Offenders’ interrogation behavior: the importance of crime scene characteristics and corroborating evidence

Sara Hellqvist
OFFENDERS’ INTERROGATION BEHAVIOR: THE IMPORTANCE OF CRIME SCENE CHARACTERISTICS AND CORROBORATING EVIDENCE

Sara Hellqvist

Offender profiling aims at generating information of an offender based upon the crime committed and the goal is to be an adjunct in the crime investigation process. The aim of the study was to examine crime scene characteristics and corroborating evidence and their associations with offenders’ interrogation behavior. Results from 207 analyzed police files indicated that reactive (impulsive) offenders confessed more often when there was technical evidence against them compared to instrumental (calculating) offenders. Reactive offenders also had more injuries. Injured reactive offenders were more inclined to deny, whereas injured instrumental offenders claimed amnesia more often. When comparing the confessions injured reactive offenders where more inclined to confess than injured instrumental offenders. There was also a strong tendency implying more confessions with witness reports. The findings point towards the practical usefulness of information of crime scene characteristics and corroborating evidence in the interrogation phase by better tailoring the interviewing strategy.

Keywords: offender profiling; interrogation; crime scene characteristics; evidence; homicidal violence

The consulting detective Sherlock Holmes (invented by Arthur Conan Doyle in 1887) is one of the first fictional characters that became known for his ability to solve crime mysteries with the help of forensic science and logical reasoning (Canter, 2011; Verde & Nurra, 2010). Since then, numerous movies and television series have been inspired by the offender profiling mythology, resulting in an increasing popularity in the general public as in experts already working in the field. However, it is important to note that there are few similarities between profiling in fiction and profiling in reality. In the past, the construction of profiles has been too easily used and abused both on screen and in real cases (Verde & Nurra, 2010). The present study attempts to illustrate aspects of the complexity of offender profiling, but also its practical usefulness when applied properly. The purpose of the study was to examine crime scene characteristics and corroborating evidence and their associations with offenders’ interrogation behavior.

The aim of offender profiling1 is to generate information of an offender based upon the crime committed (Muller, 2000; Trojan & Salfati, 2011). The assumption in profiling is that behavior reflects personality (Christianson, Granhag, & Hartwig, 2008; Crabbé et

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1In the literature, profiling is also referred to as psychological profiling, investigative profiling, criminal profiling, and crime scene profiling, and are often used inconsistently and interchangeably (Crabbé, Decoene, & Vertommen, 2008).
al., 2008). Questions of interest to the profiler can be: Where did the crime take place? Who is the victim? How was he or she found? If any weapon was used, what kind? Are any valuables missing? Have the offender left any traces? It refers to the idea that individuals who have similar background and personality characteristics will behave in a similar way. Thus, the offenders’ behavior at the crime scene can tell us something about what kind of a person he or she is. Another perspective within profiling is focusing on serial offending. In those cases, the profiler is doing linkage analysis, which is based on the assumption that an offenders’ behavior will be consistent if the situations are similar.

In general, the main role of offender profiling is to be an adjunct in the crime investigation process (Corovic, Christianson, & Bergman, in press). Profiling can have several purposes depending on the phase in the investigation (Salfati, 2000; Turvey, 1999). When the offender is unknown, the aim is to provide different angles, to narrow down suspects, do linkage analysis and risk assessments. When the offender is arrested, a profile can provide a ground for guide strategies for how to approach the offender during interrogations (Gudjonsson & Copson, 1997).

There have been disagreements about when profiling is suitable. Traditionally, it has been used when the offender to a series of homicides or rapes is unknown (Muller, 2000). However, recent research has tested the efficiency of profiling on different kind of crimes (e.g. theft and burglary) and on single-victim single-offender crime cases (Canter, 2000). It has been debated whether there is more to gain by focusing on profiling in single crimes than in serial crimes, since they have a higher incidence (Jackson & Bekerian, 1997). Serial killers are a relatively rare phenomenon and tend to be fundamentally different to single offenders (Harbort & Mokros, 2001; Kraemer, Lord, & Heilbrun, 2004; Muller, 2000). Moreover, research on the area has shown that profiling has been very useful and successful in the interrogation phase (Santtila & Pakkanen, 2007). Therefore, the present study focused on single violent crimes with emphasis on the use of profiling during interrogations.

