Crime stories
The influence of investigative experience in the construction of crime scenarios

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Abstract

Since 2005, it is obligatory for detectives to work with hypotheses and scenarios during an investigation. Although creating scenarios is an important task during the investigation, there has been little empirical study about this topic. Little is known about how to construct a scenario, let alone multiple ones based on the same pieces of evidence. Moreover, little is known about the influence of experience within this process of scenario construction. The aim of this research was to explore the influence of investigative experience in scenario construction.

To gain information about the present trainings in constructing crime scenarios, semi-structured interviews are carried out with experts in the domain of scenarios, counter arguing and the use of scenarios in practice. In the second place, an experiment is done whereby detectives as well as students were asked to write two scenarios based on one crime scene photo. The students are used as reference material. The scenarios are analysed on the elements of a good story as well as on elements of the CBCA, elements of the crime and details. In addition, both versions are compared on similarities and differences.

In short, the most important results show that different scenarios are created when one assignment is given. Detectives write short scenarios with little information, which miss the form of a narrative. In addition, detectives more often write an alternative scenario in which the victim committed suicide or died from an accident. This seems an effect from the training in hypotheses and scenarios. Also, it seems that detectives use a standard list of evidence for which to look at a crime scene. A final result shows that the alternative scenario of the detectives contains less information than their first scenario.
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Chapter 1 Introduction

1.1 Stories

“Science without context is meaningless at best and dangerous at worst.”

(Gallo and Stockdale, 1998, p. 70)

People view the world in terms of cause and effect and we all tell stories about how the world works in order to understand it. Only pure facts or science without context can tell us nothing or even worse, they tell us the wrong things when interpreted incorrectly. Facts can be interpreted in many different ways. Different meaning can be assigned, depending on one’s preconceptions, with the consequence of bad results. People need a context, a story in order to make sense of information, give structure to it and interpret it. Thus, a story has to be created of different pieces of information (Van Koppen, 2010). Police investigations are also about creating stories; stories of the crime. One of the most important tasks of detectives, besides maintaining public order and providing assistance, is solving crimes. This is a difficult task since the detectives have to find out what happened in the past. Especially murder cases are difficult, because a victim who might know some of the facts is not available to give a witness statement. In order to find out what happened, detectives collect different pieces of evidence; the facts. This can be physical traces left on a crime scene, such as DNA or fingerprints. But also statements taken from witnesses, memories of those involved, footage captured by cameras, telecom data etcetera. Eventually they have to create a story of the crime, supported by the evidence to find out who is the offender. Therefore, investigations are about creating stories of the crime in order to solve it (De Poot, Bokhorst, Van Koppen and Muller, 2004).

Criminal cases can be distinguished in cases with both a known story and a known suspect in the beginning, cases with a story but no suspect and cases where neither a story nor a suspect is known (De Poot, et al., 2004). These latter type of cases are defined as search cases i.e. whodunnits. The way of investigating in this type of cases is usually bottom-up; one or more possible stories are constructed based on information police detectives find (De Poot and Van Koppen, 2010). Such cases are difficult, since detectives have no direction in which to start their search. Parts of the story of the crime first have to be reconstructed. The reconstruction of what might have happened is the core of the investigation in search cases. The reconstructed story is subsequently verified with the use of new information in the verification phase. However, it is not possible to keep the two phases separated. It is rather an
interaction between the reconstruction and verification. New information is used to test a reconstructed story, as well as to expand and adjust the story (De Poot, et al., 2004).

Detectives will try to construct a story by interpreting and analysing the traces first. When a crime scene is discovered the detective starts with a search for traces. They collect as much evidence as possible after which the traces will be analysed and interpreted. The traces and their interpretation all form a part of the reconstruction. The reconstruction tells something about the sequence of actions or events from the past. Questions as who, what, how and why have to be answered as the reconstruction continues and more information is to be found (Van Koppen and Van der Kemp, 2010). Although the reconstruction is the start of the creation of a scenario, there still is no scientific method for the reconstruction of a crime. The step from evidence at the crime scene and the interpretation of it is not scientifically underpinned.

The reconstruction of a crime will subsequently lead to a scenario that tells what exactly happened during the crime. The crime scenario is a chronological description of where, when, by who, how and why the crime is committed (Van der Kemp and Balk, 2008). The reconstruction, therefore, is a part of the scenario (Van Koppen and Van der Kemp, 2010). A scenario creates well-founded suspicions and hypotheses about the direction in which new information might be found. When the search process is directed by knowledge of the story or by well-founded suspicions, detectives can search for information more specifically. This promotes both the efficiency and the likelihood of success. However, a disadvantage to this process can be the closure of many possible search paths and the possibility that the scenario or hypothesis appears to be wrong (De Poot and Van Koppen, 2010). The process of reconstruction and scenario construction will be further elaborated in chapter three.

From the above description of the investigation process can be deduced that investigating is a difficult task. The risk of error always lies in wait. A frequent phenomenon during investigations is that detectives tend to decide the most likely suspect at a very early stage of the investigation, with the consequence that only one suspect-led scenario is investigated (Rossmo, 2009). They subsequently develop too much confidence in the assumption that their suspect actually is the offender. Due to this confidence, only confirming evidence is found. Bias on the nature of the story might direct the interpretation of the findings, in which claims can be found for a story that is incorrect (De Poot and Van Koppen, 2010). This is also referred to as tunnel vision.
1.2 Tunnel vision

Tunnel vision is a natural human tendency that has particularly pernicious effects in the criminal justice system. Once people form an impression, they unwittingly look for, interpret and even create data that verify it (Kassin, 2005). As Kassin (2005) states, detectives also have this tendency during their work. In order to solve a crime as quickly as possible, it is necessary for detectives to create a form of tunnel vision. There is not enough time and there are not enough resources during an investigation to search for all the information that might be relevant to make an optimal decision. Tunnel vision can be interpreted as a process that serves a useful purpose whereby people focus on important, relevant evidence and ignore irrelevant evidence. In this way, tunnel vision is a guide in the information search during the complex situation (Rossmo, 2009). The detective can protect himself against an abundance of too differentiated information (Rassin, 2007). However, it is important to be able to go back to the start of the tunnel when the chosen tunnel appears to be the wrong one.

Tunnel vision has serious consequences when detectives focus on one suspect, select and filter the evidence that will build a case for conviction, while evidence that points away from guilt is ignored or suppressed (Blaauw, 2002). Blaauw (2002) concludes that any alternatives are possibly ignored during the investigation. The drive to confirm this belief in guilt adversely impacts on the rest of the investigation; witness interviews, eyewitness procedures and the interrogation of suspects are all influenced by this belief (Ask, 2006). Research of Ask (2006) shows that different meaning can be assigned to ambiguous evidence, depending on the preconceptions of the detectives. Tunnel vision can lead, at worst, to a wrongful conviction.

In recent years, the Dutch police got severe criticisms for their investigative practice. This critique is based on an analysis of cases of wrongful convictions (see for examples www.geredetwijfel.nl). In 2005, the program ‘Versterking Opsporing en Vervolging’ was set up. The program was made in response to a wrongful conviction in 2005. An innocent man was convicted in court and appeal, while a large-scale police investigation had taken place (Rapport Versterking Opsporing en Vervolging, 2005). In response to the wrongful conviction, it was recommended to organise counter arguing; persons not involved in the investigation, but do operate intern, constantly review the decisions of the detectives. This should ensure that group thinking and tunnel vision is avoided. Another consequence of the wrongful conviction is the obligation for Dutch police detectives to investigate multiple scenarios (Rapport Versterking Opsporing en Vervolging, 2005). The final scenario should
rule out other scenarios and lead to a compelling judicial story to base a conviction on (De Poot and Van Koppen, 2010).

1.3 Benefits of producing alternative scenarios
As mentioned above, the reconstruction of a crime will lead to a scenario that tells what exactly happened during the crime. In order to avoid tunnel vision and wrongful convictions, it is obligatory to create multiple scenarios (Rapport Versterking Opsporing en Vervolging, 2005). By creating and testing multiple scenarios, a falsification process is started: possible explanations have to be excluded (Lettinga, 2009). Creating multiple scenarios has more benefits. When, during an investigation, only one scenario is constructed there is a twofold danger. When it appears to be incorrect, time and opportunities are lost. By constructing multiple scenarios, this danger will be eliminated for the most part. The other danger is found in the fact that if the scenario is not proven incorrect (but is still wrong), there is a danger of accusing the wrong person. Additionally, detectives, both expert and novices, are prone to overconfidence in for example the scenario, significance of specific evidence, or in understanding the motives (Rossmo, 2009). A way to decrease this feature is to provide an alternative hypothesis. By producing and comparing several scenarios, the subjective probability of the original scenario reduces (Rossmo, 2009).

Constructing multiple scenarios also has benefits for evidence and its diagnosticity. When focussing on only one scenario, there is a possibility that evidence that doesn’t fit that scenario may be overlooked. By creating more scenarios than just one, this evidence may become visible in light of a different scenario. In addition, alternative scenarios help measuring the quality and diagnosticity of the evidence. When evidence fits in all scenarios, it has no diagnostic value because no scenario is excluded by the evidence. The production of alternative scenarios promotes exploration of various possibilities, avoiding tunnel vision to which a single scenario is prone (Rossmo, 2009; Van Koppen, 2011)).

Developing multiple scenarios is an important task for detectives. Scenarios are, besides the importance of avoiding tunnel vision, also important for other areas in the investigating process.

1.4 Importance of scenarios
Scenarios are important for the interpretation of evidence. With the use of multiple scenarios, the search of the crime scene, the search in the victim’s world, but also in the laboratory can be structured. A scenario is also essential for analysis of evidence by experts. A
reconstruction of the events has to be made in order to decide where the offender possibly left traces on the crime scene. Without a scenario, or a context, it is impossible to know what piece of evidence has to be analysed on which place (Van Koppen, 2010).

A scenario is also necessary for the task of behavioural or offender profiling (Van der Kemp, 2010). A thorough reconstruction of the crime is the beginning of the work with profiling. Only with a reconstruction based on the traces left at the crime scene, it is possible to determine the behaviour of the offender. From the crime reconstruction, the most likely scenario of the crime is created in order to describe and interpret the offender’s behaviour. The determined behaviour will subsequently lead to a profile, by assigning psychological meaning and relating this meaning to characteristics of the offender. The offender can be seen as the actor of the scenario (Van der Kemp & Balk, 2008). The role of reconstruction and scenarios in profiling will be further elaborated in chapter 3.

It is evident that scenarios are of great importance in different areas during the investigation. However, there is no explicit method for the creation of just one scenario, it is even more unclear how to create multiple ones. Little is known about the construction of scenarios and the elements it should consist of. Research by Wright (2004) shows that senior investigative officers are able to elicit quite detailed crime scenarios due to their experience. Wright (2004) showed the detectives multiple photos of crime scenes and asked them, inter alia, to create one story per crime scene, verbally, about what might have happened. The study showed that detectives use their experience in their decision making and were able to create detailed scenarios (Wright, 2004).

1.5 Experience

Because experienced detectives will pay attention to details, it is to be expected that the stories provided by experts will provide a more in-depth analysis (Rossmo, 2009). Additionally, aspects of former cases might be used in present cases by experienced detectives. Although experience can be helpful with the formulation of a scenario with, for example, the transformation of evidence into a story of the crime whereby the context and evidence suggest a narrative immediately, a scenario based only on experience is not acceptable. Not everyone’s experience is equal or instructive. Any hypothesis made must be supported by factual details submitted to thoughtful analysis and logic. One creating a scenario solely based on experience won’t be able to show the logic and science behind the hypothesis made (Chisum and Turvey, 2008).
1.6 Research question

Scenarios obviously are of great importance in different areas during the investigation. However, little is known about the construction of scenarios and the elements it should consist of. Research by Lettinga (2009) shows that the use of multiple scenarios is not fully applied yet. However, Lettinga (2009) only studied one district. Wright (2004) discovered influence of experience in the scenarios developed by police detectives. Is this also visible in the scenarios of Dutch police detectives? If so, is this influence of experience positive or negative? As mentioned earlier, it is important to start the investigation with multiple scenarios so that during the investigation, detectives can decide in which scenario new found information fits best, and which scenario can be eliminated. The question is whether detectives are able to construct several scenarios, based on the same pieces of evidence, at such an early stage. And if so, how do they construct the scenarios? Although creating scenarios is an important task during the investigation, there has been little empirical study about this topic. Little is known about how to construct a scenario, let alone multiple ones based on the same pieces of evidence. In order to gain a better understanding of the construction of crime scenarios in practice, it is important to study this part of criminal investigations. This leads to the following research question:

How is the creation of crime scenarios influenced by investigative experience?

- What influence does experience have on police detectives?
- What kinds of scenarios are created?
- Which elements are visible in the crime scenarios?
- How much variation is visible between the scenarios?
Chapter 2 Narratives in law

There has been little empirical study on crime scenarios. Little is known about the construction and form of a scenario. Therefore, literature about stories and narratives in law is studied to see whether this sheds light on the construction of crime scenarios. The definition of a scenario is, according to Van Koppen and Van der Kemp (2010), a chronological description of where, when, by who, how and why the crime is committed. This scenario should rule out other possibilities and lead to a compelling judicial story to base a conviction on. Stories take a central place during the whole judicial process. Stories are told by witnesses and suspects, stories are written down in police reports and police detectives create stories about what happened (Wagenaar, Van Koppen and Crombag, 1993).

In order to create a comprehensible story, people apply common sense and knowledge about how the world works to do so. In addition, they place the elements of the story in terms of cause and effect. In this manner, narratives are created (Pennington and Hastie, 1993; Rossmo, 2009). Part of the criminal investigation is the creation of narratives. From the first moment at a crime scene, a detective starts applying common sense and criminological models to construct a story of the crime, he creates a narrative. The evidence at the crime scene suggests the narrative, and the narrative identifies and selects the evidence. Just a piece of evidence, like a blood stain, has no meaning without a narrative. Detectives also bring a package of knowledge about how the world works when they go to a crime scene; they have no open mind without beliefs or preconceptions. When creating a narrative, these beliefs and preconceptions influence the kind of narrative the detective constructs (Rossmo, 2009).

Bennett and Feldman (1981) are considered the introducers of the term narrative in analyses about the judicial process. They studied the decision making of jurors during trial. Jurors have to decide whether there is enough evidence to base a conviction on. Such a decision is complicated for lay people due to lack of knowledge of laws, rules, procedures and how to deal with conflicting information. Bennet and Feldman (1981) found that jurors use stories for their judgment of cases. Story construction about an alleged offence provides a link between the legal context and the daily life of the juror. Wagenaar et al., (1993) also studied narratives in law and the way they should be anchored in general rules that need no further testing. Anchors are common-sense rules justifying our belief in particular pieces of evidence. Without anchors, evidence does not prove anything (Wagenaar et al., 1993). Like Bennet and Feldman (1981), Wagenaar et al., (1993) claim that a good story should consist of a clear storyline and a context in which the actions of the individuals become comprehensible. This seems a rather vague description of a good story. The theory about narratives is further
elaborated by Pennington and Hastie (1993). They also studied the decision making by jurors and developed the story model. The essence of the theory is that the construction of a causal model of events, a story, is central in understanding the evidence and its implications. While creating a story, the story will be constructed with use of experience and common knowledge as well as knowledge about the evidence of the case (Pennington and Hastie, 1993). The next paragraph will explain how story construction works.

2.1 Story construction

During the judicial process, stories are created, told, judged, and adapted. When a story is created, told or read, gaps in the story will be filled by the creator or listener. These gaps are filled with knowledge gained through experience and common knowledge one has about the regarding subject of the story. To give an illustration of this process, suppose a listener hears the following narrative: “Pete just got in his pajamas and walks to the bathroom to brush his teeth. The curtains are closed and his bed light is on.” Many listeners will infer spontaneously that it is evening. Yet, nothing is mentioned about the time of the day. The evening is inferred because we share knowledge about the habits of people before they go to bed at evening: to close curtains, put their pajama on and brush their teeth.

People draw conclusions about unnamed facts and give meanings to statements which may never have been intended. (Haket, 2007; Wagenaar et al., 1993). The kind of meaning one assigns to certain facts and statements depends on schemes one has developed regarding to the subject. A schema is formed on the basis of cognitive processing of experiences and consists of connections which we made in the past, based on our experience. Facts or events are interpreted by using the schemas stored in our memory (Hogarth, 2001). The influence of schemes is further elaborated in paragraph 2.3.2.

According to Pennington en Hastie’s’ (1993) story model, stories are besides experience and common knowledge also constructed based on knowledge of evidence found in the regarding case. Jurors combine facts and stereotyped themes (e.g.” the cold-blooded killer takes revenge”) from pre-existing knowledge structures with new information to construct their own story of the case. This process of filling gaps is also referred to as ‘active story construction’ (Pennington and Hastie, 1993). Detectives also construct stories during the investigation. The story is partly based on information and partly on inferences based on their general knowledge (Wright, 2004). A way of creating a story is to combine the known facts regarding the crime first. For example there is a dead body (fact) of a man (fact) with stab wounds (fact) and there is blood on the wall (fact). In order to create a coherent scenario,
however, gaps have to be filled where there is no significant evidence (Wagenaar et al., 1993). This can be done by making inferences. When describing facts, the detective might first establish the facts of the case and next uses logical inference to interpret the facts and make assumptions about the crime. By giving facts a name or by interpreting them one necessarily implies inferences about their meaning (Wagenaar et al., 1993). For instance, the bloodstain from the offender, the living room was ransacked etc. Schum and Tillers (1991) described a same sort of model for scenario construction.

2.1.1 Scenario construction
According to Schum and Tillers (1991) a scenario should consist of two crucial elements: benchmark events and hypothetical events or gap fillers. Benchmark events are events for which there is some evidence found. Hypothetical events are possible events that are not yet supported by evidence. A scenario outruns the available evidence by creating hypothetical events. The gap fillers can be seen as indicators of the possible existence of relevant evidence. By creating these two events a story of the crime arises. With the construction of a possible story one automatically discovers the vacancies. The evidence that is found after the construction of the first scenarios can support a hypothetical event, but the evidence can also prove (parts of) the story wrong or exclude some of the hypothetical events. A more extensive scenario can lead to more leads and (research) questions (Schum and Tillers, 1991).

The evidence at a crime scene is rather ambiguous than entirely explicit. It is expected that detectives use their models (theories) and mindsets (unconscious ideas) about how the world works, how criminals behave and crimes occur, to form a coherent narrative and fill in the missing pieces (Rossmo, 2009). A narrative is highly an artificial construction. The reality is not organized as a narrative by itself. The narrative form is deliberately imposed on a series of events by the narrator. This is done by giving meaning to an event or a series of events. A scenario is in fact a representation of a set of data in a coherent whole, in which meaning is given to events and relationships (Wagenaar, 1997). Cognitive processes like confirmation bias and group think can have an influence on the kind of meaning assigned to certain events. These processes are further elaborated in paragraph 2.3. As shown stories are constructed on the base of elements, for instance pieces of evidence. Next to that stories have a structured form. The question is how these elements give structure to a story.
2.2 Structure of a story

According to Wagenaar (1997), a report with findings or with an event can be called a story if it contains a number of elementary structure characteristics. In the first place the report has to form a whole to be considered as a story. This means that it represents an action that has an explicit begin, middle and end. Secondly, it is important for the separate parts to exhibit an explicit coherence (Wagenaar, 1997).

