beyond children's control, such as the delay between the event and recall, which is largely determined by various factors in the criminal justice system. Furthermore, the type of questioning conducted, including the extent of suggestive and leading questioning in the interviews and the language used by the interviewer, also affects recall performance (e.g., Ceci & Bruck, 1995; Saywitz & Camparo, 1998).

Children's eyewitness reports for events they only observed but did not experience have raised a number of questions. Leippe, Romanczyk and Manion (1991) suggested that child victims of a crime are more accurate than are child witnesses to a crime that they only observed but did not experience. A survey by Flin, Boon, Knox and Bull (1992) showed that more than half of the children who come to the courts in the UK to testify do so in relation to events they have only observed rather than experienced personally.

How to Present a Staged Event

The most common way to study the accuracy of children's eyewitness testimony for observed events is by showing them a videotape (Ackil & Zaragoza, 1995, 1998; Roebers & Schneider, 2000). This method has been used mainly for practical and ethical reasons (Roebers, Gelhaar & Schneider, 2004). In Study III in the present thesis, child participants were asked to watch a film depicting a classic grooming strategy used by child molesters, which is a man walking around in a park looking and calling for his lost dog. This has been known to be a popular strategy used by child molesters to try to lure children to follow along and search for the missing dog (which in most cases does not even exist). The purpose of the film was to test whether children would remember the potential offender (e.g., what he looked like, what he was wearing, his age, etc.) if they were to witness such an event on an ordinary day in a park.

Questions concerning the validity and generalizability of this presentation modality (e.g., videotapes and slide shows) have been raised, and it has been argued that they are not as relevant as the actual events about which children testify in court. Roebers et al. (2004) argued that this difference may lead to an underestimation of children's memory performance. Comparisons between different media are of interest, not just events in which children participate (Roebers et al., 2004). One reason why it is important to study different types of media is that children may come across videotapes containing child pornography (e.g., while playing on an adult's computer or when forced by a child molester to look at such material), and they must be able to recall and relate details about the film to the police.

Previous studies comparing recall performance across presentation modalities that included video presentation (e.g., Bates, Ricciardelli & Clarke, 1999; Tobey & Goodman, 1992) have used unedited videos (Lorch & Castle, 1997) of real life events that do not maintain children's attention to the same degree as do professionally made film sequences that include panning, perspective changes, and zooms. The video used in Study III in the present thesis was unedited, in the sense that it did not contain any zooms, sound effects or perspective changes.

Accuracy and Confidence Ratings

Rating one's confidence in whether or not a given answer is correct adequately is an important part of the ability to report past events accurately (Allwood, Ask, &

Granhag, 2005; Allwood et al., 2005; Granhag, Jonsson & Allwood, 2004; Roebers et al., 2004). However, people have difficulty in making valid (accurate or realistic) confidence judgements, in the sense that the level of their confidence judgements tends not to match the level of accuracy of their testimony. Roebers and Lockl (1999) showed that the difference between confidence judgements given after correct and incorrect statements was significantly larger for adults than for 6- and 8-year-olds. Studies have focused on the accuracy of children's confidence in their eyewitness memories (e.g., Allwood et al., 2005; Roebers, 2002).

In Study III in the present thesis, the accuracy and confidence of children (8- to 9-year-olds and 12- to 13-year-olds) were compared with that of adults. To test these factors, calibration measures were used. *Calibration* is often preferred to correlation, because correlation is more sensitive to the spread of the confidence judgements over the confidence scale (Juslin et al., 1996). That is, the greater the spread of the confidence judgements, the larger the correlation regardless of the calibration of the data. Calibration measures can be said to measure how well people know whether they know or not, or how well people's subjective probability judgements correspond with their performance.

There are many so-called measures of realism (calibration measures), among which *calibration* is one. Two others are called *over/underconfidence* and *resolution*. The correspondence between a person's subjective confidence and the proportion of correct answers is measured by over/underconfidence and calibration (Koriat & Goldsmith, 1996). Over/underconfidence compares a person's mean confidence judgement with the person's overall correctness, for example, if an individual answers 50 % of a number of questions correctly while his/her mean confidence judgement on those particular questions is 80 %, then the person is overconfident.

A typical study works as follows, a person answers a question (e.g., What colour was his jacket?) with blue or red, and then the person rates his/her answer on a scale ranging from 0–100 % or 50–100 %, reflecting how sure the person is that the answer he/she gave is correct. Fifty percent typically means the person was guessing and 100 % that the person is absolutely sure he/she is correct, while 0 % means the person is sure he/she was incorrect. The scale can be divided into units such as 50–59, 60–69 % and so forth, and then a calibration graph can be made to determine the mean accuracy level for each confidence level. In such a graph, the diagonal represents perfect calibration, which is achieved when each confidence and accuracy level coincide over the whole scale, for example if one has an accuracy level of 70 % and has assigned a confidence of 70 % to each

question answered. Resolution measures how well the confidence distinguishes between correct and incorrect answers. Resolution relates a person's subjective confidence in the correctness of every answer. To achieve good resolution, a person must sort all correct judgements to one confidence unit and all incorrect answers to another confidence unit.

Concluding Remarks and the Aim of the Studies

However appalling it may be to think about children as the targets of child molesters, it is an inevitable fact of contemporary society. We must learn more about the workings of the minds of offenders who target children, stressing the *how*, *where* and *when*. The combination of psychology, geography and technology is a powerful one, and it would seem to be the way to go if we are to protect children in the future. Likewise, it is important in this context and others to improve our understanding of children's capabilities as witnesses.

The aim of the present thesis is to explore the spatial patterns and MO of offenders who target children, as well as to gain insights into children's memories in order to explore their capacity to be reliable witnesses.

Overview of the Empirical Studies

Study I

Aims

The aim of Study I was to explore the spatial patterns and MO of non-familial child molesters. More knowledge about how child molesters choose their victims and commit their crimes is needed. This is especially true for cases in which the offender is unknown to the victim. More specifically, the purpose of Study I was to map out the MO of the child molesters, in terms of learning how they recruit their victims and what they do to them, and also to explore the spatial patterns of these offenders in order to see whether there are any common denominators among them regarding their choice of victims and where they commit their crimes.

Method

Seventy cases (i.e., 70 victims) of non-familial child molestation, committed by 26 different child molesters, were collected from the police archives. An instrument was created to collect the information from the police protocols. The instrument had the form of a questionnaire. There were a total of 64 variables in the instrument. Eight variables were later removed from the instrument due to their irrelevance or because there was no such information to be gathered from the protocols. The instrument was filled out like a questionnaire with both boxes to check off (e.g., a question, such as in what kind of area the crime occurred, followed by examples, like shopping area, industrial site, school, etc.) and free line spacing, where additional information could be filled in.

The offences took place during the period 2000–2005. In all cases, the offender was male. The victims were girls in 48 cases and boys in 22. The mean age of the offenders was 42.3 years, the age ranged from 23–65. The mean age of the victims was 11.7 years, the age ranged from 5–15.

Multidimensional scaling (MDS) analyses were used to analyse the relations between the different objects and explore possible underlying structures among these objects. MDS has also been called perceptual mapping and is a method that can make the data easier to interpret. This is done with a graphical plot showing the variables as dots on a spatial area (known as 'maps'), where the distance (closeness) between dots represents the similarity of the variables.

Results

One major finding was that the offenders' mean travelling distance was 5.8 km from their home base to the site of the crime. There were two outliers (i.e., two offenders who had travelled much farther than the others, 48.3 km and 46.6 km, respectively). When these two were removed from the analysis, the mean travelling distance decreased to 4.6 km. However, the decision was made not to remove them from the analyses, because they could help investigators learn more about offenders who tend to travel longer to commit crimes. If they were removed, this kind of information would be missed.

The result also showed that most of the offenders committed their crimes in their own home, and in all such cases, bribes (such as money) were used to lure the victim there. The most common bribe was offering money for sexual favours. It was also common among the offenders to act kindly towards the victim (e.g.,

being friendly) and in some cases the offender asked for something (e.g., directions) in order to get the victim's attention and lure him/her away. Some of the offenders used previous victims to recruit new victims. One interesting finding was that violence was rare and only used in 5 of the 70 cases. Here, violence refers to physical harm caused by punches, kicks, strangulation or any other type of brutal force to get the victim to comply. The most common criminal action perpetrated by the offenders in this study was touching, such as caressing and fondling the victim. The result also showed that offenders with no children of their own, as compared to those with children, more often fondled/caressed their victims and committed more severe abuses, such as touching of the genitals and forcing them to have intercourse. Another interesting finding was the negative relationship between the offender's age and the victim's age, the older the offender, the younger the victim.

Discussion

One of the main purposes of Study I was to see whether the data could yield some new information about child molester's spatial patterns. One major finding was the confirmation of what previous studies have found, which is that child molesters most often commit their crimes in their own home (e.g., Ouimet & Proulx, 1994). If they do travel to find victims and commit crimes, they do not travel far away from the home base. Thus, it seems that offenders usually find victims close to their home base and that they stay in that vicinity during the course of their crimes. Several of the results confirmed previous studies showing that offenders do not travel far from home (e.g., Brantigham & Brantigham, 1993a; Canter, 2000a, b). The notion that most offenders use bribes to lure the victim to them was also confirmed (e.g., Proulx & Ouimet, 1995; Singer, Hussey & Strom, 1992).

The finding that older child molesters seemed to prefer younger children may provide helpful information for police investigators, allowing them to narrow down the number of suspects (e.g., if a very young child is victimized, the investigators could possibly start by focusing on suspects who are older, above the age of 50, for example).

Study II

Aims

The main purpose of this study was to examine whether it is possible to predict the home location or base of an offender who has made obscene phone calls (OPC) using a geographical profiling tool. Previous studies have varied in their focus on types of crimes and the accuracy and reliability of techniques (e.g., Canter & Gregory, 1994; Rossmo, 2000; Santtila, Laukkanen, & Zappalà, 2007). These studies all have one thing in common, and that is that they have focused on physical crime sites, that is, crimes involving an actual crime site that has been visited by the offender/-s, such as arson, rape, murder or robbery. However, to my knowledge, only one previous study has been done on crimes with no physical crime site such as obscene phone calls (i.e., where there has been no physical contact between the victim and offender) and applied geographical profiling software (Canter, 2003).

Method

This exploratory study investigated one case of obscene phone calls and used a geographical profiling system to see whether or not it could be useful even in cases of hands-off crimes. This study used the Dragnet system, which is a geographical profiling software system developed at the Centre for Investigative Psychology at the University of Liverpool (Canter, Coffey, Huntley, & Missen, 2000). This study is based on a single male offender. The offender was in his early thirties when he perpetrated these crimes, and when he was apprehended by the police. The offender made obscene phone calls to 86 children during the years 1999 (41 children) and 2000 (57 children).

The offender conducted an actual study for himself when he phoned the children, taping or writing down all answers to the questionnaires he had created. These questionnaires consisted of approximately 50–70 questions, and he had three different versions of them. Two were quite similar, but the third version was much more explicit in nature with questions such as whether the child gets turned on by urinating or whether he/she would like to have sex with a sibling.

The addresses of the victims' homes and the offender's home were recoded into X and Y coordinates, and then entered into Dragnet for the calculations. Several analyses were made on the data by Dragnet in order to see whether the

program could predict the most probable area in which the offender would have his home or base.

Results

The results showed that the offender found most of his victims via newspaper ads for selling children's things (mostly children's bicycles). The most important finding was that the Dragnet program was able to predict in what area the offender was most likely to live. This was shown by an "H" for the home of the offender on a spatial map produced by Dragnet and consisting of several coloured circles, where the centre circle indicates the area in which the offender is mostly like to live.

Dragnet analyses on the time aspect were also made. The crimes were divided into four categories; crimes committed during the first half of 1999 (Jan–July), the second half of 1999 (Aug–Dec), the first half of 2000 (Jan–July), and the second half of 2000 (Aug–Dec). The analyses showed that the offender started calling victims close to home and then farther away, and at the end of 2000 he started calling close to home again.

A search cost analysis (i.e., an index defined by the proportion of the area that has to be searched in order to find the offender's home or base, Canter et al., 2000) was also made, which showed that only 6 % of the total search area needed to be searched to find the offender's home or base.

Discussion

The purpose of using geographical profiling software is to see whether it can predict a probable area in which the offender is most likely to live or have his/her base. The result showed that Dragnet was able to predict the most probable search area in the analysed case of an offender who had made obscene phone calls.

One interesting finding was the differences in the offender's MO regarding the time aspect, if one makes speculations based on the program's maps. According to Dragnet, the offender began the phone calls rather close to his home in the first half of 1999, changing later in 1999 to making the calls to addresses farther away, and then in 2000 he made his calls closer to home throughout the course of the year. On the basis of this result one could speculate that the offender started out by making calls rather close to home, but then got

cold feet. After a while he became more confident again, perhaps because he had not been caught yet, and started making his calls very close to home. Overall, Dragnet showed good results and predicted the likely area of the offender's home.

Study III

Aims

The aim of Study III was to compare the accuracy and confidence judgements given by children after watching a film, and then to compare the results with adults. Child witnesses giving testimony feel some degree of confidence in the correctness of their reports, just as adults do. Prior research indicates that children's confidence judgements regarding their own memory reports may be quite unreliable. In this study, we investigated the realism of 8- to 9-year-old, 12- to 13-year-old and adult witnesses' confidence judgements regarding their memory performance, in relation to free recall and focussed questions pertaining to the witnessed event. In order to accomplish this, we also analysed the witnesses' actual recall performance.

Method

Participants (31 in each age group) first saw a 4-minute video of a staged event, in which a man is looking for his lost dog. The film was intended to depict an everyday event with potential forensic relevance. One week later, the participants were interviewed individually and asked to freely recall everything they remembered about the film, and they also answered 39 questions on the contents of the film in a questionnaire with items allowing two response alternatives (yes/no, red/blue etc). The answers from the interviews and questionnaire were transcribed and put on individual sheets of paper with a confidence scale beneath each answer. One week after recall, the participants assessed their confidence in their interview statements and in their answers to the questions by filling out the confidence scales. Calibration measures (i.e., over/underconfidence, resolution) were then used to test the realism of their responses with regard to their confidence. Calibration and over/underconfidence reflect the relation between the level of confidence and the accuracy. Resolution reflects the ability to distinguish between two sets of answers, one that is correct and one that is incorrect (by means of confidence ratings).

Results

The 8- to 9-year-olds showed perfect realism (e.g., no overconfidence) in their confidence judgements for the free recall. The free recall results also showed, as expected, that the youngest group had lower completeness but similar accuracy as compared to the adults. All age groups showed poorer realism for the focussed questions. In addition, when the within-subject variation of the confidence judgements was analysed, the results showed question format differences but few age differences, indicating that the confidence judgement task was age appropriate also for the youngest children. The results showed that the formats differed clearly in accuracy and confidence, but that there were no main differences between the question formats for calibration, over/underconfidence and resolution. The results also showed that the participants tended to underestimate the number of items that they had answered correctly, although the deviation from zero was only significant for the youngest children's free recall estimations and the adults' estimations for the focussed questions.

Discussion

An interesting finding in our study is that there were no large differences in the proportion of correctly recalled information between the age groups within either of the two formats. The result showed that the 8- to 9-year-old children's overconfidence for the free recall question was at the same level, or even showed better realism, than the older children and the adults. The youngest children also gave confidence judgements that were well adapted to the level of accuracy in their free recall assertions. In contrast, for the focussed questions, the children, although showing accuracy similar to the adults, gave confidence judgements that resulted in poorer realism (in terms of overconfidence) than the adults' confidence judgements and also than their own confidence judgements for the free recall questions. Thus, when children (8-9 and 12-13 year olds) did not have the possibility to choose what information to report, the realism in their confidence judgements appears to suffer as compared with the adults.

One implication of these results for forensic practice, given that the results replicate (which they did in Allwood, Innes-Ker, Holmgren & Fredin, in press), is that both the difficulty and the question format of the memory task should be considered, not only in the context of the completeness and accuracy of witnesses' answers, but also in the context of the realism of particularly children's confidence

judgements. For example, the present study shows that the realism in 8- to 9-year-old and 12- to 13-year-old children's confidence judgements may be at least as good as adults' when age-appropriate free recall questions are answered but, as shown by this and previous research, not necessarily when focussed questions with response alternatives are used.

General Discussion

The Purpose of the Studies

The main purpose of the present thesis was to investigate and explore the behaviour of offenders who target children. The aim was specifically to find common denominators in these offenders MO and spatial behaviour, and preferably in such a way that the results and methods could be of value to professionals investigating crimes against children. A further aim was to study children's reliability as witnesses. A great deal of research (e.g., Beauregard et al., 2005; Canter & Gregory, 1994; Santtila et al., 2005) has been done on sexual offenders who target adults, in terms of both their MO and their spatial behaviour. However, research on offenders who target children is scarcer (e.g., Leclerc et al., 2008; Ouimet & Proulx, 1994), and more research is needed to map out the specific behaviours of these offenders. In the present thesis, two of the studies (Study I and II) aim to explore the behaviours of offenders who target children. The aim of Study III was to investigate whether a child could be a reliable witness, if the child observed some suspicious behaviour known to be a popular grooming strategy among these types of offenders.

The Behaviour of Offenders Who Target Children

The '*How*'

The results from Study I supported previous research on the MO of child molesters (e.g., Ouimet & Proulx, 1994; Singer et al., 1992), showing that the child molesters in Study I used bribes as a popular grooming strategy, the offenders made contact by being friendly or they used previous victims to recruit new victims. The most commonly used bribes were money, mobile phones or Mp3 players. Most of the victims who accepted these bribes were boys, and boys were also more willing than girls were to go home with the offender who offered the bribes. These boys accepted these bribes, knowing what they had to do to get

them, and afterwards they felt disgusted and ashamed, as they reported in the police interviews. But still, there were some boys who kept coming back to the offender to get more money in exchange for sexual favours. Is money such a temptation that one simply cannot resist the idea of it, even though the consequences are known? If this is the case, then much more information about the consequences of this type of actions is needed to reach children (e.g., information in the schools), in order to stop child molesters from recruiting new victims. Because if it is so easy to get a victim to comply, without threats or violence, then many child molesters will continue their crimes and feel that they are doing nothing wrong, because the victims come to them and not the other way around. This particular grooming strategy, of getting former victims to recruit new ones, seems to be one of the more difficult to prevent. The victims did not tell anyone (police or parents) about these actions either; in some cases the offender did verbally threaten the child, but in most cases the child seemed to be highly ashamed of what happened.

Shame seems to be a powerful emotion, especially when it comes to sexual crimes. In Study II, the offender who made obscene phone calls to children also used the grooming strategy of being friendly. Almost all the victims in Study II said that the caller was very kind and friendly, and never angry or threatening. Still, most of the children did not tell their parents what had happened, and if they did tell, they usually did not tell all the embarrassing details of the conversation. The victims were not analysed in any way in Study II, as the focus was entirely on the offender's modus operandi and Dragnet as a profiling tool. However, Leander, Granhag and Christiansson (2005) studied the same victims as those used in Study II. Leander et al. investigated the victims' event memories of the incident of being recipients of an obscene phone call, and their results showed that many of the children did not report the phone call or any details to parents or the police.

In Study III, the results indicated that children are quite capable of reporting a witnessed event. The film used depicted the grooming strategy of a man trying to find his lost dog by asking both children and adults if they had seen it. For ethical reasons, the man in the film did not snatch a child at the end of the film, he only ask the children if they had seen his dog. The results from Study III confirmed that children were capable of describing the man in the film rather accurately compared to adults (in free recall). The film used was not exciting and without action, which was the whole purpose. The idea behind the film was to investigate the following scenario: If a child is in a park playing one day, and then

after several days it is made known that another child was abducted from that park the very day the first child was there, can the first child remember all the people in the park and help the police with a description? It can be quite difficult to remember what happened on an ordinary weekday.

However, Study III is, in a rewritten form, part of another article by Allwood et al. (in press). The Allwood et al. study consists of two experiments, where Study III in this thesis, is Experiment 1. The second experiment was the same, except another film depicting a woman being kidnapped was used instead of the child molester scenario used in Experiment 1. The study was conducted to determine whether the results from Study III could be replicated using another kind of film. One difference between the two films used was that one included no action, just an ordinary day in a park, while the other film was more of an action type, including a kidnapping scenario. The results were confirmed (and expanded) and showed that 8- to 9-year-olds in their free recall did not show any overconfidence, while the other two age groups did (12- to 13-year-olds and adults as control), and that all participants showed poorer results on focussed questions than on free recall. These results indicate that children can be reliable as witnesses, if they are given a chance to tell their story in their own words.

