Police Research Series
Paper 135

Reading between the Lines: An evaluation of the Scientific Content Analysis technique (SCAN)

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Editor: Carole F. Willis
Home Office
Policing and Reducing Crime Unit
Research, Development and Statistics Directorate
Clive House, Petty France
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Foreword

Detectives often have to assess the extent to which an individual's account of events is truthful or deceptive. Detecting deception is not a simple task and one technique that claims to aid investigators is the Scientific Content Analysis technique or SCAN. SCAN identifies issues contained within a written statement that may need to be examined in more depth in subsequent interviewing. It highlights instances where a suspect, witness or victim, may have tried to deceive the investigator.

This report describes the results of a small study designed to assess the effectiveness of the SCAN technique in detecting instances of potential deception within written statements. This report indicates that officers trained in the SCAN technique can discriminate between truthfulness and deceit in written statements with some accuracy. However, experienced detectives without training in the technique were found to be just as able to detect deception using a combination of investigator experience and general intuition. The report discusses a number of practical challenges over the introduction of SCAN within a British Policing context. All those concerned with the detection of deception and investigative interviewing will be interested in this report.

Carole F. Willis
Head of Policing and Reducing Crime Unit
Research, Development and Statistics Directorate
Home Office
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The author

Nicky Smith is a member of the Home Office Policing and Reducing Crime Unit, Research Development and Statistics Directorate.

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Executive summary

The detection of deception is an important part of the investigator's role. A number of techniques have been developed to assist officers in this process and these draw upon a range of criteria thought to be associated with deceitful behaviour. The reliability and validity of such criteria are, however, open to debate.

One technique used in a number of countries is the Scientific Content Analysis (SCAN) technique (Sapir, 1987). This is a technique designed to highlight potentially deceptive language contained within a written statement. The results can be used to formulate an investigative interview strategy; SCAN does not claim to identify whether the suspect is lying. For SCAN to be effective the written statement must be a 'pure version' statement, that is made without assistance from any other individual.

This report describes the results of a small exploratory study designed to assess the effectiveness of the SCAN technique in detecting instances of potential deception within written statements. Five groups of assessors were asked to judge whether 27 pure version statements were truthful, deceptive or inconclusive. Three groups of police officers with varying levels of familiarity and experience in using SCAN judged the statements using the technique. A fourth group, untrained in SCAN, assessed the same statements by using their experience as detectives and a fifth group of newly recruited officers judged the statements using their general intuition.

Findings

Accuracy in discriminating between statement types

Officers who used the SCAN technique, and those untrained officers in Group 4 who drew upon their experience as detectives to assess the statements, were all able to correctly identify the majority of the four truthful and twenty deceitful statements. These four groups correctly identified at least 80% of the truthful statements and 65% of the deceptive statements. The officers in Group 5, who had not received SCAN training and used their general intuition to assess the statements, were only able to correctly assess 45% of deceptive statements. However, all five groups performed significantly better than would have been expected by chance.

Influence of training in and familiarity with SCAN

Familiarity and experience with SCAN appeared to have little influence on the groups' performance. Statistically significant differences in the accurate identification of statements classified as 'truthful' and 'deceitful' were only identified between the three SCAN groups and the recently recruited police officers who were not trained in the technique.

The fact that experienced investigators were found to perform as well as SCAN trained assessors could reflect a number of factors. One possible explanation for this is that SCAN may be providing assessors with a means of substantiating their intuition based upon their experiences as investigators. It may also provide experienced investigators with a structure to assist the identification of deceptive indicators contained within a statement.

Application of the SCAN criteria

If the SCAN technique can be used as a reliable means of differentiating between truthful and deceptive statements, then we would expect SCAN assessors to be able to use the technique in a consistent way (i.e. different assessors would use the same SCAN criteria on the same individual statement). However, an analysis of the use of SCAN criteria used by different assessors revealed low levels of consistency. It is unclear whether inconsistency in the application of the technique reflects variations in training or differences in the way the assessors are applying their training in practice.

The practical implications of using SCAN in a UK setting

The research identified a number of practical implications that may affect the use of the SCAN technique within the UK.

- *Legal implications*
  The present system of statement taking within the UK (i.e. with the assistance of a police officer) does not result in a 'pure version' statement and the SCAN analysis of such statements is more likely to produce unreliable results (Sapir, 1987). Although there are some circumstances where SCAN could be applied without changing the current legislative context, widespread introduction would require substantial legal changes.

- *Procedural and resource implications*
  A written statement is the only material that is required for SCAN and this can be analysed independently from an on-going investigation. It is, however, essential that the statement is uncontaminated. To avoid contamination the statement would have to be obtained before any discussion of the event in question with the individual. This could serve to delay the investigative process.

- *Training implications*
  This research has demonstrated that the consistency with which different assessors apply the SCAN criteria to the same statement is low. This raises issues about the training in the SCAN technique and its application in practice. In

particular, officers need to understand fully the conditions under which the technique can be applied and to understand its limitations. The findings of this study suggest that trained assessors apply the criteria differently and this might lead to potentially different interpretations of statements.

- *Research implications*
  Further research could usefully focus on the reliability of the individual SCAN criteria and could help to improve investigators' analytical skills in assessing written statements, whether or not they use the SCAN technique. Additional research to separate out the influence of training in the SCAN technique from detective experience would be helpful. Clarifying the precise impact of SCAN training might involve detectives assessing the statements using their experience, and then comparing performance after training in the SCAN technique (any improvements in accuracy might then be attributed to the SCAN training). Research comparing the performance of SCAN trained police officers against SCAN trained civilians could also help to identify the respective influences of training in SCAN and detective experience.