Bennet and Feldman (1981) have studied if stories contain substantive elements by which they are judged as true or false, or if the structure of the story has an influence on that. They found that structure has a major influence on the credibility of the story. As the story holds more ambiguities, like contradictions or the absence of a logical connection between different story elements, the story will be judged as false more easily. Especially contradictions around the central action, in this case committing the crime, lead to untrustworthiness of the story. The story should contain coherence and logic, which are important elements of a good story. In addition, the story should contain a context that provides an easy and natural explanation of why the actors behaved in the way they did (the motive for the crime) and how they did it (Bennet and Feldman, 1981; Wagenaar et al., 1993). Wagenaar et al., (1993) agree with the theory of a good story and added that it should be supported by evidence as well. The truth of a story is established by means of evidence. But evidence alone proves nothing as every piece of evidence is a sub-story in itself which needs further support, until it can be safely anchored in a general rule that needs no further testing because of the general acceptance of it. These general rules are usually common-sense facts of life which are called anchors. A judge descends in the hierarchy of sub-stories until the general accepted rules are met and the story of indictment is anchored (Wagenaar et al., 1993).

Thus, a story should contain some structure elements and should be supported by means of evidence to be assessed as a good and believable story. As shown, the narratives, or scenarios, are essential to interpret the facts. This applies strongly to the investigation process. Competitive scenarios are necessary in order to interpret the facts. Both the search on the crime scene as the search for traces on pieces of evidence in the laboratory is structured with the use of scenarios. And the results should be interpreted based on a scenario as well (Van Koppen, 2010; Van Koppen, 2011). Only a well-defined narrative makes it possible to judge the available evidence. Evidence without context is problematic, since it won’t be clear whether the evidence corresponds with the story of what have happened (Wagenaar et al., 1993).
A scenario serves as a guide in the investigation, which might lead to the offender. The police, eventually, try to come to a true, anchored narrative (De Poot and Van Koppen, 2010). It is important for the police to be sure that the anchors they use are relevant for the subject on which a decision is based, since several studies show that in all sorts of decision-making processes people unconsciously use anchors that are not relevant for the subject (Englich, Mussweiler and Strack, 2006; Mussweiler and Englich, 2005). It needs no further explanation that decisions based on irrelevant anchors can lead to other wrong decision, which can be crucial faults in the investigation process (Rassin, 2007).

In order to avoid wide ranging interpretations and identify inconsistencies it is important for the police to formulate clear explicit narratives. This entails that it’s best for the scenario if it contains a theory of the crime with assumptions and causal inferences made. In addition, confirming and disconfirming evidence should be given (Rossmo, 2009).

It seems that all researchers agree on the importance of a good story and they all attempt to describe the elements of a good story: a central action, events which follow logically after each other and no contradictions. This explanation seems to be quite logic, but what is the exact meaning of this description? A further development of the elements of a good story would provide more clarity about the content of a good story. Pennington and Hastie (1993) found principles that determine the acceptability and the confidence in a story. These principles are called the certainty principles.

2.2.1 Certainty principles
According to Pennington and Hastie (1993), there are four principles that determine the acceptability and the resulting level of confidence in a story. Two of the principles govern acceptance: coverage and coherence. Uniqueness, another certainty principle, will contribute to confidence in the story. A story’s coverage of the evidence refers to the extent to which the story accounts for the presented evidence. The story will be found more acceptable if it covers a large part of the available evidence. The last principle involves the goodness-of-fit of the story. Figure 1 shows a scheme of the principles. I will elaborate on the principle coherence in more detail.

Coherence is, according to the theory of Pennington and Hastie (1993), a concept that has three components: consistency, plausibility, and completeness. A story is consistent when it does not contain internal contradictions either with evidence believed to be true or with other parts of the story. Plausibility means that the story should correspond to the reader’s knowledge about what typically happens in the world. In order to be assessed as plausible, the
story should not contradict that knowledge. A story is complete when the expected structure has all of its parts. Pennington and Hastie (1993) state that a story is expected to consist of some episodes and events. A story exists of a hierarchy of embedded episodes and an episode consists of a typical configuration of events. In stories and in episodes, events, considered to be initiating events, cause characters to have psychological responses and to form goals that motivate subsequent actions which cause certain consequences and accompanying states (Pennington and Hastie, 1993). Confidence in the story will decrease by missing information or lack of plausible inferences about one or more major components of the story structure. Thus, a good or accepted story, in this case a good scenario, should not contain inconsistencies, should correspond to knowledge about what happens in the world, and should contain all expected elements (Pennington and Hastie, 1993). A good story interprets the physical evidence, the behavioural events and explains the motive, goal and meaning of the crime. And the story must be believable. The principles are a tool to determine the acceptability of a story. However, the principles of a good story are difficult to test empirically. Plausibility is difficult to measure since different people have different ideas about what typically happens in the world and what is normal for them. Also completeness of a story is hard to determine. There are no clear rules that ascertain whether a story is complete. Nevertheless, since research on stories is one of the few possibilities in studies for scenario construction, the principles plausibility, consistency and completeness will be used to try to measure the acceptability of the scenarios. The expected elements of a crime scenario will be described in paragraph 3.3.1. Alongside the certainty principles developed by Pennington and Hastie (1993) there are other criteria which can be used in order to analyze quality: the system of content criteria.

Figure 1: Certainty principles

Acceptance  Confidence

Coverage  Coherence  Uniqueness  Goodness-of-fit

Consistency  Completeness  Plausibility
2.2.2 Criteria-Based Content Analysis

These criteria of content analysis are often used to analyze the quality of statements and the risk of deceit. The analysis of the quality of a statement by use of content criteria is made against a background of the individual’s personality and cognitive and verbal competencies. A procedure that is used is called criteria-based statement analysis (CBCA) (Steller & Koehnken, 1989). CBCA is based on the assumption that statements based on observations of self-experienced events differ in content and quality from statements that are based on invention or fantasy. The reality criteria reflect specific features that differentiate truthful from invented statements. This assumption is originally stated by Undeutsch (1967) who is considered the pioneer of statement analysis. The presence of the criteria in a statement suggests that the statement is based on a genuine personal experience. Thus, a truthful statement contains more elements than false statements do (Steller & Koehnken, 1989).

The system of content criteria consists of five major categories containing nineteen individual criteria. The five major categories are: general characteristics, specific contents, peculiarities of content, motivation-related contents, and offence-specific elements (Steller & Koehnken, 1989). Some of the nineteen individual criteria can also be useful for the analysis of stories. The presence of the elements makes the story more plausible. The individual elements that can be used for the analysis of stories in this study are: logical structure, quantity of detail, and description of the context and interactions of the categories general characteristics and specific contents.

2.3 Influence of cognitive processes

As mentioned before, the interpretation of facts and assumptions can be influenced by cognitive processes. Our interpretations and judgments of incoming data are influenced by various cognitive processes. One can think of contextual information, expectations, things we already know, hope, motivation, and state of mind. These processes can be seen as a sign of expertise. All things we learn and experience during lifetime influence new incoming data. However, this process can also interfere and contaminate our perception, judgment, and decision-making processes, with the consequence that people lose objectivity. Because we have different experiences and expectations, we judge and perceive information differently. Because of the existence of these processes, it is not easy to judge incoming information objectively. Research has shown that even logical reasoning is not immune to psychological effects (Evans, Barston and Pollard, 1983). It appears that people use past experience more so than logic and rationality to guide their decision making. The influence of cognitive processes
is unavoidable. The decision making of detectives is most likely influenced by these processes. It appears from the interviews that gut feeling is found as important as logical reasoning. It is unclear to what exactly this gut feeling can be attributed. Gut feeling comes from experience, but the relation with cognitive processes is still unclear. Three of the most important conceptual errors are confirmation bias, belief perseverance and groupthink. Since the influence of believe perseverance and groupthink is beyond the scope of this research, only confirmation bias will be further elaborated on.

2.3.1 Confirmation bias

Confirmation bias can be defined as the tendency to search and interpret evidence in a way that an existing belief, expectation or hypothesis is confirmed (Nickerson, 1998). We all are influenced by this process. We form presumptions about parts of how reality works. Once we have formed some presumptions we want more certainty about them, which results in a search for evidence that confirms our presumption. Our belief in our own visions increases with new data that confirms our presumption. In order to confirm our presumptions people have the tendency to look for confirming information only and ignore disconfirming information (Nickerson, 1998). However, in order to obtain certainty on a presumption, one should collect all possible relevant information. In fact, it is even better to search for contradicting evidence. When this evidence can’t be found, it is justified to believe in your presumption. This process is also referred to as falsification (Nickerson, 1998).

Confirmation bias is also present in the work of detectives (Rossmo, 2009). This is not unusual since we all are guilty of confirmation bias. However, confirmation bias during the decision-making of detectives might have more serious consequences. Once a conclusion is reached, for example what kind of offender committed the crime, this conclusion is cognitively adopted and the detective will search for information that confirms the decision. This means that information is judged in a biasing context, whereby information proving the innocence of the suspect may be ignored (Rossmo, 2009). Research by Ask (2006) shows that prior expectations regarding the nature of the crime influence the way evidence is interpreted and evaluated. Depending on the presumptions of the detectives, different meaning can be assigned to ambiguous evidence. Hypotheses are unlikely to be rejected because of the manner in which information is processed (Ask, 2006).

Components of confirmation bias include failure to seek evidence that would disprove the theory, not utilizing such evidence if found, refusing to consider alternative hypotheses and failure to evaluate evidence diagnosticity. This can be described as a form of tunnel
vision. In this case, the theory will never be really challenged and there is a real chance of convicting the wrong person. (Rossmo, 2009).

Because of this phenomenon it is important to start the investigation with several plausible scenarios, so all evidence can be evaluated and one can determine to which scenario fits the evidence best. In order to minimize the chances of a successful defence and a wrongful conviction, all reasonable alternatives must be falsified. It appears from the interviews that the influence of cognitive processes is part of some of the education or courses for detectives. However, the recognition of a conceptual error in practice and the knowledge of how to cope with it is insufficient (interview, 2010). Counter arguing and the construction of multiple scenarios should decrease the influence of these errors. However, the study of the influence of cognitive processes is beyond the scope of this research.

2.3.2 Prototypes
From the literature about story construction (Pennington and Hastie, 1993) we know that facts of the crime are interpreted and combined with knowledge one has about the particular subject, in this case the sort of crime. From this can be deduced that police detectives would probably create different narratives than lay people, since they possess different knowledge of crimes due to their experience. Wright (2004) studied this by analyzing the stories created by detectives. The stories of homicide offences told by detectives were grouped into three types of narratives of investigation. This accentuated how there was little variation in the type of accounts detectives told. Wiener, Richmond, Seib, Rauch and Hackney (2002) studied stories told by eligible juror members. They asked the members to imagine a first-degree murder scenario, describing the events that led to the killing. They concluded from their study that there was variability in the murder stories told by eligible jurors. However, their findings did support existing literature in that some prototypical stories were apparent for some crime types. Nevertheless, detectives shared more similar stories of homicide when asked to describe an offence than the eligible juror members studied by Wiener et al., (2002). This difference might be due to the fact that detectives are involved in homicide investigations on a daily basis, while members of the public are exposed to high profile homicide cases that are reported in the media. Therefore, the narratives told by the jurors are likely to be biased toward these type of homicides (Wright, 2004). These prototype scenarios told by detectives arise because of schemas in which information is stored.
2.3.2.1 Schemas, prototypes and experience

Cognitive psychology suggests that information is stored in so called schemas, also called prototypes or scripts. A schema is formed on the basis of cognitive processing of experiences and consists of connections which we made in the past, based on our experience. Large amounts of information can be structured and situations are understood because of the schemes. There is a continuous interaction between available information and knowledge during an investigation: information can bring up certain knowledge, while knowledge has an influence on gathering and interpretation of information. Schemes also have influence on interpretation of evidence (Hogarth, 2001). All different schemas are formed based on past experience. Observed behaviour is interpreted using the schemas in our memory (Van Koppen, 2010). Detectives implicitly create schemas or prototypes of crimes during their work process.

Dutch police detectives work with standard scenarios. Examples of standard scenarios are common motives for murder (like a business conflict, relational problems and a settlement in the criminal circuit) and the scenario of mistaken identity (Lettinga, 2009; Derksen, 2009). The use of standard scenarios might increase the creation of prototypes since it reduces the scenario construction of other types. The next chapter will elaborate on the construction of scenarios.

Chapter 3 Crime scenarios

Although the above is mainly about stories and narratives in law, it also applies to scenarios for the most part. Little is known about the construction of a scenario, thus studies about stories is one of the few offerings that can be used for information about scenario construction. The next two paragraphs describe studies originated from research on offender profiling. Creating a profile should start with a reconstruction and the creation of a scenario (Van der Kemp, 2010). Since a reconstruction and a scenario are also prerequisite for profiling, one should expect that the literature about profiling describes a scientific method for the reconstruction and the creation of a crime scenario.

3.1 Profiling

Offender profilers try to derive characteristics of the offender from the characteristics of the crime (Hicks and Sales, 2006). It is a technique aimed at identifying and interpreting crime behaviour or actions for the purpose of predicting the personality of the offender, his/her modus operandi (MO) (this term refers to the method of the crime, that is, the key elements of
the crime incident itself), and, possibly the motivation for the crime (Kocsis and Palermo, 2007). At first, profilers attempt to determine what exactly happened and in which sequence. The features of the crime and offender are derived from an extensive examination of the crime scene, which often holds information valuable to the detective. This is done based on traces found at the crime scene and other gathered information; they start with a reconstruction. A reconstruction is required since the task with profiling is to search for pathways linking evidence to offender characteristics. But the way a reconstruction should be carried out is quite unclear.

3.1.1 Reconstruction of the crime

The search for traces at the crime scene can be divided in forensic and tactical investigation. The search for traces is central during the forensic part. Traces can be defined as objects that are connected with the fact and that are perceptible to the senses, also called physical evidence. Examples are bloodstains, fingerprints and fibers. The forensic-technical traces will be analyzed and placed in chronological order. This provides an as objective as possible report of the actions during the crime (Chisum and Turvey, 2008). The search for specific traces is done by specialists of the forensic detectives, or from the forensic institute. These specialists possess the knowledge to note and interpret the traces (De Poot et al., 2004). The tactical analysis of the crime scene is about non-physical evidence. This contains all the material that might provide information about the crime. One can think of witness descriptions and offender and victim information.

The detectives collect as much evidence as possible after which the traces will be analysed and interpreted. The traces and their interpretation all form a part of the reconstruction and tell something about the way the crime was committed (Chisum & Turvey, 2008). The reconstruction does not provide a fluent story of the crime; it rather consists of loose components based on the evidence. A story, a crime scenario, has to be constructed on the basis of the loose components of the reconstruction. However, there is no scientific method for crime reconstruction, which makes it difficult to explain how to start with a reconstruction and a scenario. The most likely scenario of the crime is created in order to describe and interpret the offender’s behaviour. The characteristics of the offender are derived from his behaviour. The step from behaviour of the offender to his profile should be partly based on empirical research about the same kind of offenders (Hicks and Sales, 2006).

As a reconstruction, a crime scenario is also prerequisite for offender profiling. Before a profile can be made, detectives have to create a scenario about what might have happened to
answer the questions as why, where, when, how, and who (Van Koppen and Van der Kemp, 2010). And the profile, in his turn, tries to describe the most likely type of offender that has committed the crime based on the reconstruction. In this way, offender profiling has a part in writing crime scenarios, since a crime scenario needs an offender that fits in the story (Van Koppen and Van der Kemp, 2010).

The most extensive and systematic description of making an offender profile comes from Turvey (1999), which is called a deductive criminal profile. Making a profile starts with a minute analysis of the forensic material whereby the behaviour of the offender is reconstructed. This is mostly done on the basis of physical evidence, like wound patterns, bloodstain patterns and traces of bullets. Secondly, an extensive analysis of the characteristics of the victim has to be made, because these characteristics are connected with the motives and the MO of the offender. Thirdly, profilers have to make an analysis of the crime scene (Turvey, 1999). Although Turvey (1999) comes with an extensive description, he doesn’t state how the reconstruction of the crime exactly has to be executed either.

The evidence which can be used for profiling can vary from physical evidence, such as bloodstain patterns and fibers, to nonphysical evidence, such as witness descriptions and offender and victim information. If the forensic analysis of evidence is insufficient for making predictions about the offender, one must make inferences that relate a piece of evidence to behaviour of the offender (Hicks and Sales, 2006). Hicks and Sales (2006) describe this as the essence of crime reconstruction. However, one can wonder if making inferences isn’t already part of the scenario construction, since it is more than an objective evaluation of the evidence.

Although Hicks and Sales (2006) point at the importance of reconstruction and the importance of a science of forensic crime analysis and crime reconstruction, they do not go further into the matter. There is surprisingly little empirical research that examines the links between offender characteristics, MO, and crime scene variables. Meanwhile, there is no accepted way of conducting the reconstruction of the crime, even though it’s the starting point for profiling (Turvey 2008; Chisum and Turvey 2007; Hicks and Sales 2006). Thus, even the literature about profiling doesn’t provide a scientific method for reconstruction. And beyond that, the creation of a crime scenario.

Although the beginning and end of the reconstruction phase is still unclear, it is suggested by Derksen (2009) that detectives should start with the formulation of hypotheses after or during the reconstruction.
3.2 Hypothesis

Hypothesis formulation can be defined as the construction of plausible facts about what could have happened of the crime under investigation. It can be described as a conclusion or assumption which doesn’t have to be right, but realistic and reasonable in terms of being able to be right (McDowell, 2006). Blonk (2004) describes a hypothesis as an assumption about the actual and the yet to investigate situation based on the preliminary facts.

The interviewees define a hypothesis as the what-question of the crime (Interview, 2010). The Dutch police department uses four standard hypotheses in case of discovery of a dead body: natural death, suicide, accidental death or death resulting from a crime. A disadvantage of the use of standard hypotheses might be the risk of limited reasoning. The hypotheses might control the reasoning process and inhibits curiosity to the undiscovered. After the hypotheses are chosen a crime scenario is created which provides answers on the how question (Derksen, 2009; Interview, 2010).

3.3 Crime scenario

A scenario describes the occurrences that might have taken place, the sequence of the occurrences and the causal relations between the occurrences. By occurrences is meant behaviours, intentions and circumstances of persons and objects (Schum and Tillers, 1991; Shen, Keppens, Atiken, Schafer and Lee, 2006).

It is best to create scenarios as early as possible in the investigation, even before there is a suspect, or a motive. The hypotheses and scenarios produce the first lines of enquiry. In this way, detectives can easily fit new found information in the different scenarios. Some scenarios will consequently become more plausible while others fall away. Creating scenarios at an early point in the investigation also reduces the probability that information gathering only serves for confirming the initial hypothesis. Less difficult changeable ideas are formed at the initial stage of the investigation, so that information gathering remains broad (Ask & Granhag, 2005). At some point in the investigation the possibility arises to focus on just one scenario. However, when the scenario appears to lead to the wrong offender, it is important to go back and focus on the other scenarios again (Bollen, 2006).

The creation of hypotheses and scenarios is an iterative process, since it is no step by step process. Scenarios have to be reformulated after new information is found, and new lines of enquiry have to be created, which makes scenario construction a continue process (Derksen, 2009). As previously mentioned, there is no scientific method for the creation of scenarios. Also the literature about profiling doesn’t provide a method, although a scenario is
prerequisite for a profile. In order to generate research questions, the scenario should at least contain several core elements.