The '*Where*'

In both Study I and Study II, the results clearly indicated that the offenders committed their crimes close to home, which supports previous research (e.g., Beauregard et al., 2005; Brantigham & Brantigham, 1993a, b; Canter & Gregory, 1994; Davies & Dale, 1995; Ouimet & Proulx, 1994).

The majority of the child molesters in Study I committed their crimes in their own homes. According to Proulx and Ouimet (1995), this is a very common choice of crime site for child molesters, mainly because one's own home has so many advantages, e.g., it is easy to make the child feel comfortable and it is less suspicious. In Study II, the Dragnet program indicated that even in the case of a hands-off offence, the offender chose to call victims close to where he lived, as was also shown by Canter (2003) in his case on an obscene phone caller in England. The difference between Canter's case and the present one, is that his was an actual case in which he aided the police investigation, whereas Study II in the present thesis, is a research study based on a previously solved case. It is assumed that there is a cognitive space in which hands-off offenders travel (Canter, 2003), which makes sense in some respects. For instance, an obscene phone caller might

choose local phone numbers based on their area code; because he/she is quite familiar with the surroundings, it may be possible to visualize a 'map' covering the victims' locations (i.e., the houses in which they lived). Canter (2003) described the notion of cognitive space rather well:

> "[t]his parallel world is man-made, and is thus still infused with the foibles of humankind. It is still a landscape that can be mapped and searched; it will have busy areas that many people visit, like commuters. Many people will stay local to what and where they know, like marauding criminals who commit many assaults travelling out from their bases. There will be dominant routes through this world that we can keep track of and watch. The new technologies demand new ways of thinking about human actions" (p. 222).

There are several theories (e.g., Canter, 2000a, b; Rossmo, 2000) explaining why offenders tend to commit crimes close to home. One of them is the least-effort principle, which states that if an offender needs to choose between two alternatives, he/she will choose the alternative entailing the least effort. This theory is in line with the distance decay pattern as well, which suggests that an offender usually keeps close to his/her home or base, and the risk of crimes decreases with increased distance away from the home or base. These theories could be linked to the routine activity of criminals (e.g., Brantigham & Brantigham, 1993a, b; Cohen & Felson, 1979), which basically imply that criminals keep close to their home or base because they are comfortable there. They know the surroundings and landscape well, so they know where there are potential victims and where to commit the crime without detection.

Another theory that supports the results from Study I is the rational choice approach, which suggests that an offender makes rational choices along the way and makes decisions regarding how he could achieve his goals, such as sexual satisfaction in the case of sexual offenders (Beauregard & Leclerc, 2007; Canter & Youngs, 2008a; Cornish & Clarke, 1986).

These theories concerning where an offender chooses his hunting ground and crime sites all seem logical in the sense that they offer good explanations of how offenders' minds tend to work. This also suggests that both offenders and non-offenders function similarly with regard to spatial behaviour. The positive implication of this suggestion, is that it makes it easier to understand criminals' behaviour.

The '*What*'

In Study I, the most common action of the offenders was touching. The touching varied in degree; some offenders were satisfied with touching outside the clothes of the victim, while others needed to get under the clothes. The preferences of one offender were not the same as those of another, as was shown by the results of both Study I and Study II. Both studies revealed differences in preference regarding age and gender. One interesting finding in Study I was the negative relationship between the age of the offender and that of the victim. This indicated that the older the offender, the younger his victims. This finding may not be remarkable *per se*, but put in the context of a police investigation of a series of sexual crimes against children, it may suggest where to start narrowing down the suspects. Another very interesting finding in Study I was that offenders who were fathers seemed to be gentler toward the victim and did not commit the more severe abuses (e.g., rape, oral sex). Again, this may also be a good indication of how to narrow down suspects in cases of such crimes.

Study II was of a different character than Study I, in the sense that it dealt with a hands-off offence, which means that the offender and victim never met in person. However, the offender was still able to hurt the victims emotionally (e.g., Larsen, Leth & Maher, 2000; Leander et al., 2005). Making obscene phone calls (or using the Internet) from one's own home may seem like an easy way to access children. Even though today's technology is advanced and could be intimidating (e.g., tracing the call or computer used) to a potential obscene phone caller, this does not seem to prevent these crimes from occurring. This is why it is important to study hands-off cases and apply theories of the spatial behaviour of criminals to them as well (Canter, 2003; Canter & Youngs, 2008a). Furthermore, the use of geographical profiling tools (such as Dragnet) is a new way of fighting these types of crimes. As shown in Study II, Dragnet was able to predict the area in which the offender's home or base was most likely to be located. This is another result providing positive indications that may be valuable to the police and help them narrow down the number of suspects, even in hands-off cases.

Limitations and Future Implications of the Studies

There are limitations to all of the studies in the present thesis. In general and overall, the three studies lacked a cultural approach, and the number of cases in Study I and Study II was small. Study I and II had a gender approach with regard

to the victims. In Study I, there was no gender approach of the offenders, as most sexual offenders are male. However, it would be interesting to conduct a similar study on female child molesters, if it were possible to obtain a large enough sample. Furthermore, another limitation to Study I was the lack of sociodemographic comparisons. There was an intention to make such comparisons, but the police records were insufficient in providing all the detailed information needed for such analyses (e.g., workplace, income, living conditions). It would also be of interest to replicate Study I with a comparison to intra-familial (offenders that are known to the victim, family members or relatives) offenders, in order to compare MO and grooming strategies.

The main limitation of Study II is that it is a case study on a single offender, still, the findings did have interesting implications. In future research, more perpetrators of hands-off offences should be used in such analyses, in order to test the generalizability of the results of Study II.

One limitation of Study III could be that the task of making confidence ratings is too difficult for the younger children. However, the result showed good realism in the free recall task for younger children, indicating that they understood the task properly. But this aspect is worth considering, because the realism in focused questions was not particularly good for the younger children. Also, gender differences should be considered.

Conclusions

The present thesis has focused mainly on the offenders (who target children) and not the victims/witnesses. Therefore, the main results of the presented studies are that child molesters do tend to commit their crimes in their own home or close to their home/base, which seems to be true even in hands-off cases, and that the most common grooming strategy is using bribes and being friendly toward the victim/-s. However, although Study III does not have its main focus on the offender's behaviour *per se*, the finding that children can be reliable as witnesses are important as well.

Mapping the behaviours of offenders who target children are important, because it can help facilitate the investigation process for the police investigating these types of crimes (e.g., Beauregard et al., 2005; Canter, 2003; Leclerc et al., 2005; Proulx & Ouimet, 1995; Soothill et al., 2005). The more we learn about sexual offenders' behaviours, the more we can understand and try to be one step ahead of them, the ambition being to prevent new crimes from happening.

Combining different research disciplines such as psychology, geography and technology has proven to be ground breaking in mapping out offenders' behaviours, regardless of the crime (e.g., Bernasco, 2007; Canter et al., 2000; Goodwill & Alison, 2005; Levine, 2002; Rossmo, 2000; Santtila et al., 2003; Santtila et al., 2004). Psychology contributes well-founded theories such as cognitive maps (or mental maps), rational choice and decision-making, routine activity and spatial thinking. The discipline of geography contributes landscapes, roads and maps. The technology contributes advanced computer software and statistics programs. Taken together, this threesome may be the best choice for future research in this area to further explore all aspects of criminal spatial behaviour, in both hands-on and hands-off offences.

Research on the victims/witnesses should also be moved forward, especially research on young children (10 years or younger). It is important to realize that in cases of child molestation the victims are often very young, and they may be of great importance in the investigative process, for instance as witnesses in the courts (e.g., Ceci & Bruck, 1995; Flin et al., 1992; Leander et al., 2005). Therefore, it is crucial that we understand children's cognitive processes and their memories in particular.

Unfortunately, the modus operandi and spatial behaviours of sexual offenders are a research area that has many years ahead of it. I say unfortunately, because as long as there are sexual crimes against children, the research must continue. Hoping for a world in which no such crimes occur is a noble (and necessary) thought, but reality tells a different story. Children are curious and innocent, and both qualities attract different kinds of attention. In some of the worst cases, that attention might come from a child molester.

It is important to note that even though most research on criminals shows that they tend to commit their crimes close to their home or base, one must not forget that this is not always the case. Crimes that do not fall into this category are just as important to solve and should not be overlooked.

One final reflection is that we must never forget that the numbers and dots on the spatial maps and statistical outputs all represent a person who has been victimized.

Summary in Swedish / Svensk sammanfattning

Barnförövare och barn som vittnen: Spatialt beteende, modus operandi och minnesåtergivning

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Brott som begås mot barn har länge ansetts som ett av de grövsta brotten som finns. När ett barn blir utsatt för brott av en vuxen, främst av sexuell karaktär, är det av yttersta vikt att fånga den skyldiga så fort som möjligt. Det är anledningen till att forskning på barnförövare är så viktig. Om man genom forskning kan finna gemensamma nämnare bland barnförövares beteende och därmed kartlägga dem, kan det underlätta och skynda på tillfångatagandet av den skyldige.

Forskning på kriminellas rörelsemönster, *spatialt beteende*, och deras specifika tillvägagångssätt, *modus operandi*, har utförts under fler årtionden och man har funnit flera intressanta och värdefulla indikationer så som att de flesta förövare begår brott i sina hem eller i närheten av sina hem (eller annan bas, så som arbetsplats) (Brantigham & Brantigham, 1993 a, b; Beauregard et al., 2005; Canter, 2003; Canter & Youngs, 2008a; Leclerc et al., 2005; Proulx & Ouimet, 1995). Som ett led i detta kartläggande av förövares beteende har man börjat kombinera olika forskningsdiscipliner som psykologi, geografi och teknologi. Studiet av spatialt beteende utgör grunden inom det som kallas *geografisk gärningsmannaprofilering* (t.ex. Canter, 2003; Rossmo, 2000), där man gör statistiska analyser av mänskligt beteende och applicerar det på kartor för att på så vis kunna minska ner det sökområde som polisen måste söka igenom för att finna var den skyldige bor eller har sin bas.

Forskare inom geografisk gärningsmannaprofilering har utvecklat avancerade dataprogram som är baserade på antaganden om *distance decay*, vilken antar att en brottsling oftast begår brott nära sitt hem/bas och att sannolikheten för att begå brott minskar med avståndet från den punkten (Brantigham & Brantigham, 1993a; Canter, 2003; Canter & Hammond, 2006). Dessa dataprogram omvandlar geografiska koordinater till sannolikhetsområden på en karta, det vill säga programmet föreslår var man kan börja söka efter en misstänkt. Detta kan vara av

stor vikt för polisen då de kan minska ner antalet misstänkta genom att använda ett sådant program. Det är dock viktigt att notera att ett sådant här dataprogram ska användas i kombination med övriga faktorer som ingår i en polisundersökning (t.ex. forensiska bevis, kunskap om det geografiska området, erfarenhet).

Det är även viktigt att inte glömma barnens roll i detta sammanhang. Om ett barn blir utsatt för eller bevittnar ett brott, kan man då lita på dess vittnesmål? Det finns mycket forskning på barns minne och deras tillförlitlighet som vittne (t.ex. Ceci & Bruck, 1995; Saywitz & Camparo, 1998). Flertalet studier visar att barn faktiskt kan vara jämförbara med vuxna (t.ex. Granhag et al., 2004; Allwood et al., in press). Ett vanligt misstaget som vittnen gör är att de är överkonfidenta gällande deras svar, det vill säga de tror att det de säger är korrekt när det inte är det. Är man underkonfident är det tvärtom, man tror man har fel när man har rätt. I studie I i denna avhandling, undersökte jag okända barnförövares modus operandi och spatiala beteende. I studie II undersökte jag modus operandi och spatialt beteende hos en gärningsman som ringt obscena telefonsamtal till barn. I studie III undersökte jag barns minne och konfidensbedömningar.

Studie I

Forskning på spatialt beteende hos barnförövare har visat att de flesta begår sina brott nära eller i sina hem (Beauregard et al., 2007; Beauregard et al., 2007; Ouimet & Proulx, 1994). En förklaring till varför det är på detta viset är att hemmet har flera fördelar jämte andra brottsplatser. Ett exempel på en sådan fördel kan vara att barnet känner sig mer säker och bekväm i en hemmamiljö, och att det då skulle göra det enklare att övertala barnet att delta i sexuella aktiviteter (Leclerc et al., 2008).

Forskning har även visat på ett positivt samband mellan våld och avståndet som färdats till brottsplatsen (Beauregard et al., 2005). Detta innebär att ju längre en barnförövare har åkt för att begå brottet, desto mer våld tenderar att användas. En förklaring till detta fenomen kan vara att barn inte är så villiga att hoppa in i en främlings bil och att en gärningsman måste vara snabb när han tar ett barn så att barnet inte hinner göra motstånd. Det vill säga att han tvingas använda mer våld än om han hade lurat med barnet till sitt hem istället.

Barnförövare använder sig av flera olika metoder och strategier för att lura till sig nya offer. Proulx och Ouimet (1995) listar fyra rationella val som en barnförövare antas göra som ett led i deras brottsprocess. (1) Först handlar det om att välja ett jaktområde (d.v.s. platser eller område där det är sannolikt att

potentiella offer finns), så som arbetsplats, offrets hem eller lekplats etc. (2) Det andra valet rör tidpunkten för brottet, när han ska begå sitt brott eftersom barn inte är ute ensamma på nätterna till exempel. (3) Det tredje valet berör val av offer, det vill säga vilka sexuella preferenser barnförövaren har, så som kön, ålder, hårfärg etc., men även hur sårbart offret är. (4) Det fjärde valet handlar om vilken närmande strategi förövaren tänker använda sig av, så som hur han ska ta första kontakten och sedermera initiera sexuella handlingar. Det är viktigt att notera att dessa fyra strategier inte kan appliceras på alla barnförövare och att det inte alltid sker i ovannämnda ordning, men det är strategier som forskning visat att de använder sig av i en eller annan utsträckning.

De olika strategier en barnförövare använder sig av kallas för *grooming* strategier (Singer et al., 1992), vilka alla går ut på att förföra offret. De vanligaste strategierna som används är manipulation, hot, förförelse och mutor eller gåvor (så som pengar). Tidigare studier har visat att de barnförövare som använder sig av manipulativa strategier, oftast begår sitt brott inomhus och främst i sitt eget hus eller på arbetsplatsen (Beauregard et al., 2007).

Enligt Beauregard et al. (2005) finns det en brist på studier som fokuserar på sambandet mellan modus operandi och avstånden som färdats, det vill säga det spatiala beteendet hos sexualbrottslingar. I studie I studerades okända (ej släkt eller familj) barnförövares modus operandi, så som grooming strategier, och var de begick sina brott. Brott som begås av okända förövare anses vara mest svårlösta, och därför behövs mer forskning på den typen av brott. I studie I, undersökte jag 70 fall (70 barn) av barnövergrepp, begångna av 26 okända barnförövare (alla män). Dessa brott begicks mellan år 2000–2005, och offren var både flickor och pojkar. Resultaten analyserades bland annat med hjälp av *multidimensional scaling* (MDS), en metod som på ett överskådligt sätt kan visa samband och relationer mellan olika variabler.

Resultaten visade att majoriteten av gärningsmännen begick sina brott i eller i närheten av sina hem. I alla de fall där brotten skedde i gärningsmannens hem, använde han sig av mutor för att locka till sig barnen. Det vanligaste lockbetet var pengar, som erbjöds i utbyte av sexuella tjänster. En annan strategi som var vanlig bland gärningsmännen var att de uppträdde vänligt mot offret, ofta tog de kontakt genom att gå fram och fråga om något (t.ex. vägbeskrivning). Vissa gärningsmän fick tidigare offer att rekrytera nya offer via skolan, genom att erbjuda pengar.

Vidare visade resultaten att våld endast användes i fem av de 70 fallen, vilket kanske kan förklaras av tidigare studiers resultat att våldet ökar med avståndet från

hemmet. Den vanligaste sexuella handling som utfördes i studie I var beröring, utanpå eller innanför kläderna av offret, så som smekningar och kel. Ett intressant resultat var att de gärningsmän som hade egna barn, utförde mindre allvarliga handlingar så som smek och kel, medan de som inte hade egna barn begick grövre brott som oralsex eller masturbation. Intressant var också att ju äldre gärningsman, desto yngre var offret.

Studie II

Människor har så kallade mentala (kognitiva) kartor över vår omgivning. Dessa kartor representerar våra dagliga rutiner och i takt med att vi får ny information så ändras de över tid (Canter & Youngs, 2008a; Godwin, 2001; Kitchin, 1994). Om två personer ombeds rita varsin karta över samma by, så skulle de se olika ut på grund av att alla människor har sin egna, unika bild av sin omgivning. Dessa spatiala funktioner har en väsentlig roll i forskningen om kriminellas spatiala beteende, då de kan ge hänvisningar om var en gärningsman bor eller till och med var nästa brott är sannolikt att ske, och sambandet mellan dessa (Canter, 2003; Canter & Youngs, 2008a, b).

Forskare (t.ex. Beauregard et al., 2007) hävdar ett behov av mer forskning på sexualbrottslingars geografiska beteende. Framförallt behövs mer forskning på sambandet mellan deras kriminella och geografiska beteende, för att man på så vis ska kunna utveckla nya utredningsmetoder att jobba efter inom polisen (Beauregard, Proulx, Rossmo, Leclerc & Allaire, 2007).

Spatialt beteende hos kriminella ligger till grund för det som kallas geografisk gärningsmannaprofilering och de speciellt framtagna dataprogram som används vid denna typ av profilering. Vid geografisk gärningsmannaprofilering, analyserar man avstånden mellan brottplatserna och en möjlig plats för gärningsmannens hem eller bas, för att hitta spatiala medelvärden och standardavstånd mellan dessa platser. Detta gör man för att kunna se var det är mest sannolikt att nästa brott sker och var det är mest sannolikt att gärningsmannen bor eller har sin bas/utgångspunkt (Canter, 2003; Levine, 2002; Rossmo, 2000). Om man därtill kombinerar den kunskapen med fakta om hur det geografiska området faktiskt ser ut (t.ex. var sjöar ligger, var vägar finns, närhet till motorvägar etc.), så får man ännu bättre och mer relevanta resultat.

De flesta studier som hittills gjorts inom geografisk gärningsmannaprofilering har utförts på brott med fysiska brottsplatser, det vill säga brott där det har skett en interaktion mellan gärningsman och offer. Så vitt jag vet har endast en studie

utförts på ett fall med en icke-fysisk brottsplats, ett fall av obscena telefonsamtal till kvinnor i England (Canter, 2003). Det behövs mer forskning på detta, vilket ledde till att jag i studie II undersökte ett fall av obscena telefonsamtal till barn, vilket kan klassas som ett icke-fysiskt brott då det inte skett en fysisk kontakt mellan gärningsman och offer. Gärningsmannen var en man i 30-års åldern och han ringde obscena samtal till 86 barn under år 1999–2000. Mannen var vänlig i telefonen och utgav sig för att göra en undersökning om barn- och ungdomars sexliv, på uppdrag av ett universitet. Han fann de flesta telefonnumren via tidningsannonser, framförallt annonser om barncyklar till salu.

Som nämndes ovan har det utvecklats flera olika avancerade dataprogram som ska främja bearbetningen av spatiala data vid geografisk gärningsmanna-profilering. I studie II valde jag att använda Dragnet (utvecklat vid the Centre for Investigative Psychology vid Liverpools universitet av Canter et al., 2000), där syftet var att se om programmet kunde vara lika effektivt i ett fall av ett icke-fysiskt brott, som det visat sig vara vid fysiska brott (Bernasco, 2007; Canter & Hammond, 2006; Canter et al., 2000), och i ett fall av obscena telefonsamtal (Canter, 2003). Grundprincipen med Dragnet är att programmet beräknar var det är mest sannolikt att en gärningsman har sitt hem/bas, och det producerar en sannolikhetskarta med ringar i olika färger för att indikera detta. Rött markerar den innersta cirkeln, där det är mest sannolikt att gärningsmannen bor, sedan rosa, ljusgrönt etc., och ett ”H” som markerar hemmet om man vet det på förhand. Adresserna från alla 86 barn och gärningsmannen, omvandlades till koordinater (baserat på longitud och latitud) och analyserna gjordes i Dragnet.