Recommendations

The study shows no clear evidence that the SCAN technique significantly improves an experienced investigator's ability to ascertain truth or deceit in written statements, although it does serve to highlight areas within an account that require clarification. The technique can therefore be especially useful during the early stages of an investigation. This report has highlighted the need for caution before its widespread introduction is considered in a UK context. The conditions under which SCAN should be applied need to be fully understood. Consequently, the following points are recommended for consideration:

- SCAN may have value in the systematic analysis of alleged victim and/or witness statements in the UK, although the legal implications of its use need to be further explored. Association of Chief Police Officers (ACPO) should develop interim advice to forces on how and when SCAN might be applied.

- If the application and use of the SCAN technique do grow in the UK, consideration needs to be given to training issues. SCAN training would need to be delivered to a consistent, national standard. Thought should be given to the development of a small number of SCAN trained assessors who could develop their expertise for the service as a whole.

- In order to clarify the extent to which detectives draw upon their investigative experience in detecting deception rather than applying the SCAN criteria, further research should be undertaken to compare the performance of SCAN trained police officers against SCAN trained civilians in a similar exercise.

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1. Introduction

Background

SCAN (Scientific Content Analysis) is an analytical technique that claims to be able to detect instances of potential deception within the language behaviour of an individual; it does not claim to identify whether the suspect is lying. The results of a SCAN analysis highlight areas within a statement that require clarification and so can be used to form part of an interviewing strategy to elicit more information from the individual (Sapir, 1987). If valid, such a method can be usefully applied within an investigative context. The results provide investigators with a means of analysing the statements of witnesses, victims and/or suspects to help ascertain the presence of deception (Adams, 1996).

SCAN is currently used in several states within America, Australia, Canada and Israel for investigative purposes. Proposals to adopt this technique as a precursor to an investigative interview have been suggested by some UK police forces. Several officers from the National Crime Faculty (NCF) have attended SCAN training courses, and private tutors have begun exploring commercial opportunities for training in this area, with the police service seen as a potential customer. Little empirical research has, however, been carried out to investigate the effectiveness of SCAN. In light of interest from a range of law enforcement agencies, this study examines its effectiveness in detecting instances of possible deception within an individual's language behaviour.

Objectives

The research discussed in this report forms part of the Policing and Reducing Crime Unit's (PRCU) serious crime research programme. It has two key objectives:

- to assess the effectiveness of the SCAN technique in detecting potential deception within statements; and,
- to consider its usefulness as a technique to be employed by UK police forces.

Methodology

A sample of 27 statements[1] was assessed by five groups of assessors. Each group was asked to classify each of the statements as truthful, deceitful or inconclusive. The assessors were 'blind' to the correct classification of the statements. Three groups assessed the statements using the SCAN technique (Groups 1 to 3). Two groups (Groups 4 and 5), untrained in SCAN, evaluated the statements using their intuition and experience. Group 4 consisted of two detective sergeants who were experienced as detectives. Three recently recruited officers, inexperienced in detecting deception within an investigative context, formed Group 5.

[1] The study began with a sample of thirty statements, but due to the poor quality of some of the statements three were not analysed.

Teams of assessors were used for two reasons. First, it is common practice within those countries that currently employ SCAN to have a group of individuals assess documents. It is felt that this allows a more thorough analysis. Secondly, not all the assessors who took part in this study have had the opportunity to develop their skills in using SCAN. Assessing group rather than individual performance increased participants' confidence in undertaking this exercise. Table 1 provides a summary of the assessors' details.

Table 1 Summary of assessors

Group	Description of group	Force	No. of assessors
1	Occasional SCAN users	National Crime Faculty	3
2	Infrequent SCAN users	Kent Constabulary	2
3	Experienced users of SCAN	Royal Canadian Mounted Police	3
4	Experienced detectives (not SCAN trained)	National Crime Faculty	2
5	New police recruits (not SCAN trained)	Hampshire Constabulary	3

Selection of assessors

Two of the five groups of assessors were drawn from a sample of British police officers that had been trained in using SCAN. Originally, it was hoped that each group would comprise three individuals. However, one officer had to withdraw from the study, leaving one group (Group 2) with only two assessors. The third group consisted of three SCAN assessors from the Royal Canadian Mounted Police which employed the technique on a regular basis. The SCAN groups varied in terms of their training, familiarity and application of the technique. Groups 1 and 2 were both trained in SCAN, but only those within Group 1 employed it in a practical setting, albeit on an irregular basis. Group 3 was the most experienced in using SCAN. It was expected that those officers with more experience of SCAN might achieve better results than the other two SCAN groups.

To compare the performance of SCAN with more general intuition, two groups of officers untrained in the SCAN technique were invited to take part in the study. Group 4 was formed of experienced detectives[2] and Group 5 consisted of newly recruited officers undergoing police training. This enabled more detailed comparison with those applying SCAN to the evaluation of the statements.

[2] *Group 4 submitted only individual assessments rather than a group report.*

Structure of the report

The report divides into five further sections. Section two identifies the principal problems involved in the detection of deception within the language behaviour of an individual. Section three summarises the SCAN technique, while section four examines its effectiveness in discriminating between truthful and deceptive statements. Finally, section five discusses the key findings and their implications for the use of SCAN within the UK and offers some recommendations for action.

2. Problems in identifying deception in communication

Introduction

Examining language behaviour, either in the spoken or written form, is not a new area of research and has attracted attention from many areas of science. Recent years, however, have seen the growth of forensic linguistics, a discipline concerned with the examination of the units of language, the results of which can be applied to criminal investigations and to wider judicial questions (e.g. Coulthard, 1994; McMenamin, 1993; Rabon, 1994). Such applications have essentially been concerned with the reliability and validity of confessions, witness accounts, suicide notes, police interviews and so forth. These examples are largely concerned with establishing the extent to which any account is an accurate reflection of events.