**Crime scene characteristics and interrogation behavior**
An analysis of the crime scene can be made in regard to, for instance, what kind of violence that has been used. Thus, type of violence is a part of a profile based on crime scene characteristics. Violence is often categorized into an either instrumental or reactive type (Cornell et al., 1996; Pollock, 1999). In reactive violence, the attack is driven by an impulsive response which is caused by an immediate negative emotion towards the victim (Christianson, Freij, & von Vogelsang, 2007; Reidy, Shelley-Tremblay, & Lilienfeld, 2011). In this category, crimes of passion and bar fights are common. Contrary, instrumental violence refers to a planned and goal-directed attack. In this case, the victim itself has little personal significance and is only used to satisfy a certain need, for example sexually motivated offenders and offenders who kill for economic gain (Christianson et al., 2007; Reidy et al., 2011). To characterize violence, several crime scene characteristics are taken into account, for instance if the offender beforehand had purchased a gun or had threatened the victim.

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2 Profiler is an unofficial profession title, often used by police officers, FBI agents, psychologists, and forensic scientists (Kocsis, Middelorp, & Karpin, 2008).
It is important to note that the reactive-instrumental dichotomy is simplified and has been criticized for lacking support in real crime cases that are more complex (Bushman & Anderson, 2001). On the opposite side, other studies have found that up to 79% of violent offenses can be categorized as purely reactive or instrumental, supporting the dichotomy (Tapscott, Hancott, & Hoaken, 2012). In general, it is still regarded as an important conceptualization when linking violence to psychological characteristics (Cornell et al., 1996).

Further on, it is important to emphasize that emotion and behavior go hand in hand. A violent crime is often a strong emotional event even for the offenders, and it can be of both negative and positive valences. As mentioned above, offenders use violence for different reasons, which reflects how they relate to and retell the criminal event. How offenders’ narratives look like, if they confess, deny or claim amnesia, is associated with the crime experience (Christianson et al., 2007). For example, in relation to the categorization of reactive and instrumental offenders’ violent acts, the categories are useful during interrogations (Christianson et al., 2007). The purpose with the interrogation is to gather information of the crime, to elicit the truth, and to move a guilty suspect from denial to confession3 (Kassin et al., 2007; Moston & Engelberg, 2011). Therefore, it is of great importance to create an environment that encourages the offender to talk. Practically, by knowing important associations between crime features (e.g., instrumental violence) and interrogation behavior (e.g., claims of amnesia), the interrogator can be better prepared for questioning the offender (Santtila & Pakkanen, 2007).

Offenders’ explanations for their behaviors are often expressed in confessions or denials of the criminal event (Christianson et al., 2007). Although the research of offenders’ memory is scant, it has also been demonstrated that it is common for offenders’ to allege memory loss (Christianson et al., 2007). The amnesia can be either genuine or feigned. The general opinion among scholars is that a lot of crime-related amnesia is deliberately malingered, implied by findings from when its authenticity is evaluated by comparing with how a genuine memory pattern usually looks like (Jelicic & Merckelbach, 2007; Schacter, 1986). Simulation occurs when offenders believe they will avoid punishment, but also as a cause of psychological distress, which is common among reactive offenders (Christianson et al., 2007). Indeed, an analysis of offenders’ memories of homicidal violence found that 23% of the reactive offenders claimed amnesia during the whole investigation, compared to 14% of the instrumental offenders (Christianson et al., 2007). Santtila and Pakkanen (2007) found that similar patterns are implied regarding confession behavior, where instrumental offenders denied to a higher extent than reactive offenders. In line with this, Christianson and von Vogelsang (2012) showed that reactive offenders tend to claim amnesia, and thus distancing themselves from the crime, whereas instrumental offenders deny having committed the crime at all. This is supposed to be associated with offenders’ feelings of shame and guilt, where reactive offenders feel guilty of their actions or are distressed by the crime itself. They therefore confess as a part of a reparative action or claim amnesia to avoid thinking of the criminal event (Santtila & Pakkanen, 2007). On the other hand, instrumental offenders usually feel shame, which has a decreasing effect on confessions. At the same

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3 Note the word ‘guilty’, false confessions should be avoided at all time (Moston & Engelberg, 2011).
time, because instrumental offenders are more likely to have an antisocial background, they are not as distressed by the crime itself and the action is not in contrast with offenders’ self-image as it is for reactive offenders (Santtila & Pakkanen, 2007). This is in accordance with earlier studies, and Gudjonsson et al (2004) have found that confessions are in general related to the offenders’ perception of the strength of the evidence, internal pressure, and external pressure.