Resultaten visade att Dragnet kunde förutspå i vilket område mannen bodde (i detta fall var det känt vilken adress han hade när analyserna gjordes, då fallet var löst). Dragnet placerade mannens hem i den näst innersta cirkeln (rosa), vilket innebär det område med näst störst sannolikhet att innehålla hans hem/bas. Detta resultat indikerar att Dragnet kan användas även i fall med icke-fysiska brottsplatser. Datan delades även in i tidsperioder, efter när mannen gjort samtalen (jan–jul 1999, aug–dec 1999, jan–jul 2000 och aug–dec 2000). Enligt Dragnets analyser visade det sig att mannen börjat ringa barn i närheten av sitt hem för att därefter ringa barn längre ifrån, och slutligen i slutet av 2000, börja ringa barn alldeles i närheten av sitt hem igen. Dessa resultat indikerar att det kan vara användbart att använda ett dataprogram, som Dragnet, vid olika typer av brott för att hantera en större mängd data och få en överskådlig bild av var man eventuellt kan påbörja sökandet av en gärningsman. En sök-kostnads analys (ett

index baserat på de proportioner av området som måste genomsökas för att hitta gärningsmannens hem/bas) gjordes också, vilket visade att endast 6 % av hela sökområdet behövde sökas igenom för att finna gärningsmannens bas/hem.

Studie III

Forskning på barns vittnesminne har sitt fokus på själva frågeformatet, alltså *hur* man ska fråga för att få fram så mycket korrekt information som möjligt. Studier har visat att barn är känsliga för suggestibilitet och det är därför som frågeformatet är viktigt vid intervjuer med barn (Lamb et al., 2003; Pezdek & Roe, 1997; Quas & Schaaf, 2002; Quas et al., 2007). De två frågeformat som är mest diskuterade inom intervjutekniker för barn är fri återgivning (där barnet fritt får återge från minnet med egna ord) och fokuserade frågor (frågor som ofta innehåller två svarsalternativ, som till exempel ja/nej eller blå/röd).

Tidigare forskning har visat att både barn och vuxna tenderar att ha en övertro till vad de minns, det vill säga att de tenderar tro att de har fler korrekta svar än de faktiskt har. Detta fenomen kallas för överkonfidens. Motsatsen kallas för underkonfidens, och innebär att man tenderar tro att man har fler fel/misstag än man faktiskt har (Allwood et al., 2006; Juslin et al., 1996). Ett exempel på detta är att om man tror man har 100 % rätt på alla sina svar, och det visar sig att man faktiskt har alla rätt, då uppvisar man det som kallas för perfekt realism (man har en realistisk uppfattning om sin minnesförmåga).

Den vanligaste metoden för att studera barns vittnesminne, är att visa en videofilm som de sedan får återge vid ett senare tillfälle (t.ex. Ackil & Zaragoza, 1995, 1998; Roebers & Schneider, 2000). Det har debatterats om det är en bra metod för att spegla verkliga händelser, men av etiska, praktiska och metodologiska skäl så anses det som en användbar metod. Dessutom kan ett barn komma över barnpornografiskt material, som oftast finns i form av videofilmer eller bilder.

I studie III fick deltagarna (8-9 åringar, 12-13 åringar och vuxna) se en film som hade ett tema av en klassisk barnförövar strategi, nämligen en man som går omkring i en park och letar efter sin försvunna hund (detta är en strategi många barnförövare har använt sig av för att kunna lura med sig barn). Mannen i filmen frågar både barn och vuxna som befinner sig i parken om de sett hans hund. Av etiska skäl kunde mannen i videon inte lura med sig ett av barnen. Syftet med filmen var att se om barnen kunde minnas hur mannen såg ut, vad han hade på sig och liknande.

Proceduren för experimentet var som följer: barnen såg filmen (ca 4 min), en vecka efter det fick de göra enskilda intervjuer med fri återgivning (berätta med egna ord allt de mindes om filmens innehåll) och efter det fick de fylla i en enkät med frågor om filmen med två svarsalternativ per fråga (t.ex. Vilken färg hade mannens tröja? Röd/Blå). Svaren från intervjun och enkäten transkriberades över på ett nytt formulär under en veckas tid och med på det nya formuläret fanns en konfidensbedömningsskala som gick från 0–100 %. Femtio procent innebär att man gissat, 100 % betyder man är helt säker på att svaret är korrekt och 0 % betyder man är helt säker på att svaret är fel. En vecka efter att intervjun/enkäten fick varje barn två nya individuella formulär med deras svar från föregående vecka, nu med konfidensbedömningsskalan under varje svar. De fick klassa alla svar enligt den skalan.

Svaren analyserades sedan med kalibreringsmått, en typ av mått som mäter relationen mellan konfidensbedömning och korrekthet i varje svar. Perfekt kalibrering uppnås om man har en korrekthetsnivå på 70 % och har bedömt varje svar med 70 % konfidens.

Resultaten i studie III visade att den yngsta åldersgruppen visade perfekt realism (d.v.s. ingen överkonfidens) i deras konfidensbedömningar vid fri återgivning. De yngsta barnen visade sig ha nästintill lika hög korrekthet som de vuxna vid fri återgivning, men de hade mindre kompletta svar än de vuxna. Alla tre åldersgrupper visade sämre realism för de fokuserade frågorna (enkäten). Resultaten indikerar att barn så unga som 8-9 åringar kan vara likvärdiga vittnen till vuxna vid fri återgivning, i alla fall vid fri återgivning av händelsen.

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Study I

I

Modus Operandi and Spatial Behaviour of a Random Sample of Non-Familial Child Molesters in Sweden

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Abstract

More knowledge about how child molesters choose their victims and commit their crimes is needed. This is especially true for cases where the offender is unknown to the victim (e.g. non-familial). The present study was exploratory and had two objectives. The first was to describe the characteristics, such as the modus operandi (MO), of Swedish non-familial child molesters. The second was to explore the spatial (geographical) patterns of their offences, and also the relationship between the results for the two objectives. Seventy cases of child molestation, committed by 26 different child molesters, were collected from the police's archives. The offences took place during the period 2000–2005. The results showed that the mean travelling distance from home base was 5.8 km for those child molesters who did travel. However, in the majority of the cases the crimes were committed at the offender's home, to which the victims had been lured by the offender or recruited by other victims. Child molesters who had children of their own committed less serious actions (e.g. fondling, kisses and hugs) and those who did not have children of their own committed more severe actions (e.g. oral sex).

Keywords: Modus operandi, spatial behaviour, non-familial child molesters

Modus Operandi and Spatial Behaviour of a Random Sample of Non-Familial Child Molesters in Sweden

"The belief in a supernatural source of evil is not necessary; men alone are quite capable of every wickedness" (Joseph Conrad, 1911, p. 113).

To see daily proof of human evil all we have to do is turn on the TV or open up a newspaper. Child sexual abuse is perhaps one of the worst kinds of evil that is displayed in media, and is a horrific crime that is part of almost all societies today.

The knowledge about how child molesters choose their victims and commit their crimes is still an area that needs further research. This is especially true when it comes to cases where the offender is unknown to the victim, such as when the offender is not a family member or a relative. There is research on modus operandi (MO) regarding homicide, arson, sexual crimes (against adults) and so forth (e.g., Canter, 2000b; Hazelwood & Warren, 2002; Ressler, Burgess & Douglas, 1988; Rossmo, 2000; Santtila, Häkkänen, Canter, & Elfgren, 2003), but when it comes to MO and sexual assault on children the research is sparse. This report will take a geographical approach and explore the MO of Swedish child molesters, during the years 2000–2005. By a geographical approach we refer to the offenders' MO and especially their spatial behaviours will be studied. The spatial patterns of child molesters is also an area which needs more research, since potential results could help the police in their investigations and search for suspects.

Since the spatial patterns of offenders are of particular interest for this study, a brief summary of the theories of criminal spatial behaviour and cognitive maps to date will be presented. Second, a section on research and theories on MO and criminal spatial behaviour will follow. Finally, current research on child molesters´ MO and spatial behaviour will be described.

Criminal Spatial Behaviour and Cognitive Maps

Brantigham and Brantigham (1993a) note that "crime is a part of our way of living" (p. 22). All humans have a spatial behaviour, which are the patterns we use in our movements in the environment. The spatial behaviour of a probable offender could be determined from information of the crime site location/-s, as

well as the geographic connections (e.g., the offender's house, the victim's house, bus lines etc.) and the characteristics and demography of the surrounding neighbourhoods (Canter, 2000a). Most people have some kind of home base, which is the geographical area around our homes. We use this area more regularly than areas that are farther away (Canter, 2000b; Godwin, 2001). Examples of components of the home base could be a workplace, shopping area, friends' homes or leisure areas.

All people have cognitive maps, which are mental representations over what and where something is possible in the neighbourhood around us. These maps represent our daily routine patterns and social interactions, thus they change over time as we get new information (Godwin, 2001). According to Brantigham and Brantigham (1993a, b) cognitive maps consist of the subjective images of the environment, which in turn are crucial for the criminal in determining the places where the crime could be carried out. These spatial perspectives have important functions when it comes to geographical behaviour linked to crimes, such as directing attention to where the offender lives and where the crime scene is, and perhaps most importantly the relation between these places (Canter, 2003; Godwin, 2001; Rossmo, 2000). Research has shown that the properties of cognitive maps change depending on the characteristics of an individual (Brantigham & Brantigham, 1993a, b) and that cognitive maps are influenced by the relationship between offender characteristics and criminal mobility (i.e., how the offender moves in his surroundings) (Beauregard, Proulx & Rossmo, 2005).

Canter (2000a) concluded that locating where the offender lives is the cornerstone of any detective work and can provide the essential details from which the offender's identity can be known. For example, Davies and Dale (1995) found in their study on 79 stranger rapists that younger men tended to commit crimes close to home. Rapists 26 years of age or younger were within 2.9 km (1.8 miles) of their home base. Warren, Reboussin, Hazelwood, Cummings, Gibbs and Trumbetta (1998) found similar results in their study on 108 serial rapists. Rapists 20 years of age or older travelled farther than younger ones. Warren et al. suggest that the difference could reflect that younger offenders are more impulsive or that they do not have the same access to vehicles as older offenders have, or it may be due to a difference in the development of spatial behaviour.

Canter (Canter 2000a; 2003; Canter & Gregory, 1994) proposed two models for classifying offenders due to their criminal travelling styles. They are called marauder style and the commuter style and represent broad definitions of spatial

characteristics. The marauder style proposes that the offender uses his home as a base, to which he returns after each crime committed. In cases of marauder style offenders it is possible to calculate where the offenders' home is (often in the centre of the circle of the crimes), since they tend to use this as a fixed base, given that one knows the location of their crimes. The commuter style proposes that the offender travels from his home to an area where he commits his crimes, and then returns to the home area. With commuter style offenders it is more difficult to model the location of their home since they travel from somewhere outside of the crime area (Canter 2000a). Furthermore, there are similarities in the spatial behaviour between people's daily activities and the marauder style offenders (i.e., we travel within close range of our homes). The research on these two styles has mostly been done on rapists (e.g., Canter & Gregory, 1994).

There are three main theoretical models which outline the ground work of geographical behaviour of criminals (Beauregard et al., 2005). The first is *routine activity theory* which has its emphasis on the daily activities of offenders and potential victims (Beauregard et al., 2005.; Cohen & Felson, 1979). These activities include identifying where to find a suitable victim, where a "good" crime scene would be (e.g., if it is easy to get away without detection). Brantigham and Brantigham (1993a) argue that most offenders choose to commit their crimes near their usual major pathways, but they will explore the vicinity around those paths as well. Thus, the exploration seems to be somewhat limited to places that are known or easy to access.

The second theory is the *rational choice approach*, which has an emphasis on the adaptive nature of human behaviour, such as interactions and transactions between people (Beauregard et al., 2005; Clarke & Cornish, 1985). This theory suggests that there is a decision to be made in every step of the crime process. Beauregard et al. (2005) uses date-rape as an example, where the decision to commit a rape only arises in the heat of the moment when the victim refuses to go along with the demands to engage in sexual contact. The main differences between routine activity theory and rational choice, is that routine activity deals with the ecological context to a greater extent than rational choice. Basically, this means that a certain ecological context gives rise to more options from which choices are made (e.g., the focus is on the surroundings such as where a "good" crime site would be). Rational choice, however, focuses more on the content of the decisions *per se* (Beauregard et al., 2005; Felson, 1986).

The third theory is *crime pattern theory* which draws on of several research areas, such as rational choice, routine activity, environmental criminology, strategic analysis, life-style theory, hot spot analysis, crime prevention and opportunity theory (Beauregard et al., 2005; Brantigham & Brantigham, 1993b). This theory suggests that there are activity spaces, which is used to describe how offenders find their victims through the course of their daily routines. This could be likened with a triangle, where the offender could be going from home to work to recreation. The offender looks for criminal opportunities while he walks around these paths in his daily life. Offenders usually stay in the vicinity of their paths, in their triangle, but they tend to have a buffer zone where they do not commit crimes due to recognition risks. The whole purpose of this approach for the offender is that it is much easier to commit crimes during their daily routines than by making a special journey to commit these crimes (Brantigham & Brantigham, 1993b).

Criminal Spatial Behaviour and MO

Brantigham and Brantigham (1993a) argue that a crime site is sought by the offender from the premises that it feels "comfortable" to the offender. This is based on the notion of learned characteristics of what a "good" crime site would be. The offender is then assumed to search for a potential victim within that crime site and wait for the right situation to come along. Brantigham and Brantigham argue that this search process is not random, thus it seems to involve searching for potential victims close to the offender's usual travel paths, which are between the routine activity places like the home, workplace or leisure locations.

Offenders spend most part of their time conducting non-criminal activities. Thus, a criminal is most likely to know a city or an area from legitimate routine activities, and in most cases they seem to stay in these areas even when they commit crimes (Brantigham and Brantigham, 1993a). There seems to be no difference between criminals and other people's ways of learning pathways and how we create mental maps of our surroundings.

How we learn the pathways of a place and how cognitive maps are developed, and the relationship between perception, cognition and behaviour are important and more research is needed within these areas. Furthermore, how this knowledge changes due to age, socioeconomic or cultural background, and how these cognitive representations can influence the behaviour and spatial choices of criminals are also important topics (Brantigham & Brantigham, 1993a).

According to Beauregard et al. (2005) there are a lack of research regarding the relationship between the distances travelled and the MO of offenders, especially regarding sexual offenders. Canter and Gregory (1994) conducted a study on forty-five serial rapists and their crime trip distances. They found that rapes that occurred outdoors were 2.7 times farther away from the home base than rapes committed indoors. Furthermore, there was a 2.6 times greater chance that they would travel farther than 0.8 km (0.5 miles) to commit each crime when the crime was committed outdoors. In Davies and Dale's (1995) study, mentioned above, on 79 stranger rapists and their spatial behaviour, they found that the majority of rapists travelled less than 8 kilometres (5 miles) to commit their crimes.

Child Molesters' MO and Spatial Behaviour

The spatial and temporal behaviour of ten pedophiles in treatment was studied by Ouimet and Proulx (1994). The result suggested that most child molesters offend near their homes. The same conclusion has been reached about other crimes like burglary or robbery (Beauregard et al., 2005). However, there is a different explanation as to why this holds in the case of child molestation. Beauregard et al. argue that it appears that the home of the child molester is the best possible location to commit their crimes, because it holds several advantages over other locations. Such advantages are that, the child might feel more secure in a home setting and thus more easily persuaded to engage in sexual activities.

Studies on spatial behaviour of pedophiles, have found a high risk of recidivism for offenders whose routine activities occurred around places with children, such as schools, parks and playgrounds (Ouimet and Proulx, 1994). Beauregard et al. (2005) argue that the factors mentioned above (see the advantages) might explain why most child molesters are looking for children nearby their homes. This phenomenon might also be explained by distance decay pattern, or the least-effort principle, which states that an individual, who faces several possibilities to do something, is most likely to choose the one requirering the least effort (Canter, 2003; Rossmo, 2000).

Beauregard et al. (2005) found a positive relationship between the level of violence used and the distance travelled from the home of the offender to the victim. They argue that this could be explained by the fact that many children are unwilling to get into a car with a stranger, and it would be easier for the offender to lure his victim home if the child also lives nearby. If the child molester has to

travel a distance to find a target, he might be compelled to use more violence than he would need close to home, thus an attack away from the home base needs to be swift and more direct, perhaps more ambush style, which in turn might lead to increasing the violence of the crime.

Child molesters are excellent manipulators and very good at keeping the victim from telling anyone about what has happened (Leclerc, Proulx and McKibben, 2005; Proulx & Ouimet, 1995). Proulx & Ouimet (1995) conducted a study on the rational choices of pedophiles and from their results they identified a four step choice-model. (1) The pedophile chooses his hunting ground (i.e., areas or places where there is likely to be potential victims), such as the offender's home, workplace, victim's home or parks etc. (2) The offender next chooses what time he should commit his crimes (e.g., children are not out alone at night). (3) Next a target selection has to be made, which is usually based on the pedophile's sexual preferences (e.g., age, gender of the victim), as well as how vulnerable the victim is. (4) Finally, the offender will choose an approach strategy (i.e., how to make contact and then proceed to initiate sexual actions). The most common strategies used by pedophiles are manipulation, threats, seduction and bribes (such as money). This four step choice-model is a good example of the rational choice approach, since every step or decision involves a risk assessment, as to what consequences each choice would generate (Beauregard et al., 2005). Singer, Hussey and Strom (1992) calls these different strategies used by a child molester, grooming, in which the whole purpose of the grooming is to seduce the child.

Elliott, Browne and Kilcoyne (1995) report that little research has been done on how child molesters target children and on how they maintain them as victims (in the cases of repeated crimes). In their interview study on 91 child molesters, the offenders were asked questions about these issues (e.g., how they would choose a victim, the age-range, how they maintained the children as victims). Note that the percentages may add up to more than 100, this is due to multiple responses. The result showed that 34 % of the offenders were strangers to their victims. Forty-two per cent of the offenders said that it was important that the child they chose was pretty. Thirty-five per cent of the offenders frequently visited places with a high number of children (e.g., schools, amusement parks, parks, playgrounds or beaches). Fourteen per cent were opportunistic, that is they took the chance when it appeared (e.g., a child approached with a question). Eighteen per cent of the offenders in the study said they tried to 'recruit' new victims by having their current victims bring new children home. The recruitment consisted

of encouraging by giving bribes and gifts or, the opposite, such as threats to the newly recruited victims. Furthermore, the results showed that 61 % of the sexual abuse occurred in the offender's home and in 49 % of the cases it took place in the victim's home (the offenders used more than one location to commit their crimes). The offenders were less likely to commit the abuse in a friend's home (13 %), or close to the offender's home (6 %) or in a car (4 %). Forty-six per cent of the offenders said they offered gifts, bribes or offered to drive them home as a strategy to approach the victim. Offenders told their victims not to tell what had happened (33 %), and used threats of retaliation (24 %).

Kaufman, Holmberg, Orts, McCrady, Rotzien, Daleiden et al. (1998) found that intrafamilial (i.e., within family/relatives) offenders used bribes and/or threats more frequently to get the victim to comply with sexual activities. Non-familial offenders used alcohol and drugs to gain the victims´ compliance significantly more than intrafamilial offenders did. Girls are more often victims of intrafamilial abuse than boys (Fischer & McDonald, 1998; Tseng & Schwarzin, 1990). In their study on 556 sexually assaulted children, DeJong, Hervada and Emmett (1983), found that of the victims assaulted, boys were more likely to be assaulted by strangers than girls (50 % vs. 46 %) or acquaintances (35 % vs. 29 %). Research has also shown that, in general, younger children are more likely to be intrafamilial victims, in contrast to older children who more often are victims of non-familial abuse (Fischer & McDonald, 1998). The preference for boys among child molesters could be shown from the interesting findings by Abel (1989), who interviewed 453 child molesters during a period of 8 years. Abel's studies showed that 62 per cent of the offences (touching in this case) were committed on boys, whilst it only occurred to girls in 38 per cent of the cases. The most interesting about this finding was that of the 453 child molesters, 162 had molested boys and the rest had molested girls.

Beauregard et al. (2005) stressed the fact that studies that focuses on the relationship between MO characteristics and the distances travelled by sex offenders are of great value and importance, both in terms of models of criminal spatial behaviour and on terms of an integration of psychological and also geographical profiling. The present study was exploratory and had two objectives. The first objective was to describe the characteristics, such as the MO, of Swedish non-familial child molesters. The second was to explore the spatial (geographical) patterns of these offenders, and also the relationship between the two objectives.