SCAN is only one of a number of techniques that have been developed to help assess the truthfulness or otherwise of linguistic behaviour. Applying formal techniques to establish truthfulness rests upon the assumption that there are observable differences between the language behaviour of truthful and deceptive individuals. A number of research studies have attempted to identify indicators of either truth or deception that demonstrate this distinction. Such indicators tend to focus on the use of verbal[3], non-verbal, physiological[4] and content criteria[5]. The appropriateness of employing such indicators within an investigative context is, however, open to debate. Certain problems need to be addressed before any technique, including SCAN, can be employed confidently by the police to reliably discriminate between true and deceitful accounts.

[3] *This includes physical aspects of communication such as changes in the pitch of voice, gaze aversion and hand movements (e.g. DePaulo et al, 1985; Vrij, 1998).*

[4] *For example, the Polygraph technique.*

[5] *Criteria-based content analysis examines the linguistic content of child witness statements (e.g. Steller and Kohnken, 1989).*

Identifying deception

While a range of deception detection techniques have been taken up in various countries and applied in investigative settings, the application of such techniques needs to be carefully considered. First, the effectiveness of the techniques has not always been assured through academic research. Even when this has been the case, research into techniques to identify deception encounters a number of methodological problems. Secondly, there are a range of practical considerations which need to be addressed before such techniques can be applied confidently in a live investigation. The following section examines these issues in detail.

Methodological issues in research

- Empirical testing of techniques in a practical setting

One of the problems in evaluating the effectiveness of indicators of truth and/or deception lies in the experimental nature of the many research studies that have assessed their performance. In particular, many research studies carried out in tightly

controlled laboratory situations do not reflect real-life settings; they lack ecological validity. If a suspect is interviewed by police officers concerning his/her potential involvement in a crime, it is likely that his/her language behaviour will be different from a 'simulated' interview, where the consequences of deception or truthfulness will not be serious. Results from laboratory studies may provide some empirical support for some techniques, but the confidence shown in the findings can be open to question.

- Case selection

A second methodological issue relates to the selection of statements to be studied. To improve the ecological validity of research in this area, data are often derived from genuine police interviews. Cases are then classified as 'true' or 'deceptive' based on whether the offender confessed, the extent of corroborating and unequivocal evidence, if the witness withdrew the allegation, dismissal of the case in court and so forth (e.g. Esplin et al, 1988). The *absolute* truth of these statements can, however, rarely be ascertained. People do confess to crimes they have not committed (Driscoll, 1994); a judge could dismiss a case due to the witnesses' inability to convince a jury (Ruby and Brigham, 1997); and the Crown Prosecution Service may be unwilling to go through a trial process on public interest grounds. Not being able to identify the absolute truth of a statement is an inherent weakness of research when dealing with data derived from police records.

- Contradictory findings

As might be expected, in spite of the large amount of research into the detection of deception within accounts, the findings often appear contradictory. Extensive research, for example, on the identification of verbal and non-verbal indicators of deception has resulted in inconsistent findings. Such indicators only point tentatively to deception within communication. Conclusive measures of verbal and non-verbal deception do not appear to exist. A similar situation also appears to exist for indicators that have been devised to assess the content of statements.

This could be attributed, in part, to the belief that indicators of deception are likely to be consistent across individuals. This is not the case. As Vrij (1998) argues, some individuals may display deception through movements, some through voice cues and so on. Individual characteristics of deception are rarely taken into account within deception studies, and individual differences are seldom reported.

Deceptive indicators have also been found to decrease when a person is deliberately lying (Akehurst, 1997). The suspect will be conscious of the fact that they are being deceptive. If the interviewer makes it clear during the interview that they believe

the suspect is lying, it is likely that the suspect will attempt to control the deceptive indicators they are emitting (Stiff and Miller, 1986). This effect is enhanced if the suspect has a prior knowledge of what deceptive indicators are being used by the interviewer. Furthermore, if there is a lack of guilt about lying, the interviewee is less likely to exhibit the common indicators which tend to be associated with the anxiety of being deceitful (Ekman, 1985).

Finally, studies have revealed different numbers of indicators of deception or truthfulness that have to be present within a statement for it to be considered truthful or deceptive.

- Influences of style

Psycholinguistic research indicates the differences that exist between people in the consistency of their language behaviour. This raises the question of whether the linguistic indicators of deception apply uniformly to all people. The language that we learn differs widely and variations in linguistic behaviour are common (e.g. Ellis and Beattie, 1980). Social class, geographical location, culture, educational achievement and experience, occupation, personality, sex and ethnic background have all been shown to lend themselves to differing patterns of communication. Any method of detecting truthfulness or otherwise, that is based upon a person's written language behaviour, is likely to be influenced by these differences in style. The SCAN technique does not appear to control for these many influences on linguistic behaviour.

Practical application of techniques

Research has identified a number of factors that are likely to affect the practical application of techniques for detecting the truthfulness or otherwise of a statement. These need to be acknowledged and addressed when their introduction is being considered within a live investigative setting. Some of these factors are summarised briefly below.

- Prior assumptions

Police officers can find it difficult not to make some sort of implicit assumption about which behaviours are likely to indicate whether a statement is truthful or deceitful. For instance, many officers believe that facial expressions can be employed to discriminate between true and fabricated accounts, although research has demonstrated that this is in fact a poor indicator of deception (Kohnken, 1990).