**Corroborating evidence**

Corroborating evidence refers to information that strengthens hypotheses in the judicial process, such as the guilt of a suspect (Moston & Engelberg, 2011; Walsh, Jones, Cross, & Lippert, 2010). Forensic science has become an important aid in the crime investigation process (Mennel & Shaw, 2006). One of the most increasing identification technologies are DNA and fingerprint testing (Durnal, 2010). As in the mythology surrounding profiling, it is important to stress that these forensic methods cannot alone solve a crime case and are only to be regarded as a tool that can conclude if a persons’ DNA or fingerprints are present or absent – not if the suspect committed the crime (Burg, Kahn, & Welch, 2011). However, in the right context a DNA or fingerprint match is reliable information. For example, if a person claims that he has never visited a certain place, but his DNA is found there, it can be concluded that he is probably not telling the truth. Another important source of evidence is the presence of witnesses (Weber & Perfect, 2012). Although much has been debated of witnesses’ credibility, witness reports are valuable information both in the investigation process and in the proceedings of the court (Moston, Stephenson, & Williamson, 1992). Hence, witnesses play a vital role, and a lot of time is put into the investigation to find someone who saw the criminal event. Moreover, whether or not the offender has been physically injured can also be of importance. It is common that offenders themselves get hurt when assaulting another person, and is a source for further information (Eriksson, 2008). If the victim had tried to defend him- or herself, injuries can be detected on the offender. In these cases, a medical examination often reveals injuries in the face, neck, arms, and on the lower legs after the victims’ scratching, beating, biting, and kicking (Rättsmedicinalverket, 2007).

Only a handful of studies have focused on corroborating evidence at the crime scene. Among laypersons, it is assumed that instrumental offenders, who plan their crimes, take precautionary actions and do not leave any evidence behind them (Lyle, 2004). When examining this assumption, some studies have included the variable “forensic awareness”, which have found instrumental offenders being more forensic aware (Salfati, 2000; Salfati & Canter, 1999; Santtila & Pakkanen, 2007). For example, Santtila and Pakkanen (2007) showed that offenders with the highest level of instrumentality covered up their tracks by burying the dead victim far away from the crime scene. It is also found that offenders who have been previously convicted tend to not leave fingerprints at the crime scene (Davies, 1997; Horning, Salfati, & Crawford, 2010).

In the context of confessions, it has been found that the more technical evidence available, the higher is the probability that the offender will confess (Santtila & Pakkanen, 2007). The presence of technical evidence is considered by both police and the offender to be central during the interrogation (Moston et al., 1992), and
corroborating evidence against the offender is often the strongest predictor of a confession (Moston & Engelberg, 2011). With recommendation from scholars in the field, interrogators are strongly encouraged to make strategic use of the evidence against the offender to extract as much information from him or her as possible (Hartwig, Granhag, Strömwall, & Vrij, 2005).

Despite of these findings that illustrate the importance of corroborating evidence, the “forensic awareness”- variable is often only one of several other variables included in studies of violent offenders. Most research on interrogation behavior is outdated or concentrates merely on false confessions (Moston & Engelberg, 2011). Few studies to date have focused solely on the interaction effects of crime scene characteristics and corroborating evidence and their associations with interrogation behavior. The offender profiling research is still in the process of finding out which variables that can be successfully used in profiling. This is because there have been relatively few attempts of scientific evaluation, or it has had inconclusive results (Kocsis, 2006; Schlesinger, 2008). For example, studies have shown that profilers have a low accuracy rate (Alison, Smith, & Morgan, 2003), and that accuracy itself is a problematic term (Kocsis et al., 2008). Hence, more research is needed to provide reliable data to base the profiles on. The present study combined crime scene characteristics, corroborating evidence, and interrogation behavior in an attempt to examine important patterns that can be used to facilitate the investigation process.

**Aim**
The aim of the study was to examine crime scene characteristics (type of violence) and corroborating evidence (technical evidence, offender injury, witness report) and their associations with offenders’ interrogation behavior (confession, denial, claims of amnesia). Based on theories and previous studies, it was hypothesized that:

1. Type of violence is associated with corroborating evidence. Reactive offenders leave more technical evidence behind, get more injuries, and are more likely to commit the crime in front of other people than instrumental offenders

2. Corroborating evidence is associated with offenders’ interrogation behavior. There is a higher frequency of confessions with the presence of corroborating evidence

3. Type of violence is associated with offenders’ interrogation behavior. Reactive offenders confess or claim memory loss more often than instrumental offenders, whereas instrumental offenders deny more often than reactive offenders