Method

Subjects and Case Selection

The police in the south of Sweden was contacted and 160 randomly selected cases of non-familial child sexual abuse cases were requested. The inclusion criteria were that the offenders were not familial to the victims and that the age of the victims should be 15 years of age or younger, and also that the case had led to prosecution in a Swedish court. After reviewing the selected cases, eighty-seven were excluded due to the fact that there was a familial connection after all (e.g., stepfather), which might be explained by that the coding of the crimes had been faulty. In addition, one case took place on international waters and two cases were telephone based crimes (e.g., the offender called the victims and asked questions containing sexual content). These were excluded because they did not match the rest of the sample. This resulted in 70 cases committed by 26 different child molesters, where the offences took place during the period 2000–2005.

The definition of child sexual abuse in the present study follows the Swedish legislation, which defines child sexual abuse as penetration (vaginally or anally), sexual fondling or any other sexual act carried out by an adult on a child (15 years of age or younger), under threat, violence or by persuasion to get the child to participate in this kind of actions.

In all cases, the offender was male. The victims were girls in 48 cases and boys in 22. The mean age of the offenders was (n = 26) 42.3 years (SD = 10.9), the age ranged from 23–65. The mean age of the victims (n = 70) was 11.7 years old (SD = 2.5), the age ranged from 5–15.

The mean number of series per offender was 2.7 (i.e., one offender committed on average 2.7 crimes in a series). Twenty-two of the 26 offenders committed between one to three crimes. One offender had as many as ten in his series. Since this is an exploratory study, the material did not only include serial cases, because cases with one crime could provide useful information as well.

Materials and Content Analysis of Cases

The case files collected from the police's archives contained a description of events as recorded by the police, a record of the victim's interview, and in some cases the suspect's interrogation. In addition, some case files contained witness

statements, records of possible forensic evidence, transcripts from line-ups, and a statement by a medical examiner or a psychologist.

An instrument was created to collect the information from the police protocols. The instrument had the form of a questionnaire. There were a total number of 64 variables in the instrument. Eight variables were later removed from the instrument, due to irrelevance or that there were no such information to be gathered from the protocols. The instrument was filled out like a questionnaire with both boxes to tick off (e.g., a question, such as in what kind of area did the crime occur, followed by examples, like shopping area, industrial site, school etc.) as well as free line spacing, where additional information could be filled in.

Furthermore, demographical information was also collected on both the victim and offender. The predetermined variables were chosen and based on previous research on MO in sexual crimes, such as rape, and research on the spatial behaviour of child molesters (see Beauregard et al., 2005; Canter, Bennell, Alison & Reddy, 2003; Leclerc, Proulx & McKibben, 2005; Ouimet & Proulx, 1994). The variables included reflected the crime scene behaviours of the offenders (e.g., what did the offender do to the victim, where and for how long), offender characteristics (e.g., demographics, such as age, living condition, marital status, address), information about the victim (e.g., age, gender, what the victim was doing at the time of the offence, address) and other circumstances (e.g., what did the offender do to lure the victim to him, to get the victim to comply with sexual activities). The information was then collected by reviewing and reading the protocols thoroughly and filling out an instrument per case. Each victim became a case of its own; even if the crime was committed by the same offender. In order to ensure confidentiality no identifying information of the offenders or victims was used in the analyses. The addresses used were recoded into numbers so that identification was not possible.

The calculated distances in the MDS analyses, was derived from the kilometres between the offender's home and the crime scene/-s.

Statistical Analysis of Variables

Multidimensional scaling (MDS) analyses were used to analyse the relations between the different objects and explore possible underlying structures among these objects. MDS can also be called perceptual mapping and is a method that could make the data easier to interpret for the researcher. This is done with a graphical plot which shows the variables as dots on a spatial area (known as

'maps'), where the distance between dots represents the similarity of the variables (Hair, Black, Babin, Anderson & Tatham, 2006; Tabachnik & Fidell, 2001). The choice of using MDS rather than factor analysis or cluster analysis, was based on two aspects, (1) it is possible to get a solution for each individual and (2) it does not use a variate but instead a perceptual map (Hair et al., 2006). Hair et al. simplifies the latter by saying "it is like providing the dependent variable (similarity among objects) and figuring out what the independent variables (perceptual dimensions) must be" (p. 638).

Kruskal's stress is applied to calculate the Goodness of fit in the configurations derived from the MDS analyses. Kruskal´s stress measures how well the configuration or dimensionality fits the data, a good fit is considered to range between 0 and 0.15 (Stalans, 1998).The RSQ (*R* squared) which measures how good the relationship is between the dependent and the criterion variable (i.e., the relationship between the variables in the data), and it states that the better the relationship, the closer to 1 it is (Stalans, ibid.). The MDS configurations calculated in this study were all conducted with Euclidian distances with two dimensions in the solutions.

Results

In 31 of the 70 cases (44.3 %) the offender used bribes to lure the victim to comply. The most common bribe (64.5 %) was offering money for sexual favours. In thirteen (18.6 %) of the cases the offender acted kindly towards the victim (e.g., being friendly) and in another 13 cases (18.6 %) the offender asked for something (e.g., directions). Other ways to get into contact with or approach the 70 children were via Internet (5.7 %), snuggling up to the children (4.3 %), verbal threats (2.9 %), seizing the child (1.4 %) together with some complex behaviour (4.3 %) that did not fit into a single category.

Violence only occurred in 5 (7 %) of the 70 cases and the victims were four girls and one boy. By violence is meant physical harm caused by punches, kicks, strangulation or any other type of brutal force to get the victim to comply. There was a significant negative relationship between offenders who travelled farther than 7 km and violence used (r_s = -.42, p = < .00).

The most common criminal action done by the offenders was touching such as caressing and fondling outside the victim's clothes and/or attempts to get under the clothes, which occurred in 47 (67 %) of the cases (sometimes in combination with other activities, e.g., oral sex). Proportionally, girls were

significant more often subjected to touching compared with boys, χ^2 (1, N = 70) = 5.37, p = < .05. Other kind of actions than touching did not significantly differ in proportionality between boys and girls. In 11 (16 %) cases the offender masturbated in front of the victim, in five cases (7 %) the victim was coerced to touch the offender's genitals, and in another five (7 %) the offender touched the victim's genitals. Oral sex was performed on four victims (6 %) and in three additional cases there were oral sex on both victim and offender (4 %). In five cases (7 %) there was a full vaginal penetration.

One interesting finding was the negative relationship between the offender's age and the victim's age, which indicates that the older the offender, the younger the victim is (r = -.32, p< .00).

At the prospect of Multidimensional scaling (MDS) analyses of the victims' gender and the behaviour of the perpetrator, a cross tabulation with chi-square tests with Yate' correction for continuity was conducted (Table. 1). The chi-square tests showed significantly that perpetrators who had children of their own proportionally more often contacted girl victims indoors whereas perpetrators without children of their own contacted girls outdoors. Regarding the crime scene indoors or outdoors, there was no difference in the proportional distribution between girls and boys but those perpetrators who had their own children offended children significantly more often indoors than those offenders that had no children of their own did. Perpetrators lured boys more often by offering them bribes, and to lure girls, offenders usually behaved in a friendly way. Offenders without children of their own approached the child victims by asking for help.

The chi-square tests also revealed that proportionally, more girls than boys were subjected to touching and boys were more often forced to touch the offender. Regarding masturbation, touching genitals, oral sex, kissing and sexual penetration chi-square tests did not show any significant proportional differences. However, only girls were subjected to sexual penetration.

Two ALSCAL (MDS) analyses were made with the victim's age, the victims gender (boys and girls), how the offender made contact with the victim, where the contact was made (indoors and outdoors) and where the crime scene was (indoors and outdoors) as well as what kind of actions the offender committed and if the offender was a father himself, to see the relationships between these variables more clearly (see Figure 1).

Table 1.*The proportional distribution of perpetrators' actions and Chi-square test with Yate' correction for continuity regarding the victims' gender (Vgirl/Vboy) and whether the perpetrator was a father or not with own children (PFather/PnoFather). N = 70 (df = 1).*

Behaviour	Vgirl/ Vboy		PFather/PnoFather	
	N (valid cases)	χ^2	*N* (valid cases)	χ^2
Contact indoors	19/18 (62)	5.59**	19/18 (62)	3.57*
Contact outdoors	21/4 (62)	5.59**	6/19 (62)	3.57*
Crime scene indoors	25/18 (64)	2.32	21/22 (64)	5.79*
Crime scene outdoors	17/4 (64)	2.32	3/18 (64)	5.79*
PusedBribes[a]	12/19 (70)	20.60**	14/17 (70)	0.98
PbehKindly[b]	13/0 (70)	5.64*	8/5 (70)	2.88
PaskedHelp[c]	12/1 (70)	2.93	1/12 (70)	4.48*
PTouchV[d]	28/19 (70)	4.18*	16/31 (70)	0.25
VtouchP[e]	0/6 (70)	11.05**	0/6 (70)	2.33
PMasturbate[f]	6/5 (70)	0.54	5/6 (70)	0.08
VMasturbateP[g]	3/2 (70)	0.00	1/4 (70)	0.12
PTouchVgenit[h]	2/3 (70)	0.86	1/4 (70)	0.12
PpenetrateV[i]	5/0 (70)	1.15	1/4 (70)	0.12
Oral sex	4/3 (70)	0.07	4/3 (70)	0.55
PKissCuddleV[j]	10/2 (70)	0.75	9/3 (70)	7.04**

Note. [a] = perpetrator used bribes, [b] = perpetrator behaved kindly, [c] = perpetrator asked for help, [d] = perpetrator touched the victim, [e] = the victim touched the perpetrator, [f] = perpetrator masturbated, [g] = the victim masturbated the perpetrator, [h] = perpetrator, [I] = perpetrator penetrated the victim, [j] = perpetrator kissed and cuddled the victim, * = p <.05, ** = <.01

The ALSCAL solution with girls did have a decent fit (R^2 = .92, stress = .14). The perceptual map (Figure 1) shows that the offenders had different strategies to make contact with the victims. The dimension 1 show that girls (Vgirls) tend to be contacted outdoors (contactoutdoors) and the crimes are committed outdoors (Cscneout). The contact approach used by the offenders in this study are asking for help or any other request (e.g., directions) (PaskedHelp), being kind and

friendly (PbehKindly) whereas offering bribes (PusedBribes) were somewhat less common behaviour towards girls. According to the actions revealed by the MDS, the crimes committed against girls seem to be clustered into two patterns; one pattern with more severe actions and one single action distanced from the other offence categories. In the negative orientation of dimension 1, the more severe offences consisted of a cluster of vaginal penetration, victims forced to masturbate the perpetrator, the perpetrator touched the victim's genitalia, oral sex, perpetrator masturbated and kisses and cuddle. The single action in the positive orientation of dimension 1, perpetrator touching the victim was found distanced from the cluster of more severe offences. The dimension 2 shows that approaching girls outdoors by asking for help or behave kindly are distanced from perpetrators who offering bribes when approaching girls. Thus, dimension 2 reveal two distinct patterns that offenders use to lure girl victims.

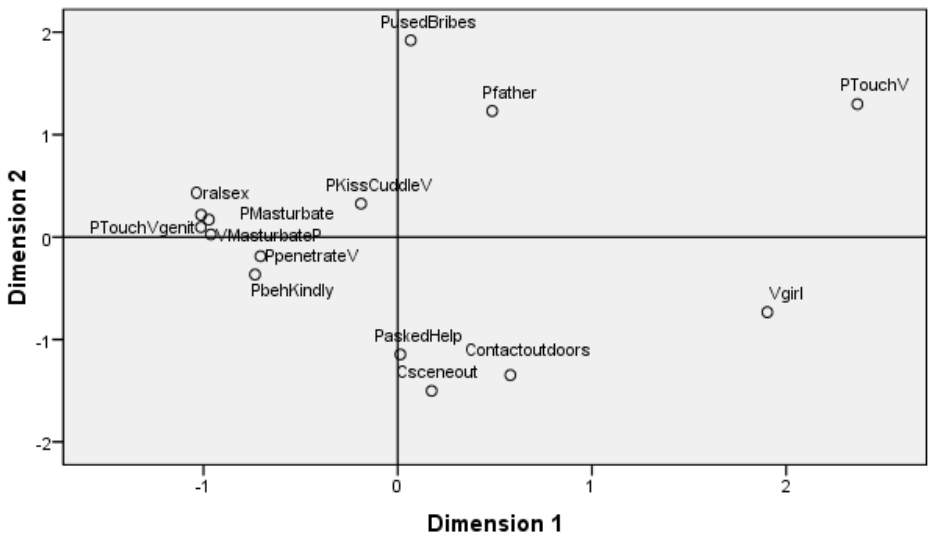

Figure 1. A perceptual map over how the offenders made contact with girl victims, meeting point, crime scene location, if the offender had children of his own and what kind of actions/crimes that were committed.

Regarding how offenders approach boys and what action these victims are subjected to, a second MDS was conducted which also had a decent fit (R^2 = .94, stress = .11). An inspection of figure 2 and its negative orientation of dimension 1 show that perpetrators tend to approach and abuse boys indoors (Contactindoors and Cscenein) and when approaching boys, offenders in this study used bribes to

lure the victims. In the same orientation, one single abusive behaviour of touching the victim (PTouchV) stands out distanced from a cluster of more severe offences. In this positive orientation, kisses and cuddles (PKissCuddleV) is somewhat distanced from the more tight cluster of offences as forced to oral sex (Oralsex), forcing victims to masturbate the offender (VMasturbateP), the perpetrator touched the victim's genitalia (PTouchVgenit), the perpetrator masturbated by himself (PMasturbate) and the victims were forced to touch the perpetrator (VtouchP). The dimension 2 in some meaning confirm that perpetrators used bribes when approaching boys and these perpetrators, in this study, tended not to be fathers with children of their own.
In the negative orientation of dimension 2 it further shows that boys, in this study, who are molested by offenders with no children of their own, tend to be molested by more serious actions (Fig. 2). These offences were such as being forced or coerced to touch the perpetrators' genitals (VtouchP), masturbation (PMasturbate & VMasturbateP), perpetrator touching the victim's genitalia (PtouchVgenit) and oral sex. The boys are approached and lured by bribes (i.e., money, gifts) or recruited by another victim. To illustrate how this recruitment works, a case example will be illustrated.

> One boy has been approached by the offender in a park, where the offender asked if he was interested in getting some cash in exchange for some sexual favours. The boy asked what kind of favours and the offender explained. Then the boy accepted and followed the offender home. After the incident he got paid as promised, and the offender asked if he knew any other boy that might be interested. The boy got offered more money to 'recruit' another boy. The following day at school the boy asked a friend if he wants to make some money and told what he needed to do to get the money. That boy accepted the offer and followed the first victim to the offender's home.

In brief and regarding boy victims, the map in figure 2 indicates that having children of ones own corresponds with less serious actions (e.g., fondling, kisses and hugs) and not having children of one's own corresponds with more severe actions (e.g., oral sex). An inspection of figure 1 shows a similar relationship for girl victims but somewhat distanced than for boys. In 31 (44 %) of the 70 cases, the crimes were committed at the offender's home. In 12 (17 %) cases the crimes were committed in parks or recreational areas. In 10 cases (14 %) the crime scene was at a residential area with schools in the vicinity. In 7 cases (10 %) the offender

committed his crimes at his workplace or near his workplace. In 6 cases (8 %) the crimes were committed at a shopping area and in 3 (4 %) cases the crimes were committed at the victim's house.

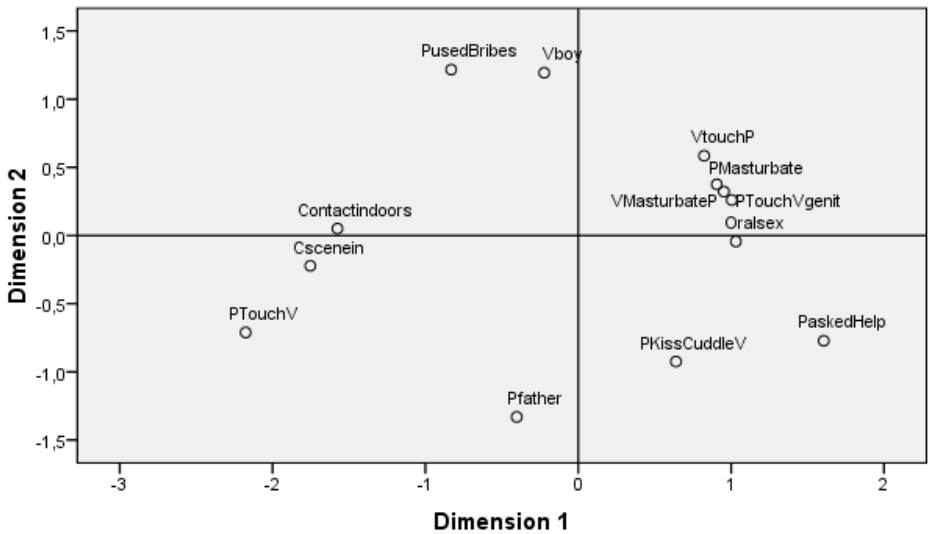

Figure 2. A perceptual map over how the offenders made contact with boy victims, meeting point, crime scene location, if the offender had children of his own and what kind of actions/crimes that were committed.

The mean travelling distance from the offender's home to the crime scene was 5.8 km. There were two outliers (i.e., two offenders that had travelled much farther than the others, 48.3 km and 46.6 km). When these two were removed from analysis the mean travelling distance became 4.6 km. However, the decision was made not to have them removed from the analyses because they could provide valuable forensic information. In 31 cases (44 %) offenders did not travel to commit crimes (i.e., at home). In nine cases (13 %) the offender travelled between 1–3 kilometres and in eighteen (25.7 %) of the cases the offender travelled 3–7 kilometres. In the remaining twelve cases (17 %) the offender travelled farther than 7 kilometres. Sixty (85.7 %) of the offenders lived in a city, three (4.3 %) lived in a suburb and seven (10 %) lived in a rural area.

Regarding the age of the victims and perpetrators as well as travelling distances and its relation to the victims' gender, a cross tabulation with chi-square

tests with Yate' correction for continuity was conducted (Table 2). According to the chi-square test, the proportional distribution of girls and boys were equally regarding the victims' age. Equal proportions were also found regarding the perpetrators' age with except for one group, and regarding distances between the perpetrators home or base and the crime scene. Offenders at the age between 40 and 49 proportionally molested more often boys in comparison to girls.

Table 2.*The proportional distribution of actions and Chi-square test with Yate' correction for continuity regarding the victims' gender (Vgirl/Vboy) related to the victims' age, perpetrators' age and distance between the perpetrators' home base and the crime scene . N = 70 (df = 1).*

	N Vgirls	*N* Vboys	Valid cases	χ^2
Victim's age 5 – 6	1	1	64	0.00
Victim's age 7 – 9	5	5	64	0.59
Victim's age 10 – 12	15	5	63	0.71
Victim's age 13 – 15	21	11	64	0.00
Perpetrators' age 20 – 29	7	0	70	2.13
Perpetrators' age 30 – 39	21	4	70	3.25
Perpetrators' age 40 – 49	7	13	70	12.54**
Perpetrators' age 50 – 59	10	4	70	0.00
Perpetrators' age 60 – 69	3	1	70	0.00
Km 0, Perpetrators' home	28	11	70	0.15
Km 05 to 3	9	3	70	0.34
Km 4 to 6	9	4	70	0.00
Km over 7	10	4	70	0.00

Note. ** = p <.01

Two other MDS analyses were made with the variables gender of the victims, victims' age, offenders' age and distances travelled between home base and crime scene. The solution for the first MDS with girl victims included, showed a not perfect fit with a R^2 = .85 and a stress = .19 (Fig. 3). The first dimension indicates a cluster where offenders in the age span 30–39 (Page3039) abuse girls at the age between ten and 12 (Vage1012), and that these perpetrators travel more than seven kilometres (Kmover7). Another cluster shows a tendency that girl victims between 13 and 15 years old (Vage1315) have been abused at the perpetrators

home (Km0Phome). Moreover, a third cluster indicate that the youngest offender group (Page2029) and the two oldest offender groups (Page5059 & Page6069) have abused the youngest girl victims (Vage56 & Vage79). The distance between these offenders' home base and their crime scenes varied between 0.5 to 6 kilometres (Km05to3 & Km4to6).