- Truthfulness versus accuracy

There have been many studies (e.g. Zuckerman et al, 1981; DePaulo et al, 1982; Kohnken, 1989) which have examined the issue of detecting deception within witness statements. However, it is important to distinguish between those that attempt to establish the truthfulness of a statement, and those that examine the accuracy of a statement. A statement can appear truthful but contain a number of inaccuracies. These inaccuracies could be the result of unintended errors revolving around a distorted perception/memory of events, or they could be those associated with a deceptive account (Canter and Alison, 1999). It is important that interviewers are clear whether techniques are identifying measures of deception and truth, or are demonstrating differences between accurate and inaccurate statements.

- Reliability of techniques

For police officers to apply these techniques effectively, it is important that they apply them correctly, recognising the relevant indicators that suggest truth or deception. For any technique to be considered reliable there should be a high level of agreement as to which indicators are present between different officers evaluating the same statement. Moston (1992) emphasises the importance of stressing the unreliability of such techniques to officers, claiming that even though research studies *"..always contain a small warning about the unreliability of detecting deception, this is all lost amidst the general enthusiasm for showing how to detect deception"* (p31).

- Training and experience in detection of deception

The detection of deception forms an integral part of police work. Consequently, one would expect that experienced police officers would be able to discriminate between truthful and deceptive statements with a greater degree of accuracy than other inexperienced individuals. There is, however, little empirical evidence to support this (e.g. Kohnken, 1987). Furthermore, research has demonstrated that training police officers to recognise certain indicators of deception does not generally lead to an improvement in the detection of deception (e.g. Moston, 1992). This has obvious implications for the relevance and use of such techniques within an investigative context.

- Legal implications

Many of the techniques that have been developed to assist police in the detection of deception have originated abroad and are rarely admissible as evidence within a British court of law. It is imperative that the legal implications of applying such techniques within the UK are assessed prior to their application. Moston (1992)

points out many techniques that might assist an investigator in determining the truth or otherwise of a statement, would contravene the rules of the Police and Criminal Evidence Act, 1984 (P.A.C.E.). As an example he provides a detailed critique of the behavioural analysis interview[6] (Inbau and Reid, 1967), illustrating how many of the interview questions could not be applied according to the rules of P.A.C.E.

[6] *It employs both verbal and non-verbal indicators to detect deception.*

Summary

This section has demonstrated some of the problems around appropriate independent testing of deception indicators before applying them in an investigative context. It is essential that such techniques undergo thorough empirical testing in order to establish high standards of reliability and accuracy. Such testing requires a range of complex methodological issues to be addressed. Furthermore, the practical application of such techniques needs to be carefully considered both within live investigations and the specific legal context. This is not to say that such techniques have no role to play within the investigative process, but their limitations need to be recognised so that appropriate weight can be placed on their results.

3. What is the SCAN technique?

The SCAN technique

SCAN is a technique developed by Sapir, a former Israeli Polygraph examiner. It is based upon his studies of linguistic behaviour used by individuals within deceptive forms of communication. Sapir (1987) claims that the technique can be used to obtain information, and detect deception. The SCAN technique appears to draw upon the Undeutsch hypothesis: that statements based upon observations of actual, self-experienced events will be different from statements that are the products of fantasy and invention (Undeutsch, 1989).

According to Sapir (1995) *"when people are given the choice to give their own explanation in their own words, they would choose to be truthful"* and that *" it is very difficult to lie with commitment....a person can kill, rob a bank, set a fire, steal money, but a person cannot actually lie".* Every form of communication represents a series of choices, such as the words to employ, punctuation and grammatical structure, in order to convey an intended meaning. Some of these choices are constrained by the requirements of the rules of the language system in which the communication is cast, whilst others are dependent upon the author's linguistic knowledge, the context of the communication and other personal influences. It is these determinants of choice, which are open to each author, that will affect both the form and content of language behaviour. In short, they form the 'linguistic code' for an author.

By examining the choice of words (content) and the way in which they are structured within a statement, the technique claims to detect instances of potential deception and the withholding of other relevant information; *it does not claim to identify whether an author is lying.* The technique does not examine the level of language, which could be affected by factors such as IQ and linguistic skills, but looks instead into the structure and changes in the language behaviour of the same person. The SCAN analysis will highlight issues within the statement that need to be examined in more depth, as well as areas where the individual may have tried to deceive the police. The results of such analysis could then be applied as an aid within the investigation or subsequent interview.

Obtaining the statement for SCAN

How the statement is obtained is critical for the application of the SCAN technique. It is vital that the statement is as uncontaminated as possible (a 'pure version' statement). It must be in the writer's[7] own words. This can be achieved in one of two ways. The individual can be asked to make a written statement that details the event in question, with no assistance whatsoever from the police officer.

[7] *SCAN can be applied to any statement, including victim, witness and suspect statements.*

Alternatively, individuals can fill out the 'VIEW questionnaire'. This consists of a series of predetermined questions (see Sapir, 1995 for a detailed description of the VIEW questionnaire)[8].

[8] When this questionnaire is used to obtain information it is employed for the purposes of identifying the truth, rather than instances of deception.

In the UK, statements frequently are the result of a semi-structured discussion between a subject and a police officer. The statement becomes a combined effort, as the officer is likely to assist the individual through the statement. It is probable that the officer does not write down exactly what was said, but conveys the 'gist' of what occurred. The officer will 'word' the statement on the behalf of the individual, so that the language contained within the statement is not wholly that of the suspect. Furthermore, while engaging in this process, officers may find it difficult not to make some sort of implicit assumption concerning the truthfulness of the account. This may convey itself to the individual, affecting the responses given.

A statement, together with the specific instructions given to the writer, is the only material that is necessary for the SCAN technique. No further details concerning the event or any suspicions are required. Consequently, there does not need to be any interaction between the individual and the SCAN assessor and the assessment can therefore be done remotely. Lesce (1990) describes it as a 'cold technique', free of any biases and other influences which could be open to individual interpretation.