3.3.1 Core elements
A constructed scenario will lead to answers on some core elements (In Dutch called the seven W-vragen). Detectives have to construct an event that consists of several connected story elements. One can think of answers about who committed the crime, what happened, where it happened etcetera. Research has shown that the story elements that have to be filled in, the core elements, primarily get a chance while writing research findings in a crime report, rather than that they are connected with the investigation itself (De Poot et al., 2004). Detectives in the Netherlands learn that crime reports should consist of:

1. *who* can be connected with the crime (informer, injured, victim, discoverer, witness and suspect);
2. *what* exactly happened;
3. *where* did the crime occur (crime scene and other possible locations that consist of traces);
4. *with what* kind of objects is the crime committed;
5. *in which way* did the crime occur;
6. *when* did the crime occur and when did other relevant facts take place;
7. *why* did the crime occur (what was the motive behind the crime) (De Poot et al., 2004).

The answers on these questions constitute the so called core elements of a scenario. By filling in the seven questions detectives learn more about the MO. To answer the question about what happened one can start with the type of crime that took place. To learn more about how (in which way) the crime was carried out, attention can be paid to point and method of entry, suspect’s actions, object of attack, method of departure, weapon type, and the property taken. The type of location and the address describe where the crime took place, and to answer the question about when the crime occurred one have to find out the time and date of the crime. All these elements are part of a modus operandi of the offender (Boba, 2009). Bollen (2006) mentions one more element, namely the opportunity. Before you can call a person a suspect, it is import to consider whether the person had the opportunity to commit the crime. If not, this person can never be the offender. With the use of scenarios one can look whether the suspect fits or not.
At present, these questions are, amongst other things, dealt with during tactical observation of the crime scene. Detectives have to form a narrative about an event occurred in the past. The seven questions, or story elements, can be seen as standpoints from where new information about the missing pieces can be gathered. The where-question forms the search area at the crime scene, the who-question forms the search area around the victim and possible suspects and the what, whit what and which way-questions form the search area with regard to the crime itself (De Poot et al., 2004). These questions should be answered while writing a scenario, so search areas can be formulated and new information can be found. When guiding elements are missing, the investigation might fail (De Poot and Van Koppen, 2010).

In short, formulating hypotheses and scenarios seems in essence the next five steps:

1. Hypotheses are about what could have happened;
2. The scenarios are about how the incident in the different hypotheses could have happened;
3. After creating the scenario one has to find out which information confirms the scenario; verification of the scenario (plus-info);
4. Question which information weakens the scenario; falsification of the scenario (min-info)
5. Last question is what else you would like to know, what has to be investigated; the formulation of new questions (Derksen, 2009).

Besides this short approach, there is no distinct way for scenario construction. There is a possibility of using standard scenarios within the different hypothesis. When it is obvious that the crime concerns a murder, then scenarios can be put in a format. The scenario in which the murder is committed by someone from the inner-circle of the victim is an example of a standard scenario. Derksen (2006) supports this standard scenario with statistics: 35 percent of all homicides is committed by someone from the inner-circle of the victim (Nieuwbeerta and Leistra, 2007). Derksen (2009) introduced a way of writing crime scenarios: mindmapping.

### 3.3.2 Mind mapping

A mind map is a diagram composed of concepts, texts, and links, which are arranged around a central theme. The diagram has a tree structure (Derksen, 2009). Mind mapping should stimulate extra thinking with each notion that is made, because of the way notions are written. Derksen (2009) applies mind mapping for scenario construction. It starts in the middle with a notion that describes the crime. For example murder. From there, sub-subjects will be noted
and research question will arise. Eventually, the answers to the sub-questions will contribute to the information that is gathered in response to the question that has to be analysed (Derksen, 2009). Only keywords are used at the beginning of an investigation, since a complete story might affect flexibility (Interview; Derksen, 2010). Figure 2 shows an example of a mind map in which different subprojects are developed. This mind map does not contain scenarios, but information about what has to be done in the investigation. Bex (2011) suggests a same sort of method in which nodes are connected with arrows. It is different from the method of Derksen (2009) in that the nodes has different forms which denotes propositions (like a hypothesis or a piece of evidence) and has a probability. The arrows also have different meanings. For example, a vertical arrow means that one proposition tends to prove another with normal force; a vertical arrow with a double arrowhead means that the force is strong.

With the use of a mind map or other graphic design there might be a chance of information getting lost. A mind map can be very useful to get a clear overview. However, it is more difficult to get a clear view of the context by linking two keywords only with an arrow or a line instead of creating a story. The different aspects should be seen in context in order to be able to determine whether the scenario is plausible and credible (Pennington and Hastie, 1993). The construction of a story will also lead to more holes, since context will show if the story contains contradictions, impossibilities or misses information (Schum and Tillers, 1991).

Another method used in one district is creating ‘contact-hypotheses’. Not the story (what, how and why) is central during the investigation, but the persons with whom the victim had contact. The contacts of which – based on general understanding – involvement is more probable, are further elaborated (Lettinga, 2009). One can wonder with this method, if it’s not the story that shows whether a person can be considered a suspect or not. The offender is part of the story. The story and the context select possible suspects. And when a body is discovered, doesn’t one start to think in a story about what might have happened?

Both the research by Lettinga (2009) and the interviews show that there is a concern for the scenarios to become a goal rather than a means to solve a crime. Scenario constructing should be used as a means to an end. The use of standard hypotheses and scenarios might increase the chance of standardization. Standardization, in his turn, might obstruct out of the box thinking. Out of the box thinking should be encouraged in order to avoid this process of standardization. Brainstorming with multiple scenarios and thinking in narratives might result in more options and possibilities compared to standard hypotheses and scenarios, and mind
maps. A mind map might even obstruct out-of-the-box thinking. By playing the scenario in mind, more questions might be raised.

It appears that there is no clarity about the content and method for constructing scenarios. Even within the police department there is confusion about the differences between hypotheses and scenarios. If it is even unclear exactly how to construct one scenario, how should multiple ones be created?

![Figure 2: Example of a mind map (Derksen, 2009).](image)

### 3.4 Alternative scenarios

Due to a wrongful conviction in 2005, it was recommended to organise counter arguing and it became an obligation for Dutch police detectives to investigate multiple scenarios (Rapport Versterking, Opsporing en Vervolging, 2005). The creation of multiple scenarios should avoid tunnel vision. The final scenario should rule out other scenarios and lead to a compelling judicial story to base a conviction on (De Poot and Van Koppen, 2010). The more alternatives are examined and ruled out, the more information is gathered for a reconstruction,
and the better the best explanation will be. A failed attempt to falsify the working hypothesis or scenario would only strengthen the case after all (Wagenaar and Crombag, 2005).

One can wonder how different an alternative scenario should be. The interviewees mentioned the absence of a standard for the degree of variation between two scenarios. It can either be a subtle or a big difference in order to be described as an alternative scenario. There are no rules or guidelines for the variability of the scenarios. One interviewee added that a certain difference should be present if the scenarios are used to distinguish between lines of enquiry, in order to avoid investigating the same lines.

Wagenaar and Crombag (2005) stated five criteria or assumptions to which an alternative scenario should meet. In short, it comes to the following points:

1. A reasonable alternative should not contain elements that are physically impossible. If some alternative scenario requires that a suspect has travelled a distance of 100 miles within a period of twenty minutes, there is no need to investigate such a scenario any further.

2. The already available evidence should fit in the alternative scenario and some pieces of the evidence should serve as anchors for at least some part of the alternative scenario. The more points of contact there are, the more urgent it becomes to explore it further.

3. A reasonable alternative scenario must have, just as the first scenario, the structure of a good story. This means that it contains a clear central action and a context or setting that easily explains the actions of all the main characters in the story, as described by Bennet and Feldman (1981). If an alternative scenario can be developed into an equally good or even better story than the indictment, it certainly deserves to be investigated with the utmost care.

4. There must be no almost indisputable pieces of evidence in the case file that contradict a critical element in the alternative scenario.

5. An alternative scenario deserves more priority for investigation as it is more recognised as a rather common sequence of events. In other words, common scenarios should get more priority than outlandish ones. One should not forget, however, that sometimes outlandish events happen (Wagenaar & Crombag, 2005).

The criteria stated by Wagenaar and Crombag (2005) are indeed correct. However, they somewhat go without saying and they are still vague descriptions. Assumption three for example, argues that an alternative scenario should be an equally good or even better story than the first scenario. But what makes an alternative a better story? Additionally, the criteria
contain no information about the variety between two scenarios. Thus, still little is known about how to develop multiple scenarios.

The danger exists that creating alternatives becomes a goal rather than a means to solve the crime. This danger appears both from the interviews, since the interviewees expressed their concern, and it appears from practice. A recent Dutch case provides a good example of this danger. A twelve year old girl, Milly, disappeared from her parental home after she had phone contact with her mum. Milly ends this conversation, according to her mother, because the neighbour was at the door with one of their cats. When her mother came home, Milly was gone. The television and the lights were still on and the door wasn’t on double lock. Milly’s bike was still at home and she left without a jacket, while the temperature was freezing. Under these circumstances, the most logical scenario seems that Milly is with one of the neighbours, since she disappeared after the neighbour showed up at the door. The situation indicated that Milly must have left the house abrupt. This scenario should have gotten the most priority according to assumption five of Wagenaar and Crombag (2005). The detectives went to work with alternative scenarios, while sufficient indications for a most obvious scenario were present. However, they were focussed too much on creating alternatives so that the most evident solution was overlooked; the creation of alternatives became a goal (Rapport Milly Boele, 2011).

Above I described the construction of narratives, the influence of cognitive processes and the construction and content of a crime scenario. This study aims to explore how detectives construct crime scenarios and what role experience plays in the creation of the scenarios. The following hypotheses arise from the above.

3.5 Hypotheses
It is expected that detectives who have attended a course in hypotheses and scenarios create scenarios in the form of a mind map and an alternative ‘no crime’ scenario. Since a scenario should consist of some core elements, it is expected that the scenarios consists of the questions: who, where, when, how, why and what. In addition, in order to create a believable story the scenarios will consist of causal relationships and internal consistency. Since detectives can use their experience it is also expected that they create a more in-depth story of the crime compared to the students. In addition, the detectives will create more prototype stories due to their experience. This means that the scenarios of the students will show more variation than the scenarios of the detectives. There is no literature about the variability of multiple scenarios, which makes it difficult to express expectations about the variation
between the two scenarios. As it is difficult for people to create multiple stories based on the same information, the stories will probably not differ much.
Chapter 4 Method

First, before the data collection was started, an exploratory pilot study was carried out. During the pilot, semi-structured interviews with several experts in the domain of crime scenarios were carried out. The interviews provide an insight into the education about the construction of scenarios, counter arguing and the use of crime scenarios in practice. Next, the data collection consisted of police detectives and criminology and criminal law students writing two different scenarios based on one police photo of a crime scene. These scenarios are scored via a codebook. An analysis of the descriptions of the scenarios as well as a comparative analysis is executed.

4.1 Exploratory Pilot Study

The interviews are used to learn more about the use of crime scenarios by the criminal investigation units in the Netherlands. The semi-structured interviews that are carried out contained the topics ‘scenarios during education’, ‘the importance of objectivity’, and ‘the use of crime scenarios in practice’. Each interview was concluded with the opinion of the interviewed. Each topic consisted of multiple questions. For the complete set of questions, see appendix 1. The respondent had the opportunity to deviate from the questions as long as the questions were ultimately answered. The interviews took approximately one hour. All three experts agreed for their interviews to be audio taped.

The experts were approached through direct contacts. The interviews were carried out at the police stations where the experts were working. Different parts of the interviews are included in the theory in the former chapters.

4.1.1 Interviewees

The three experts came from three different police regions. One of these experts interviewed is head of the Criminal Investigation Unit in Zuid-Gelderland where he leads three teams. The other interviewee is division chief of investigation in Noord- and Oost-Gelderland and worked before as manager in region Twente in different facets, ranging from General Judicial Affairs to more investigative matters, sex offences, homicides and large scale investigations. The last interviewee is unit chief of large scale investigation in region Twente. Two of the interviewed developed the education of hypotheses and scenario thinking. The third one is a visiting lecturer at the police academy who teaches in investigative strategies and hypotheses and scenario thinking. The group existed of two males and one female.
4.2 Data collection: the crime scenarios

The second phase involved the collection of crime scenarios created by students and detectives. This paragraph describes the material, procedure and respondents.

4.2.1 Material

In order to collect the data for this study, the students and detectives were asked to write two scenarios based on one crime scene photo. The photo that was shown to the respondents came from the book ‘Plaats Delict Amsterdam’ (Suermondt and Missana, 2006). The title translates to Crime Scene Amsterdam. The photo shows a body on the ground in a little old fashioned looking room (see figure 3). The photo is rather ambiguous as it is, for example, not explicit whether it is a males’ or female’s body on the ground. This photo is selected so that a clear picture of the thought process of the students and detectives is obtained. Multiple explanations are possible because of the ambiguity of the photo. The information in the book tells us that the body is from a dairyman who was killed by a pimp and a prostitute. The crime took place in 1968. The offenders assumed that the dairyman had a large amount of money at home. The dairyman was eventually beaten to death.
The assignment for the students had a different setup, compared to the assignment for the detectives in that the detectives had more (five) questions to answer. The assignment for the students was part of the educational programme of the course ‘Crime Analyses’, followed by master students at the VU University Amsterdam. The instruction was to write two possible scenarios based on the crime scene photo. The photo shows the situation as found by police detectives. The students had to give a description of the motive, modus operandi, and the profile of the offender in their scenarios. Additionally, they had to explain on what their interpretation was based. No more instructions were given. The assignment was an introduction to the lecture about crime scenarios. The subject ‘scenarios’ was not discussed by the teacher before this assignment, so the students had not learned about crime scenarios when they made the assignment. The students were not asked about their prior knowledge of
scenarios. For this reason, it is unknown what knowledge of crime scenarios students already had. The detectives were given the same instruction. In addition, some more questions were asked after each scenario. They were explicitly asked about the motive, type of crime, Modus Operandi, traces and evidence. The questionnaire can be found in appendix 2.

4.2.2 Procedure

The criminology students wrote the scenarios as part of the course Crime Analysis. The teacher of the course was able to give the researcher access to the scenarios of the students. The detectives are gathered from various locations in the Netherlands and come from twelve different districts. They were approached through direct contacts and via the police academy. Two appointments took place at the police academy in Apeldoorn. Detectives occasionally follow courses at the academy and the teachers of two courses were asked if time could be made for filling in the questionnaires. The questionnaires are in both cases completed at the beginning of the lesson, so that the detectives were all present and still concentrated. In the other cases, the respondents completed the questionnaires at the police station. These were police stations in Twente, Utrecht and another district. The detectives were explicitly asked to write the scenarios themselves. They were told that it is important to give their own opinion and that it was not possible to give wrong answers.

First, all scenarios being produced by the subjects are coded by the researcher on facts, inferences and assumptions. This is done by isolating single sentences in the scenarios and classifying them, with the help of a coding sheet. Then, in a second phase of the coding, the researcher issued a judgment on the narrative form, the occurrence of inconsistencies, the degree of plausibility of the whole story, the degree of completeness, the elements of the crime, and so on. In order to do so, a codebook is developed. The codebook consists of several measurable characteristics which are used to compare and analyse the scenarios. The characteristics are derived from various literature about the elements of a good story, literature about crime scenarios and details, which are described in chapter 2 and 3. This phase had difficulties since a part of the variables are ambiguous. In order to create coding instructions for these variables my supervisor functioned as a second assessor. Variables that led to discussion were, among others, facts, inferences and assumptions. Especially the difference between inferences and assumptions was in some scenarios difficult to determine. An inference is based on a fact written in the scenario and an assumption is based on nothing. A statement is a fact if it is visible at the photo. If a statement was, in our opinion, based on something visible at the crime scene photo (a fact), but the fact was not given in the scenario,
we decided to score such a statement as an assumption. Simply stated, the fact on which a statement is based must be given in order to be scored as an inferences. An example of this process is shown in appendix 4 with an example of a scored scenario. For frequently recurring ambiguous statements, we created rules so these statements were scored the same in each scenario. After discussion we agreed on the scenarios we both accessed.

Additionally, variables that are dependent on personal opinion and therefore difficult to assess are plausibility, completeness and logic. Since plausibility can be assessed differently by different people, my supervisor and I discussed several scenarios. Especially the scenarios that are based on relatively many facts are scored as more plausible than the scenarios which are based on less facts. My supervisor and I agreed on most of the scenarios. We did not count the times we agreed and disagreed. The same goes for completeness of the scenario and the presence of a logical connection. For the other variables and the complete codebook, see appendix 3. Paragraph 4.3 will describe the definitions of the concepts used.

4.2.3 Respondents

Students

52 Students wrote two scenarios as part of the assignment. They were criminology and criminal law students at the VU University Amsterdam. Six of the students are male and 45 female (see table 1). One is unknown.

<table>
<thead>
<tr>
<th></th>
<th>Students</th>
<th>Detectives</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>6</td>
<td>27</td>
<td>33</td>
</tr>
<tr>
<td>Female</td>
<td>45</td>
<td>13</td>
<td>58</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>40</td>
<td>92</td>
</tr>
</tbody>
</table>

Detectives

Forty police detectives were asked to participate in the research, of which 27 (67 percent) were male and 13 female (see table 1). The age of the detectives ranged from 25 to 58 with an average of 43.3 years. The number of years the detectives worked in the police force as a police officer ranged from 0 to 37 years with an average of 20.35 years. The number of years as detective ranged from 0 to 32 years with an average of 8.89 years. The preparatory training
of the detectives varies from MAVO to WO. The training that occurs most frequently is MBO with 25 percent of the total, as is also shown in table 2. Furthermore, thirteen of the forty detectives have followed a course in which hypotheses and scenarios or counter arguing came up for discussion.

One of the detectives neither had experience as a policeman nor as a police detective. This respondent is excluded from the data analyses. The complete structure of the research is shown in figure 4.

Table 2: Study, function and district of the detectives.

<table>
<thead>
<tr>
<th></th>
<th>Number of detectives</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAVO</td>
<td>7</td>
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</tr>
<tr>
<td>HAVO</td>
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<td>17.5</td>
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<td>VWO</td>
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<td>2.5</td>
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<tr>
<td>MBO</td>
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</tr>
<tr>
<td>HBO</td>
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<td>12.5</td>
</tr>
<tr>
<td>WO</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Police training</td>
<td>9</td>
<td>22.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Number of detectives</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Function</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tactical detective</td>
<td>9</td>
<td>22.5</td>
</tr>
<tr>
<td>Technical detective</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Other detectives</td>
<td>18</td>
<td>45</td>
</tr>
<tr>
<td>Other</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Number of detectives</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>District</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amsterdam-Amstelland</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Brabant-Noord</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Flevoland</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Friesland</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Groningen</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>Other district*</td>
<td>11</td>
<td>27.5</td>
</tr>
<tr>
<td>Koninklijke marechaussee</td>
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<tr>
<td>Korps Landelijke-Politiediensten</td>
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<td>5.0</td>
</tr>
<tr>
<td>Noordoost Gelderland</td>
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<td>5.0</td>
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<tr>
<td>Rotterdam-Rijnmond</td>
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<td>7.5</td>
</tr>
<tr>
<td>Twente</td>
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<td>7.5</td>
</tr>
<tr>
<td>Utrecht</td>
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<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

* = Wants to stay anonymous
4.3 Operationalization

This paragraph will describe the operationalizations of the variables used in the analyses. All variables are scored in the scenarios. The method of coding is described in the preceding paragraph. The variables on which the scenarios are scored, present four topics: construction of the story, evidence, elements of the crime and MO and details.

Construction of the story

Facts: Something can be defined as a fact when it is a description of something that is actually visible on the photo. An example of a fact is the statement ‘the curtain is closed’ or ‘the victim has bloodstains on his/her clothes’. This variable is scored by the number of facts stated in the scenario.