The MDS analysis regarding boys as crime victims (see Fig. 4), their and perpetrators' ages as well as travelling distances between the offender's home base and their corresponding crime scene, did not show a perfect fit ($R^2 = .81$, stress = .20). From the perspective of the first dimension, two clusters appear somewhat distanced from each other. In the positive orientation of this dimension, perpetrators in this study and at the age between 40 and 49, tended to abuse boys at the age between 13 and 15, and the crime scenes were the offenders' own homes. The other cluster appears in the negative orientation of dimension 1 and indicates that the offenders between 30 and 39, as well as 40 and 69 years old in the present study, have travelled between 0.5 to over seven kilometres to their crime scenes. The eleven boys abused were between the age of five and 12 years old. There were no perpetrators in the age group 20 to 29 who abused boys.

Moreover, offenders at the age between 30 and 39 appear as those who travelled the longest distance, seven or more kilometres, between their home base and crime scene.

Another MDS analysis (not shown) was made and the result showed that the investigated offenders aged 30–39 exclusively offended outdoors as well as made the first contact outdoors. Whilst the offenders aged 40–49 committed their crimes indoors. The other age groups (20–29, 50–59 and 60–69) were more versatile in their offending preferences of indoors vs. outdoors. One issue that could be important here is that those offenders that were married at the time of the crime/-s, committed their crimes outdoors, whilst the single offenders committed their crimes at their homes, indoors. This MDS analysis generated a perfect fit ($R^2 = .99$, stress = .00).

Furthermore, an additional MDS analysis (not shown) showed that it is the young teenage victims (ages 13–15) in the present study that got lured home to the offender, thus the crimes are committed indoors, and it is mostly boys, which also is in line with the orientation of dimension 1 in Figure 2 and 4. The younger victims in this exploration were offended outdoors, and are mostly girls ($R^2 = .95$, stress = .10).

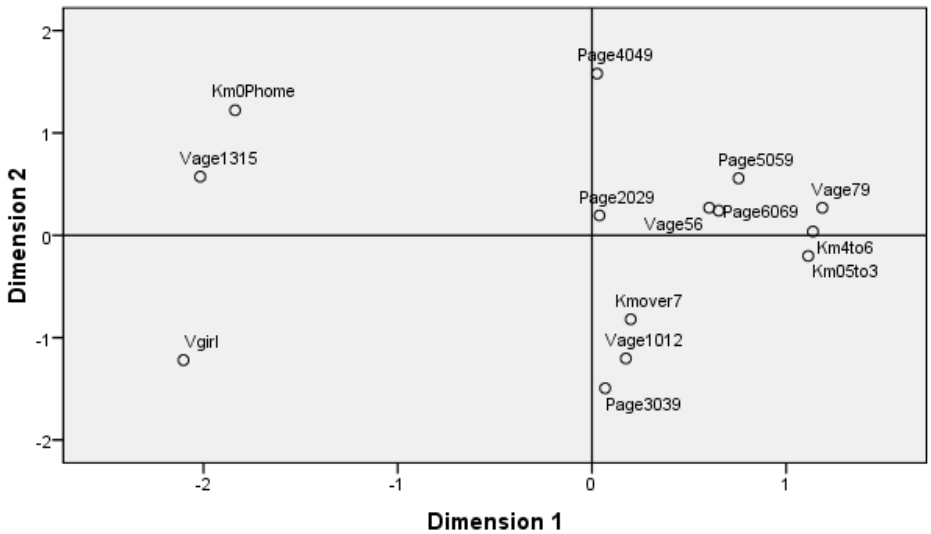

Figure 3. A perceptual map over the variables girl victims, victims' age (Vage…), offenders age (Page…) and distances travelled between home base and crime scene (Km…).

The offenders aged 20–29 years and vaginal penetration showed a significant relationship ($r_s = .46$, $p < .00$) as well as the offender touching the victims genital ($r_s = .27$, $p < .05$). This result suggest that the younger offenders in the present study were more interested in these kinds of actions, while the 40–49 year old offenders preferred to touch the victims body both with or without clothes ($r_s = .48$, $p < .00$). The four oldest offenders (age 60–69) were those who performed oral sex on their victims to the largest extent ($r_s = .47$, $p < .00$).

Correlation analyses were done to examine the relationship between the MO (i.e., what type of contact approach the offender used and what kinds of actions/crimes) and the spatial patterns used by the offender (i.e., how many kilometres he travelled and in what kind of area the crimes were committed). The results showed a significant association between perpetrators' kindly behaviour and conducting crimes at their home ($r_s = .39$, $p < .00$).

A significant negative relationship was also revealed, between offenders using bribes to lure their victims and the distance 0.5–3 km travelled to commit the crimes ($r_s = -.25$, $p < .05$). The latter indicates that those who committed crimes within this range did not use bribes as their primary strategy.

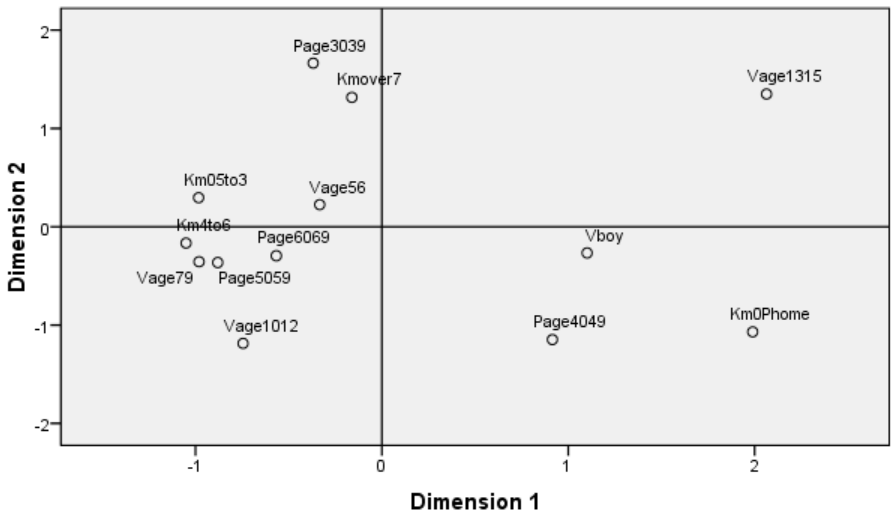

Figure 4. A perceptual map over the variables boy victims, victims' age (Vage…), offenders age (Page…) and distances travelled between home base and crime scene (Km…).

The analysis also showed a significant relationship between offenders who approached potential victims by asking for help and the distance 0.5–3 km travelled to commit crimes ($r_s = .47$, $p < .00$) as well as a negative association to conducting crime at the offenders' home ($r_s = -.43$, $p < .00$), which suggest that those offenders that commit crimes close to but not in their home/base used this strategy to contact victims. Furthermore, the analysis showed that those offenders that used the strategy to ask for help or directions, most frequented park- and leisure areas ($r_s = .37$, $p < .00$), and residential areas with schools close by ($r_s = .33$, $p < .00$). The offenders using the strategy of having earlier victims recruit new victims, did so most often at shopping areas ($r_s = .25$, $p < .05$).

The offenders who committed their crimes at their workplace travelled in general 4–6 km from their home ($r_s = .45$, $p < .00$). Those who committed their crimes in a residential- and school area travelled 0.5–3 km ($r_s = .25$, $p < .05$) as did those who committed crimes in a shopping area ($r_s = .27$, $p < .05$). Offenders who travelled farther than 7 km, were those who in a larger extent performed oral sex on their victims as well as coercing the victim to perform oral sex on the offender ($r_s = .25$, $p < .05$). The offenders who committed their crimes at their own home masturbated in front of the victim ($r_s = .32$, $p < .00$), coerced the victim to touch

the offenders body without clothes on (r_s = .34, p < .00) and made the victim touch the offenders genitals (r_s = .31, p < .00).

Discussion

The objectives for this exploratory study were two-fold. First, the aim was to describe the MO of Swedish non-familial child molesters. Second, the aim was to explore their spatial patterns as well as the relationship between the first and second objective.

The results showed that the offender's mean travelling distance was 5.8 km from their home base to the place of the crime. However, with the outliers removed from that analysis, the mean travelling distance was 4.6 km. This result indicates that the offenders have a home base from which they set off from and later return to, which could be called a marauder style according to Canter's (2000; Canter & Gregory, 1994) classification. These results also indicate that the child molesters know the areas around their home or base quite well, since 5.8 km (or 4.6 km) is not a too long distance for being familiar with their surroundings when searching for victims to abuse. One could assume that the offenders are quite familiar with the surroundings and keep to this area for comfort. The above described routine activity theory (Cohen & Felson, 1979) seems to be a good theory to explain this type of behaviour. It seems to be the easiest way of learning your neighbourhood and its geography, as well as where potential victims might be (Brantigham & Brantigham, 1993a), since offenders can be assumed to spend most of their time conducting non-criminal activities. Alternatively, this might be explained by a distance decay pattern or the least effort principle, which states that if one faces several possibilities to do something, one is most likely to choose the one requirering the least effort (Canter, 2003; Rossmo, 2000).

The short travelling distance found in this study is in line with what Davies and Dale (1995) found in their study, that stranger rapists travelled less than 8 km to commit their crimes. This is information that perhaps may be of value to the police investigating sexual crimes, both on adults and children.

Violence only occurred in 5 cases in the present study. One explanation for this could be that the distance travelled from home was short. The results showed that there was a relationship between violence and the distance travelled (>7 km). Beauregard et al. (2005) found a positive relationship between violence and the distance travelled. This they explained by the fact that if an offender needs to travel far he would most likely need a car and persuade the child to get into the

car. This could in turn lead to violence, since most children do not get into cars with strangers and the offender needs to make a quick move to snatch the victim.

Ouimet and Proulx's (1994) study on ten pedophiles in treatment showed that they usually committed their crimes near their homes which are in line with the results from the present study. Most of the offenders in this study (31 of 70 cases) committed their crimes at their own home and in all these cases, bribes (such as money) were used to lure the victim there. This result of the bribes is in line with previous studies (e.g., Proulx & Ouimet, 1995; Singer et al., 1992). Most of the victims lured home to the offender in the present study were young adolescents (13–15 years old, see Figure 3 and 4), and in that age it is, at least for boys and somewhat, often important to have the latest Mp3 player or mobile phone, and maybe it is hard to resist when a man offers these gifts or money for a 'small favour'. The MDS result also showed that boys tend to be contacted by the offender indoors and being molested indoors (see the negative orientation of dimension 1 in Figure 2). This coincides with the fact that several boys were recruited by previous victims. According to Kaufman et al. (1998) it was more common for intra familiar offenders to offer bribes as a grooming strategy than for non familial offenders. However, the present study did not include a comparison between intra familial and non-familial offenders.

On the whole, there were more female victims than male victims in this study, just like several other studies have shown (e.g., Fischer & McDonald, 1998; Singer et al., 1992; Tseng & Schwarzin, 1990). This is the opposite of what DeJong et al. (1983) found since they reported that boys were more likely to get assaulted by strangers than girls. As mentioned above, the present study does not have intrafamilial offenders in the sample but it would be of interest for future studies to make such a comparison. Abel (1989) found that touching occurred in 62 % of the cases against boys and only in 38 % committed against girls, even though only 162 cases of all 453 offenders molested boys. This is in line with the present study since there were more female victims than males but more cases with boys being touched than girls.

The most common criminal action done by the offender in this study was touching, such as caressing and fondling on the victim. The result also showed that those offenders that had children of their own, fondled/caressed their victims to a larger extent than those who did not have children of their own, who committed more severe actions such as intercourse or oral sex. One speculative explanation for this could be that those who are fathers themselves have more

insight into children's lives and emotional states, than those who are not fathers, and thus are more use to handling children with more affection, and feel more protective on some level toward the child.

Of particular interest was the negative relationship between the offender's age and the victim's age, the older the offender, the younger the victim. It would be interesting, in future research, to investigate this matter more closely to see if it could relate to the fact that child molesters often state youthfulness and innocence as a preference in their victims.

An important limitation of this study is clearly the small number of cases and it would be of interest to replicate this study with a larger number of cases, to see if the same patterns emerge. Another limitation is the difficulties catching detailed research data from protocols of crime investigations. A crime investigation focusing on items for presentation in the court, is not always synonymous with items for conducting research.

One of the main purposes with this study was to see where the data could yield some new information about child molester's movements, so that it could simplify matters for the police. This study did find a few interesting leads, child molesters most often commit their crimes at their own home. If they travel to find victims and commit crimes, they do not travel far away from the home or base. Thus, it seems that the offenders find the victims close to their home base and that they stay in that vicinity during the course of their crimes. Older child molesters seem to prefer younger children, which could provide helpful indications for the police investigators to narrow down the search field of suspects.

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Study II

II

Geographical Profiling Obscene Phone Calls — A Case Study

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Abstract

Studies on geographical profiling have typically focused on crimes with physical crime sites. This study focused on crimes with no physical crimes sites (i.e., no physical contact occurred between the victim and offender). A single offender made obscene phone calls (OPC) to 86 children during the years 1999–2000 in the south of Sweden. The locations in which obscene phone calls were received were analysed in a geographical profiling system (Dragnet) to see whether it could provide a map which showed the most likely area the offender would reside in. The purpose of this study was to explore whether or not geographical software such as Dragnet can be of use for investigators of crimes with no physical crime locations. The result showed that the offender in this case had his home close to the region assigned the highest probability of containing home or base, which indicates that Dragnet can provide maps which can narrow down the search areas for the police in cases without physical crime locations.

Keywords: Geographical profiling, obscene phone calls, Dragnet, children

Geographical Profiling Obscene Phone Calls — A Case Study

"The only way to discover the limits of the possible, is to go beyond them into the impossible" (Clarke, 1962, p. 31).

The past few years a steadily growing number of studies on geographical profiling have emerged. These studies have varied in their focus of types of crimes, in terms of accuracy and reliability of the techniques (Bernasco, 2007; Canter, 2000, 2003; Rossmo, 2000; Santtila, Laukkanen, & Zappalà 2007; Sarangi & Youngs, 2006). However, to my knowledge there are only one study that has studied obscene phone calls (i.e., where there have been no physical contact between the victim and offender) in relation to geographical profiling (Canter, 2003). That study will be described in more detail below.

This exploratory study investigates one such case of obscene phone calls and applies a geographical profiling system in order to see whether or not it can be useful even in cases such as these. This study used the Dragnet system, which is a geographical profiling software system developed at the Centre for Investigative Psychology at the University of Liverpool (Canter, Coffey, Huntley, & Missen, 2000). A more detailed description of Dragnet will be given in the method section. The introduction gives a summary of the basic theories and recent studies within the field of geographical behaviour and profiling techniques, and also a short summary of theories about obscene phone calls as well as spatial behaviour in crimes with no physical crime location.

The main purpose of this study is to examine whether it is possible to predict the home location or base of an offender who have made obscene phone calls (OPC). In the chosen case, the offender made obscene phone calls to 86 children in the south of Sweden during the years 1999–2000.

Criminal Spatial Behaviour and Cognitive Maps—the Underlying Theories of Geographical Profiling

All humans have a spatial behaviour, which are our mental representations of our surroundings (Brantigham & Brantigham, 1981; Canter & Youngs, 2008a). These mental representations could be called mental or cognitive 'maps', which represent how we make sense of our environment and how we relate to our surroundings (Canter & Hodge, 2008).

Research on spatial behaviour has been going on for many decades and one recurrent finding seems to be that humans have some kind of a home or base, which we set out from in our daily lives and that one does not go very far from that base (Brantigham & Brantigham, 1993a; Bromley, 1980; Canter & Youngs, 2008a, b; Snow, 2008). This finding also seems to apply to criminal spatial behaviour (Lundrigan & Canter, 2001; Canter & Youngs, 2008a, b; Kind, 2008). The spatial behaviour of a probable offender could be determined from information of the crime site location/-s, as well as the geographic connections (e.g., the offender's house, the victim's house, bus lines etc.) and the characteristics and demography of the surrounding neighbourhoods (Canter, 2000a, 2003; Canter & Youngs, 2008a, b; Godwin, 2001; Levine, 2002; Rossmo, 2000).

There are two theoretical approaches which are often cited in the literature on geographical behaviour of criminals (Beauregard, Proulx & Rossmo, 2005). The first is routine activity theory which has its emphasis on the daily activities of offenders and potential victims (Beauregard et al., 2005.; Cohen & Felson, 1979). These activities include identifying where to find a suitable victim, where a "good" crime scene would be (e.g., if it is easy to get away without detection). Brantigham and Brantigham (1993a) argue that most offenders choose to commit their crimes near their usual major pathways, but they will explore the vicinity around those paths as well. Thus, the exploration seems to be somewhat limited to places that are known or easy to access. According to Canter and Youngs (2008a) this routine activity theory gives an offender a passive role in his/her choice of crime location since it suggest that the offender only becomes aware of criminal opportunities as s-/he are doing non-criminal activities. Canter (1977) proposes that this is only one aspect of how humans make sense of their surroundings, and that there are two psychological processes interacting in the understanding of our environment: (1) how we encode the information, and (2) how we make use of our surroundings. Thus, a mental 'map' is the result of this interaction between storing information and the availability of environmental cues, and this will give us information about what is possible and where (Canter & Youngs, 2008a).

The second theory is the rational choice/decision approach, which has an emphasis on the adaptive nature of human behaviour, such as interactions and transactions between people (Clarke & Cornish, 1985). This theory suggests that there is a decision to be made in every step of the crime process. Beauregard et al. (2005) uses date-rape as an example, where the decision to commit a rape only arises in the heat of the moment when the victim refuses to go along with the

demands to engage in sexual contact. Rational choice theory provides an explanation to the underlying cognitive processes such as decision making when it comes to criminal spatial behaviour (Canter & Shalev, 2008). In a logic way this theory shows how rational decisions/choices are made throughout the entire criminal process, from the choice of crime location and how to get away undetected. These actions require planning and there are several rational choices/decisions to be made by the offender, even though they might not seem rational to a non-criminal (Canter & Youngs, 2008a).

The main differences between routine activity theory and rational choice, is that routine activity deals with the ecological context to a greater extent than rational choice. Basically, this means that a certain ecological context gives rise to more options from which choices are made (e.g., the focus is on the surroundings such as where a 'good' crime site would be) (Beauregard et al., 2005), whereas rational choice focuses more on the underlying cognitive processes. However, one theory does not have to exclude the other, a combination of the two might provide a strong basis for the understanding of criminal spatial behaviour.

The study of criminal spatial behaviour has created the foundation and groundwork of geographical offender profiling. Geographical offender profiling should be used as a 'decision support tool' for criminal investigations and it does not solve cases on its own (Canter, 2000, 2003; Rossmo, 2000). It rather provides a search strategy and can help to manage large quantities of data. A geographical profile does not indicate on a map where the offender of a specific crime lives, it rather indicates an optimal search process that can be used for investigative purposes (Canter, 2003; Canter & Youngs, 2008b). Usually, a geographical profile can determine the location of offender residence within 5 % of the total hunting area, which is a performance that is significantly better than what could be expected by chance (Rossmo, 2000).

The knowledge of criminals committing crimes close to their home/base has provided an interesting idea when it comes to linking crimes. If offenders commit their crimes close to their home/base, it could also indicate that crimes that are close together in location are committed by the same offender (Canter & Youngs, 2008a). Studies (e.g., Grubin, Kelly & Brunsdon, 2001; Bennell & Canter, 2002) have found that crimes that were close together were committed by the same offender, which could suggest that a geographical analysis could help both in linking crimes to a common offender as well as providing where his base is most likely to be. There is also a time factor involved when a crime occurs, since one

can not be at two places at the same time (Canter & Youngs, 2008b). According to Canter and Youngs there is a pattern to the temporal occurrences, which could come from within the offender (e.g., addiction to drugs gives the offender a need to go out and get those drugs) or it could be an external factor (e.g., changes to ones work schedule).

Geographical Profiling Techniques

There are different geographical profiling strategies which can be used to provide guidance on where to look for an offender or rather in which area s-/he is most likely to have his base (Canter, 2003; Canter & Youngs, 2008a,b; Levine, 2002; Rossmo, 2000). These geographical profiling techniques is based on the assumption that crimes usually takes place near the home/base of the offender and that the number of crimes gets lesser farther away from that home or base, an assumption called *distance decay* (Bennell, Snook, Taylor, Corey, & Keyton, 2007; Canter et al., 2000; Canter & Hammond, 2006; Canter & Youngs, 2008a, b; Laukkanen & Santtila, 2006; Santtila et al., 2007). By using a distance decay function in a geographical profiling system, one can reduce the total area which needs to be searched by the police by up to 90 % (Bennell et al., 2007; Canter et al., 2000; Rossmo, 2000). One of the systems based on distance decay functions is Dragnet, the system used in the present study. Dragnet will be described in more detail in the method section.