SCAN criteria

The language behaviour of an individual can be examined using a number of criteria (see Sapir, 1987 for a full explanation). The criteria used within the context of this study are briefly summarised below. Where appropriate, more detailed examples have been provided to show how the SCAN technique is applied in an investigative context.

1. Change in language

Sapir (1987) argues that if an individual is consistent in their use of vocabulary within a statement this is indicative of a truthful account, and " a change of language reflects a change in reality" (page 73). Changes in vocabulary during a statement reveal that something has altered in the lives of the author. Sapir recommends that the most frequent changes in language concern references to family members, people, transportation, communication and weapons.

For example, a man involved in a road traffic accident was suspected of driving under the influence of alcohol. The suspect would not take a breath test and alleged that the cause of the accident was in fact another car. He later confessed that this second car did not actually exist. This point was picked up by the SCAN technique.

The analysis emphasised the change of language in reference to this fictional second car. It was initially referred to as 'that vehicle', then 'the car', 'the vehicle' and 'the dark coloured car' within the statement.

2. Placing of emotions within the statement

Sapir (1987) states that if references to emotion are inappropriately placed within a statement, this indicates deception. This is particularly relevant if they are mentioned at the same time as a weapon is discussed or at the peak of the story.

For instance, a man was suspected of insurance fraud relating to injuries sustained at work. He was allegedly placing a box on a high shelf when he fell, injuring his neck and back. Just before the description of his fall, he wrote *"..as I was trying to climb up the boxes with that heavy box I got very nervous. I was afraid I might fall because the boxes were beginning to move some..".* The SCAN analysis highlighted these references to emotion and their location within the statement. The man later confessed to fraud.

3. Improper use of pronouns

The SCAN technique examines a number of different parts of speech. Among the most frequently used by analysts are the use of pronouns within the text. Pronouns (e.g. 'I', 'he', 'she', 'we', 'his' and 'their') are words that add cohesiveness and connectivity to a text, providing back-reference as well as signalling responsibility and possession. Improper use includes omitting personal pronouns, especially 'I' (e.g. got dressed, walked out of the door). Sapir (1987) suggests that omitting the 'I' from the action weakens the assertion considerably; it demonstrates the writer's reluctance to commit to the action described. Furthermore, the technique suggests that as pronouns can also signal responsibility, the use of the word 'we' where we would expect to see 'I' shows that the writer may be trying to absolve him/herself of personal responsibility for an action.

Pronouns also indicate possession (e.g. my, ours, his etc). When these pronouns are inappropriately changed or left out, the SCAN analysis would suggest that the writer may be denying ownership. The assumption being that changes in the use of pronouns and their omission within a statement highlight areas that an interviewer should probe into further.

For example, in the following account the writer claimed that he parked his car before going shopping. On his return he claimed that he went to where he had parked his car to find it missing. He reported the car as having been stolen.

"Parked in ..parking lot section G. Went shopping for half an hour. Came out it was gone".

This example shows a total absence of pronouns; the writer does not want to say "I parked in…I went to the shops". According to the principles of SCAN, the omission of pronouns demonstrates a lack of commitment to his version of events; the writer appears to be devoid of any personal involvement. Furthermore, he does not associate himself with the car as one might expect him to do: "came out..it was gone" as opposed to "my car was gone". Based upon the SCAN technique, the writer was found to be withholding information concerning the disappearance of his car. The writer was interviewed and confessed that his car had not in fact been stolen. Instead, he had made arrangements for someone to drive his car away, take it apart and sell the parts.

4. Lack of conviction/memory concerning the incident

Sapir (1987) claims that a deceptive writer is likely to demonstrate a lack of conviction regarding his/her version of events. They may avoid providing information that might implicate themselves by being deliberately vague (e.g. 'I believe, sort of') and/or pretending not to remember specific details surrounding the incident (e.g. 'I don't recall').

For example, a man was suspected of setting fire to his own house. He was asked to make a statement concerning his actions on the morning leading up to the fire. He began the statement *"I really cannot remember much about what I did this morning before I left….I had my usual coffee for breakfast and do not remember if I had anything else…I may have used the toaster and had toast. I think I did. I usually leave around this time (7.30a.m.) but I am not sure when I left this morning. I drove to work listening to my radio. There was a talk show on I think."*

5. No denial of allegations

According to Sapir (1987), truthful subjects will often directly deny allegations, whereas deceptive people will not. For example, a man was suspected of theft of money from his place of employment. He begins his statement with a full and frank denial of the allegation made against him – *"Plain and simple – I did not do it. I don't know who did it."* Based on the SCAN technique he was determined to be truthful, and another employee later confessed to the theft.

6. Out of sequence information

Sapir (1987) claims that a deceptive writer is likely to include information that appears, to the reader, to deviate from the logical progression of events they are being asked to describe. The information provided might not seem relevant; the rationale behind the actions is offered in addition to a description of them. The use of terms such as 'because', 'since', 'so that' as well as the use of what Sapir refers to as 'ambivalent sentences' (e.g. excuse me, should I continue?) are all common indicators of 'out of sequence' information.

7. Social introduction

According to Sapir (1987), the lack of a social introduction reflects an ambiguity of personal references within the statement. The writer is ambiguous about who is acting and acted upon; the writer distances him/herself from the person(s) described by referring to them in a vague, generalised way. This ambiguity can be characterised in several ways. For instance, by failing to introduce the people mentioned (e.g. 'we waited for XX to come home" – who is 'we'?); referring to some people by their proper name and others by pronoun; using a pronoun when a proper name should be used; or suddenly omitting personal names when the writer uses them consistently at other points within the statement. Sapir argues that the lack of a social introduction may indicate deception and distance between the people identified in the statement.