Inference: An inference can be defined as a conclusion which is drawn from a fact, but is not actually directly visible from the photo. By making inferences, one is interpreting the facts. In other words, something is said about what is probable instead of what is actually known. An example of an inference is: ‘it’s evening (because the curtains are closed)’. A statement is only scored as an inference when the fact on which the inference is based is given as well. This variable is scored by the number of inferences stated.
Assumption: An assumption is a description of something that is written as if it is a fact, but which is not actually visible from the photo. A statement is defined as an assumption when the statement was not based on a fact. An example of an assumption is: ‘the victim was taken by surprise by four or five attackers’. Assumptions are also scored on the number stated.

Narrative form: The scenario can be defined as a narrative if it is a description of the theory of the crime. This means that the story is completed by assigning a cause to the event. The scenario does not consist of only facts, but also inferences and/or assumptions should be made. In this way the person gives meaning to the event which makes it more than only a statement of what is seen (Wagenaar and Crombag, 2005). Another condition for defining it as a narrative is the presence of a central action, in this case the criminal action. The criminal action should be placed in context to make clear how the crime is committed. The variable narrative is scored in either one of the categories: yes, partly or no. The options:
Yes: The scenario is a narrative from start till the end.
No: The scenario consist of only (a few) facts or loose statements.
Partly: The scenario starts with a list of facts and continues with a possible scenario in narrative form.

Inconsistencies: In order to create a good story, it should not contain inconsistencies. Consistency is, according to Pennington en Hastie (1993), one of the components of coherence. The story is not consistent if it contains internal contradictions, which make the story less believable. If the scenario contains contradictions it is defined as inconsistent. The story is also defined as inconsistent when the respondent wrote multiple options for one variable in one scenario. The variable can be scored with yes or no.

Plausible: Plausibility is another component of coherence. A story can be defined as plausible if it corresponds to the knowledge about what typically happens in the world. This concept is difficult to measure since different people have different ideas about what typically happens in the world and what is normal for them. As a consequence, the categories have vague boundaries and can be looked at differently. Nevertheless, in order to realize a score as reliable as possible several assessors are used. Since it is difficult to clear cut define plausibility a scale ranging from 1 (yes, very plausible) to 5 (no, very implausible) is used.
**Complete:** Completeness is the last component of coherence. A story is complete when the expected structure has all of its parts. The completeness of the scenario is determined by considering how many of the facts about the crime were included in the scenario. The more facts included in the scenario, the more complete the scenario. However, also for this variable, it is difficult to clear cut define the exact completeness. Hence, a scale ranging from 1 (yes, very complete) to 5 (no, very incomplete) is used.

**Logic connection between story elements:** A logic connection can only be present if the scenario is written in narrative form. The events or elements in the story should be connected by causal relationships. There is no logical connection when the scenario is only a list of isolated facts. Since it is difficult to clear cut define this variable as well, a scale ranging from 1 (yes, very logic) to 5 (no, very illogic) is used.

**Chronological time sequence:** Bennet and Feldman (1981) found that the structure of a story has a big influence on the credibility of the story. The story will be an unstructured production if it is not written in a chronological time sequence. A crime scenario is a chronological narrative according to Van der Kemp en Balk (2008). The scenario is scored as yes, chronological if it begins with the start of the crime and ended with the end of the crime.

**Evidence**
In order to create a plausible scenario about what might have happened, an detective has to evaluate the evidence. Naming the evidence at a crime scene will support the scenario that is written. A valid scenario must be supported by evidence found at the crime scene. It also makes the scenario more complete.

**Evidence:** Evidence is scored with yes if the respondent stated if there is any evidence left behind at the crime scene.

**Type of evidence**
The support for the scenario will be stronger if the kind of evidence is given per described event in the scenario. This is the case if the respondent described which evidence supports which event. Evidence is subdivided into:
Blood

*Blood victim:* This includes visible blood on all the body parts of the victim and on the clothes.

Evidence of the offender

*DNA:* DNA of the offender left at the crime scene. The respondent explicitly mentioned the term DNA.

Evidence deduced from the photo: Given evidence that is actually visible at the photo. This variable is scored by number of real evidence stated.

Interpreted evidence: Interpreted evidence can be defined as evidence that is given to support written events, but is not visible at the photo. This variable is scored with number of interpreted evidence stated.

Elements of the crime and Modus Operandi (MO)

By filling in the elements of the modus operandi the story will be more complete and credible. The term refers to the method of the crime, that is, the key elements of the crime incident itself.

Type of crime: For the detectives the type of crime can be copied from the survey since they are asked for the type of crime. As far as the students are concerned, the type of crime can be deduced from the written scenario. The categories are:

*Murder/homicide:* A murder or homicide means that the only goal of the offender was to kill the victim or if the victim was killed as consequence of a fight or something similar (i.e. the offender was not prepared).

*Revenge/settlement:* The crime is qualified as a settlement if it was a crime out of revenge like a personal settlement or a settlement in the criminal circuit.

*Murder with robbery:* The crime is qualified as a murder with robbery if the offender commits theft with the use of violence.

*Burglary:* The crime is qualified as burglary if the intention of the offender was to commit only burglary. The offender did not expect the victim to be at home. The offender kills the victim out of fear of being recognized and often leaves the crime scene without any loot.
*No crime*: The crime is qualified as no crime if the respondent described an accident, natural death or suicide.

*Other*: The crime is defined as other when it involves any other crime.

*Preparation*: The crime is prepared when the scenario obviously shows that the offender had planned the crime. The respondent must have written about the planning of the crime. The variable is scored with either yes or no.

*Type of location*: This can be understood as the type of location where the crime is committed. The location can be explicitly mentioned in the scenario or it can be deduced from the scenario. The categories are:

*House victim*: The crime is committed in the house of the victim.

*Other*: The location is qualified as other if the location is different than the house of the victim.

*Type of weapon*: This can be understood as the type of weapon that is used to commit the crime. This can only be scored if the weapon is mentioned explicitly in the scenario. The categories are:

*Blade-weapon*: This includes all possible stab-objects, like a knife or a pen.

*Blunt-weapon*: This includes all possible objects with which the victim is hit, like a candlestick or with the hands.

*Fire arm*: This includes pistols as well as guns.

*Multiple*: This option is filled in if the respondent gave multiple types of weapons.

*Other*: Any other kind of weapons. An example of this is medication.

*Not applicable*: Type of weapon is not applicable in case of an accident or natural death.

*Point of entry*: By this is meant the point where the offender entered the crime scene. The possibilities are door, window, other, multiple and not applicable.

*Method of entry*: Method of entry gives a description of the way the offender entered the crime scene. The categories are:

*Let in by victim*: The offender was able to enter the crime scene because he was let in by the victim.

*Breaking in*: The offender entered the crime scene by breaking and entering.
**Came in by him of herself:** The offender was able to enter the crime scene by him or her self. This is also the case if the victim committed suicide, or died from an accident or in a natural way.

**Other:** Any other method than the ones mentioned.

**Multiple:** The respondent describes multiple ways of entering the crime scene.

**Wounds:** The variable wounds can be filled in when the respondent explicitly named the place where the victim was wounded. If it is not mentioned the variable is scored as missing. The options are head/neck, breast/belly and other.

**Property taken:** The property taken can only be filled in when the respondent explicitly mentioned the kind of property that the offender took with him. The options are:

- **Money or valuables:** The offender took money and/or other valuables.
- **Nothing:** The offender left the crime scene without any properties from the victim. The respondent explicitly stated that the offender left without any loot.
- **Other:** The offender left the crime scene with something else than money or valuables.
- **Unclear:** The loot is not clear from the scenario. There is mentioned something about it, but the respondent did not describe what the loot exactly was.
- **Not applicable:** There was no offender.

**Motive:** Variable motive is divided into the categories money/financial trouble, revenge, rage/anger, other, multiple and not applicable.

- **Money/financial trouble:** If the offender committed the crime in order to gain money or other valuables, the motive is money/financial trouble.
- **Revenge:** The motive is revenge if there is a (long) history preceded between victim and offender.
- **Rage/anger:** The motive is rage or anger if there is no history and the crime is more sudden and unplanned.
- **Other:** All other motives.
- **Multiple:** If the respondent wrote multiple motives for the crime.
- **Not applicable:** Not applicable is filled in if the scenario described an accident or natural death.
Kind of relationship: The kind of relationship between offender and victim is subdivided into acquaintances, strangers, multiple, unclear and not applicable. Multiple means that the respondent stated multiple options.

Description of interaction: Interaction is about the dynamics described in the scenarios. For instance, a scenario that starts out with a crime of robbery becomes murder as the victim resists. While the motive is financial gain the interaction with the victim leads to the crime of murder. The interaction between victim and offender is subdivided into kind of interaction and interaction term. These variables are deduced from the scenario since there was no explicit question about the interaction. When it was not clear if there was any interaction between victim and offender, the option missing was filled in. The categories are yes or no.

Kind of interaction: This variable was divided into the categories not mentioned, aggressive, threatening, emotional, familiar, other and not applicable.

Not mentioned: There is any interaction, but it is not clear what kind of interaction.

Aggressive: The interaction between victim and offender is aggressive if there is physical violence. One can think of overpowering the victim in a rough way, or maltreatment of the victim.

Threatening: The offender threatens the victim with, for example, a weapon in order to get something from the victim.

Emotional: There are intense emotional feelings like sadness or anger. It can be the victim or offender who is affected.

Familiar: The contact between offender and victim is conversant. This is especially the case when offender and victim have some kind of relation with each other.

Other: Any interaction different than the categories named above.

Not applicable: If there was no interaction this category is filled in.

Does the interaction have influence on the course of the story: The interaction has influence on the course of the story if the crime ends differently than initially planned by the offender. An example is a burglary in which the offender wrongly thought that the occupant would not be at home. Because of fear of detection, the offender kills the occupant. A robbery can also ends up in murder because of the resistance of the victim. This variable can be scored with yes or no.
Details

**Specifics**

‘Specifics’ include details about the crime and is divided into specifics about the room or house, about the victim, the offender or an exact time or date. The variables are scored with either yes or no.

**Other details:** Any other details about the crime. This variable can be scored with yes: the respondent stated other details than the ones mentioned above, or no: the respondent stated no other details.

**State of mind:** State of mind of the offender is subdivided into the categories fight and flight.

The fight or flight response occurs when a person feels threatened. The responses are a set of internal processes that prepare the organism for a fight or flight. The response is triggered when a situation is interpreted as threatening (Zimbardo, Weber and Johnson, 2005).

*Fight:* The offender feels like fighting in order to protect him or herself in a stressful situation. In this case the situation during the crime. The offender starts fighting with the victim.

*Flight:* The offender wants to flee in order to protect themselves in a stressful situation. In this case the situation during the crime. The offender wants to get away as soon as possible.

**4.4 Analysis**

Basically, the variables can be clustered into four groups that represent four main themes. The first group comprises variables about the kind of story that is created. The theme is named the construction of the story. The second group of variables consists of the variables about evidence, the elements of the crime and the interaction described. These variables provide information about the way the crime is committed and this theme is therefore called the reconstruction of the crime. The variables of the third group describe the details mentioned about the offender, the victim and about the crime. Consequently, this main theme is named details of the crime, offender and victim. The last main theme, called comparison of the two versions, shows the comparison of the first and alternative scenario. The data is analysed by using different kinds of analysis in SPSS.

Importantly, the main purpose of the data analysis in all themes is a comparison of the scenarios of the students with the scenarios of the detectives. In order to get a first impression of the differences between the students and the detectives a homals analysis is done. The
The technique is more often referred to as multiple correspondence analysis or homogeneity analysis. Homals is an explorative technique to search for different profiles or types. The technique creates several profiles and shows which categories of the variables are correlated. Objects with the same score are situated in the same place in the plot, whereas objects with different scores are far apart. Categories situated around the origin of the plot apply to the majority of the respondents and do not contribute strongly to differences between both groups. In this study, the origin is indicated by the figure of a star. The used measure in this analysis is the fit of the dimensions. The total fit is the sum of the eigenvalues. Eigenvalues can have a maximum of 1 per dimension. This means that the total fit of an analysis is up to the size of the number of dimensions. The number of dimensions in this study is 2. A total fit of 0.4 to 0.6 is found low, while a fit higher than 1.6 is to be found an exception. However, the interpretability is decisive (Bijleveld and Commandeur, 2008). The first homals solution will be explained comprehensively in the next chapter. In case of the homals analysis, the mean of the total scores of scenario one and two of the respondents is used.

Next to the homogeneity analysis, it is tested whether various variables have an equal or a different distribution for students and detectives. The test used is dependent on the measurement level of the variable studied. In case of a nominal measurement level (e.g. narrative form, motive inferred or type of crime and the like), the $X^2$ test (chi-squared-test) is used, augmented with a post-hoc identification of the categories for which a distinct difference in relative frequencies for both group of subjects is observed. This difference is found through the use of the adjusted residual in a cross-table. If the residual is above 1.96 or below -1.96 the difference is significant. In contrast to the homals analysis, the scenarios are not analysed on the total scores. In fact, the two versions of the scenarios are compared separately with these analysis. Consequently, the sample size is too small for a chi-squared-test in some cases. As a result, Fisher’s Exact test is used instead of the chi-squared-test with some variables (Sachs, 1967). Next, distributions are compared with use of the Mann-Whitney U-test (two-sided, $\alpha = 0.05$) when the studied variable has an ordinal measurement level (e.g. plausibility, logical connections or completeness). When the variable studied has an interval level of measurement (e.g. number of facts, inferences, pieces of evidence and details recognized), the distributional difference between students and detectives is tested by a two-sample Student’s t-test (two-sided, $\alpha = 0.05$) (De Heus, Van der Leeden & Gazendam, 2006). The two scenarios are compared separately with these tests as well.

During the last part of the analysis, a within subject comparison is done. Both versions of the scenarios of the students are compared with each other, as well as the two scenarios of
the detectives. The two versions of scenarios are compared on differences within both groups. Ordinal variables are compared with use of the Wilcoxon rank test. The interval variables are compared with use of a paired sample t-test. Furthermore, the mean differences between the two scenarios of both students and detectives are compared and analysed on differences with use of an independent t-test. Besides, mean differences in nominal variables are compared with use of a chi-squared-test. An analysis on the mean differences between students’ and detectives’ first and second scenarios provides information about the differences between the two groups and their variation between both scenarios. The questions that can be answered and the way the test are used will be explained per theme.

Theme 1: Construction of the story

Homals is used in this theme to find out whether or not distinct types can be found. All the scenarios are shown as a figure in a multidimensional area, and category averages are shown in a plot. If two category averages are close together in a homals solution (for example ‘written in narrative form’ and ‘written by detectives’), it can be interpreted that detectives write their scenarios in a narrative form. If the group students is close to the category average ‘very plausible’, it implies that students write very plausible scenarios. When a category (for example ‘yes the story is consistent’) is situated around the origin, it can be interpreted that both students and detectives wrote consistent scenarios. In this way, information can be gathered about and from the scenarios of the subjects. The interpretation of the solution will be explained based on the first figure of the homals analysis in the next chapter, results. The question that can be answered with this analysis is whether the two groups create different kinds of scenarios. Nevertheless, whereas homals only provides an impression of the different types of scenarios and only allows an interpretation of the data, multiple tests are used in order to test whether the differences are significant.

Chi-square

In this theme the variable narrative is compared on differences between the two groups to determine if the interpretation of the homals solution with these variables is correct. In order to get a full impression of the (significant) differences between the students and detectives the count, percentage and adjusted residuals are also given. The adjusted residuals test whether the scored numbers differ significantly from the expected numbers. In case of too small expected cell values, the Fisher’s Exact test is executed.
Mann-Whitney U

Another test used is the mann-whitney u test. In this theme, the mann-whitney u gives an answer on the question whether there is a difference in the average scores on plausibility, logical connections, and completeness of the story between the students and detectives. Since these variables are scored on a scale ranging from 1 to 5, they need to be analysed with a mann-whitney u test.

T-test

The data also consist, besides the variables on nominal and ordinal scale, of variables of interval scale. In order to test these variables on differences (or similarities) in average scores between students and detectives, an independent t-test is done. The test is used in this theme to check on differences between the number of facts, inferences and assumptions.

Theme 2: Reconstruction of the crime

In order to search whether students and detectives create different types of evidence and elements of the crime a homals analysis is done. A chi-square is done with the variables type of crime, method of entry, motive, kind of weapon and interaction to determine if the interpretation of the homals solution with these variables is correct and whether the differences are significant. The numbers of pieces of interpreted or real evidence in this theme are also compared on differences with use of a t-test, to ascertain the interpretation of the homals solution with variables about type of evidence.

Theme 3: Details of the crime, offender and victim

Within the third theme, a homals analysis is used to get an impression of the described offender profiles and the details of the crime. Differences in the numbers of details stated is tested with use of a t-test.

Theme 4: Comparison of versions

The comparison of the two versions is done with the use of two tests. First, a Wilcoxon Rank test is used to compare on plausibility, completeness and the presence of a logical connection between version one and two. Next, interval variables (number of facts, inferences, assumptions, evidence and details) are analysed with the paired sample t-test. Finally, the mean differences of students and detectives are tested on significant differences. This is done with a chi-square for the known nominal variables and an independent t-test for mentioned
interval variables. In brief, this analysis gives answer on the question whether there is a significant difference in variation in scenarios between students and detectives. Since creating multiple scenarios is obligatory for detectives, it is of great importance to study the way detectives work with multiple scenarios. Figure 5 reflects the design and the tests in a scheme to clarify the analysis. The next chapter will show the results of these tests.

Figure 5: Design and tests used in this study.
Chapter 5 Results

The first theme that will be described is the construction of the story. This theme is followed by the theme ‘reconstruction of the crime’. Details of the crime, the offender and the victim form the third theme. The analysis is concluded with the last theme, the comparison of the two versions.

The results of the homals solutions will be described in two parts. First, a description of the plain results of the analysis will be given, followed by an interpretation of the results. The first homals analysis will be explained extensively due to a different kind of interpretation. Besides the homals analysis, other analysis are executed in each theme. The two versions of the scenarios are compared separately for these tests.

5.1 The construction of the story

5.1.1 Facts, inferences and assumptions

The first three items on which the scenarios are analysed are the number of facts, inferences and assumptions. The definitions of the terms are already described in the previous chapter. These variables, together with the variable narrative form, are first entered into a homals analysis. Figure 6 shows the results of this analysis.

The results in this first figure will be discussed in detail. This solution is different from the following homals solutions due to the presence of categories. The answers on the questions on facts, inferences and assumptions are divided into 7 categories. The chosen categories are based on a normal distribution. Table 3 shows the categories and their frequencies. The numbers in figure 6 indicate the minimum value of the category. Explicitly, 22 refers to category 22-28 and 18 refers to 18-23 and so on. Furthermore, each variable is characterised by its own figure. The figures are explained on the right side of the figure: assumptions are labelled with a circle, facts with a square and inferences with a cross. The categories of the variable narrative are labelled as nar: yes, nar: no, and nar: partly. To take one example, 22 and circle refers to assumptions in the category 22-28. The frequency of this combination is nineteen (see table 3) The same interpretation goes for facts and inferences. The three big circles in the figure are drawn by the researcher. The circles represent three profiles found and interpreted by the researcher. The interpretation will be explained after a plain description of the results.

---

1 The results of all the homals analysis show the mean of total scores of the respondents
Figure 6: Plot with interpretation of the variables facts, inferences, assumptions and narrative form.

Table 3: categories of number of facts, inferences and assumptions.