4. Offenders’ interrogation behavior is a result of interaction with corroborating evidence and type of violence. There are more confessions among reactive offenders when there is corroborating evidence against them, compared to instrumental offenders.
Method

**Material**
Profiling aims to make predictions from clues (variables) of the crime scene in a phase when explanations or answers are not yet available. By analyzing solved cases, we can with hindsight conclude whether the crime, for example, was committed by an instrumental or reactive offender. The present study was a part of an ongoing project run by Professor Sven Å. Christianson. The project has been ethically approved, and the data have been handled in accordance with ethical guidelines by the Swedish Research Council. In total, the database consists of 280 Swedish police investigation files obtained from police jurisdictions. The files were investigations of murder and manslaughter, designated as homicidal violence, and attempted murder and attempted manslaughter, designated as attempted homicidal violence. The crimes were committed during the years 1991-2009. The files were supplied by the National Criminal Investigation Department from the ViCLAS database, after crime cases have been sorted out on the basis on certain criterions. The investigation files consist of transcribed interrogations with the offender, victim and witness testimony, medical examiner's report of offender and victim, technical report of the crime scene, and forensic laboratory results report. All transcribed material and texts have been composed by police officers and other involved law enforcement personnel during the investigation.

**Sample**
To avoid both random and systematic noise, 73 cases of the original database were excluded. First, only offenders that have been convicted in court were included. As mentioned, this study focused on single criminal event, hence cases with several offenders or several victims were excluded. No child victims were included (below 15 years). Moreover, female offenders were excluded because most research has focused on males since they make up for most of the reported violence. Therefore, the model of explanations for females' criminal behavior can differ, and needs to be studied separately. For similar reasons, gang-related crimes were excluded. They also usually have multiple offenders and victims.

For the present study, the nonrandom sample consisted of 207 offenders and five main variables were used in the analyses. Crime scene characteristics, corroborating evidence and interrogation behavior are shown in Table 1. The mean age of the offenders were 35 years (s = 13, range = 15-80), and for the victims 40 years (s = 17, range = 16-84). Half of the victims were females.

**Coding procedure**
The police investigation files were coded by using a coding scheme, developed for this project, which comprised 116 variables. The variables in the scheme have been selected based on previous research of offenders’ crime related behaviors. A dichotomous coding method was used for most variables, which are scored as either present/yes (1) or absent/no (0). Some variables included several values, and were assigned with relevant numbers. There have been different raters coding the investigation files during the years. The present author coded 40 of them, and all of the corroborating evidence information in each file, since they were not included in the original coding scheme. No inter-rater reliability checks were possible due to practical constraints. However, spot
checks of the previous ratings were made and any ambiguity was discussed with the supervisor.

**Variables**

Five variables were included in the main analyses.

1. **Type of violence**: reactive or instrumental violence used by the offender. This was coded by analyzing several crime scene characteristics by interpreting them as indication of either planned or unplanned criminal actions.

2. **Corroborating evidence**: includes “technical evidence” (refers to the presence of offenders’ DNA or fingerprint), “offender injury” (refers to injuries that connects the offender to the crime), and ”witness report” (referring to if a witness saw the offender commit the crime). Corroborating evidence is actually a category, including these three variables. They had to be treated separately in the coding procedure because one of the variables is almost always present when an offender has been convicted.

3. **Interrogation behavior**: the offender confesses, denies, or claims amnesia for the criminal event. The interrogation behavior at the end of the investigation was of interest, allowing for behavior to change during the investigation as an assumed influence of the other analyzed variables.

**Table 1. Crime scene characteristics, corroborating evidence, and interrogation behavior**

<table>
<thead>
<tr>
<th>Variables</th>
<th>React.: 52 %</th>
<th>Instrum.: 48 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of violence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tech evidence</td>
<td>Yes: 84.5 %</td>
<td></td>
</tr>
<tr>
<td>Offender injury</td>
<td>Yes: 49%</td>
<td></td>
</tr>
<tr>
<td>Witness report</td>
<td>Yes: 40 %</td>
<td></td>
</tr>
<tr>
<td>Interrogation</td>
<td>Confess: 57 %</td>
<td>Deny: 28 %</td>
</tr>
<tr>
<td>behavior</td>
<td>Amnesia: 15 %</td>
<td></td>
</tr>
</tbody>
</table>