8. Spontaneous corrections

Sapir (1987) claims that if aspects of the statement are corrected (crossings out, words changed, etc.) this may indicate deception; a truthful statement should contain no corrections.

9. Structure of the statement

According to Sapir (1987), a truthful statement should be 'balanced'. He states that 20% of the statement should serve to introduce the event in question (the 'trivial' issue); 50% should reflect the occurrence of the event itself (the 'main' issue), with 30% of the statement discussing the conclusion to the event ('trivial' issue). The more 'unbalanced', the more likely the statement is to be deceptive.

10. Tense change

Sapir (1987) assumes that a truthful statement should be written in the first person singular, past tense. Therefore, a change to the passive tense is indicative of deception.

11. Time

Sapir (1987) defines time in terms of the relationship between *subjective* and *objective* time. *Subjective* time is characterised by the amount of text written by the subject to cover a particular period of time within the statement. This should correspond to *objective* time if the statement is true, but will differ in deceitful statements. For instance, if a subject devotes ten lines to a 20-minute period within the statement and then only three lines to cover a 3-hour period, the *subjective* time is not corresponding to the *objective* time and would therefore be seen as deceptive.

12. Unimportant information becomes important

Some statements appear to contain information that is seemingly not relevant or important to the reader. However, Sapir (1987) argues that the inclusion of 'unimportant' information in the statement is likely to be 'important' for the writer; the subject considers that information relevant but may be trying to minimise its importance to the reader. It is therefore important that the SCAN analyst identifies these instances so that they can be explored further within an investigative interview.

13. Unnecessary connections/missing information

The SCAN technique also examines what are termed 'signals of linguistic sensitivity' within a statement. When an individual is providing an account of events, it is rare for them to include absolutely every detail of what transpired. According to Sapir (1987), signals of linguistic sensitivity indicate information that the writer did not want the reader to know. They can be identified through vague time references where the writer indicates the progression of time in a very general, unspecific manner. Identification of missing time can be highlighted through the use of words such as 'finally' and 'left'; the writer refers to a beginning of an action, but never affirms its completion (e.g. started to, began, tried to, left). It is argued that such references replace information that the subject intentionally took out of the statement and should be seen as a signal of deception. For instance, a man was suspected of assaulting his wife. He claimed that he did not but was restraining her from hitting and kicking him – *"She began hitting and kicking me….finally she hit me with the wine bottle"*. What occurred between the time when she began hitting him until 'finally' she hit him with the bottle? The suspect later confessed that he did assault his wife on this occasion.

Evidence to support SCAN

Sapir (1987) argues that as SCAN is based upon structure and content, rather than subjective factors such as non-verbal forms of communication, it is therefore likely to be more scientific and objective. There are, however, few empirical studies within the published literature which have validated the SCAN technique.[9] Validation appears to have largely come from students of SCAN who have used the technique 'successfully' in investigations. However, this does not necessarily mean that the SCAN technique is effective; we do not know how many suspects were seen as giving a truthful account when in fact they were being deceptive. The next section examines the effectiveness of SCAN based on a study of experienced and inexperienced officers.

[9] *Driscoll (1994) carried out a limited validity assessment of statements using SCAN, highlighting the need for caution when using the technique in investigations.*

4. Evaluating the effectiveness of the SCAN technique

The principal aim of this study was to investigate whether the SCAN technique was able to detect potential instances of deception within statements. This was explored at four levels:

- to assess the effectiveness of the SCAN technique in discriminating between truthful, deceptive and inconclusive statements;
- to ascertain whether officers trained in the SCAN technique performed with greater accuracy than officers with no SCAN training, who could rely only on intuition and general experience;
- to assess whether levels of familiarity with the SCAN technique influenced the ability to distinguish between the statement types; and,
- to investigate whether some of the SCAN criteria are more sensitive to the detection of deception than others.

This section summarises the main findings.

Effectiveness of the SCAN technique in discriminating between statement types

Statement types

The statements assessed in the study were suspect[10] statements from actual cases investigated by a United States police department that actively uses the SCAN technique. This was to ensure that the statements were 'uncontaminated'. The current procedure for taking statements in the UK would not have resulted in a 'pure version' statement; this is a critical condition for the application of SCAN. Furthermore, since it is claimed that the SCAN technique is cross-cultural it should, in theory, be applicable to any statement that is produced in the same language as the analyst (Lesce, 1990).

[10] The two sexual assault cases were suspected of being false allegations.

Table 2 Summary of cases

Crime type	Number of statements	Crime type	Number of statements
Abduction	1	False alibi	1
Arson	2	Indecent exposure	1
Assault	4	Insurance fraud	4
Child abuse	1	Robbery	2
Driving offence	3	Sexual assault	2
Drugs offence	1	Theft	5

The statements were concerned with a variety of different crimes, ranging from driving offences through to sexual assault. Table 2 illustrates the crime types involved.

The statements were originally classified by the US police as 'true', 'deceitful' or 'inconclusive' based upon whether they possessed at least two of the criteria presented in Figure 1. Inconclusive statements were categorised as those that possessed only one, if any, of these criteria.

Figure 1 Criteria used by originating force to categorise statements as truthful or deceptive

Truthful criteria	Deceptive criteria
• Confession by another person	• Confession by the suspect
• Arrest of another person	• Arrest of the suspect
• Conviction of another person	• The police dropping the case (i.e. false allegation)
• Unequivocal evidence to support the truth of the statement	• Unequivocal evidence to support the deceit within the statement

SCAN is used to detect areas of *potential* deception within a statement. It does *not* provide the investigator with an overall assessment of truth or deceit. In the context of this research, however, we instructed assessors to make an overall classification. The term 'truth' relates to whether or not potential areas of deception were identified. A statement was to be classified as *truthful* if the assessors identified *no* potential areas of deceit. If there were any indicators of potential deceit contained within the statement, then the assessors were instructed to classify it as a *deceptive* statement. *Inconclusive* statements were those where the assessors were unsure if evidence of deceit was contained within the statement. Providing a general assessment of truth or deceit in this manner enabled comparisons to be drawn between the accuracy of the SCAN technique compared with individuals with no SCAN training in discriminating between truthful and deceptive accounts.