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Category</th>
<th>Frequency</th>
<th>Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 1</td>
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<td>0 - 3</td>
<td>48</td>
<td>0 - 4</td>
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<td>16 - 32</td>
<td>13</td>
<td>18 - 23</td>
<td>14</td>
<td>29 - 51</td>
</tr>
</tbody>
</table>

Description

The total fit of the solution in figure 6 is .991. The categories with a higher number of facts, inferences and assumptions are clustered around the students, on the right side of the solution. The detectives are on the left side together with the categories with a low number of facts, inferences and assumptions. The scenarios without a narrative form are near the detectives,
while the scenarios with a narrative form are situated near the students. Some scenarios are partly written in narrative form, these ones are situated in the upper right corner.

**Interpretation**

Based on the clusters in the solution, it seems that the detectives write scenarios that consist of a low number of facts, inferences and assumptions, which are not written in a narrative form. The students, on the other hand, seem to create scenarios written in narrative form, with a high number of facts, inferences and assumptions. In the upper right corner seems to be a group that create partly written narratives, but with a relatively high number of facts and inferences (respectively category 12-15 and category 18-23). This can be explained by the fact that a number of the students created scenarios in two parts. First, they described the facts and some inferences. After that, they created a small scenario. In order to gain an impression of the number of facts, inferences and assumptions stated by the students and detectives, tables 4, 5 and 6 show the mean, mode, standard deviation and range for both respondent groups.

Table 4: facts

<table>
<thead>
<tr>
<th>Facts</th>
<th>Student 1 (N=52)</th>
<th>Detective 1 (N=39)</th>
<th>Student 2 (N=52)</th>
<th>Detective 2 (N=39)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean *</td>
<td>9.5</td>
<td>3.46</td>
<td>8.44</td>
<td>2</td>
</tr>
<tr>
<td>Mode</td>
<td>7</td>
<td>0</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>6.21</td>
<td>2.84</td>
<td>6.51</td>
<td>1.65</td>
</tr>
<tr>
<td>Range</td>
<td>30</td>
<td>12</td>
<td>32</td>
<td>6</td>
</tr>
</tbody>
</table>

* = P <.001

Table 5: Inferences

<table>
<thead>
<tr>
<th>Inferences</th>
<th>Student 1 (N=52)</th>
<th>Detective 1 (N=39)</th>
<th>Student 2 (N=52)</th>
<th>Detective 2 (N=39)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean *</td>
<td>12</td>
<td>5</td>
<td>10.92</td>
<td>2.85</td>
</tr>
<tr>
<td>Mode</td>
<td>9</td>
<td>7</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>4.9</td>
<td>2.99</td>
<td>5.29</td>
<td>1.94</td>
</tr>
<tr>
<td>Range</td>
<td>20</td>
<td>10</td>
<td>21</td>
<td>8</td>
</tr>
</tbody>
</table>

* = P <.001

Table 6: Assumptions

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Student 1 (N=52)</th>
<th>Detective 1 (N=39)</th>
<th>Student 2 (N=52)</th>
<th>Detective 2 (N=39)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean *</td>
<td>17.58</td>
<td>6.18</td>
<td>19.02</td>
<td>6.03</td>
</tr>
<tr>
<td>Mode</td>
<td>14</td>
<td>5</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>9.46</td>
<td>3.43</td>
<td>9.29</td>
<td>3.65</td>
</tr>
<tr>
<td>Range</td>
<td>42</td>
<td>19</td>
<td>46</td>
<td>18</td>
</tr>
</tbody>
</table>

* = P <.001
**T-test**

Besides the homals analysis, a t-test is done. A t-test can provide information about the significance of the differences between students and detectives. The analysis for the first scenario shows that the police detectives write fewer facts in their crime scenarios compared to students. The difference is significant (t(75.495)=6.204, p<.001). Detectives also make significantly fewer inferences compared to students (t(85.815)=8.417, p<.001). This difference is logical since the detectives write fewer facts as well and inferences are derived from facts. Also, the detectives make significantly fewer assumptions compared to the students (t(67.69)= 8.016, p<.001).

Similar results are found in the second scenario. The police detectives write fewer facts in their second version of the crime scenarios compared to students. The difference is significant (t(59.563)=6.845, p<.001). Detectives make significantly fewer inferences than students (t(67.997)=10.137, p<.001). Also, the number of assumptions made by detectives is significant less compared to the students (t(70.19)= 9.184, p<.001). Figure 7 reflects the differences between the two versions and the differences between the students and detectives. St1 means students’ first scenario, st2 means students’ second scenario, det1 stands for detectives’ first scenario and det2 means detectives’ second scenario.

![Figure 7: Facts, inferences and assumptions in students and detectives first and second scenario.](image-url)
5.1.2 Narrative

Another item on which the scenarios of both groups are compared is the question on the form of the scenarios. The variables consistency and chronology are together with narrative form, entered in a homals analysis. The plot with the solution is shown in figure 8. To give an example of an interpretation of a category: ‘chron: yes’ means that the story is consistent.

**Figure 8: Plot with variables about the narrative.**

**Description**

The total fit of this solution is .891. This is not extremely high, but sufficient since a total fit of 0.6 or lower is defined as low. The positive answers on the questions about the structure of the scenario are clustered in the upper right corner. The students are somewhat lower, but on the same side. The positive answer on consistency of the story is near the origin of the plot. The scenarios without a narrative form and a chronological time sequence are in the upper left corner. The detectives are close to these kinds of scenarios. The scenarios that are partly written in a chronological time sequence and partly in a narrative form are at the bottom of the plot. The inconsistent scenarios are somewhat besides and above the ‘partly’ scenarios.
Interpretation

The homals solution in figure 8 implies that the students create scenarios written in a chronological time sequence, which are consistent and have a narrative form. However, consistency is situated near the origin so this category does not apply strongly to differences between the students and detectives. The police detectives create scenarios without chronology and without a narrative form. A number of the respondents started the scenario with the description of facts and inferences after which they concluded with a possible scenario in narrative form. In this case the scenario was scored as partly a narrative. These scenarios were partly chronological and are situated at the bottom of the plot.

Chi-square

The homals plot in figure 8 already showed that students, unlike detectives, write their scenario in a narrative form. A chi-square is done in order to test whether or not the difference between the two groups is significant. Table 7 show the difference between the two groups in scenario 1 and scenario 2.

<table>
<thead>
<tr>
<th>Narrative</th>
<th>Student 1 (N=52)</th>
<th>Detective 1 (N=39)</th>
<th>Total Scenario 1</th>
<th>Student 2 (N=52)</th>
<th>Detective 2 (N=39)</th>
<th>Total Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>34</td>
<td>10</td>
<td>44</td>
<td>37</td>
<td>17</td>
<td>54</td>
</tr>
<tr>
<td>% within Student or police detective</td>
<td>65.4%</td>
<td>25.6%</td>
<td>48.4%</td>
<td>71.2%</td>
<td>43.6%</td>
<td>59.3%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>3.8</td>
<td>-3.8</td>
<td>3.8</td>
<td>2.6</td>
<td>-2.6</td>
<td></td>
</tr>
<tr>
<td>no</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>6</td>
<td>27</td>
<td>33</td>
<td>6</td>
<td>20</td>
<td>26</td>
</tr>
<tr>
<td>% within Student or police detective</td>
<td>11.5%</td>
<td>69.2%</td>
<td>36.3%</td>
<td>11.5%</td>
<td>51.3%</td>
<td>28.6%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>-5.7</td>
<td>5.7</td>
<td>-5.7</td>
<td>-4.2</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>partly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>12</td>
<td>2</td>
<td>14</td>
<td>9</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>% within Student or police detective</td>
<td>23.1%</td>
<td>5.1%</td>
<td>15.4%</td>
<td>17.3%</td>
<td>5.1%</td>
<td>12.1%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>2.3</td>
<td>-2.3</td>
<td>2.3</td>
<td>1.8</td>
<td>-1.8</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>39</td>
<td>91</td>
<td>52</td>
<td>39</td>
<td>91</td>
</tr>
<tr>
<td>% within Student or police detective</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

The results show that a significant difference exists between students and detectives and the form of scenario one ($\chi^2 (2)= 32.402, p< .001$). The results in table 7 show that the scenarios with a narrative form together with the scenarios which are partly written in narrative form are significantly more present within the students, whereas the scenarios without a narrative form are significantly more present within the police detectives. The same results are found in the
second scenario of both groups: the difference between students and detectives and their scenario form is significant ($\chi^2 (2)= 17.909, p<.001$). The results of both scenarios are shown in figure 9.

Figure 9: Form of the scenarios.

Figure 10 shows an example of a scenario written by a detective to gain an impression of a scenario without a narrative form. The respondent just stated some keywords and gave two options in each step. Clearly, the scenario is not written in a narrative form, but as a small scale mind map. There has to be said, however, that it shows an extreme example.

Figure 10: scenario of an detective.

5.1.3 Plausible, complete and logic

The last variables about the structure of the scenario are plausibility, completeness and a logical connection. In order to test if there are differences on these variables between the
scenarios of the students and detectives a mann-whitney u test is done. The results are shown in table 8. The table shows that both the first and second scenarios of the students are more complete (1) (Z= -4.725, p<.001), (2) (Z= -4.972, p<.001) and logical (1) (Z= -5.165, p<.001), (2) (Z= -5.483, p<.001) compared to the scenarios of the detectives. Regarding plausibility, there is only a significant difference between the students’ and detectives’ second scenarios: the students scenarios are more plausible (Z= -3.820, p<.001).

<table>
<thead>
<tr>
<th></th>
<th>STUDENTS 1 (N=52)</th>
<th>DETECTIVES 1 (N=39)</th>
<th>STUDENTS 2 (N=52)</th>
<th>DETECTIVES 2 (N=39)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean rank</td>
<td>Mean rank</td>
<td>U-value</td>
<td>Mean rank</td>
</tr>
<tr>
<td>Plausible</td>
<td>45.10</td>
<td>47.21</td>
<td>967</td>
<td>37.76</td>
</tr>
<tr>
<td>Complete*</td>
<td>35.63</td>
<td>59.83</td>
<td>474.5*</td>
<td>35.07</td>
</tr>
<tr>
<td>Logic*</td>
<td>34.54</td>
<td>61.28</td>
<td>418*</td>
<td>33.65</td>
</tr>
</tbody>
</table>

* = p<.001

### 5.2 Reconstruction

The next paragraph displays the results of the tests with the variables about the way the crime was committed. The sub-themes are: evidence, elements of the crime and interaction.

#### 5.2.1 Evidence

The first test done is a homals analysis. The variables that were entered into the analysis are blood on victim, DNA of the offender, possible evidence, and respondent type. These variables are chosen because they will show the differences between evidence that is directly visible on the photo (blood on victim) and evidence that is not visible on the photo, but interpreted (DNA and possible evidence). The solution is shown in figure 11. The figure should be interpreted in the same way as the former solution: the plot shows the categories of the variables.
Figure 11: Plot with clusters of variables about evidence.

**Description**

The total fit of this solution is .700. The negative answers on DNA of the offender and possible evidence are clustered on the right of the origin of the solution. The category student is right beside these answers. The category ‘yes’ on the question about possible evidence is on the left side in the solution. The category detective is a little bit more on the right of this ‘yes’. The negative answer on blood on victim is on the upper side of the plot. The positive answers on DNA of the offender and blood on the victim are on the lower side of the solution; DNA on the left side, blood on victim on the right side.

**Interpretation**

The circles in figure 11 show the interpretation of the solution. The negative answers on possible evidence and DNA of the offender are clustered in the same place as the student category. This suggests that the students are the ones that did not write about DNA of the offender and other possible evidence (i.e. interpreted evidence). The category ‘yes’ of the variable blood on victim is more on the bottom of the plot, but on the same side of the solution as the students. This implies that the students did mention blood on the victim as evidence. In short, the students mentioned no possible evidence, but stated only real evidence. The detectives, on the other hand, are on the left side of the solution nearby the ‘yes’ category of the variable possible evidence. It seems that the detectives mentioned possible evidence in
their scenarios. The positive answer on DNA of the offender is more on the bottom of the plot, but on the same side of the solution as the detectives. The same goes for the negative answer on blood on victim; this category is more on the upside of the solution, but also on the same side as the detectives. Simply stated, the solution suggests that the detectives mentioned less real evidence, but stated more possible evidence. The interpretations are tested with a t-test.

**T-test**

Since a homals analysis only gives suggestions and does not provide hard evidence for the interpretation, a t-test is done in order to test if the interpretation is correct. The interval variables real evidence and interpreted evidence are entered into the analysis. The results show that no significant difference exists in the first scenarios of students and detectives and the pieces of evidence stated that can be actually seen on the photo of the crime scene. Interestingly, the detectives give significant more pieces of evidence that are interpreted \( (t(45.449) = 5.737, p < .001) \).

Contrary to the results in scenario one, there appears to be a significant difference between the students and detectives and the pieces of evidence that are visible at the photo of the crime scene. The students stated more pieces compared to the detectives \( (t(84.591) = 2.894, p < .005) \). Consistent with the results in scenario one, the detectives stated significantly more pieces of evidence that are interpreted in their second scenario \( (t(43.199) = 4.822, p < .001) \).

**5.2.2 Elements of the crime**

The next sub-paragraph describes the results of an analysis in which differences in crime elements are tested. The variables that are analysed are: type of crime, kind of location, method of entry, and kind of weapon. In addition, different analysis are done to test on differences in kind and number of details described.

**Type of crime**

In order to test whether the students and detectives created scenarios about the same type of offenses or not, a Fisher’s Exact test is done. The results of the test are shown in table 9. The results show that the students and the detectives wrote about different offences both in scenario one and two. The difference in variation in the first scenarios is significant \( (p < .01) \). The results in the table show that the variables revenge and robbery with murder differ significantly between the students and detectives in their first scenarios. In fact, the students
wrote more scenarios concerning a (personal) settlement. The detectives wrote more scenarios in which a robbery with murder was committed.

The alternative scenarios also show a difference in type of crime: the detectives wrote significantly more scenarios in which no crime was committed ($p<.001$). Explicitly, suicide, an accident or natural dead. The other categories differ not significant from the expected count. Furthermore, the table shows that students have more variation in their scenarios. An interesting result is the fact that a large part of both the students and the detectives think in the right direction: they created a scenario concerning a robbery with murder.

Table 9: Type of crime in scenario 1 and 2.

<table>
<thead>
<tr>
<th>Type of crime</th>
<th>Student 1 (N=52)</th>
<th>Detective 1 (N=39)</th>
<th>Total scenario 1</th>
<th>Student 2 (N=52)</th>
<th>Detective 2 (N=39)</th>
<th>Total scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murder/homicide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>19</td>
<td>12</td>
<td>31</td>
<td>18</td>
<td>15</td>
<td>33</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>36.5%</td>
<td>30.8%</td>
<td>34.1%</td>
<td>34.6%</td>
<td>38.5%</td>
<td>36.3%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>.6</td>
<td>-.6</td>
<td>-.4</td>
<td>.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenge/settlement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>10</td>
<td>0</td>
<td>10</td>
<td>6</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>19.2%</td>
<td>0%</td>
<td>11%</td>
<td>11.5%</td>
<td>2.6%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>2.9</td>
<td>-2.9</td>
<td>1.6</td>
<td>-1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robbery with murder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>15</td>
<td>20</td>
<td>35</td>
<td>19</td>
<td>9</td>
<td>28</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>28.8%</td>
<td>51.3%</td>
<td>38.5%</td>
<td>36.5%</td>
<td>23.1%</td>
<td>30.8%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>-2.2</td>
<td>-2.2</td>
<td>1.4</td>
<td>1.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burglary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>8</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>7.7%</td>
<td>2.6%</td>
<td>5.5%</td>
<td>15.4%</td>
<td>5.1%</td>
<td>11%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
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<td>-1.1</td>
<td>1.5</td>
<td>-1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No crime</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>0</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>5.8%</td>
<td>10.3%</td>
<td>7.7%</td>
<td>0%</td>
<td>28.2%</td>
<td>12.1%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>-8</td>
<td>.8</td>
<td>-4.1</td>
<td>4.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>1.9%</td>
<td>5.1%</td>
<td>3.3%</td>
<td>1.9%</td>
<td>2.6%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>-8</td>
<td>.8</td>
<td>-2</td>
<td>.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>52</td>
<td>39</td>
<td>91</td>
<td>52</td>
<td>39</td>
<td>91</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Location

Location of the crime is another item on which the scenarios are compared. The results of a chi-square show no significant difference between the students and detectives. Both groups
described the house of the victim as the location of the crime. Only one respondent in each group described another location.

Method of entry
A chi-square with the variable ‘method of entry’ on the first scenarios shows that students wrote more scenarios in which the offender is let in by the victim. Unlike the students, the detectives created relatively more scenarios in which the offender came in by him or herself. This can be partly explained by the fact that detectives created more scenarios in which the victim committed suicide or died a natural dead. The offender, or the victim in these cases, came in by him or herself. Furthermore, detectives more often gave multiple possibilities. The differences between the students and detectives is significant ($\chi^2 (4)=12.516, p< .05$). Regarding the second scenario, similar results can be seen. A Fisher’s Exact test is used due to small cell values. Students wrote more scenarios in which the offender was let in by the victim or came in by breaking and entering. Again, detectives described how the offender came in by him or herself. The differences are significant ($p<.001$).

Motive
Motive is another item on which the scenarios are analysed. To test on differences between the students and the detectives and the motive they described, a Fisher’s Exact test is done. The results are shown in table 10. The results show that students have more variation in their motives compared to detectives. Regarding the first scenarios, the students wrote significantly more scenarios in which the motive was revenge, whereas relatively more detectives described money or financial trouble as motive for the crime ($p< .01$). The students and detectives do also differ significantly in motives in their alternative scenarios ($p<.05$). Equally, the students wrote more scenarios in which the motive is rage or anger.
Table 10: Motive of the offender

<table>
<thead>
<tr>
<th>Motive</th>
<th>Student 1 (N=51)</th>
<th>Detective 1 (N=34)</th>
<th>Total Scenario 1</th>
<th>Student 2 (N=52)</th>
<th>Detective 2 (N=31)</th>
<th>Total Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Money/financial trouble</td>
<td>Count</td>
<td>23</td>
<td>23</td>
<td>46</td>
<td>29</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>% within Student or detective</td>
<td>45.1%</td>
<td>67.6%</td>
<td>54.1%</td>
<td>55.8%</td>
<td>48.4%</td>
</tr>
<tr>
<td></td>
<td>Adjusted Residual</td>
<td>-2.0</td>
<td>2.0</td>
<td>.7</td>
<td>-7</td>
<td></td>
</tr>
<tr>
<td>Revenge</td>
<td>Count</td>
<td>12</td>
<td>0</td>
<td>12</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>% within Student or detective</td>
<td>23.5%</td>
<td>0%</td>
<td>14.1%</td>
<td>13.5%</td>
<td>9.7%</td>
</tr>
<tr>
<td></td>
<td>Adjusted Residual</td>
<td>3.1</td>
<td>-3.1</td>
<td>.5</td>
<td>-5</td>
<td></td>
</tr>
<tr>
<td>Rage/anger</td>
<td>Count</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>% within Student or detective</td>
<td>9.8%</td>
<td>0%</td>
<td>5.9%</td>
<td>13.5%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Adjusted Residual</td>
<td>1.9</td>
<td>-1.9</td>
<td>2.1</td>
<td>-2.1</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Count</td>
<td>9</td>
<td>8</td>
<td>17</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>% within Student or detective</td>
<td>17.6%</td>
<td>23.5%</td>
<td>20.0%</td>
<td>11.5%</td>
<td>32.3%</td>
</tr>
<tr>
<td></td>
<td>Adjusted Residual</td>
<td>-.7</td>
<td>.7</td>
<td>-2.3</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>Multiple</td>
<td>Count</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>% within Student or detective</td>
<td>3.9%</td>
<td>8.8%</td>
<td>5.9%</td>
<td>5.8%</td>
<td>9.7%</td>
</tr>
<tr>
<td></td>
<td>Adjusted Residual</td>
<td>-.9</td>
<td>.9</td>
<td>-.4</td>
<td>.4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>51</td>
<td>34</td>
<td>85</td>
<td>52</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>% within Student or detective</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Missing</td>
<td>Count</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>

**Weapon**

In order to test whether or not the students and detectives created scenarios in which the offender used the same kind of weapon and created the same kinds of wounds another homals analysis is done. The variables that are entered into the analysis are type of weapon and wounds of the victim, together with occupation. The solution with the categories is shown in figure 12.
Figure 12: Plot with the clusters of variables type of weapon and wounds of the victim.