**Statistical analysis**

Because the variables were categorical and the analyses included multiple variables, log linear analyses were conducted (Field, 2009; Howell, 2010.). The method makes it possible to compare more than two variables at a time. Log linear analysis is an extension of chi-square test, and can be thought of as a categorical version of analysis of variance, making data in complex multivariate contingency tables more manageable and both main effects and interaction effects visible (Baker & Subkoviak, 1981; Meissner, Brigham, & Collen, 2001; Simkiss, Ebrahim, & Waterston). However, since no distinction is made between dependent and independent variable, the effects should only be interpreted as associations. Log linear analysis performs Pearsons chi-square test statistic based on the likelihood ratio (G²) and the logged odds ratio, where the logs of expected frequencies are compared to the logs of observed frequencies (Combse-Orme, 2008). It is primarily used for model building (as in logistic regression analysis) and hypothesis testing, where the latter is of interest in the present paper. The particular log
linear analysis chosen was the hierarchical method, allowing for a simple interpretation of the effects (Howell, 2010). In practice, the method first provides a saturated model including all main and interaction effects ($A*B*C, A*B, A*C, B*C, A, B, C$). The goal is to find a more parsimonious model that best fits the data, which is done with a backward elimination procedure by removing terms from the model and see if the removal has a statistically significant effect. Thus, it is the change in the $G^2$ that are of importance and are reported. For a deeper understanding of the underlying algorithms and more advanced reading, see Agresti (1996). Since a significant p-value only reveals that the effect is significant, but not exactly where, interpretations of the significant results were made from the contingency tables.

Regarding hypothesis 1, following interaction was of interest: type of violence x technical evidence, type of violence x offender injury, and type of violence x witness report

Regarding hypothesis 2: technical evidence x interrogation behavior, offender injury x interrogation behavior, and witness report x interrogation behavior

Regarding hypothesis 3: type of violence x interrogation behavior

Regarding hypothesis 4: type of violence x technical evidence x interrogation behavior, type of violence x offender injury x interrogation behavior, and type of violence x witness report x interrogation behavior.

Results

In total, three hierarchical log linear analyses were conducted to assess main, two-way, and three-way effects. For the strength of association, Cramer’s $v$ ($v$) is reported for the two-way analyses, which is a preferred effect size measure when the variables contain more than two levels (Howell, 2010). The results from the log linear analyses are presented in three steps according to the saturated models, starting with the most complex model (thus, to answer hypothesis 4). Degrees of freedom, likelihood ratio, p-value, and effect size are only reported in the text when the main results are statistically significant ($< 0.05$), or close to statistical significance ($< 0.10$). See Table 3 for a summary of findings.

The first three-way log linear analysis for type of violence, technical evidence, and interrogation behavior retained all effects, thus found a significant three-way relationship $G^2(2) = 6.980$, $p = 0.031$. As shown in Table 2, distributed over interrogation behavior, reactive offenders were more prone to confess when there was technical evidence against them compared to instrumental offenders (61% compared to 55%). When only comparing the confession rates and disregarding the denial and amnesia category, the difference gets larger (94% compared to 69%). The patterns for denial and amnesia were similar for reactive and instrumental offenders. However, it is important to note that there are small values in several cells, since the frequency for no technical evidence is small, having a negative effect on the power. Thus the interpretation of the result should be made with caution. Further analysis found no
significant relationship between technical evidence and interrogation behavior. There was a tendency for a significant relationship between type of violence and technical evidence \(G^2 (1) = 2.765, p = 0.096, \nu = 0.153\). Reactive offenders had more technical evidence against them (90% compared to 78%)\(^4\). Regarding the separate variables, technical evidence was significant, \(G^2 (1) = 58.832, p = 0.000\), and interrogation behavior was significant, \(G^2 (2) = 50.608, p = 0.000\). As shown in Table 1, most offenders had technical evidence against them, and more offenders confessed, then they tended to deny, but few claimed amnesia. There was no significant effect for type of violence.

The second three-way log linear analysis was also significant, \(G^2 (2) = 6.560, p = 0.038\). Distributed over interrogation behavior, injured reactive offenders were more prone to confess than deny or claim amnesia, but so were also the injured instrumental offenders. Surprisingly, the difference was that injured reactive offenders denied to a higher extent compared to injured instrumental offenders, 32% compared to 21%, and the difference increased up to 40% when looking separately at the denial category. Moreover, injured instrumental offenders claimed amnesia more often than injured reactive offenders (21% compared to 12%). However, when only comparing the confession rates, injured reactive offenders confessed more often than injured instrumental offenders (61% compared to 37%). There was no significant relationship between offender injury and interrogation behavior or type of violence and interrogation behavior. A significant relationship was found between offender injury and type of violence, \(G^2 (1) = 9.974, p = 0.002, \nu = 0.226\). Reactive offenders had more injuries than instrumental offenders (60% compared to 37%). There was no significant effect of only offender injury. As shown in Table 1, half of the offenders were injured and half were not.