The use of computer programs such as Dragnet has several advantages, such as being more reliable and consistent, less likely to be biased (compared to human predictions) and therefore less likely to be open to sources of error, and also computers systems are more likely to hold up to scientific scrutiny in court. Most crimes that have been tested using geographical offender profiling techniques and softwares, has mostly been done on crimes with an actual physical crime site. To test the full extent of these softwares, different types of crimes needs to be put through the system including crimes with no physical crime sites. Canter (2003) used Dragnet on a case of obscene phone calls, with good results. This case study will be presented after a brief summary of some current theories of obscene phone calls.

Theories of Obscene Phone Calls

Obscene phone calls can be categorized as a hands-off offence, since there is no physical contact between offender and victim (Saunders & Awad, 1991). Most offenders who make obscene phone calls are suffering from what is known as telephone scatologia, a paraphilia which is characterized by sexual arousal from presenting sexual and obscene materials over the telephone to a victim (Pakhomou, 2006). However, it is important to note that not all obscene phone calls are made by individuals suffering from scatologia (Pakhomou, 2006). In the present study it has not been established that the offender was suffering from this particular paraphilia.

As reported in several studies (e.g. Katz, 1994; Pakhomou, 2006; Saunders & Awad, 1991; Smith & Morra, 1994), in most cases of obscene phone calls the victim is unknown to the offender (i.e., the offender is a total stranger to the victim). No conclusive evidence has been found that scatologists have a risk of committing physical violence, such as assault or rape, against the victims (Pakhomou, 2006; Saunders & Awad, 1991), but there is no way for the victim to know this or be sure if an offender makes threats about these kind of actions. Theories of spatial behaviour such as routine activity theory have been discussed in relation to hands-off offences as well as hands-on crimes (Cohen & Felson, 1979; Katz, 1994). Routine activity theory is based on the daily activities of offenders and potential victims (Beauregard, Proulx &Rossmo, 2005; Cohen, & Felson, 1979). These activities include identifying where to find a suitable victim. Studies on child molesters and pedophiles have also shown that these offenders tend to commit their crimes close to their home (e.g., Beauregard et al., 2005; Proulx & Ouimet, 1995).

In a review Matek (1988) found that obscene phone callers do not choose a specific victim, the telephone numbers could just as well be chosen at random with no other meaning to the offender. In this case the offender chose his victims from newspaper ads, especially ads on children's bicycles for sale.

Spatial behaviour in hands-off offences

There are some assumptions underlying geographical offender profiling. One of those is *locatedness*, which is the assumption that all crimes have a distinct location. This assumption might seem obvious in crimes with a physical crime site, but how about crimes with no physical crime site (e.g., obscene phone calls, Internet

fraud)? According to Canter and Youngs (2008a) there are spatial patterns even in hands-off offences, even though the crimes exist in a cognitive (or 'virtual') space which the offender uses. As an example they mention that an offender might call only local telephone numbers, despite the fact that he are able to make calls farther away. This assumption of locatedness makes it possible to make geographical analyses even in cases where there is no obvious crime site. Canter (2003) used Dragnet in a case of obscene phone calls and the results were of direct contribution to solving the case. An offender, Simon Wadland, called women during the years 1988–1992 in England. He would claim to have kidnapped the women's husbands or family members and demand the women to mutilate themselves, otherwise she would not see the kidnapped spouse again. Canter conducted a geographical analysis where all the locations were treated as physical crime sites. Dragnet produced a map (see Figure 1) which placed the home of the offender in the region assigned the highest probabilities of containing the home or base of the offender. The victims in the Wadland case lived within a 16 km radius (10 mile).

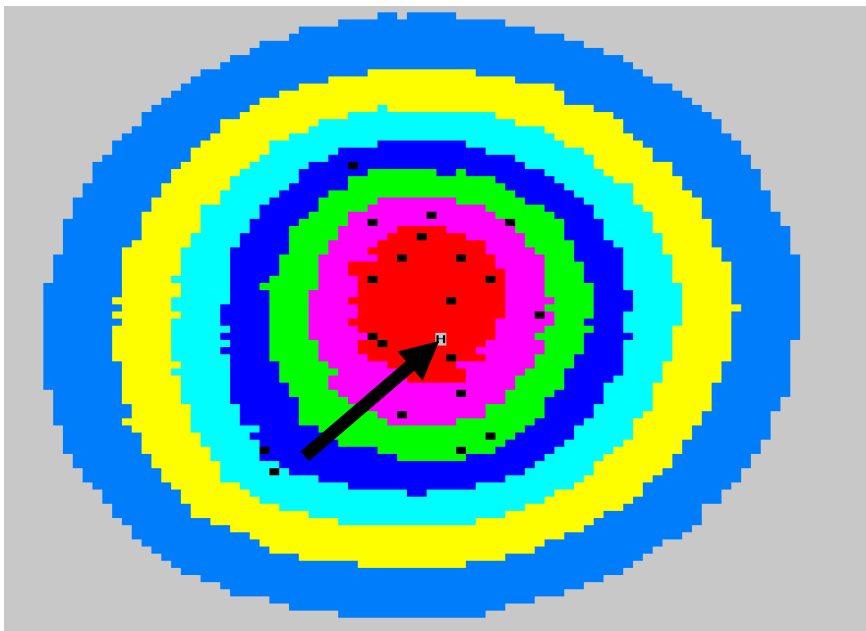

Figure 1. The Dragnet output over the Simon Wadland case. The "H" is placed in the centre (p = 306). The arrow is not produced by the system, it is placed there afterwards in order to highlight the 'H'.

A search cost analysis was also made in this case. Search cost analysis is an index defined by the proportion of the area that has to be searched in order to find the offender's home or base (Canter et al., 2000). The lower the search cost, the more effective Dragnet is at prioritizing the search for the offender. Thus the smaller the area that needs to be searched, the faster the police can locate an offender. The search cost analysis in the Wadland case showed that 0.02 or 2 % of the total area needed to be searched in order to locate the offender.

The current study explored a case study on an offender who made obscene phone calls to 86 children, in order to test if Dragnet was able to predict in what area the likely home or base of this particular offender was located.

Method

Subject

This study is based on a single male offender. The offender was in his early thirties when he conducted these crimes, as well as being apprehended by the Police. The offender made obscene phone calls to 98 children, in the year 1999 he called 41 children and 57 in the year 2000. Twelve cases were removed from analyses. Ten of the 12 cases were removed due to the fact they did not live in the south of Sweden but rather in the northern and middle parts of the country and were therefore considered to be outliers. The removal of these cases could be based on research (e.g., Grubin, Kelly & Brunsdon, 2001; Bennell & Canter, 2002) which have found that crimes that are close together usually are committed by the same offender, and as such the end result should not be significantly affected. In this study 86 of 98 cases (84.3 %) were within a radius of 23 km or 14 miles (*SD*= 13.65). Dragnet calculates (in this case) the result using a negative exponential function, which gives more weight to the crime sites close to the home or base and reduces with the distance away from that.

The other two cases were removed because they were duplicates (i.e., they were siblings who received phone calls living at the same address).

The children were between the ages 8–16, those between the ages 10–13 made up the majority of the victims with 82.7 %. Of the victims, 80 were girls and 18 boys, all 12 cases removed were girls, so the total number of girls in the analyses was 68.

Procedure

The data for this study were collected from the police's archives. All personal identities were recoded into numbers, to procure the anonymity of both victims and offender.

The addresses to the victim's homes and the offender's home were recoded into X and Y coordinates. The coordinates were collected via the Swedish RT90 coordinate system used in public maps, which is equal to the Eastings and Northings on a map. The RT90 is in turn based on the WGS84 geographical system of longitudes and latitudes.

Materials

Dragnet software system was used for the analyses of the data. Dragnet was chosen for this study because it is user-friendly and has been designed for individuals with little background training. Dragnet is a system based on the principles of distance decay and was developed at the Centre for Investigative Psychology at the University of Liverpool (Canter et al., 2000). Dragnet is based on empirical research on spatial behaviour of offenders of several types of crimes (e.g., rape, murder, arson, burglary, robbery). The basic principle of this program is to indicate an area in which it is likely an offender has his home or base and it should be seen as a decision support tool as mentioned above (Canter et al., 2000).

The system can employ different decay functions, one is the negative exponential function, which is based on the assumption that an offender lives near the crime site locations and the likelihood of this assumption decreases with increasing distance (Canter & Hammond, 2006). Canter et al. (2000) tested the systems accuracy and found that it predicted 51 % of all the offenders' homes within the top 5 % of the overall search area, and that 87 % of the offender homes were within 25 % of the total search area.

Dragnet calculates probability values from each crime location which range from 0 to 0.5, where 0.5 is the most likely place of the home and 0 is the least likely place for it. The scale is not set 0 to 1 in order to reduce the likelihood of mistaking the values as direct probabilities (Canter et al., 2000). A map is then produced as a result of the calculation of the probability values, a map that displays different colour circles. Red is marking the inner centre circle, which is the most probable area of the offender's home or base, the second highest probability area is pink, then bright green, dark blue, light blue and so forth. The

map does not take into account the topography, land use or road networks etc. (Canter et al., 2000).

Within the system there are two normalization procedures, which are based on the notion that there are differences in the area sizes (e.g., some offenders travel far to commit crimes and some offenders stay within a couple of kilometres) in which offenders have committed their crimes (Canter et al., 2000). Because of this differentiation between offenders (i.e., not all offenders commit their crimes in the same way or distribution), it is necessary to adjust the calculations to fit the range of a series of an offender. This is called a normalization procedure and it should be done to be able to compare different offenders. Normalization procedures are based on the average distance between offences. The two normalization procedures in Dragnet are called *Mean Interpoint Distance* (MID), which gives equal weight to all distances between all the crime sites. The *QRange* is the other procedure and it takes the asymmetries between the incidents into account. The QRange is the mean of the perpendicular distances from each crime site to the regression line that characterizes the series.

Furthermore, the QRange has been shown to be the optimal normalization parameter according to Canter et al. (2000). Both MID and QRange was tested as normalization procedures. The maps produced using the QRange provided better probability maps, in the sense that it placed the home of the offender closest to the region assigned the highest probability, than those using MID. This is in line with what Canter et al. (2000) found in their studies. For a full explanation on the methodological differences between these two procedures see Canter et al. (ibid.).

Statistics

Several analyses were made on the data within the Dragnet system in order to see whether the program could predict the most probable area in which the offender would have his home or base. In this case the home of the offender was known and is marked with an 'H' (in a small white rectangle) on the map.

To reduce the risk of mass effects, that is to avoid that a large number of observations produce significant results by chance, a random selection using split-half was made, resulting in 43 cases. Further, the sample was again randomly split in one-fourth also (i.e., 22 cases) and this was done in order to see if there were any differences in the probability maps. No such differences were found in either the case of 86, 43 or 22 cases (i.e., the 'H' was in the same probability area regardless of the number of sites).

The probability values (described above) of the home of the offender are presented below within a parenthesis as a p-value. Search cost analyses were also made as another measure to test the efficacy of Dragnet.
Analyses were also made on the time aspect as well, to see whether the offender changed his modus operandi (MO) from the earlier cases to the latest cases (i.e., whether or not he made phone calls within the same area during his crime series).

Results

The offender found most of his victims via newspaper ads about children's things for sale. The most common ad was on children's bicycles (40.8 %). The offender usually called the victims on weekdays after school (i.e., in the afternoons), presenting himself as "Peter" in most cases but not all (which was not his real name). He was friendly and always began by asking if the parents were home and then explained that he was conducting a study on sex and relations among school children (adolescents if the child was older) for a university in the south of Sweden. If he got the child to stay on the phone and answer the questions, he first asked about general demographics (e.g., age, number of siblings, if he/she lived with both mother and father). Then he went on to ask more sexually explicit questions such as how often they masturbated, what they called the female/male genitalia etc. The offender conducted an actual study for himself, taping or writing down all answers on self-made questionnaires that he had created. These questionnaires consisted of approximately 50–70 questions and he had three different versions of these questionnaires, of which two were quite similar but the third version were much more explicit in nature with questions such as if he/she gets turned on by urinating or if he/she would like to have sex with a sibling. The police that caught the offender found all records in his computer with lots of details about each telephone call.

The Dragnet analyses using QRange as normalization procedure on the 86 crime sites, showed a probability map which placed the offender's home ('H') in the pink area ($p = 0.303$), which is the second most likely area which should be searched according to the program (see Figure 2). The same analysis was made using MID as normalization procedure, which placed the offender's home in the bright green area ($p = 0.206$), which is the third area from the centre (which is marked red).

Search cost analyses were also made on both normalization procedures, QRange and MID. A search cost of 0.060 or 6 % was found, using QRange, for

the whole sample of 86 crime sites. The search cost, using MID, for the whole sample was 0.059 or 5.9 %. These results suggest that approximately 6 % of the total area needed to be searched in order find the offender's home or base. The search cost difference between the QRange and the MID procedures was not significant.

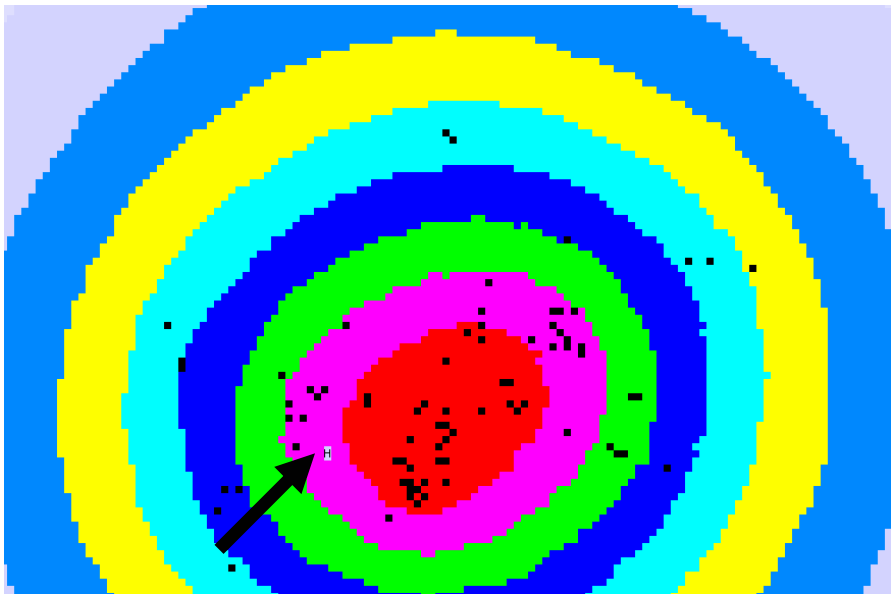

Figure 2. Dragnet probability map over the 86 cases of OPC, using QRange. 'H' marks the offender's home and is placed in the pink area.

Dragnet analyses on the time aspect were also made. The crimes were divided into four categories; crimes committed the first half of the year 1999 (Jan–July), the second half of 1999 (Aug–Dec), the first half of the year 2000 (Jan–July) and the second half of 2000 (Aug–Dec). See Table 1 and Figure 3. The search cost analyses are also presented in Table 1.

The search cost analyses on the time aspect showed small differences between the two normalization procedures, in which the MID procedure produced slightly better results. However, the differences between the two normalization procedures in terms of their effect on the search cost/p-value were not significant, which could suggest that both measures of analysis (p-value and search cost) are equally good.

Table 1. *Summary over the time aspect of the crimes, p-values, search cost and colour zone.*

Time	QRange			MID		
	p-value (p-home)	Search cost	Zone	p-value (p-home)	Search cost	Zone
1st half of 1999 (*n*= 19)	0.295	0.057 5.7 %	Pink	0.203	0.053 5.3 %	Bright green
2nd half of 1999 (*n*= 24)	0.269	0.121 12 %	Bright green	0.167	0.117 11.7 %	Dark blue/ Light blue
1st half of 2000 (*n*= 33)	0.289	0.043 4.3 %	Pink/ Red	0.208	0.041 4.1 %	Pink
2nd half of 2000 (*n*= 10)	0.341	0.009 0.9 %	Red	0.264	0.008 0.8 %	Red

Figure 3. Probability map over the crime sites during August–December in 2000. 'H' marks the offender's home, in the red centre area, with both QRange and MID.

Discussion

The purpose of using geographical profiling computer software is to see if it can predict a probable area in which the offender is most likely to live or has his base. This study was set out to test whether or not a geographical software program could predict the most probable area of location, in cases of hands-off offences as well as it has been shown to do with physical crime sites (e.g., Canter, 2000; Levine, 2002; Rossmo, 2000; Santtila et al. 2007) and in the Simon Wadland case (Canter, 2003).

The result showed that Dragnet was able to predict the most probable search area in the analysed case of an offender of obscene phone calls. The best probability maps were produced using the QRange normalization procedure, in line with previous research done by Canter et al. (2000). The search cost function showed that only 6 % of the total search area needed to be searched in order to find this particular offender, which is a good indication of Dragnet's efficiency.

The results also showed a slight difference between the two normalization procedures. The QRange provided better p-values than the MID, whilst the MID provided better search cost results. However, the differences were not significant and would suggest that it does not matter which analyses one chooses to use, because both provides equally good results.

There is a time factor involved in any given crime (Canter & Youngs, 2008b), and thus there was an interest to test and see if the offender's MO (if he made phone calls to the same area or not during his crime period) changed in this case.

The results showed changes in the offender's MO regarding the time aspect. According to the Dragnet maps, the offender began the phone calls rather close to his home (pink area using QRange) in the first half of 1999, changing later in 1999 to making the calls to addresses farther away (bright green area using QRange) and then in the year 2000 he made his calls closer to his home during the course of the year (close to the pink area to the centre in the red area). From this result one could speculate that the offender starts out by making calls rather close to home that is familiar, then gets cold feet (e.g., the offender gets nervous about being recognized, or his voice in this case) and after a while he gets more confident again maybe because he had not been caught yet, and starts making the calls close to his home. Why the offender choose to call children near his home is not clear. One possible explanation could be that he used local newspapers and therefore the victims lived in a rather small area. However, when using a telephone one is

without limits and boundaries of physical obstacles. No one can see you make the call and no one can hear you (other than the victim), which are both essential elements in the choosing of a physical crime site in crimes such as robbery, rape or murder for instance. There is a similarity to child molester research (e.g., Beauregard et al., 2005; Proulx & Ouimet, 1995), which shows that child molesters tend to commit their crimes close to home. However, it is not quite possible to make a correct comparison between an offender of obscene phone calls to children and child molesters, because the offender in this case has not been established as a child molester in the sense that he has not had any physical contact with the victims. But it would be an interesting future finding if there turned out to be such a connection between these two types of crimes.

Is it really possible to assume that there is a kind of spatial behaviour even in hands-off crimes? According to Canter (2003) there are spatial patterns even in crimes without physical locations. Hands-off crimes have locations which could be said to exist in a cognitive or 'virtual' space which the offender uses (Canter, 2003; Canter & Youngs, 2008a). Underlying cognitive processes such as rational decision making, could show how rational decisions/choices are made throughout the entire criminal process, from where to commit the crime (i.e., *systematic crime location choice*) and how to get away undetected (Canter & Hodge, 2008; Canter & Shalev, 2008), from careful planning of get-away routes to where there is most likely to be potential victims as well as considering the consequences of each of these thoughts.

Since the results suggest that even in this hands-off case, the offender commits his crimes close to where he lives, in accordance with spatial theories on crimes (e.g., Brantigham & Brantigham, 1993a, b). This particular offender chose his victims from newspaper ads, where he mostly looked for ads on children's bicycles for sale. However, it was not clear from the police records whether the offender only used newspapers in his search or if he also used the Internet or any other source of information to choose victims. The offender targeted a majority of children between the ages 10–13, which could suggest a selection preference of age among his victims, even though he was a complete stranger to all of the victims. This assumption on selection preference also seems to be true regarding the gender of the victims, since most of the victims were girls.

There seemed to have been some kind of thought behind the choice of ads as well, the offender seemed to call ads with an age indication in it first (e.g., "Children's bicycle for sale, would fit a 7–8 year old child well" etc.). This

assumption is based on the fact that several parents of the children involved in this case, stated in their interviews with the police that they had placed an age indicator in their ad. One speculation would be that from these ads with an age indication, the offender could calculate that the child in question (whose old bicycle it was that was for sale) would be about 10 or so in age when his/her parents would sell the old bicycle.