Table 3 provides a breakdown of the total number of different statement types used in this study. Those countries that employ SCAN often apply it only to cases where the suspicion of deception already exists. The SCAN technique appears to be principally used to detect deception rather than truth. This is reflected in the low volume of 'truthful' statements used within this study.[11]

[11] *When more truthful statements were requested, the reply was that the research had been provided with all those that they possessed.*

Table 3 Number of statement types, as classified by a US police department	
Statement type	Number of statements
True	4
Deceitful	20
Inconclusive	3
Total	27

Accuracy of judgements

The accuracy of the judgements was determined by calculating the number of statements that the assessors correctly classified against the initial US police categorisation. The groups could score each statement into only one of three categories: true, deceitful or inconclusive. The number of 'hits' for each group was calculated and the scores across them are presented as frequency and percentage scores in Table 4.

Table 4 Frequency and percentage scores of accurate assessments						
Group	True statements correctly identified		Deceptive statements correctly identified		Inconclusive statements correctly identified	
	No.	%	No.	%	No.	%
1 Occasional SCAN users	3	80	20	100	0	0
2 Infrequent SCAN users	4	100	15	75	1	33
3 Experienced SCAN users	3	80	19	95	0	0
4 Experienced detectives Officer 1 Officer 2	 3 4	 80 100	 13 14	 65 70	 0 0	 0 0
5 New police recruits	4	100	9	45	0	0

The results demonstrate that all five groups were successful in their assessment of truthful statement types. The minimum 'hit' rate for the truthful statements was 80%. The three SCAN trained groups and the experienced detectives (Groups 1 to 4) were also relatively successful in correctly assessing the deceptive statements with a minimum 'hit' rate of 65%, with the new police recruits (Group 5) correctly assessing only 45%.

We would expect, however, some 'hits' to occur by chance alone. Since the assessors were not aware of how many statements fell under each of the three classifications, we would expect, by chance, that each group should correctly classify approximately 33% of the statement types accurately. Table 4 shows that the 'hits' for both the truthful and the deceptive statement types exceeded this figure for both the three SCAN groups and the two SCAN untrained groups (Groups 4 and 5). These results were statistically significant.

Table 5 Summary of assessments

Statement	Actual classification	Assessor's Predicted Classification					
		Group 1	Group 2	Group 3	Group 4 Officer 1	Group 4 Officer 2	Group 5
1	Deceptive	Deceptive	Truthful	Deceptive	Deceptive	Deceptive	Truthful
2	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive
3	Deceptive	Deceptive	Deceptive	Deceptive	Truthful	Truthful	Truthful
4	Deceptive	Deceptive	Truthful	Truthful	Deceptive	Deceptive	Truthful
5	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive
6	Truthful	Truthful	Truthful	Truthful	Truthful	Truthful	Truthful
7	Deceptive	Deceptive	Deceptive	Deceptive	Truthful	Truthful	Deceptive
8	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Truthful	Truthful
9	Deceptive	Deceptive	Deceptive	Deceptive	Truthful	Deceptive	Truthful
10	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive
11	Truthful	Inconclusive	Truthful	Inconclusive	Deceptive	Truthful	Truthful
12	Inconclusive	Deceptive	Inconclusive	Deceptive	Deceptive	Deceptive	Deceptive
13	Inconclusive	Deceptive	Deceptive	Deceptive	Truthful	Truthful	Deceptive
14	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Truthful	Truthful
15	Truthful	Truthful	Truthful	Truthful	Truthful	Truthful	Truthful
16	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive
17	Inconclusive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive
18	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive
19	Deceptive	Deceptive	Truthful	Deceptive	Truthful	Truthful	Truthful
20	Deceptive	Deceptive	Deceptive	Deceptive	Truthful	Deceptive	Truthful
21	Deceptive	Deceptive	Deceptive	Deceptive	Truthful	Deceptive	Deceptive
22	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive
23	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive	Deceptive
24	Deceptive	Deceptive	Truthful	Deceptive	Deceptive	Truthful	Truthful
25	Deceptive	Deceptive	Deceptive	Deceptive	Truthful	Deceptive	Truthful
26	Truthful	Truthful	Truthful	Truthful	Truthful	Truthful	Truthful
27	Deceptive	Deceptive	Truthful	Deceptive	Deceptive	Deceptive	Truthful

* Group 1 occasional SCAN users; Group 2 infrequent SCAN users; Group 3 experienced SCAN users; Group 4 experienced detectives (untrained in SCAN); Group 5 newly recruited police officers (untrained in SCAN).

A detailed examination of the assessments obtained from each group across the 27 statements is shown in Table 5.

Truthful statements

Examining the incorrectly classified statements showed that the same 'true' statement was misjudged by both the occasional users of SCAN and the experienced SCAN users (Groups 1 and 3 respectively) and one of the experienced detectives (Officer 1 of Group 4). This statement (number 11) was perceived by these assessors as too short to be considered true; a 'truthful' individual would provide a fuller account, justifying their innocence. The brevity of the statement, however, was actually seen by the other experienced detective (Officer 2 of Group 4) and the new police recruits (Group 5) as being a reason for classifying it correctly as true. They saw the account as being succinct, with the author probably feeling that he did not have to prove something that he did not do.