Regarding the third three-way log linear analysis, there was no significant relationship between type of violence, witness report, and interrogation behavior. There was no significant relationship between type of violence and witness report. However, there was a tendency towards a significant relationship between witness report and interrogation behavior, \(G^2 (2) = 5.653, p = 0.059, \nu = 0.186\). When there was a witness report, the offenders tended to confess to a higher extent (69% compared to 51%). When there was no witness report, the interrogation behaviors among the offenders were more varying. They tended to confess, but they also denied or claimed amnesia more often. As mentioned, this was unrelated to type of violence. There was a significant effect for witness report, \(G^2 (1) = 6.363, p = 0.012\). As shown in Table 1, there was less common with witness reports.

In sum, regarding effects for the separate variables (see also Table 1); there were as many reactive offenders as instrumental. Half of the offenders were injured, and half were not. However, there was technical evidence against the majority of the offenders, but there was less common with witness reports. Most of the offenders confessed. Regarding the two-way relationships; reactive offenders seemed to have more technical evidence against them. In the same direction, reactive offenders had more injuries. Moreover, there was a strong tendency for interrogation behavior being associated with witness reports, where there were more confessions with the presence of witness

\(^4\) Example on how these percentages are calculated from Table 2: 33+13+8=54; 2+3+1=6; 54/60=90% & 22+11+7=40; 10+1+0=11; 40/51=78%
reports. Regarding the three-way relationship; type of violence and technical evidence reach significance when interrogation behavior was included. Reactive offenders confessed more often when there was technical evidence against them. Type of violence and offender injury remained significant when interrogation behavior was included. Injured reactive offenders denied more often compared to injured instrumental offenders, who tended to claim amnesia. When only comparing the confessions, reactive offenders with injuries where more inclined to confess.

Table 2. Observed frequencies for corroborating evidence and interrogation behavior divided into type of violence (% per row (r) and column (c))

<table>
<thead>
<tr>
<th>Type of violence</th>
<th>Corroborating evidence</th>
<th>Interrogation behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Confess</td>
</tr>
<tr>
<td>Technical evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reactive</td>
<td>Yes</td>
<td>33 (r61, c94)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2 (r33, c6)</td>
</tr>
<tr>
<td>Instrumental</td>
<td>Yes</td>
<td>22 (r55, c69)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>10 (r91, c31)</td>
</tr>
<tr>
<td>Offender injury</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reactive</td>
<td>Yes</td>
<td>34 (r57, c61)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>22 (r54, c39)</td>
</tr>
<tr>
<td>Instrumental</td>
<td>Yes</td>
<td>20 (r59, c37)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>34 (r59, c63)</td>
</tr>
<tr>
<td>Witness report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reactive</td>
<td>Yes</td>
<td>26 (r68, c51)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>25 (r49, c49)</td>
</tr>
<tr>
<td>Instrumental</td>
<td>Yes</td>
<td>19 (r70, c43)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>25 (r54, c57)</td>
</tr>
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</table>
Table 3. Results from hierarchical log linear analyses testing associations between crime scene characteristics, corroborating evidence, and interrogation behavior

<table>
<thead>
<tr>
<th>Variables</th>
<th>n</th>
<th>df</th>
<th>G^2</th>
<th>Sig.</th>
<th>Estimates^a</th>
<th>SE</th>
<th>Z</th>
<th>Lower</th>
<th>Upper</th>
<th>95 % CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interrogation behavior x Corroborating evidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IB x TE</td>
<td>111</td>
<td>2</td>
<td>1.525</td>
<td>0.467</td>
<td>-0.093</td>
<td>0.209</td>
<td>-0.444</td>
<td>-0.503</td>
<td>0.317</td>
<td></td>
</tr>
<tr>
<td>IB x OI</td>
<td>193</td>
<td>2</td>
<td>0.371</td>
<td>0.831</td>
<td>0.014</td>
<td>0.101</td>
<td>0.141</td>
<td>-0.184</td>
<td>0.212</td>
<td></td>
</tr>
<tr>
<td>IB x WR</td>
<td>162</td>
<td>2</td>
<td>5.653</td>
<td>0.059</td>
<td>0.233</td>
<td>0.112</td>
<td>2.087</td>
<td>0.014</td>
<td>0.452</td>
<td></td>
</tr>
<tr>
<td>Type of violence x Corroborating evidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TV x TE</td>
<td>111</td>
<td>1</td>
<td>2.765</td>
<td>0.096</td>
<td>0.014</td>
<td>0.179</td>
<td>0.081</td>
<td>-0.336</td>
<td>0.365</td>
<td></td>
</tr>
<tr>
<td>TV x OI</td>
<td>193</td>
<td>1</td>
<td>9.974</td>
<td>0.002</td>
<td>0.176</td>
<td>0.084</td>
<td>2.095</td>
<td>0.011</td>
<td>0.340</td>
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</tr>
<tr>
<td>TV x WR</td>
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<tr>
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**p < 0.01. *p < 0.05. †p < 0.10.**