So based on these speculations, one could indicate a spatial pattern and a geographical thinking in a case of obscene phone calls such as this, as proposed by other researchers (e.g., Canter, 2003; Canter & Youngs, 2008a). Since this is a single case, it is difficult to say how these results could be generalized to other hands-off crimes because there is not enough research on this specific topic yet. Still, it provides interesting indications worth exploring further.

Conclusions and Future Research

This study has its obvious limitation in that it is a case study of a single offender. Even though Dragnet has proven to be efficient in this case as well as the Simon Wadland case (Canter, 2003), there has to be more hands-off crimes analysed.

However, this study and the Wadland case provides interesting information about what a software like Dragnet can do in terms of producing a good probability map which could have directed the police in the right direction to be able to apprehend an offender making obscene phone calls.

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Study III

Accuracy and the Realism in Confidence in Children's and Adults' Event Recall in Response to Free Recall and Focussed Questions

III

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Abstract

This study compared the accuracy and confidence judgements of 8-9-year-old and 12-13-year-old children with adults in free recall and in focussed questions. Participants first saw a 4 minute video of a staged event and one week later gave a free recall and answered focussed questions about the film. One week later they assessed their confidence in their free recall-statements and their answers to the questions. The results showed that the two question formats differed clearly in accuracy and confidence for all age groups. In addition, compared between the age groups, the 8-9-year-olds showed best realism in the confidence judgements of the answers to the free recall questions but the adults showed the best realism for the focussed questions. As indicated by within-subject variation in the confidence judgements, question format, but not age, contributed to noise in the confidence judgements. One implication of these results is that 8-9-year-old children in some contexts can show at least equally good realism in their confidence judgements as adults.

Keywords: Children's memory, adult's memory, eyewitnesses, confidence judgements, realism in confidence judgements, free recall, focussed questions

Accuracy and the Realism in Confidence in Children's and Adults' Event Recall in Response to Free Recall and Focussed Questions

Children are not spared from being victims or witnesses to crimes and to increasingly higher extents children have to undergo police interviews and appear as witnesses in court. In these forensic contexts the accuracy in the children's recall and the realism in their confidence in their testimony are of great relevance.

The study of the realism in child witness confidence in their memory assertions is of great importance since research has shown that jurors tend to see confident witnesses as more accurate and credible witnesses regardless of age (Cutler, Penrod & Stuve, 1988; Luus & Wells, 1992). Perfect realism in confidence judgements implies a perfect match over many items between the level of the participants' accuracy and the level of their confidence, e.g., all items rated as "100 % sure that the answer is correct" should be correct and 70 % of the items rated with "70 % confident that the answer is correct" should be correct. In the present study we analyse the accuracy and the realism in the confidence judgements of 8-9- year-old and 12-13-year old children and of adults when answering questions about their event memory of the contents of a short video film.

The interviewing of children and adults in the forensic process involves asking different kinds of questions. These include open free recall questions, focussed open questions (i.e., questions that ask for some specific particular information, such as "Did the man wear a coat?" -a so called yes/no question) and focussed questions with more than one provided answer alternatives (Was her jacket blue or black?). The proportion of these different types of questions in an interview may, at least to some extent, be dependent on the type of forensic interview. For example, McGough and Warren (cited in Peterson & Grant, 2001) found that 64 % of the questions to child victims interviewed by the child protective services was yes/no questions and only 4 % of the questions had other types of provided answer alternatives. Compatible with this, Lamb, Hershkowitz, Sternberg, Boat and Everson (1996) found that open-ended questions ("invitations") made up 1– 2 % of all interviewer utterances in interviews by US child protective service workers with 4 –12-year-old children who were alleged victims to sex abuse.

However, the proportions with which any specific type of question format is used may not be indicative of how important that type of questioning is. All types can be assumed to be important tools in forensic interviews. As noted by Lamb, Sternberg, Esplin, Orbach, Stewart and Mitchell (2003), open free recall questions are often seen as forensically critical and research by Perry and Hunt (cited in Peterson and Grant, p. 119) shows that even though questions with multiple answer alternatives in the context of the child protection services were few, they often asked for information that was the most forensically critical to find out. Since the forensically relevant properties of different question types are likely to vary it is of importance to find out more about different types of questions. Very few studies have analysed the effect of question format in relation to the realism of confidence judgements of answers to interview questions. In this study, we analyse the performance of children and adults in relation to free recall questions and focussed questions with two answer alternatives.

Below, we first briefly review previous research on the completeness and accuracy in children's and adults' interviews when free recall and focussed questions are asked. Next, we review research on confidence judgements and the realism in these confidence judgements in the same context. Finally, we briefly describe the present study and our hypotheses.

Completeness and Accuracy in Free Recall and Focussed Questions

Completeness and accuracy are two important aspects of recall performance. Completeness refers to the amount of information recalled about an event and accuracy to the proportion of the recalled information that is correct. Much research has been done on children's performance level in free recall and in relation to focussed questions and the factors that determine these outcomes (for reviews see Ceci & Bruck, 1993; Lamb, Sternberg, Orbach, Hershkowitz, & Esplin, 1999; Milne & Bull, 1999; Peterson & Grant, 2001; Pipe, Lamb, Orbach & Esplin, 2004). Children's recall in forensic contexts is partly determined by factors beyond children's control, such as the delay between the event and recall, which to a large extent is determined by various factors in the criminal justice system. Furthermore, the type of questioning conducted, including the extent of suggestive and leading questioning in the interviews and the language used by the

interviewer, also affect recall performance (see e.g., Ceci & Bruck, 1995; Saywitz & Camparo, 1998).

In addition, as shown by Koriat and co-workers, there can be a trade-off relation between completeness and accuracy. When the respondent has the possibility to strategically control what information he or she will report, accuracy increases (Koriat, Goldsmith, Schneider & Nakash-Dura, 2001). This can be seen as a form of metacognitive control that the respondent may not always perform on an explicit conscious level. For example, Koriat et al. (2001) showed that the level of accuracy in 7–12-year-old children's answers to focussed questions with and without answer alternatives was affected by the children's possibility to choose which questions to answer.

The factors noted above may contribute to the fact that the results in previous research on children's accuracy are not completely stable. Previous results show that children's free recall accounts typically are less *complete* than those of adults. Hutcheson, Baxter, Telfer and Warden (1995) argued that general probes do not provide young children with enough support for memory retrieval. Accordingly, focussed follow-up questions could be needed to obtain a complete account of what the child knows.

Research has shown that free recall questions soon after the event typically also result in high *accuracy* with children (e.g., Ceci & Bruck, 1995; Hutcheson et al, 1995; Pipe et al., 2004). Laboratory research on eyewitness testimony has indicated that, for children above about 8 years of age, age *per se* is a poor predictor of accuracy in free recall (see e.g., Hudson, 1990; Poole & White, 1991), at least fairly soon after the event (Poole & White, 1993).

One explanatory factor appears to be the respondents' regulation of what information to report. As discussed above, this may affect both completeness and accuracy in free recall (Koriat et al., 2001). The importance of the active regulation of which information is reported is also supported by the fact that completeness is one of the aspects stressed in the instructions to the cognitive interview and that the cognitive interview has repeatedly been shown to elicit a greater amount of correct information compared with a standard interview (see e.g., Allwood, Ask, & Granhag, 2005).

An advantage of focussed questions is that the interviewer can probe for any information that he or she deems relevant and there is usually some pressure on the respondent to attempt to answer the question (i.e., focussed questions are not affected by the completeness factor to the same extent as free recall). In contrast

to the results for free recall, research on focussed questions demonstrates that children tend to show poorer accuracy than adults for this type of questions, even soon after the witnessed event (see e.g., Hutcheson et al., 1995; Koriat et al., 2001). This may at least partly be due to children's documented difficulty to answer "don't know" in response to such questions, especially "yes/no questions" (e.g., Peterson & Grant 2001), maybe because they feel pressured to give an answer.

The research on recall performance in eyewitness studies can be summarized by saying that for free recall children, compared with adults, tend to show lower completeness but equal accuracy. However, children often show poorer accuracy than adults for focussed questions.

Confidence Judgements and Realism in Confidence Judgements

In the present study two types of metacognitive judgements are investigated, confidence judgements and frequency judgements (the latter are dealt with in the next section). Eyewitnesses' confidence judgements and their relation to accuracy have been investigated for at least three decades (see Bothwell, Deffenbacher & Brigham, 1987; Sporer, Penrod, Read & Cutler, 1995 for reviews). So far, most of this research has concerned adults and line-up identifications but some research has also been done with adults in the context of event memory (e.g., Allwood, Ask et al., 2005; Allwood, Granhag, & Johansson 2003; Allwood, Knutsson & Granhag, 2006; Granhag, 1997; Granhag, Jonsson & Allwood, 2004; Granhag, Strömwall & Allwood, 2000; Juslin, Olsson, & Winman, 1996; Perfect, 2003; Perfect & Harris, 2003). When it comes to children's metacognitive skills in the context of event memory fewer studies have been done (e.g., Allwood, Granhag & Jonsson, 2006; Allwood, Jonsson & Granhag, 2005; Koriat et al., 2001; Roebers, 2002; Roebers, Gelhaar & Schneider, 2004; Roebers & Howie, 2003).

Much of the previous research on confidence judgements in an eyewitness context has used the point-biserial correlation as a measure of the realism in the participants' confidence judgements. However, Juslin et al. (1996) pointed out that this measure is sensitive to the degree of spread of the confidence judgements over the confidence scale. The greater the spread of the confidence judgements over the scale, the larger the correlation, irrespective of the degree of calibration in the data. The point-biserial correlation can be described as showing the

participants' ability to discriminate correct from incorrect answers, thus reflecting the resolution measure (presented below). With respect to research on children, only the studies by Allwood, Granhag et al. (2006) and Allwood, Jonsson et al. (2005) have used calibration measures (described in the Methods section).

Previous research has found that both adults and children in event memory eyewitness situations are usually too confident that they remember correctly, that is, they show overconfidence (e.g., Allwood, Granhag & Jonsson, 2006; Allwood, Jonsson, Granhag, 2005; Juslin et al., 1996). This research has nearly always studied focussed questions, often with two answer alternatives. However, it is of interest to note that when Allwood, Ask et al. (2005) analysed the realism of adult's confidence judgements of assertions made during free recall, they found very high accuracy and confidence and also very good realism in the confidence judgements.

Moreover, on a more general level, previous research by Erev, Wallsten and Budescu (1994) has shown that error variance in a person's confidence judgements contributes to his or her overconfidence. If children have greater difficulty than grown-ups in handling the confidence judgement task this may be indicated by greater error variance in their confidence judgements. This possibility will be will be evaluated in the present study.

Also on a general level, previous research has shown that the level of realism in a person's confidence judgements is dependent on the difficulty level of the memory task. This is the so called hard/easy effect. When the task is difficult, that is, when the proportion of correctly remembered items is low, the realism in the confidence judgements tends to be poor. In contrast, when the task is easy and accuracy is high, the level of realism tends to be good or even show underconfidence (Juslin, Winman & Olsson, 2000; Lichtenstein & Fischhoff, 1977).

The research on the realism in children's confidence judgements that has used calibration methods has so far only used focussed questions with two forced choice answer alternatives. The results indicate that 11-12-year-old children are more overconfident than adults in their confidence judgements but that their *resolution* (ability to separate correct from incorrect answers by means of the level of their confidence ratings) is at about the same level as adults' (Allwood, Granhag et al., 2006; Allwood, Jonsson et al., 2005).

Frequency Judgements

Frequency judgements are estimates given by the person of his or her overall accuracy and are sometimes called *aggregated-item judgements* (Treadwell & Nelson, 1996) and *global judgements* (e.g., Liberman, 2004; Sneizek & Buckley, 1991). Previous research has found that when *focussed questions* have been used, adults' frequency judgements in eyewitness recall, have shown an underestimation (i.e., underconfidence) of performance or a tendency in this direction (Allwood, Granhag et al. 2006; Granhag, 1997; Granhag et al., 2004; Granhag et al., 2000). In all of these studies the participants' *confidence judgements* showed overconfidence. In contrast, the study by Allwood, Ask et al. (2005) shows that when the participants instead had given a *free recall*, the frequency judgements showed good realism in the sense that the difference between the level of the frequency judgements and the actual accuracy did not differ statistically from zero.

We know of only two studies that have examined children's frequency judgements, both involving 11-12-year-olds who answered focussed questions (Allwood, Granhag et al., 2006; Allwood, Jonsson et al., 2005). The results showed that both genders overestimated their number of correct answers. There appears to be no study that has investigated children's frequency judgements of their assertions elicited under free recall.

The aim of the present study was to compare two different question formats in relation to accuracy, confidence and metacognitive realism for confidence judgements and frequency judgements between 8-9- and 12-13-year-old children and adults. All age groups were shown a short videotape about an event. One week after viewing the videotape the participants were interviewed using free recall and a questionnaire with focussed questions about the film. One week later they were given questionnaires with statements from their own free recall and their answers to the focussed questions and were asked to rate their confidence in their responses. Both questionnaires ended with an instruction to provide a frequency judgement for the items in the questionnaire.

Hypotheses

In line with the previous research described above, our first hypothesis predicted a higher level of accuracy and confidence and also better metacognitive realism (as indicated by calibration and overconfidence) for the participants' *free recall* as compared with their responses to the *focussed questions*. It seems reasonable that

when the participants themselves can control what information to report (i.e., the free recall situation in the present study) they will choose information with high availability and that they are confident is correct (Koriat et al., 2001). Furthermore, this is in line with Grice's quality maxim in communication, which involves the notion "Try to make your contribution one that is true", see Schwarz, 1996).

Our second hypothesis concerned age differences and predicted that the child age groups would show a lower accuracy, higher confidence and better realism (as indicated by calibration and overconfidence) compared with adults for the *focussed questions* but not for the *free recall* question. Free recall is excluded in this hypothesis since research has shown that children in free recall can limit their reporting to mostly correct statements and we had no reason to expect any differences between the age groups for free recall.

Our third hypothesis concerned the frequency judgements. In line with the hypothesis above and the findings by Allwood, Ask et al. (2005) we expected that the frequency judgements for the participants' *free recall*, but not for the *focussed questions*, would show good realism for all age groups. Furthermore, in line with previous findings by Granhag (1997), Granhag et al. (2000) and Granhag et al. (2004) for adults and Allwood, Granhag et al. (2006) for children, we expected that the frequency judgements for the *focussed questions*, would show less overconfidence than the confidence judgements for all age groups and that in general, the children, for this type of questions, would show a greater tendency to overestimate their number of correct questions.

Method

Participants

Sixty-two children, 31 8-9-year-olds (20 girls and 11 boys) and 31 12-13-year-olds (16 boys and 15 girls), from three school classes participated. The average age of the younger children was 8.8 years, and for the older 12.7 years. Each class received a contribution of approx. US$ 125 towards a class trip fund for their participation.

In addition, 32 adults, 11 men and 21 women (mean age 25 years, range 19–56), students at the department of psychology, Lund University, and Kristianstad University, Sweden, participated. Each adult participant was paid approx. US$ 8.

Materials

Video Material. A 3 minute 50 seconds long colour videotape was used as the stimulus material. The video was aimed to depict an everyday event with potential forensic relevance. The video shows a man who looks for his dog in a park. He calls out for the dog and asks adults and children if they have seen the dog. The video simulates the point of view of a potential witness. Thus, the camera is located at a single point, with the view sweeping slowly across the park from left to right and back.

Questions on the Film. Thirty-nine questions on the film content were developed. Each question had two answer alternatives, one correct and one incorrect. The questions concerned details about the appearance of the people and children in the video, such as clothes, hair colour, age, and also of the surroundings and features of the park. In addition, there were behavioural questions about the man who had lost his dog and about events involving other people in the video.

Preparation of the Material for Confidence Judgements

The Free Recall Protocol. In order to allow for the participants to confidence rate each part of their free recall responses, a coder divided the interview transcripts into low-level units corresponding to the participants' recall during the interview. The coder used the same coding principles established by Allwood, Ask et al. (2005), in order to create an objective standard. The identified units were converted into statements, which were compiled into a questionnaire, with a confidence rating scale underneath each statement. The statements were presented in the same order as they had been mentioned in the interview.

The Questionnaire on the Film. To prepare the confidence rating for the focussed questions, a confidence scale was added underneath each question on the original questionnaire. In addition, the questionnaires were personalized for each participant by circling which answer he or she had selected originally.
At the end of each of the two questionnaires the participants were asked to rate how many of the [X] statements they thought they had answered correctly, that is, a *frequency judgement*. Due to a technical error this line was also there at the time when the participants answered the 39 questions in Session 2.

Procedure

The experiment consisted of three sessions. At Session 1 the participants were shown the videotape in groups of 15-16 in a classroom. The experimenter explained how the experiment would be conducted and the participants were then told to pay attention to the film that was then shown.

One week later the interviews were conducted individually with each child (Session 2). The interviewer first established rapport with the child by asking how he or she was and if they had any questions. The child was then asked to tell the interviewer everything he or she could remember about the events in the film and the people in it, with as much detail as possible. With the younger children the "detail"-part of the instructions was clarified. For example, if the child *only* said "A man had lost his dog and he was looking for it", the interviewer asked the child *once* to specify what that man looked like and if he/she could describe anything else. All interviews were audio-taped. After the interview, the participant filled out the questionnaire with 39 questions. The children were instructed that one of the answer-alternatives was correct and one was incorrect. During the week between Session 2 and 3, the interviews were transcribed and prepared for the confidence judgements that took place in Session 3, as was the questionnaire.

Session 3 was conducted in the classrooms and began with a presentation about confidence ratings (and frequency judgements), so that the participants would be familiar with the confidence-scales in the questionnaires. The presentation was about ten minutes long and consisted of detailed explanations of what a confidence and a frequency judgement is. Easy and less easy examples were also used. The children were instructed that zero on the confidence scale meant that they were sure their answer was wrong, 100 meant they were sure they had answered correctly. If they had guessed, they were to mark 50, i.e., a probability of 50 % chance of being right and 50 % chance of being wrong. The children were encouraged to ask if there was anything in the explanations that they did not understand.

The participants then confidence rated each item in the two questionnaires, starting with the statements from their interview. For each item confidence judged, the participants were told to assess their answers on the provided confidence scale that ranged from 0 to 100. At the end of each questionnaire a frequency judgement of the number of items answered correctly was made.

Finally, the participants were thanked and debriefed. The adults went through essentially the same procedure (adjusted to fit adults).

Scoring Procedure and Coding

The accuracy of the participants' free recall responses was scored as correct or incorrect units of information using a system similar to that employed in previous studies of children's and adults' event recall (e.g., Allwood, Ask et al., 2005). Units were defined as any rendered agent, object, action, recipient or descriptor that provided factual, verifiable information about the film. Information that was not possible to verify, e.g., psychological states, was not scored in terms of accuracy. Rules were set up for the cases were uncertainty was present, for example descriptions of the man's hair as "brown" or "red-brown" were considered correct, whereas descriptions such as "red" counted as incorrect (Allwood, Ask et al., 2005).

Calibration Measures

Three calibration measures were used to analyse the degree of realism in participants' confidence judgements. *Calibration* reflects the relation between the level of confidence and the accuracy. The following formula was used for computing calibration for single individuals:

$$\textbf{Calibration} = 1/n \sum_{t=1}^{T} n_t \, (r_{tm} - c_t)^2$$

where n is the total number of units rated, T is the number of confidence classes used, c_t is the proportion of correct units in the confidence class r_t, n_t is the number of times the confidence class r_t was used, and r_{tm} is the mean of the confidence ratings in confidence class r_t. Thus, calibration is computed by first separating participants´ confidence ratings into a number of confidence classes.

Next, for each confidence class, the difference is taken between the mean confidence and the proportion of correct units. Finally, the squared differences, multiplied by the number of responses in the confidence class, are summed overconfidence classes and divided by the total number of units. Calibration is perfect when its value is zero. For the present data, confidence ratings were

divided into eleven confidence classes, corresponding to ratings of 0–9 %, 10–19 %, 20–29 %, … , 90–99, 100. Ratings of 100 % were considered as a separate confidence class, as in previous studies of confidence ratings (e.g., Allwood, Jonsson et al., 2005).

Over/underconfidence is computed with the same formula as calibration, except that the differences are not squared. The measure indicates whether an individual is overconfident (positive value) or underconfident (negative value). Over/underconfidence is absent when the value is zero.