**Description**

The fit of this solution is 1.182, which is a good fit. In the upper right corner are the blunt weapons, close to head and neck wounds. The students are on the right side of the origin, together with the category fire arm. The detectives and the category ‘multiple’ are on the left side of the origin. In the lower right corner are the blade weapons, together with breast and belly wounds, and other kind of wounds.

**Interpretation**

The homals solution in figure 12 shows that the blunt weapons are clustered in the upper right corner. The wounds that fit best with these kinds of weapons seem to be head and neck wounds. Both students and detectives gave a blunt weapon as option in their scenario. The head and neck wounds are mostly described by students. Furthermore, it seems that the detectives created relatively more scenarios in which they described multiple types of weapons. In the lower right corner is a group of respondents that created a scenario in which the offender used a blade weapon and wounded the victim in the breast or belly or another place besides breast and belly or head and neck. In order to test whether or not the differences in kind of weapon are significant, a Fisher’s Exact test is done.
Fisher’s Exact test

A Fisher’s Exact test shows that the differences between the students and detectives and the variation in kind of weapon are significant in scenario one (p< .05) and scenario two (p<.001). The results are shown in table 11. The significant difference in the scenarios is partly due to the differences in the category not applicable: detectives wrote more scenarios in which a weapon was not applicable. Also, students wrote significantly more scenarios in which the victim was killed with a fire arm. This finding is in accordance with the homals solution. The other categories do not show a significant difference between the students and detectives.

Table 11: Kind of weapon in scenario 1 and 2.

<table>
<thead>
<tr>
<th>Weapon</th>
<th>Student 1 (N=44)</th>
<th>Detective 1 (N=26)</th>
<th>Total scenario 1</th>
<th>Student 2 (N=45)</th>
<th>Detective 2 (N=24)</th>
<th>Total scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade weapon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>13</td>
<td>7</td>
<td>20</td>
<td>12</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>28.9%</td>
<td>21.2%</td>
<td>25.6%</td>
<td>26.7%</td>
<td>21.2%</td>
<td>24.4%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>0.8</td>
<td>-0.8</td>
<td>0.6</td>
<td>-0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blunt weapon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>11</td>
<td>8</td>
<td>19</td>
<td>10</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>24.4%</td>
<td>24.2%</td>
<td>24.4%</td>
<td>22.2%</td>
<td>15.2%</td>
<td>19.2%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>0.0</td>
<td>0.0</td>
<td>0.8</td>
<td>-0.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire arm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>13</td>
<td>3</td>
<td>16</td>
<td>16</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>28.9%</td>
<td>9.1%</td>
<td>20.5%</td>
<td>35.6%</td>
<td>12.1%</td>
<td>25.6%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>2.1</td>
<td>-2.1</td>
<td>2.3</td>
<td>-2.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>5</td>
<td>7</td>
<td>12</td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>11.1%</td>
<td>21.2%</td>
<td>15.4%</td>
<td>8.9%</td>
<td>18.2%</td>
<td>12.8%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>-1.2</td>
<td>1.2</td>
<td>-1.2</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>4.4%</td>
<td>3%</td>
<td>3.8%</td>
<td>6.7%</td>
<td>6.1%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>0.3</td>
<td>-0.3</td>
<td>0.1</td>
<td>-0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not applicable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>1</td>
<td>7</td>
<td>8</td>
<td>0</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>2.2%</td>
<td>21.2%</td>
<td>10.3%</td>
<td>0%</td>
<td>27.3%</td>
<td>11.5%</td>
</tr>
<tr>
<td>Adjusted Residual</td>
<td>-2.7</td>
<td>2.7</td>
<td>-3.7</td>
<td>3.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>45</td>
<td>33</td>
<td>78</td>
<td>45</td>
<td>24</td>
<td>69</td>
</tr>
<tr>
<td>% within Student or detective</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Missing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>7</td>
<td>6</td>
<td>13</td>
<td>7</td>
<td>6</td>
<td>13</td>
</tr>
</tbody>
</table>

5.2.3 Interaction

Another item on which the scenarios are analysed is the interaction described in the scenarios. The results of a chi-square show that there is no significant difference between the students
and the detectives’ first scenario, and the question whether or not there is interaction during the crime. Both the majority of the students (63.5%) and the detectives (70.3%) created scenarios in which there was interaction. In other words, there was interaction between victim and offender. Interestingly, the detectives did not specify whether the interaction had influence on the course of the story. A Fisher’s Exact test shows a significant difference with the students, who did mention its influence (p<.05). In contrast with the first scenarios, a chi-square shows a significant difference within the alternative scenarios: students described more alternative scenarios in which interaction occurred ($\chi^2 (1) = 4.244$, p<.05). If detectives did describe interaction, the kind of interaction was more often not mentioned in the detectives’ scenarios. The students created more scenarios in which the interaction between the victim and the offender was aggressive. A Fisher’s Exact test shows that the difference between the students and detectives is significant (p<.001). Equal to scenario one, detectives did not mention the influence of the interaction. The majority of the students’ scenarios contain interaction which has influence on the course. The difference between the two groups is significant (p<.001).

5.3 Details
The scenarios are also analyzed on the number of details described. Details include the total number of characteristics of the victim, and the total number of characteristics of the offender. In addition there are some items about details of the crime. Two homals analyses are done in order to get an impression of the differences in the kind of details described between students and detectives.

The first plot, figure 13, is a homals solution with variables about the offender. The variables that are entered into the analysis are: anything mentioned about personality of the offender, about physical characteristics, about emotional features, about family of the offender, about any criminal history and about other characteristics of the offender.
5.3.1 Characteristics of the offender

Description

The total fit of the solution shown in figure 13 is .621. The students are, together with some of the positive answers on the questions about the offender, on the right side of the origin. The police detectives are on the left side in the solution. The negative answers on the questions about the offender are clustered around the origin.

Interpretation

The homals solution in figure 13 shows that the students are in the same place as the positive answers about the criminal history, personality and physical characteristics of the offender. Positive answers mean that the scenario consists of information about this subjects. The negative answers are clustered around the origin which means that both police detectives and most of the students didn’t give information about the background of the offender. The scenarios that do consist of information about the offender are written by the students. However, only a few scenarios consist of information.

5.3.2 Details offender, victim and crime

The next plot is a homals solution that consists of variables about different kind of details. The variables that are entered into the analysis are: anything mentioned about personality of the offender, criminal history of the offender, anything mentioned about family of the
offender, criminal history of the victim, anything mentioned about reasons for the crime, and the period when the crime happened. The variables are chosen after different analyses with different variables. The combination of these variables gives the best solution with the best fit. The solution is shown in figure 14.

**Figure 14**: Plot with variables of details.

**Description**

The total fit of this solution is .634. The detectives are somewhat on the left side of the solution compared to the origin. Some of the negative answers on the questions about details are clustered around the origin. These are the variables ‘period when crime happened’, ‘family of the offender’ and ‘reasons for the crime’. On the right side of the solution is a group of positive and negative answers, together with the students.

**Interpretation**

It appears from the solution in figure 14 that the students’ scenarios contain more details in comparison with the detectives’ scenarios. The scenarios that do consist of details about the crime are written by students since the positive answers are on the same side as the students in the plot. The period of the crime and information about the family of the offender is in most cases not given by both the students and the detectives, since the negative answers on these variables are in the origin of the solution. The same goes for reasons for the crime, although the negative answers (i.e. no reasons for the crime given) are somewhat closer to the
detectives than the students. The homals solution only gives an impression of the differences on the kind of details described. A t-test can give more clarity about the differences in the number of details stated by the students and detectives.

### T-test

The variables ‘number of characteristics of the victim’, number of characteristics of the offender, and total number of details are analysed with a t-test. Table 12 shows the results of the analysis. There is a significant difference on all the above mentioned variables between both the first and second scenarios of the students and detectives. This means that students give more details about the victim (t(89)=5.507, p<.001), the offender (t(72.035)=7.859, p<.001) and about the crime (t(87.840)= 9.371, p<.001) in their first scenario. The same results are found in the alternative scenarios: students give more details about the victim (t(89)=7.698, p<.001), the offender (t(69.785)=10.009, p<.001) and the crime (t(77.677)=11.869, p<.001) compared to the detectives.

<table>
<thead>
<tr>
<th>Table 12: Details of the victim, offender and crime</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Students 1</strong> (N=52)</td>
</tr>
<tr>
<td><strong>Detectives 1</strong> (N=39)</td>
</tr>
<tr>
<td><strong>Students 2</strong> (N=52)</td>
</tr>
<tr>
<td><strong>Detectives 2</strong> (N=39)</td>
</tr>
<tr>
<td># Characteristics victim *</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>3.37</td>
</tr>
<tr>
<td># Characteristics offender *</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>4.19</td>
</tr>
<tr>
<td>Total # of details *</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>8.63</td>
</tr>
</tbody>
</table>

* = p<.001

In order to get a clear overview of the differences between students and detectives, the information is reflected in a chart shown in figure 15. The means of students’ and detectives’ first and second scenario are shown in the figure.
5.3.3 Not mentioned and missing

The overall results implicate that detectives stay more implicit when creating possible scenarios. Unlike the detectives, the students create more explicit scenarios. They contain more information and elements about the crime. The scenarios of the detectives often score on ‘unclear’ or ‘not mentioned’ and they seem to have more missings. To test if this suggestion is correct, an ANOVA is done on the total scores of both scenarios. The results of the test show that the differences between the students and detectives are significant (F(1)=78.389, p<.001). It is more often the case among detectives that a variable is not mentioned or missing. The detectives have a mean of 16.68 against 11.06 from the students.

5.3.4 Variance

The analysis with a t-test show relative large differences in standard deviations between students and detectives. Simply stated, the group students displays more variation between their scenarios. Detectives create more similar scenarios. This might be due to their experience. The following table, table 13, shows with which variables the variance is equal between both groups. Variables without a checkmark have significant difference in variance between both groups.
Table 13: Equal variance.

<table>
<thead>
<tr>
<th></th>
<th>Scenario 1</th>
<th>Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inferences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assumptions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Evidence</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Interpreted Evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristics Victim</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Characteristics Offender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of details</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.4 Comparison of version one and two

Not only the differences between the students and the detectives are analysed, but also the differences or variation between both versions of the scenarios. This theme will provide information about the way of working with multiple scenarios. In order to compare version one to two, different tests are done. First, paired sample t-tests are done on the students’ scenarios. Next, the same tests are done on the scenarios of the police detectives. Also, a Wilcoxon rank test is used to compare plausibility, completeness and the presence of a logical connection in both scenarios. These tests give an indication of variability between the two scenarios. Finally, the mean differences of the students are compared with the mean differences of the detectives.

5.4.1 Construction of the story in versions

5.4.1.1 Facts, inferences and assumptions

In order to compare version one to two on the numbers of facts, inferences and assumptions, a paired sample t-test is done. Table 14 shows the results of the test. The analysis shows that, so far as the students are concerned, there are differences between the two scenarios in the number of facts and inferences. The alternative scenario contains significantly fewer facts ($t(51)=2.95, p<.01$) and inferences ($t(51)=2.193, p<.05$) compared to their first scenario. The results show no significant differences in the number of assumptions. Interestingly, the same results are found for the detectives. Their second scenarios also contain significantly fewer facts ($t(39)=3.177, p<.01$) and inferences ($t(38)=3.796, p<.001$) compared to their first scenarios. There is no significant difference between the numbers of assumptions in both versions.

The results of an independent t-test on the mean differences between scenario one and two of students and detectives show that there is no significant difference between students and detectives and the mean difference of the number of facts, inferences and assumptions in scenario one and two. The results in the table also show the differences between students and detectives and their mean differences. Basically, both students and detectives have a decline in number of facts and inferences in their second scenario. This is an interesting result since the facts are given: namely the crime scene photo.
Table 14: Facts, inferences and assumptions in version one and two.

<table>
<thead>
<tr>
<th></th>
<th>STUDENT (N=52)</th>
<th>DETECTIVE (N=39)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.d.</td>
</tr>
<tr>
<td># of facts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Version 1</td>
<td>9.5</td>
<td>6.21</td>
</tr>
<tr>
<td>Version 2</td>
<td>8.4</td>
<td>6.51</td>
</tr>
<tr>
<td>Difference in mean</td>
<td>-1.06**</td>
<td></td>
</tr>
<tr>
<td>Difference between groups</td>
<td>.40</td>
<td></td>
</tr>
<tr>
<td># of inferences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Version 1</td>
<td>12.0</td>
<td>4.9</td>
</tr>
<tr>
<td>Version 2</td>
<td>10.9</td>
<td>5.29</td>
</tr>
<tr>
<td>Difference in mean</td>
<td>-1.08*</td>
<td></td>
</tr>
<tr>
<td>Difference between groups</td>
<td>1.08</td>
<td></td>
</tr>
<tr>
<td># of assumptions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Version 1</td>
<td>17.6</td>
<td>9.46</td>
</tr>
<tr>
<td>Version 2</td>
<td>19.0</td>
<td>9.29</td>
</tr>
<tr>
<td>Difference in mean</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>Difference between groups</td>
<td>1.60</td>
<td></td>
</tr>
</tbody>
</table>

*p<.05  
**p<.01  
***p<.001

5.4.1.2 Plausibility, completeness and logical connections

Another interesting item to compare both versions on is plausibility. In order to create a good serious alternative scenario, it should be just as plausible as the first scenario. It appears from a Wilcoxon Signed Rank test that the two scenarios of the students do not differ significantly on plausibility. Remarkably, detectives do show a significant difference: their second scenario is less plausible than their first one (p<.01). An analysis with the variables completeness and logical connection shows no significant differences for students and detectives.

5.4.2 Reconstruction in versions

5.4.2.1 Evidence

Another item on which both versions of the scenarios are compared is the number of evidence stated. The results are shown in table 15. The results of a paired sample t-test show that there is no difference for interpreted evidence within groups between both versions. Also, students’ scenarios show no differences in evidence that is directly visible at the photo. However, the detectives show significantly fewer pieces of evidence that are visible at the photo in their second scenario (t(38)=2.48, p<.025). Again, this is an interesting result, knowing that the photo was the same for scenario one and two.
An analysis with a t-test on the mean differences shows that the mean differences of students and detectives on real and interpreted evidence do not differ significantly from each other. The mean differences are also shown in table 15.

Table 15: Differences in evidence in both versions for students and detectives.

<table>
<thead>
<tr>
<th></th>
<th>STUDENT (N=52)</th>
<th>DETECTIVE (N=39)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.d.</td>
</tr>
<tr>
<td>Real evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Version 1</td>
<td>2.56</td>
<td>1.72</td>
</tr>
<tr>
<td>Version 2</td>
<td>2.27</td>
<td>1.93</td>
</tr>
<tr>
<td>Difference in mean</td>
<td>-.29</td>
<td></td>
</tr>
<tr>
<td>Difference between groups</td>
<td>.35</td>
<td></td>
</tr>
<tr>
<td>Interpreted Evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Version 1</td>
<td>.31</td>
<td>.70</td>
</tr>
<tr>
<td>Version 2</td>
<td>.35</td>
<td>.65</td>
</tr>
<tr>
<td>Difference in mean</td>
<td>.04</td>
<td></td>
</tr>
<tr>
<td>Difference between groups</td>
<td>.14</td>
<td></td>
</tr>
</tbody>
</table>

*p<.025

5.4.2.2 Elements of the crime

In order to test whether there is variation between the elements of the crime in both versions of the scenarios, the number of different and the number of identical elements in both versions are analysed. A number of different variables about the crime are selected for this analysis. The selection is based on the relevancy of the variables. A chi-square is done in order to test whether there is any difference between the students and the detectives and the amount of variation between the scenarios. Table 16 shows the results of the variables on which there was a significant difference between the students and the detectives.

Type of crime

Students wrote a second scenario about the same type of crime as their first scenario more frequently than the detectives. The difference between the students and detectives is significant ($\chi^2 (1)= 4.953, p<.05$). However, the majority of both the students and the detectives (respectively 82.7% and 97.4%) created a second scenario in which a different crime was committed. It appeared from the results in the first part of the analysis that detectives created an alternative scenario in which no crime occurred more often than students did. Furthermore, the difference can be found in a different kind of murder. For example, a robbery instead of revenge.
**Location**

More detectives than students (10.3% against 1.9%) wrote about a different location in their second scenario. The difference between the students and detectives is not significant, although a trend is visible ($\chi^2 (1) = 2.980, p = .084$). By analyzing the data it seems that this difference exists because the detectives wrote less information in their second scenario. In this case, the location was scored as ‘not mentioned’. Although there is a difference, the majority of both the students and the detectives wrote about a crime that was committed in the same location (respectively 98.1% and 89.7%).

**Time of the crime**

Slightly more than half of the students wrote a second scenario in which the time of the crime was the same as in the first scenario. The opposite is true for the detectives. The majority created an alternative scenario with a different time of the crime. The difference between the two groups is significant ($\chi^2 (1) = 7.756, p < .01$). However, the difference seems to be due to the lack of information in detectives’ second scenario as well. The variable is scored as not mentioned.

**Relation victim and offender**

A bigger part of the students as well as of the detectives wrote about different relationships between offender and victim in their two scenarios. However, the difference between the number of persons who wrote about the same relationship and the number of persons who wrote about a different one is bigger for the students than the detectives. The difference between the two groups is not significant, although a trend is visible ($\chi^2 (1) = 3.760, p = .052$).

**Sex of the victim**

A larger percentage of the students as well as the detectives wrote scenarios in which the sex of the victim stayed the same, though both groups differ significantly from each other ($\chi^2 (1) = 8.965, p < .01$). Students described the same sex relatively more than detectives did.

**Social Economic Status of the victim**

Most of the detectives (82.1%) wrote an alternative scenario in which the social economic status of the victim was the same as the status of the victim in the first scenario. The percentage for the students is also higher for the same status of the victim in both scenarios.
(63.5%), although the percentage is lower than the percentage for the detectives. The difference between the groups is not significant, but a trend is visible ($\chi^2 (1)= 3.774$, $p=.052$).

**Sex of the offender**

Most of the students (73.1%) wrote a second scenario in which the sex of the offender stayed the same as written in the first scenario. Unlike the students, more detectives (59%) wrote a second scenario in which the sex of the offender was different of the sex of the offender in the first scenario. The difference between the students and the detectives is significant ($\chi^2 (1)= 9.489$, $p< .01$). An explanation for the difference can be found in the fact that detectives more often wrote a second scenario in which the victim had an accident, committed suicide or died a natural dead. In this case, the sex of the offender is scored as ‘not applicable’.