_Note_: IB = Interrogation Behavior; TE = Technical Evidence; OI = Offender Injury; WR = Witness Report; TV = Type of Violence

n = number of valid cases included in the analyses

G^2 = change in the likelihood chi-square if variables were removed from saturated model upon df

a = values for the parameters, one per df
Discussion

The aim of the present study was to examine crime scene characteristics and corroborating evidence and their associations with offenders’ interrogation behavior. In total, five interesting results were obtained, where three of them reached statistical significance. As predicted and in accordance with hypothesis 4, results revealed that reactive offenders were more prone to confess when there was technical evidence against them (note however that this analysis had low power). Moreover and in line with hypothesis 1, reactive offenders had more injuries than instrumental offenders. Remarkably, injured reactive offenders denied more often compared to injured instrumental offenders, who tended to claim amnesia. However, when only comparing the confessions, injured reactive offenders where more inclined to confess than injured instrumental offenders. Further on, there was a tendency in line with hypothesis 1 for reactive offenders having more technical evidence against them, and there was also a tendency in line with hypothesis 2 for offenders in general to confess when there were witness reports. The results failed to show a relationship between type of violence and interrogation behavior and, thus, hypothesis 3 did not get support.

The findings that instrumental offenders had fewer injuries than reactive offenders and that instrumental offenders also tended to leave less technical evidence behind them conforms to earlier research that indicates that instrumental offenders seem to take precautionary action to not leave traces at the crime scene (Davies, 1997; Horning et al., 2010; Salfati & Canter, 1999; Salfati, 2000; Santtila & Pakkanen, 2007). This could be explained with offenders choosing different kind of ways to attack the victim. For example, the reactive offender may be more likely to use a knife which is easily accessible, but also causes more injuries. In contrast, the instrumental offender may use a gun. It would be interesting to break down this effect and in detail study the instrumental offenders’ strategies to avoid detection. Corroborating evidence or type of violence had no direct effect on interrogation behavior, except for a tendency for more confessions with witness reports, which is in line with previous findings (Moston & Engelberg, 2011). Significant relationships were found when all three variables were included, in line with patterns found in previous research where reactive offenders confess, and in this case injured reactive offenders (Christianson & von Vogelsang, 2012; Santtila & Pakkanen, 2007).

An interesting question is why an effect emerged between type of violence and interrogation behavior only when offenders had evidence against them. If interrogation behavior is related to guilt and shame, then there should be an association before corroborating evidence is included. One potential explanation could be that it has to do with how offenders cope with the pressure of being the prime suspect in the shorter perspective. Conversely, guilt and shame may be central in the longer perspective. Furthermore, it was surprising to find that injured reactive offenders also denied to a higher extent compared with injured instrumental offenders who more often claimed amnesia. The result is inconsistent with earlier findings and theoretical assumptions (Christianson & von Vogelsang, 2012; Santtila & Pakkanen, 2007). It might be related to the offenders’ own perception of the strength of the evidence. Previous research have shown that if the offender perceives the evidence as weak, then a confession is unlikely, even though the evidence in fact is strong (Gudjonsson et al., 2004; Moston &
Engelberg, 2011). In this case, offenders may have considered injuries as weak evidence and were therefore more prone to deny (as reactive offenders) or claim amnesia (as instrumental offenders). The reason for the differences in regard to type of violence is unclear. There could possibly be several different kinds of denial, where reactive offenders refuse to admit their actions to themselves or others whereas instrumental offenders deny because they do not feel obligated to confess. Thus, maybe the interrogation behavior in some cases is better regarded as being on a continuum instead as fixed categories. The difficulties associated with the dichotomization of type of violence presented by Bushman and Anderson (2001) is also of relevance. Possibly, real crime cases are more complex and require several categories.