Resolution reflects the ability of an individual to distinguish, by means of confidence ratings, between two sets of answers, one set that is correct and one set that is incorrect. The formula for computing resolution is:

$$\textbf{Resolution} = 1/n \sum_{t=1}^{T} n_t (c_t - c)^2$$

Here, c is the proportion of correct units. A value of zero indicates no discrimination between correct and incorrect units, and a higher value reflects better discrimination than a lower value.

The formulas for Calibration and Resolution measure different skills (Keren, 1991). *Calibration* reflects the overall relation between confidence and accuracy, and *resolution* reflects the ability to distinguish between correct and incorrect units. For example, if an individual has an accuracy level of 70 % and has assigned a confidence of 70 % to each unit, that individual has achieved perfect calibration but shows no resolution. These measures are described in more detail by Lichtenstein, Fischhoff and Philips (1982).

Results

The means (and *SD*s) for accuracy (defined as percentage correct responses), confidence, calibration, over/underconfidence and resolution, for each age group and question type are displayed in Table 1.

For free recall, we also calculated completeness (e.g., total number of statements). The results showed that the 8-9-year-olds made an average of 12.1 (SD = 4.3) statements in their free recall, and the 12-13-year-olds made an average of 12.3 (SD = 4.6) statements. The adults averaged 15.6 (SD = 3.9) statements. The three age groups differed in completeness, F (2, 91) = 6.39, p = .003. Planned contrast showed that the adults made significantly more statements than

both child groups, t (91) = -3.57, p = .001, whereas the two child groups did not differ.

The average of *correct* statements for each age group was for the 8-9-year-olds 10.9 (SD = 3.9), the 12-13-year-olds 10.7 (SD = 3.8), and the adults 13.7 (SD = 4.0), F (2,91) = 5.75, p = .004. Planned contrast showed that, again, the adults were more correct than both child groups, t (91) = -3.39, p = .001, and that the child groups did not differ from one another.

Over-All ANOVAs

The accuracy, confidence and the three calibration measures were submitted to 2 (question type: free recall vs. focussed) x 3 (age group: younger, older, adults) mixed ANOVAs. A Bonferroni post-hoc test was also computed for the age levels for all measures.

Accuracy

Accuracy, defined as the percentage of correct statements, is forensically important, since it pertains to a statement's degree of reliability. There was a main effect of question type showing that accuracy for the free recall (M = 89 %, SD = 7 %) was higher than for the focussed questions (M = 73%, SD = 7 %), F (1, 91) = 162.4, p < .001. There were no other effects.

Confidence

Participants were more confident for free recall (M = 92 %, SD = 7 %) than for the focussed questions (M = 80 %, SD = 11 %), F (2, 91) = 127.22, p < .001. There was also a main effect of age-group, F (2, 91) = 8.08, p = .001. Bonferroni post-hoc test showed that the older children were both more confident than the younger children (p = .01) and more confident than the adults (p < .001), whereas the younger children and the adults did not differ. Finally, there was a significant interaction between type of question and age-group, F (2, 91) = 4.85, p = .01.

Although confidence was always higher for the free recall than for the focussed questions for all age groups, the difference in confidence was larger for the adults who, in fact were the least confident of all for the focussed questions.

The Calibration Measures

The analysis for *calibration* revealed a significant interaction between type of question and age, F (2, 91) = 6.44, p = .002. Inspection of the means, and accompanying paired-samples t-tests showed that the young participants were better calibrated for the free recall than for the focussed questions, t (30) = 2.35, p = .026. For the adults, the results were reversed, t (31) = -2.36, p = .025. For the older children, there was no difference in calibration for the two types of questions.

The calibration scores were also analysed for whether they significantly differed from 0, since a 0 score indicates perfect calibration. Participants showed less than perfect realism with respect to their calibration for both focussed questions, t (93) = 13.89, p < .001, and free recall, t (93) = 9.00, p < .001. This was also true at the individual age group level. Focussed questions: 8-9-year-olds, t (30) = 8.48, p < .001; 12-13-year-olds, t (30) = 8.86, p < .001; adults, t (31) = 10.22, p < .001. Free recall: 8-9-year-olds, t (30) = 5.11, p < .001; 12-13-year-olds, t (30) = 4.69, p < .001; adults, t (31) = 6.00, p < .001.

Analysis of the *over/under confidence* scores showed both a main effect of age group, F (2, 91) = 5.31, p = .007, and an interaction between type of question and age group, F (2, 91) = 4.72, p = .011.

Bonferroni post-hoc tests showed that the older children were both more overconfident than the younger children (p = .029) and the adults (p = .011). Adults and the younger children did not differ. Single sample t-tests comparing over/under confidence scores to 0 indicates that for free recall the young children showed close to perfect realism (p = .75, *ns*) whereas the other two groups showed overconfidence; 12-13 t (30) = 3.63, p = .001; adult t (31) = 2.36, p = .025. For the focussed questions adults showed very good realism (p =.58, ns) in contrast to the 8-9-year-old t (30) = 2.88, p = .007) and 12-13-year-old groups t (30) = 5.10, p < .001) who showed overconfidence. The overall analysis for *resolution* showed no effects for type of question or age group. However, single-sample t-tests showed that all groups, in both conditions, had scores significantly above 0: Free recall t (93) = 6.48, p < .001; Focussed questions: t (93) = 15.62, p < .001, indicating that all groups could discriminate between correct and incorrect answers.

Table 1. *Mean Values (SDs) for Accuracy, Confidence, =over/underconfidence and Resolution for the Free Recall and the Focussed Questions for the Three Age Groups.*

	8-9 year	12-13 year	Adults
Free Recall			
Accuracy	91.0% (10.3%)	88.3% (10.5%)	87.8% (11.1%)
Confidence	90.2% (9.5%)	94.4% (6.1%)	92.1% (5.9%)
Calibration	.042 (.046)	.042 (.050)	.068 (.064)
Over/underconf.	-.005 (.093)	.065 (.100)	.042 (.101)
Resolution	.025 (.041)	.028 (.043)	.030 (.042)
Frequency judg	83.6% (17.8%)	85.7% (14.1%)	84.5% (14.7%)
F-diff	-.075 (.20)	-.027 (.16)	-.035 (.15)
Focussed Questions			
Accuracy	71.7% (6.7%)	74.8% (6.7%)	73.5% (6.6%)
Confidence	78.4% (13.0%)	85.0% (8.5%)	74.1% (8.7%)
Calibration	.072 (.047)	.049 (.031)	.039 (.021)
Over/underconf.	.068 (.131)	.101 (.110)	.008 (.085)
Resolution	.026 (.021)	.037 (.018)	.043 (.023)
Frequency judg	62.8% (23.6%)	69.1% (22.9%)	58.2% (14.6%)
F-diff	-.088 (.28)	-.057 (.23)	-.151 (.16)

Frequency Judgements and F-Diff.

The frequency estimates were converted into a proportion of all recalled items. In addition, a difference-measure (F-diff) was calculated for each participant between the frequency estimate and accuracy (both in proportions), which gives a measure of realism in the frequency ratings. These values are shown for each question type and age group in Table 1.

The 2 (question format: free recall vs. focussed) x 2 (age group: younger, older, adults) mixed ANOVA analysis of the frequency judgements (expressed as proportion of all recalled items) revealed only the expected main effect of question format. Participants' estimated their proportion correct to be higher for the free recall (M = .84, SD = .15) than for the focussed questions (M = .63, SD = .21), F (2, 91) = 59.78, p < .001.

Question types and age groups did not significantly differ on the F-diff measure. However, as with the calibration measures, the difference from 0 is also meaningful. Overall, all groups for both types of questions gave underestimations both for the free recall, t (93) = -2,58, p = .012; and for the focussed questions, t (93) = -4.22, p < .001. Probing further it was revealed that for the free recall only the 8-9 year olds significantly underestimated their number of correct items, t (30) = -2.06, p = .05, whereas for the focussed questions only the adults significantly underestimated their number of correct items, t (30) = -5.39, p < .001.

Within-Participant Standard Deviation of Confidence Ratings

The within-participant standard deviation of confidence ratings is an interesting indicator of noise in the confidence ratings (Erev et al., 1994). For this reason, this measure was also submitted to a 2 (question format) x 3 (age level) ANOVA. A main effect of question format was found showing that the standard deviation in the confidence ratings was larger for the focussed questions (M = 20.3, SD = 7.3) than for the free recall (M = 13.0, SD = 10.8), F (1, 91) = 35.91, p < .001. No other effects were found.

Analyses for Each Question Format

We next briefly present the key results for each of the two question formats. Calibration curves for the free recall are shown in Figure 1 and for the focussed questions in Figure 2. The diagonal in these figures indicates perfect realism. The numbers in the graph show the percentages of all items per curve (i.e., age group) in each confidence class.

In Figure 1 it can be noticed that most responses are located at the confidence level 100 %. For the focussed questions in Figure 2 the responses are more evenly spread, although more responses are located at the 50 and 100 % confidence level. In order to investigate potential age differences, the results for accuracy, confidence and over/under confidence were analysed with one-way ANOVAs for each of the formats.

Free Recall

The results for the free recall format are reported first. No differences between the three age groups were found for accuracy. For confidence there was a close to significant difference between the three age groups, F (2, 91) = 2.58, p = .082.

Two one-way ANOVAs were computed for calibration and over/under confidence. Calibration did not reach conventional levels of significance. However, for over/underconfidence the outcome was significant, F (2, 91) = 4.15, p = .019. The contrasts for over/underconfidence only showed a significant difference between the two child groups, t (91) = -2,82, p = .006.

The Focussed Questions

For the focussed questions the outcome of the one-way ANOVAs showed no significant difference on accuracy for the three age groups (p = .164). The age groups did differ significantly for confidence, F (2,91) = 8.95, p < .001. Planned comparison showed that the 12-13-year-olds were more confident than both the 8-9-year-olds, t (91) = -2.53, p = .013, and the adults, t (91) = 4.20, p < .001.

Two one-way ANOVAs were computed for calibration and over/under confidence. The results showed significant results for both ANOVAs; for calibration: F (2, 91) = 7.52, p = .001, and for over/under confidence: F(2, 91) = 5.74, p = .004.

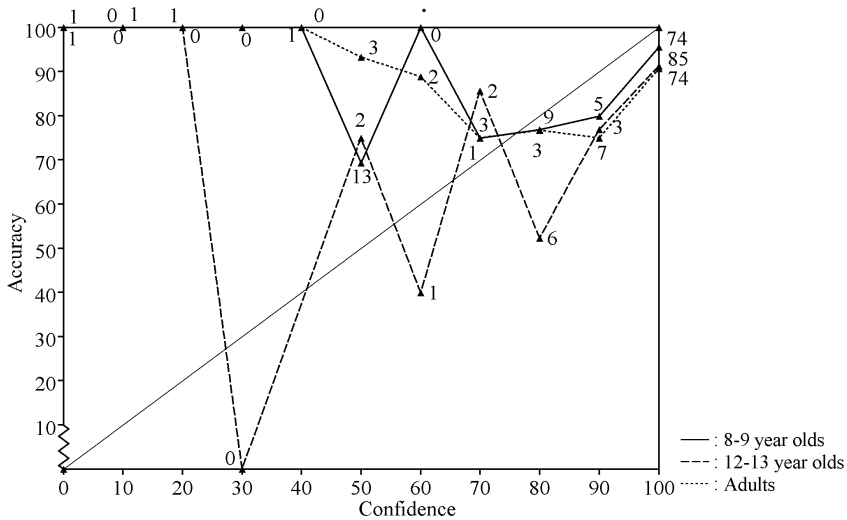

Figure 1. Calibration curves for the three age groups on the free recall. The numbers in the graph show the percentages of all items per curve (i.e., age group) in each confidence class.

Planned contrast for the calibration scores showed that the 7-8-year-olds differed both from the 12-13-year-olds, t (91) = 2,57, p = .012, and from the adults, t (91) = 3.80, p < .001. For over/under confidence, the adults differed significantly from both the 7-8-year-olds, t (91) = 2.15, p = .034, and from the 12-13-year-olds, t (77) = 3.34, p = .001.

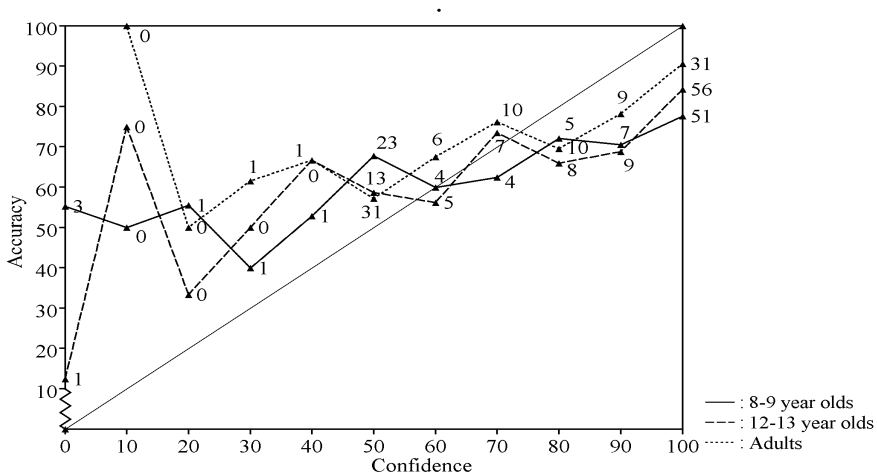

Figure 2. Calibration curves for the three age groups on the focussed questions. The numbers in the graph show the percentages of all items per curve (i.e., age group) in each confidence class.

Discussion

The present study analysed the effect of age and question format on accuracy, confidence, and realism in confidence judgements of 8-9- and 12-13-year-old children and of adults with respect to their recall of a witnessed event. Below, we first evaluate our hypotheses and then discuss some factors that appear to contribute to the explanation of the outcomes.

Our first hypothesis concerned differences between the two question formats. The results showed that the formats differed clearly in accuracy and confidence but that there were no main differences between the question formats for calibration, over/underconfidence and resolution. Thus, the results for accuracy and confidence were in line with our first hypothesis, but not the results for calibration, over/underconfidence. The fact that the metacognitive measures

did not differ between the question formats may partly be an effect of the fact that the three age groups differed within the question formats. Thus, the question formats as implemented in the present study, may not differ *per se* in metacognitive realism, but only for specific age groups. In addition, as discussed below, it should be noted that both the difficulty of the memory task and also (for the focussed questions) question difficulty may affect performance.

The second hypothesis predicted that for the *focussed* questions, the child age groups would show a lower accuracy, higher confidence, poorer calibration and a higher level of overconfidence compared with the adults. The hypothesis was fairly well, but not completely, supported by the results. No significant age difference was found for accuracy and only a trend for confidence. The hypothesis was most clearly supported for overconfidence where both child groups showed significantly more overconfidence compared with the adults. For calibration, only the youngest age group differed from the adults.

An interesting finding in our study is that there were no large differences in the proportion of correct recalled information between the age groups within either of the two formats. Seen in terms of report control (Koriat et al. 2001) the youngest children in their free recall, as was evidenced in the accuracy results, appeared to uphold a similar criterion as the adults for what information to report. Moreover, as shown by the fact that the 8-9-year-old children's overconfidence for the free recall question was at the same level, or even showed better realism, than the older children and the adults, the youngest children also gave confidence judgements that were well adapted to the level of accuracy in their free recall assertions.

In contrast, for the focussed questions, the children, although showing similar accuracy as the adults, gave confidence judgements that resulted in poorer realism (in terms of overconfidence) than the adults' confidence judgements and also than their own confidence judgements for the free recall questions. Thus, when the 8-9-year-old and the 12-13-year-old children did not have the possibility to choose what information to report, the realism in their confidence judgements appears to suffer as compared with the adults. A possible conclusion is that children's ability to make (possibly implicit) confidence judgements in connection with deciding what information to report (or not report) in a free recall task develops earlier than their ability to give explicit confidence judgements of answers to questions they have not themselves selected to answer. Further research should investigate the differences between the metacognitive processes

involved when deciding which items to report and when giving explicit metacognitive judgements.

It should be noted that some of the present results differ from previous similar research. For example, the results for the 12-13-year-olds for the focussed questions with two answer alternatives differed from previous research results for 11-12-year-olds for similar questions presented by Allwood, Jonsson et al. (2005) and by Allwood, Granhag et al. (2006). The 11-12-year-old children in those studies showed much poorer realism in their confidence judgements, as indicated by over/underconfidence, than the children in the present study. As an example, the level for overconfidence was on average .22 in four between-subjects conditions in Allwood, Granhag et al. (2006). In that study the accuracy level for the same four conditions varied between .56 and .59, i.e., lower than for the focussed questions in the present study. Likewise, the present results for adults for focussed questions differ from the results reported in previous research, e.g., by Allwood, Ask et al. (2005). In the latter study accuracy was lower and the over/underconfidence measure was poorer than in the present study. However, just as in previous research on focussed questions, in the present study the difference between children and adults in overconfidence was quite large.

A natural explanation for these discrepancies in results is that the task was more difficult in the previous studies, compared with the present study. In the previous studies (including Allwood, Ask et al., 2005) a different film was shown to the participants. As noted in the Introduction above, the hard/easy effect predicts poorer realism in confidence judgements when the memory task is harder. Accordingly, the noted differences in results are quite well compatible with the predictions associated with the hard/easy effect.

However, it is also of interest to note that the difference in results between the free recall question and the focussed questions in the present study is not quite compatible with the hard/easy effect, since the difference in realism between the two question formats is not as large as would be expected. It seems reasonable that the free- or forced report factor identified by Koriat et al. (2001) also plays an important role in explaining the difference in results between the two questions formats. However, it is noteworthy that, analysed over all three age groups the participants' ability to appropriately adapt their confidence judgements to the accuracy of their answers (as evidenced, e.g., in the results for the over/underconfidence measure) was not better in the free recall situation than for the focussed questions, although post hoc tests showed that there was a significant

difference for the question formats for the youngest age group. In order to better understand the contribution of *report control* it would be of interest in future research to use a more difficult memory task with the same design as in the present study.

A further factor that may contribute to understanding the results, especially the difference between the question formats, is the presence of noise (random error) in the confidence judgements. As pointed out above, Erev et al. (1994) showed that random error is more likely to explain the results for realism in confidence judgements the greater the within-person standard deviations of the confidence judgements are. In order to evaluate the contribution of noise, we analysed the difference in *SDs* for the two formats and the age groups. The results showed that the *SD* for the confidence judgements of the focussed questions was greater than that for the free recall questions. Thus, random error may help explain the difference between question formats, but, maybe surprisingly, not the found age differences. Again, for the question formats, this could be an effect of the fact that when answering focussed questions, the situation is less under the respondents' control as compared with the situation in free recall. The lack of effect in this context for age may be interpreted as an indication that the confidence judgement task was not too difficult for the 8-9-year-old children.

No differences for the question formats or age groups were found for *resolution*. These results are fairly well in line with previous research on children and adults. It appears that resolution is a dimension of metacognition that may not develop much over the ages studied here.

We turn next to the frequency judgements. Our third hypothesis predicted that the frequency judgements for *free recall*, but not for the *focussed questions*, would show good realism for all age groups and that, in general, the children, for the focussed questions, would show a greater tendency to overestimate their number of correct questions than the adults. The results showed that the participants tended to underestimate the number of items that they had answered correctly, although the deviation from zero was only significant for the youngest children's free recall estimations and the adults' estimations for the focussed questions.

However, no clear differences were found between the question formats or age groups and the results differed to some extent from the results in previous research in that the 11-12-year-olds in the study by Allwood, Jonsson et al. (2005) *overestimated* the number of focussed questions that they had answered correctly (the same was the case in the study by Allwood, Jonsson et al., 2005). It is not

clear to what extent the facts that the level of accuracy was higher in the present study than in previous research and that a frequency judgement was elicited (due to a technical error) one week before the analysed frequency judgement may have affected these results. However, it is of interest to note that the difference between children and adults in the level of the frequency judgements found in previous research did not hold for the free recall situation but was quite strong in numbers in the expected direction for the focussed questions.

An implication of the results of this study for forensic practice, given that the results replicate, is that both the difficulty and the question format of the memory task should be considered, not only in the context of the completeness and accuracy of witnesses' answers but also in the context of the realism of, especially children's confidence judgements. For example, the present study shows that the realism in 8-9-year-old and 12-13-year-old children's confidence judgements may be at least as realistic as adults' when fairly easy free recall questions are answered but, as shown by this and previous research, not necessarily when focussed questions with answer alternatives are answered.

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