<table>
<thead>
<tr>
<th>Table 16: Differences between scenarios by students and detectives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>**Type of crime **</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>**Time of the crime **</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>**Sex of the victim **</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Sex offender</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

* = $p<.05$
** = $p<.01$

The other variables that were entered into the analysis showed no significant difference between the students and the detectives, and the number that wrote the same or made differences in both scenarios. Table 17 shows the percentage of the students and detectives together that wrote the same in both scenarios and the percentage that made a difference in both scenarios. The variables that were described differently in both scenarios are marked.
Table 17: Variables that are tested on differences or similarities in both scenarios.

<table>
<thead>
<tr>
<th>Variable</th>
<th>SAME</th>
<th>DIFFERENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation</td>
<td>41.8%</td>
<td>58.2%</td>
</tr>
<tr>
<td>Entry point</td>
<td>71.4%</td>
<td>28.6%</td>
</tr>
<tr>
<td>Kind of weapon</td>
<td>49.5%</td>
<td>50.5%</td>
</tr>
<tr>
<td>Search for valuables</td>
<td>44.0%</td>
<td>56.0%</td>
</tr>
<tr>
<td>Kind of wounds</td>
<td>71.4%</td>
<td>28.6%</td>
</tr>
<tr>
<td>Property taken</td>
<td>54.9%</td>
<td>45.1%</td>
</tr>
<tr>
<td>Motive</td>
<td>23.1%</td>
<td>76.9%</td>
</tr>
<tr>
<td>Criminal history</td>
<td>49.5%</td>
<td>50.5%</td>
</tr>
<tr>
<td>Addiction</td>
<td>62.6%</td>
<td>37.4%</td>
</tr>
<tr>
<td>SES offender</td>
<td>65.9%</td>
<td>34.1%</td>
</tr>
<tr>
<td>State of mind</td>
<td>38.5%</td>
<td>61.5%</td>
</tr>
<tr>
<td>Interaction</td>
<td>49.5%</td>
<td>50.5%</td>
</tr>
<tr>
<td>Kind of interaction</td>
<td>20.9%</td>
<td>79.1%</td>
</tr>
<tr>
<td>Influence of interaction</td>
<td>34.1%</td>
<td>65.9%</td>
</tr>
</tbody>
</table>

To gain a better impression of the variables that are described similarly of differently, a chart with the information from table 15 is made. See figure 16.

Figure 16: Differences and similarities in scenario 1 and 2.
Importantly, notice that a thorough examination of the data suggests that the differences in elements of the crime in detectives’ first and alternative scenarios are mostly due to the lack of information in their second scenario. In these cases the variable is scored as ‘not mentioned’. Consequently, the variable is scored differently from the first scenario, in which detectives did write something about the variable in question.

Finally, in order to test whether there is a difference between the students and the detectives and the number of times they have written the same in both scenarios, an anova analysis of variance is done. The test shows that there is no significant difference between the students and detectives.

**5.4.3 Details of the victim, offender and crime in versions**

In the end, the scenarios are compared on the number of details stated in both versions. The results of the tests are shown in table 18. A paired sample t-test is done to compare both scenarios. The students show for the number of characteristics of the victim, the number of characteristics of the offender, and the total number of details no differences in both versions. The detectives, on the other hand, do show some significant differences. The number of characteristics of the victim is significantly less in the second scenario \((t(38)=3.571, p<.001)\). The same result applies to the total number of details stated. The second scenario contains significant less details \((t(38)=2.87, p<.01)\). These results suggest that detectives had more difficulty conceiving an alternative scenario as detailed as the first one. There was no difference between the number of characteristics of the offender in both versions.

In order to test whether or not the students and detectives differ in the number of details stated in scenario one and two, a t-test on mean differences is done. The results of the analysis show that both groups do not differ significantly from each other in the number of characteristics of the victim, characteristics of the offender and the total number of details stated in the first and second, alternative scenario.
Table 18: Differences in details in both versions for students and detectives

<table>
<thead>
<tr>
<th></th>
<th>STUDENT (N=52)</th>
<th></th>
<th>DETECTIVE (N=39)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.d.</td>
<td>Mean</td>
<td>S.d.</td>
</tr>
<tr>
<td># Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>victim Version 1</td>
<td>3.37</td>
<td>1.47</td>
<td>1.67</td>
<td>1.44</td>
</tr>
<tr>
<td>victim Version 2</td>
<td>3.08</td>
<td>1.45</td>
<td>0.95</td>
<td>1.08</td>
</tr>
<tr>
<td>Difference in mean</td>
<td>-.29</td>
<td></td>
<td>- .72 **</td>
<td></td>
</tr>
<tr>
<td>Difference between groups</td>
<td>.43</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offender Version 1</td>
<td>4.19</td>
<td>2.62</td>
<td>1.03</td>
<td>1.09</td>
</tr>
<tr>
<td>Offender Version 2</td>
<td>4.19</td>
<td>2.28</td>
<td>0.72</td>
<td>.89</td>
</tr>
<tr>
<td>Difference in mean</td>
<td>0</td>
<td></td>
<td>-.31</td>
<td></td>
</tr>
<tr>
<td>Difference between groups</td>
<td>.31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># Details</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>version 1</td>
<td>8.63</td>
<td>3.50</td>
<td>2.90</td>
<td>2.33</td>
</tr>
<tr>
<td>version 2</td>
<td>8.33</td>
<td>3.38</td>
<td>1.95</td>
<td>1.64</td>
</tr>
<tr>
<td>Difference in mean</td>
<td>-.31</td>
<td></td>
<td>-.95</td>
<td></td>
</tr>
<tr>
<td>Difference between groups</td>
<td>.64</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* = p<.01
** = p<.001

It appears from the results that students and detectives have different thoughts about how to work with scenarios. Where students write extensive scenarios, detectives prefer to stay short and more implicit. The differences will be interpreted in the next chapter.
Chapter 6 Conclusion, Discussion and Recommendations

6.1 Conclusion
In this study the influence of investigative experience on the creation of crime scenarios is studied using the following research question: *How is the creation of crime scenarios influenced by investigative experience?* In order to answer this question four sub questions have been formulated.

1. *What influence does experience have on police detectives?*
2. *What kinds of scenarios are created?*
3. *Which elements are visible in the crime scenarios?*
4. *How much variation is visible between the two versions of the scenarios?*

A group of students and a group of police detectives were asked to construct scenarios based on a photo of a crime scene. First, the scenarios as produced are scored on the number of facts, inferences and assumptions in order to analyse the kind of scenario. The students stated more facts, inferences and assumptions compared to the detectives. Additionally, the scenarios are studied on the form of the story. The scenarios created by students are mostly written in narrative form, whereas the scenarios of the detectives miss the form and narrative structure. Their scenarios more often consist of loose sentences or keywords. The final concepts on which the scenarios are scored is on plausibility, completeness and the presence of logical connections. The students wrote scenarios that are more plausible, complete and logical compared to the scenarios of the detectives.

In order to provide an answer to the second sub-question, the scenarios are analysed and compared with respect to the content of the stories. The first theme addresses the reconstruction of the crime. It appears that students stated more pieces of evidence in their second scenario that were actually visible at the photo of the crime scene, compared to the detectives. On the other hand, the detectives stated more pieces of evidence that are possibly present at the crime scene. It seems that detectives use a standard list of pieces of evidence for which to look at a crime scene. As part of the reconstruction, the scenarios are also analysed on the elements of the crime, that together form the Modus Operandi of the offender. Regarding the type of crime, the most striking result is the lack of variability in the scenarios of the detectives compared to the students. In addition, the detectives more frequently wrote an alternative scenario or gave a third option in which an accident or suicide is described. Since these scenarios do not have an offender, the scenarios consist of only a few elements.
The students wrote more often scenarios about a crime, with an extensive description of the Modus Operandi as a result. Most of the students also described the motive of the offender, which resulted in more variability in the scenarios of the students compared to the detectives. The detectives more often wrote scenarios in which another motive is described or in which a motive is not applicable. This is, partly, again a consequence of the no crime scenarios. The final aspect of the reconstruction studied here is the interaction between offender and victim. Both the students and the detectives described interaction in their first scenarios. However, the kind of interaction as well as its influence on the course of the story is not specified in the scenarios of the detectives. The students created more scenarios in which the interaction between the victim and the offender was aggressive and has influence on the course of the story.

Another element on which the scenarios are analysed and compared is the number and type of details stated. Regarding the details about the offender, the students gave a more extensive profile than detectives did. The students gave information about the personality, the appearance of the offender, emotional features and the criminal history of the offender. Furthermore, the detectives gave less information about the victim and details of the crime.

It can be concluded that the assignment ‘create a scenario’ produces different kind of scenarios. Students create extensive scenarios with a high number of facts, inferences and assumptions. Furthermore, they give a more extensive description of the Modus Operandi. This means that students used a lot of imagination. Conversely, detectives created more short scenarios with less facts, inferences and assumptions: they stayed more implicit. For this reason, lines of enquiry might be overlooked. On the opposite side, by staying implicit and short, the detectives also avoid tunnel vision which is a positive finding.

Variation between scenarios made by the same person

Every respondent was asked to produce two scenarios, based on the same information. The two versions of the scenarios are compared on number of facts, inferences and assumptions stated. Both students and detectives showed a decline in number of facts and inferences. The number of assumptions remained the same. The numbers of pieces of evidence stated by the detectives and students are approximately equal for interpreted evidence in the two scenarios. Interestingly, detectives stated less real evidence in their alternative scenario. In other words, the second scenario of the detectives is supported with less real evidence than their first scenario.
Regarding the elements of the crime (MO), detectives wrote something different in their second scenario more often than students did. However, these differences are due to the fact that detectives wrote less information in their second scenario. This results in a score on ‘not mentioned’, which is different from the score in the first scenario. The students described some variables differently in both scenarios. These include variables where detectives did not write about at all, such as information about the offender and victim. These variables were scored ‘not mentioned’ in both scenarios of the detectives. The differences in type of crime and in sex of the offender are due to the fact that more detectives wrote a second scenario in which an accident occurred or the victim committed suicide. In fact, the scenarios do contain some variation. The variables that are more or less directly visible at the photo, like location and type of wounds, are the same in both scenarios. This applies to students and detectives alike. Concerning the total number of details in both versions, the detectives stated less details in their second version whereas the students, displayed no differences.

The results show that different kinds of scenarios are created, based on the same assignment. Moreover, it appears that both groups have difficulty creating an alternative scenario with an equal number of facts and inferences. Particularly, detectives seem to have trouble with creating alternatives with an equal amount of information. The question is whether tunnel vision will be avoided in this way. Also, there seems to be some influence of experience in the use of a standard list for evidence and the presence of an alternative scenario in which the victim committed suicide or died from an accident. In addition, the results show that detectives do not choose to write a scenario in narrative form.

### 6.2 Discussion

This study provided insight in differences between the way police detectives create crime scenarios and the way students without any detective experience execute the same task. Unlike the detectives, students do produce a plausible, logical and extensive scenario that has the form of a narrative. Detectives prefer to be short and do not use narrative stories but refrain themselves to a number of short descriptive sentences. The question is which kind of scenarios will be most effective for the purpose of the investigation and avoids tunnel vision. This will be discussed below. In addition, the alternative scenarios of both groups consist of less facts and inferences. This finding will also be further elaborated in the discussion.
Story construction

The detectives created scenarios in which less facts, inferences and assumptions were stated compared to the students’ scenarios. Facts and inferences or assumptions are crucial elements according to Schum and Tillers (1991). They call these elements benchmark events and hypothetical events or gap fillers. The detectives wrote significantly fewer benchmark facts, than the students. Facts are events for which some evidence exists. The detectives also created less gap fillers by stating fewer inferences and assumptions. Since gap fillers are prerequisite for a plausible story, the scenarios of the detectives should be less plausible as well (Schum and Tillers, 1991). This is confirmed by the results of the degree of plausibility of the scenarios. The scenarios of the students, which do consist of both benchmark events and hypothetical events, appear to be more plausible than the scenarios of the detectives. Without the gap fillers, the scenario will only be a list of isolated facts. Pure facts are no indicators of the possible existence of relevant evidence. Importantly, gap fillers will lead to possible leads and create lines of enquiries. Additionally, the construction of a story, which consists of inferences, will also lead to the discovery of possible vacancies. In order to progress in the investigation, leads and lines of enquiry are a necessary requirement. In other words, the way Dutch police detectives create scenarios might not be completely conducive for the investigation. On the other hand, too much assumptions and imagination results in scenarios that do not match too well with the facts. Consequently, it will be difficult to investigate the scenarios. A balance between facts and inferences and assumptions might be a more effective method. However, it is worth mentioning how these findings contradict the findings of the study of Wright (2004). The detectives in the study of Wright (2004) did make inferences and provided more information. These differences might be due to the different methods used. The detectives in Wright’s study were asked to talk about the crime, whereas the detectives in this study were asked to write a crime scenario. Police detectives seem more comfortable with talking than writing.

Since detectives state less inferences and assumptions in their scenarios, the scenarios also miss the form of a narrative. A narrative or context seems necessary in order to understand the evidence and its implications. Evidence without context is problematic since it stays unclear whether the evidence corresponds with the story of what has happened (Wagenaar et al., 1993). A narrative provides meaning to an event or relationships between multiple events. A narrative is also necessary in order to structure all the incoming information (Wagenaar, 2007). The lack of a narrative form again causes the lack of a plausible and logical story. Because of the use of keywords and loose statements it is difficult
to judge whether the scenario is believable and plausible. With the use of a mind map or other ways in which the scenario is not complete or lack the structure of a narrative, it is not possible to see the elements in a complete story.

Instead of creating a narrative, detectives have been trained to create a mind map (Derksen, 2009). Nevertheless, only one scenario in this study has the form of a mind map, while the majority of the rest of the detectives’ scenarios consist of loose statements. Indeed, mind maps are really useful to order an abundance of information. However, in case of scenarios there might be a possibility of information getting lost, with as consequence that the scenario stays incomplete. In addition, there is a risk of different and/or wrong interpretations. By linking two keywords only with an arrow or line, the context remains indistinct. One might forget why a link is made between two words, or detectives might interpret the link differently. Suppose the word ‘murder’ is connected with the word ‘ex’. One knows that the ex might have something to do with the murder, but it is not clear why this assumption is made. A scenario needs context in order to become a plausible possibility. The different aspects should be seen in context to be able to determine whether the scenario is plausible and credible (Pennington and Hastie, 1993). More questions will be evoked as a result of thinking about the complete story and it promotes out of the box-thinking. With thinking in a complete story, more possibilities will arise. The mind mapping technique might only obstruct out of the box thinking. The construction of a narrative will also lead to inconsistencies, since context will show if the story contains contradictions or impossibilities (Schum and Tillers, 1991). This suggests that there might be a chance that constructing scenarios with use of a mind map impede the investigation in practice. Future research should study the effects of working with mind maps.

Reconstruction

A scenario should consist of some core elements in order to generate lines of enquiry and find new information. The core elements of a scenario are: who, what, when, where, why and how (De Poot and Van Koppen, 2010). The elements are also prerequisite for a plausible and good story, since it provides a context and explains why the offenders behaved the way they did (Bennet and Feldman, 1981). The scenarios of the detectives lack a description of the majority of these elements. As mentioned before, the scenarios miss a description of context. These elements or questions should be filled in while writing a scenario, in order that lines of enquiry can be formulated and new information can be found. When guiding elements are missing, the investigation might fail (De Poot and Van Koppen, 2010). In order to fill in these
elements, inferences and assumptions should be made since the core elements won’t be clear from the beginning of the investigation. However, the detectives stated less inferences and assumptions in comparison with the students. Concerning the type of crime, research of Wright (2004) and Wiener et al., (2002) shows that police detectives shared more similarities in their stories about homicide, compared to eligible juror members. This finding is also reflected in the results of this study. Students display more variability in their crime types compared to the detectives, indicating the presence of prototypes in the scenarios of the detectives. Notice, however, that the types of crimes are not consistent with a classical division of crimes, but in line with a self made division. However, this has no influence on the results and their interpretations. Since detectives learn to work with four hypotheses, one would expect that they often had described a ‘no crime’ scenario (Derksen, 2009). The frequency of these scenarios is not directly shown in the results. However, most of the detectives gave an accident or suicide as a third option, written or verbally.

A scenario should be supported by pieces of evidence in order to determine the veracity of the scenario. A distinction can be made between physical and nonphysical evidence (Chisum and Turvey, 2008). A difference in the kind of evidence stated is visible between the students and detectives. The students stated more evidence that was actually visible at the photo (physical evidence), while the detectives stated more evidence that was interpreted and not visible (non-physical evidence). It seems that detectives have a standard list of evidence they use in case of a crime. This will have a positive influence since the use of a list with possible evidence will ensure that no evidence will be overlooked. The fact that the detectives stated less physical evidence might be due to the poor quality of the photo since the traces were not clearly visible. However, the poor quality explains it only partly since the students did describe physical evidence.

Profiling
Part of a crime scenario is a description of the offender that fits in with the story. The most likely character that has committed the crime can be described with use of offender profiling (Van Koppen and Van der Kemp, 2010). Surprisingly, only the students described some kind of offender profile, while the detectives omitted to create a profile. They gave no information about the offender. A reason for this might be the lack of sufficient starting information and the ambiguity of the photo. However, the presence of an offender profile in the scenarios of the students created a more plausible and complete scenario, which subsequently will create more lines of enquiry.
Alternative scenario

Still little is known about the creation of multiple scenarios. The fact that all scenarios should contain a good plausible story is obvious, but to what extent an alternative should be different from the other scenario is still an open question. An effect that is visible with the detectives is the presence of a scenario in which the victim died from an accident or committed suicide. The second, alternative, scenario or a third option frequently describes this possibility. This seems to be a result of the training about the use of hypotheses and scenarios given at the police academy. The method recommends the detectives to start the investigation with four possible hypotheses (Derksen, 2009). Starting the investigation with multiple options is favorable since all possibilities should be taken in consideration. It is, after all, better to exclude unlikely scenarios afterwards, in order to avoid tunnel vision.

Furthermore, the study shows that the alternative scenario of both the students and detectives consists of less facts and inferences compared to the first scenario. This is an interesting result since the facts were similar for both scenarios: the photo of the crime scene. The creation of multiple scenarios is an obligation since it should avoid tunnel vision. In order to create a plausible, dignified alternative scenario it should be supported by the same means of evidence and it should be based on the same number of facts. Otherwise, only one scenario will be the most plausible one and tunnel vision will not be avoided. Besides, a scenario with assumptions only will not contribute to avoiding miscarriages of justice (De Poot and Van Koppen, 2010). Both the students and detectives created a second scenario in which most of the elements of the crime differed from the elements in the first scenario. In case of the detectives these differences were mostly due to the presence of an accident or suicide scenario or the lack of a description in the alternative scenario, with the consequence that most of the elements were not applicable, unlike the elements in the first scenario. The variables that showed differences in both versions might be interesting to study in order to learn more about the degree of variation between multiple scenarios.

Quality of the study

External validity

The detectives are gathered from different districts in the Netherlands. Certainly, it is important for the external validity that research findings apply to the entire group of detectives in the Netherlands (Bijleveld, 2007). Differences can’t be attributed to the district of the detectives because of the random distribution of the data. This increases the external validity.
Something that might obstruct the generalizability of the results is the lack of information for the respondents in this study. Generally, detectives start the investigation with more information. Due to the poor quality of the photo the information was quite ambiguous for the respondents. This may have contributed to the implicit scenarios of the detectives. However, the ambiguous photo was selected with a purpose. Precisely the ambiguity had to make sure that a clear picture of the thought process of the students and detectives was obtained. The facts and evidence on which inferences and assumptions were based should become explicit. This is only accomplished in the scenarios of the students. Still, the differences between the students and detectives are so significant that this limitation impossibly has seriously influenced the study negatively.