Since the evidence is scarce for the research area in general, further interpretation of the findings is difficult to do. Overall, more research is needed to unravel these complex patterns. This study was but a first step of investigating the potential use of crime scene characteristics and corroborating evidence in the interrogation phase. What was unique in this study is the illustrated differences between reactive and instrumental offenders when it comes to corroborating evidence and interrogation behavior, and may have implications in two areas. First, important interpretations can be made based on crime scene characteristics and corroborating evidence. When the violence is reactive, it is likely that the offender has injuries or has left technical evidence behind him. Looking for an unknown offender, this can be used as guidance. Second and most primarily, to know that there exist associations between offenders’ type of violence, corroborating evidence, and their behavior during the interrogation phase is as a valuable tool. The interrogator can be better prepared, which could facilitate the investigation process. By tailoring the interviewing strategy depending on the offenders’ behavior, an environment to obtain as much information as possible can be created. The present findings indicate that reactive and instrumental offenders may need to be approached in different ways. To elicit a confession, it appears as the presentation of corroborating evidence could be an efficient strategy for reactive offenders. However, alternative strategies may need to be applied for instrumental offenders. How these should be designed needs further investigation.

Limitations and suggestions for future research
In general, analysis of text material is a productive way to gather information (Oleinik, 2011). Nonetheless, it is important to underlie the problems associated with second-hand data not created for research purpose. For example, some police files were very detailed and informative and others where only summaries. This was not a major issue since the advantage with analyzing violent crimes is that they are serious offenses and a lot of time and effort is put into the investigations. And because the penalty for these crimes is high, comprehensive material is needed to make decisions based on legal certainty. A greater disadvantage is the risk of confounders, which is a common problem in non-experiments. Even though some factors can be controlled for, it is not possible to isolate the variables of interest. In this study, cases that were assumed to be fundamentally different were excluded (e.g. gang-related crimes). However, there could be other potential aspects having an impact, for instance the degree of intoxication and its relationship to claims of memory loss. Moreover, causal inferences cannot be made. Although type of violence is associated with offender injury, it is impossible to say
which variable that causes the other. Despite of these limitations, the high ecological validity is an important advantage.

It would have been interesting to see how the analyzed variables interacts with factors that previously have been identified as having impact on interrogation behavior, such as age, sexual offense, ethnicity, and criminal background (Pakkanen & Santtila, 2007). As most studies concern men, a focus on female offenders and gang-related crimes would also be an interesting line of inquiry. Another suggestion for future research is to focus on the interrogator and their interviewing tactics, since it is an interactive process (Gudjonsson, 2007; Moston & Engelberg, 2011; Moston et al., 1992). Whether reactive and instrumental offenders differ in their reaction to questioning technique (Cognitive Interview, Reid Technique etc.), and also how it relates to the presentation of corroborating evidence should also be examined. Related to this is the method of strategic disclosure of the evidence (Hartwig et al., 2005). In the present study, it is unknown how or when the interrogator disclosed the corroborating evidence, which in turn could influence the offenders’ interrogation behavior. Finally, offender profiling research is still identifying important variables that can be used in profiling, and empirical validation of the variables is crucial. However, it is essential to focus on the training of the profilers. If the profiling tools are not used properly, it is counterproductive (Cothran & Jacquin, 2011; Yonge & Jacquin, 2010).

Summary and conclusion
The findings indicated that reactive offenders confessed more often when there was technical evidence against them compared to instrumental offenders. Reactive offenders also tended to have more technical evidence against them and they had more injuries than instrumental offenders. Injured reactive offenders denied more often compared to injured instrumental offenders, who tended to claim amnesia. However, when comparing the confessions, injured reactive offenders confessed to a higher extent compared to injured instrumental offenders. There was also a strong tendency implying more confessions with the presence of witness reports for both reactive and instrumental offenders. It can be concluded that instrumental and reactive offenders in some aspects behave differently during the interrogation when crime scene characteristics and corroborating evidence are considered. Both the significant relationships and the absence of hypothesized effects illustrate the complexity of offender profiling, and it is evident that more research is needed prior to making generalizations. As mentioned in the introduction, offender profiling is surrounded by numerous myths. One of the greatest mysteries of profiling is its growth despite the lack of scientific evaluation, which often is cited with a tone of sarcasm (Kocsis, 2006). These findings contribute with empirical value to the offender profiling research field and may in the future have potential for practical use, where it can be considered during the interrogation phase.

References