In this study, the role of experience in the creation of crime scenarios was examined. The results show significant differences between the students and the detectives, which suggest that experience does have an influence. However, the precise influence of experience is still unclear. It is difficult to determine to what the differences can be ascribed. The differences might be partly due to the differences in educational level since all students are educated on WO level and most of the detectives on MBO level. Indeed, study of De Bruin (2010) shows that respondents with a higher degree of education are capable of writing a better scenario than respondents with a lower degree. Furthermore, there is a difference in sex: the group of detectives exists of mainly men, whereas the students are mainly women. It is unknown to what extent these kind of differences have contributed to the difference in scenarios. A study in which all factors, except for experience, are equal should provide more clarity about the cause of the differences. However, the fact remains that different scenarios are created while the assignment was similar for all respondents. This suggests that the method for scenario creation is unclear.

**Limitations**

One of the measured aspects was whether the scenario described a good story. Elements of a good story can be found in the certainty principles developed by Pennington and Hastie (1993). The elements that are used for the assessment of scenarios are plausibility, completeness and logic connections. Although these principles seem quite obvious, the method is somewhat arbitrary. It is difficult to determine whether a story is complete or plausible. According to Pennington and Hastie (1993), a story is plausible if it corresponds with the knowledge you have about what typically happens in the world. This knowledge arises from the experiences a person acquires. However, everybody has his own experiences
and therefore their own vision about how the world works. What seems plausible for one person might be complete nonsense for the other person. This makes it hard to measure whether a story is plausible or not. The same goes for completeness. There are no clear definitions of the degree of completeness. Another condition for a good story is that it consists of a central action. Here as well, there is no clear definition of a central action. In order to obtain a score as reliable as possible, multiple assessors are used in this study. Further research of stories, in this case stories of the crime, might clarify the definitions of the elements of a good story. A study in which scenarios (i.e. stories of the crime) are further assessed for the course of the investigation, could provide more clarity about the definitions of the principles since scenarios with good stories then can be distinguished from scenarios with poor stories.

Next, another limitation might be the quality of the photo of the crime scene. The photo was in black and white and pretty ambiguous. This may have made it difficult to create a story since the information to start with was limited and ambiguous. Indeed, this was an often heard criticism of the detectives. However, as mentioned before, the ambiguity had a purpose: it had to make the thought process of the respondents explicit. Importantly, the results showed significant differences between the thought processes of the students and the detectives.

A third limitation is found in the way the scenarios were obtained. The assignment for the students was part of a course. They all had to do the assignment to be graded. The detectives, however, wrote the scenarios voluntary. The consequence might be that the students put more effort in it than the detectives did. In addition, detectives are not used to writing like this. Research of Wright (2004) shows that detectives certainly made inferences and described details. Wright’s method, however, was somehow different. The detectives were asked about scenarios verbally. The detectives had to talk about the crimes. In this way, more information was obtained from the detectives. This may indicate that detectives create more extensive scenarios in reality. Future research should focus on different methods.

Not measuring accuracy is a last limitation. The information about the crime on the photo was very brief so measuring accuracy was not possible. However, accuracy is not necessary to study the creation of scenarios.

These limitations notwithstanding, we believe that the study provides a sound contribution to the research into making explicit the elements of a scenario and the decision making process of detectives. It is important for the practice of investigations to clarify all steps in the process of hypothesis and scenario construction.
**Future research**

The findings of the present study give rise to a number of further research protocols that can be carried out on hypothesis and scenario construction and on detective decision-making. A first follow-up study that would be interesting is a study on effectiveness of working with better instructions for detectives. Clearly, instructions are necessary. The scenarios in this study will probably not contribute to achieving their goal: avoiding tunnel vision. The present study gives a first insight into the scenarios created by investigators, but the information produced is still insufficient to base an efficient method on. A follow-up study with research on effective instructions will contribute to a more effective method for scenario construction.

A second interesting follow-up is a study that develops a scientific method for the reconstruction of the crime. It is known that formulating a reconstruction is the first step in scenario construction. However, a scientific method is not available as yet. Researchers should study the rationality underlying the behaviour derived from the crime scene in order to better comprehend the choices made by criminals during the offending process. Meanwhile, there is no accepted way of conducting the reconstruction of the crime. It was beyond the scope of this study to develop a method for the reconstruction phase.

A third study should focus on the decisions of detectives in order to clarify the decision-making process of detectives at the start of an investigation. The facts on which decisions were based and the whole process did not become entirely clear in this study. This might be due to the method used. A study in which detectives are interviewed might provide more information. It will be interesting to make decisions of detectives explicit and find out which heuristics are used by the detectives and how the story is created. Subsequently, the influence of these heuristics on the investigation process can be studied.

**6.3 Recommendations**

Some recommendations can be made based on this study. An important result is the finding that the instruction ‘create a scenario’ is not really clear. The same instruction produces different kind of scenarios. More important, scenario construction will not contribute to a more effective investigation in this way. Detectives should follow trainings in which the goal and importance of a good scenario should be explained. Furthermore, the training should focus on creating multiple scenarios. This study shows that creating alternative scenarios is found difficult, since it contains less information and is supported with less evidence than the first scenario. An alternative should be as good and plausible as the first scenario.
Finally, the detectives should be made aware that scenario construction is not a goal but rather a means to an end. The experts in the domain of scenarios that are interviewed for this study expressed their concern on this. The detectives must know at all times why they should create multiple scenarios and how they should do it to improve the investigation. Creating scenarios just because it is an obligation might in fact obstruct the investigation.
References


Kemp, J.J. van der (2010, januari 21). *The basics of offender profiling, the need to understand crime scenarios*. London, 9th International Investigative Psychology Conference of the IA-IP.


**Internet source**
Appendix 1: Interview

Goedendag,

Ik ben Madeleine de Gruijter, een Master studente Criminologie op de VU in A’dam. Ik ben bezig met mijn masterscriptie met als onderwerp het vormen van misdaadscenario’s en de rol die politie-ervaring hierbij speelt. Door middel van, onder andere, interviews wil ik meer te weten komen over scenariovorming, tegenspraak en het gebruik van scenario’s in de praktijk. Het interview zal ongeveer een uur duren en in dit uur wil ik 4 onderwerpen behandelen. Eerst zullen we het hebben over scenariovorming in de opleiding, vervolgens zullen we het hebben over het belang van objectiviteit, daarna komt het gebruik van scenario’s in de praktijk aan de orde en we zullen afsluiten met uw eigen mening over scenariovorming.

Het interview zal tevens worden opgenomen op tape. Ik gebruik deze geluidsopname voornamelijk om het interview volledig te kunnen uitwerken. Uiteindelijk zal het worden vernietigd.

Als u graag anoniem wilt blijven is dit uiteraard mogelijk. Zijn er tot zover nog onduidelijkheden, heeft u nog vragen?

Voordat we echt met de vragen beginnen zou ik graag nog wat algemene gegevens van u willen hebben.

Algemene vragen

- Wie bent u?
- Wat is uw functie?
- Wat is uw vooropleiding?

Dan zou ik nu graag met het interview willen beginnen.

Wat leren rechercheurs tijdens de opleiding/training op het gebied van scenariovorming?

- Waar moet de inhoud van een scenario uit bestaan?
- Hoe zou u een misdaadscenario definiëren?
- Waar is dit op gebaseerd? (literatuur?)
- Kunt u het verschil tussen een hypothese en een scenario beschrijven? (slechts 4 standaard hypothesen? Soort misdrijf is al een scenario?)
- Wordt de rechercheurs geleerd meerdere scenario’s te bedenken?
- Hoeveel variatie moet er tussen twee scenario’s zitten om te kunnen spreken van verschillende/alternatieve scenario’s? (verschillende hypothesen (wat)/zelfde hypothesen, hoeveel verschil in scenario’s (hoe))
Hoe wordt met de scenario’s verder gewerkt nadat ze zijn ontwikkeld? (falsifiëren/verifiëren).

Wat wordt de rechercheurs geleerd op het gebied van tegenspraak?

Zijn er verschillende trainingen?

Is het volgen van een training verplicht voor rechercheurs?

Samenvatten!

Wacht de rechercheurs het belang van objectiviteit laten zien?

Wat wordt de rechercheurs geleerd op het gebied van interpretatie van bewijs? (objectieve interpretatie)

Wat wordt de rechercheurs geleerd op het gebied van objectiviteit?

Wordt er aandacht besteed aan het gevaar van cognitieve processen?

Hoe wordt omgegaan met de invloed van dergelijke processen?

Wordt er rekening gehouden met ervaring die rechercheurs al hebben, aangezien dit van invloed kan zijn op het scenario dat wordt bedacht? (ook in artikel → short-cuts, info selectief onderzocht) Zo ja, hoe wordt hier rekening mee gehouden?

Vindt u dat politie-ervaring juist een positief of negatief effect heeft op scenariovorming?

Samenvatten!

Wacht het schrijven van scenario’s vaak gebruikt in de praktijk?

Hoe wordt scenariovorming precies toegepast in de praktijk?

Bij hoeveel procent van de zaken?

Bij welk soort zaken wordt scenariovorming ingezet?

Vanaf welk moment in het onderzoek wordt het opstellen van scenario’s ingezet?

Hoeveel scenario’s worden er gemiddeld gedurende een onderzoek opgesteld?

Samenvatten!

Wat vindt u zelf van scenariovorming?

In hoeverre denkt u dat het van invloed is op het rechercheproces?

Ziet u mogelijke nadelen van het gebruik van scenario’s/tegenspraak?

Samenvatten!
We naderen nu het eind van het interview, we hebben dit, dit en dit besproken (korte samenvatting). Heeft u hier nog iets aan toe te voegen?

Als u het eindresultaat graag wilt zien, kan ik het verslag naar u opsturen.

Hoe vindt u dat het is gegaan?

Mocht u later nog iets te binnen schieten wat u belangrijk acht voor het onderzoek dan kunt u altijd mailen of bellen.

Ik wil u hartelijk bedanken voor uw medewerking.
Onderzoek

Misdaadscenario's

Madeleine de Gruijter
&
Jasper van der Kemp
Introductie

Voor u ligt een boekje met een aantal vragen naar aanleiding van een foto van een plaats delict. Deze vindt u op een losbladig vel. Op de foto is een plaats delict zichtbaar met de omstandigheden die zijn aangetroffen door het rechercheteam. Er wordt u gevraagd een scenario te schrijven waarin u weergeeft wat u denkt dat er heeft plaatsgevonden. Vervolgens wordt u nogmaals gevraagd een scenario te beschrijven, een alternatief scenario dat u ook mogelijk acht. In beide scenario’s beschrijft u het motief, de modus operandi en ‘wie’ (wat voor persoon, een ‘schets’ van het profiel). Daarbij licht u toe op basis waarvan u deze interpretatie geeft.

Allereerst is er een aantal vragen om uw gegevens en ervaring te noteren, vervolgens vindt u de ruimte om uw scenario te beschrijven.

Voordat u begint graag aandacht voor het volgende:

- Probeer de scenario’s in te vullen, zoals u normaal gesproken naar deze zaak zou kijken,
- probeer de vragen zo volledig mogelijk in te vullen,
- voor de duidelijkheid, het gaat om uw visie, niet om correcte antwoorden.

Alvast hartelijk dank voor uw medewerking!
Algemene informatie
1. Wat is uw geslacht?
   □ Man □ Vrouw

2. Wat is uw leeftijd?
   ………………………………………………………………………………………………………

3. Wat is uw vooropleiding?
   ………………………………………………………………………………………………………

4. Wat is uw huidige functie/specialisatie?
   ………………………………………………………………………………………………………

5. Op welke afdeling bent u momenteel werkzaam?
   ………………………………………………………………………………………………………

6. In welke regio/korps bent u werkzaam?
   ………………………………………………………………………………………………………

7. Heeft u een opleiding gevolgd waarin het vormen van hypothesen en scenario’s of Tegenspraak wordt behandeld?
   □ Ja
   □ Nee (ga door naar vraag 10)

8. Welke opleiding heeft u gevolgd? (meerdere antwoorden mogelijk)
   □ Hypothese en Scenario’s
   □ Tegenspraak
   □ Cursus Algemene Recherche (onderwijs dat tot 2005 is gegeven)
   □ Basis Opleiding Recherche, Politieacademie
   □ Anders, namelijk………………………………………………………………………………

9. Wanneer heeft u deze opleiding(en) afgewerkt?
   □ Minder dan 2 jaar geleden
   □ Tussen de 2 en 5 jaar geleden
   □ Tussen de 5 en 10 jaar geleden
   □ Meer dan 10 jaar
   □ Nog mee bezig

Uw ervaring
10. Hoeveel jaren politieervaring heeft u?
-----------------------------------------------------------------------------------------------------------------
11. Hoeveel jaren recherche-ervaring heeft u?
-----------------------------------------------------------------------------------------------------------------
12. Aan hoeveel grote zaken (bij benadering) heeft u meegewerkt?
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13. Wat voor typen zaken heeft u eerder gedraaid?
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14. Bent u tegenspreker of tegenspreker geweest? Zo ja, in wat voor zaken?
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Hieronder volgt de ruimte voor het eerste scenario.
U kunt nu de plaats delict foto van
de laatste pagina erbij nemen.
Scenario 1

Schrijf een mogelijk scenario voor het misdrijf op basis van de plaats delict foto. (max één a4-tje)

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Welk delict is er volgens u gepleegd?
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Wat is het motief van de dader?
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Geef een beschrijving van de modus operandi van de dader
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Geef aan wat voor sporen er aanwezig zijn
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Geef aan wat voor bewijs er aanwezig is
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Hieronder volgt het deel voor scenario 2
Scenario 2
Schrijf een mogelijk scenario voor het misdrijf op basis van de plaats delict foto.

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Welk delict is er volgens u gepleegd?

Wat is het motief van de dader?

Geef een beschrijving van de modus operandi van de dader

Geef aan wat voor sporen er aanwezig zijn

Geef aan wat voor bewijs er aanwezig is
Tot slot:

Heeft u nog eventuele toevoegingen op deze vragenlijst?

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Appendix 3: Codebook

**Codebook**

**General**

1. Respondent number
2. Version number scenario

3. Sex:  
   1. Male  
   2. Female  
   99. Missing

4. Age:  
   open

5. Study:

6. Function

7. Department

8. Region

9. Education Hypotheze and Scenarios

10-13. Which education:  
   1. Hypotheze and Scenarios  
   2. Tegensprak  
   3. Course General Criminal Investigation (until 2005)  
   4. Basic education Criminal Investigation, Police academy  
   5. Different, ....

14-16. Education Finished  
   1. Less than two years ago  
   2. Between the two and five years ago  
   3. Between the five and ten years ago  
   4. More than ten years ago  
   5. Not finished yet

17. Police experience  
   Open (how long)

18. Experience as a detective  
   Open (how long)

19. Number of big cases  
   Open

20. Type of cases  
   Open

21. Tegenspreker?  
   1. Yes
2. No

22. In what kind of cases? Open

**Narrative**

23. How many facts are written down? Open

24. How many inferences are made? Open

25. How many assumptions are made?

26. Does the scenario have a narrative form?
   1. Yes
   2. No
   3. Partly

**Is it a good story? Cq. Does the story has a logical structure (CBCA)**

Consistency (No internal contradictions)

27. → Is the story consistent?
   1. Yes
   2. No

28. How many contradictions are visible in the scenario? Open

29. → Is the story plausible? (corresponds to the knowledge about what typically happens in the world) 1. Yes
   2. Pretty much
   3. Just a little
   4. Not really
   5. No

30. → Is it a complete story? (the expected structure has all of its parts)
   1. Yes
2. Pretty much
3. just a little
4. Not really
5. No

31. Logic connection between story elements
   1. Yes
   2. Pretty much
   3. just a little
   4. Not really
   5. No

32. Is the story written in a chronological time sequence?
   1. Yes
   2. No
   3. Partly

33. Does the scenario have a clear/explicit beginning?
   1. Yes
   2. No

34. Does the scenario have a clear/explicit ending?
   1. Yes
   2. No

Evidence
35. Is there any evidence mentioned?
   1. Yes
   2. No

36. What kind of evidence is written down? Categorize

37. How many pieces of evidence are actually seen from the photo?
38. How many pieces of evidence are interpreted?

**Modus Operandi**

39. Type of crime: Categorize

40. Preparation
   0. Not mentioned
   1. Yes
   2. No
   3. Unclear
   999. Missing

41. Type of location? categorize

42. Type of weapon: Categorize

43. Point of entry Categorize

44. Method of entry Categorize

45. Suspect’s actions Categorize
   - Before
   - During crime
   - After

46. Method of departure Categorize

47. Property taken Categorize

48. Time of the crime:
   0. Not mentioned
   1. Morning
   2. Midday
3. Evening
4. Night
5. Unclear
999. Missing

49. The motive behind the crime? Categorize

50. What kind of relationship did the offender and the victim have? Categorize

Details
(The more details and clues there are described, the more it can be described as an in-depth analysis. And experienced detectives will give a more in-depth analysis)

51. Sex of the victim
   0. Not mentioned
   1. Male
   2. Female
   999. Missing

52. Characteristics of the victim? Categorize

53. How many offenders? Open

54. Sex of offender 1:
   0. Not mentioned
   1. Male
   2. Female
   3. Unclear
   999. Missing

55. Sex of offender 2:
   0. Not mentioned
   1. Male
   2. Female
3. Unclear

88. Not applicable

999. Missing

56. Characteristics of offender 1? Categorize

58. What kind of details are described

59. How many details are described? (Quantity of detail → CBCA)

Open

60. State of mind of the offender (CBCA)

61. Does the story contain descriptions of interaction between victim and offender? (CBCA)

1. Yes

2. No

62. What kind of interaction

1. Aggressive

2. Threatening

3. Emotional

4. Familiar

5. Different

6. No interaction

88. Not applicable

99. Missing

63. Interaction term

1. Not

2. Short

3. Long

4. Not unusually short or long

5. Not clear

88. Not applicable

99. Missing
64. Does the interaction have influence on the course of the story?

0. Not mentioned
1. Yes
2. No
3. Unclear
88. Not applicable
Appendix 4: Example of a scenario

The victim is an elderly single man. The room in which the body lies is the living room in the victim’s house. The offender is an acquaintance of the victim, like a son, and it was easy to enter the residence of the victim. The offender has an urgent need for drugs or a gambling addiction. The victim refuses to give money, the offender tries to grope about in the victims’ pockets, after which the victim gives the offender a bloody nose. The offender hit the victim, whereupon the victim falls backwards and hurt his head. The offender gropes about in the victims’ pockets and gets money from his wallet. Splashes of blood from the nose of the offender land on the victim. The victim tries to stand up (you can tell by the clenched fists) but is too weak. The victim dies of his head wound.

Yellow: fact
Pink: inference
Green: Assumption

Explanation
The assumptions have no facts on which they are based. The facts are visible at the crime scene photo and the inferences are deduced from the facts. Some of the facts are given in the first scenario and are not visible in this scenario. These are: closed curtains and the wallet on the body of the victim. The sentence ‘gets money from his wallet’ is deduced from the fact that the wallet lies on the body of the victim. The sentence ‘the room in which the body lies is the living room in the victim’s house’ is an example of a statement for which we made a rule. The sentence is deduced from the photo, so we decided to score it as an inference.