Inconclusive statements

Only one of the three inconclusive statements was correctly classified as such by one of the five groups (Group 2). It is important to note, however, that these statements are in fact either simply truthful or deceitful; the US Police department that provided them were not able to classify them using their criteria (see Figure 1). The assessors may therefore have correctly identified an inconclusive statement as either truthful or deceptive, but in the context of this study they would have been incorrect. Because of this the inconclusive statements were removed from subsequent analysis.

With the exception of Group 2 which correctly classified Statement 12 as inconclusive, the remaining groups were reluctant to use the 'inconclusive' category within their assessments. Two of the three 'inconclusive' statements (statements 12 and 17) were categorised as 'deceptive' by all five groups. A mother who was suspected of being involved with the disappearance of her missing child wrote statement 12. She claimed that she was shopping with her son and they got separated. After a search of the area and an examination of the security cameras, the police began to suspect that the mother never arrived at the shops with her son. She was asked to write out a statement as to what happened that day from the time she woke up until contacting the shopping centre's security staff.

All assessors felt that this statement was evasive, never specifically addressing the loss of her son. The lack of detail and the imbalance of the statement were highlighted. In addition, the three SCAN trained groups (Groups 1 to 3) emphasised an improper use of pronouns, a change in language, a lack of

commitment to the account and the use of unnecessary connections. The missing child was never found and there was insufficient evidence to charge the mother; the case has never been solved.

All five groups classified statement 17 as deceptive. This involved the investigation of a reported fire bombing of a home that occurred at 11.30pm. The victim claimed that she observed a former friend running away from the house after the firebomb was thrown into her home. The friend was arrested. After her arrest she produced an alibi, claiming to have been with someone else that evening (statement 17 is the statement obtained from the alibi witness).

The three SCAN trained groups (Groups 1 to 3) classified the statement as deceptive based predominantly upon the relationship between subjective and objective time within the account and a lack of commitment. Both of the untrained SCAN groups (Groups 4 and 5) judged the statement on the lack of detail, with the experienced detectives (Group 4) questioning some of the times contained within the statement. The case was never solved.

A woman who claimed to be the victim of a robbery gave statement 13. She reported being robbed of her possessions while getting out of her car. She filed a claim with her insurance company, asking to be paid for the items that she claimed to have been stolen which were insured on her home owner's policy.

All three SCAN groups concluded that the writer was the victim of a robbery, but that she was claiming for more than was actually stolen, thereby making it a deceptive account. This was mainly based upon an improper use of pronouns, a change in language and an imbalance to the structure of the statement. Group 5 also assessed the statement as deceptive, due to the overall lack of detail.

The experienced detectives (Group 4) assessed the statement as truthful, concluding that the robbery probably occurred but was exaggerated. They argued that the details of how she was approached and her reaction after the event suggested the account was truthful. Each of the two officers, however, did question the lack of detail concerning the removal of some of the items by the robber. The insurance company reimbursed her for some but not all of the items and the woman accepted this offer.

For the purposes of this research these statements were given an 'actual' classification of inconclusive as they did not fulfil the criteria outlined in Figure 1. It does appear, however, from the analysis that classifying these three statements as deceptive was in all likelihood the correct assessment.

Deceptive statements

With the exception of the occasional users of SCAN (Group 1) who correctly classified all 20 deceptive statements, the assessors misjudged between 1 and 11 deceitful statements. All of these misjudged deceptive statements were categorised as truthful. The criteria used to classify these statements need to be investigated more thoroughly. This will be explored later in the section.

Confidence and accuracy

After each group had made their assessment, they were asked to rate their confidence as either high or low[12]. This was to establish if a relationship existed between assessors' confidence and the accuracy of judgements for each group. Table 6 illustrates the relationship between confidence and accuracy for the truthful and deceitful statements. The results show that the levels of confidence across the groups did generally *appear* to be higher when the groups were correct, than if they were incorrect in their classification of the statement type. These results were not, however, found to be statistically significant.

[12] *The infrequent users of SCAN (Group 2) did not complete this part of the study.*

Table 6 Confidence and accuracy of assessors' classification

Group		Correctly classified	Incorrectly classified
1 Occasional SCAN users	High confidence	18	0
	Low confidence	5	1
3 Experienced SCAN users	High confidence	18	2
	Low confidence	4	0
4 Experienced detectives:			
Officer 1	High confidence	9	2
	Low confidence	7	6
Officer 2	High confidence	13	4
	Low confidence	5	2
5 New recruits	High confidence	6	7
	Low confidence	7	4

Influence of training and experience on SCAN assessments

A central aim of this study was to establish whether officers with SCAN training were able to perform more effectively than officers with no SCAN training, who

were relying on their experience as detectives (Group 4) or solely on their intuition (Group 5). It was also expected that differences in the accuracy of the judgements would exist between the three groups employing SCAN.

To explore whether training and experience with SCAN had an impact on accuracy, all assessments were coded as 'incorrect' or 'correct'. This enabled any differences between the groups in terms of the accuracy of classification to be explored. It was expected that differences would exist between the three groups applying the SCAN technique and the two SCAN untrained groups (4 and 5). The results are presented in Table 7.

Table 7 Experience and familiarity with using SCAN by assessors' classification

Group	Level of experience and familiarity in using SCAN	Correctly classified		Incorrectly classified	
		No.	%	No.	%
Group 1	Occasional (medium)	23	85.2	4	14.8
Group 2	Infrequent (low)	20	74.1	7	25.9
Group 3	Experienced (high)	22	81.5	5	18.5
	Average of SCAN trained:	21.7	80.2	5.3	19.8
Group 4 Officer 1 Officer 2	None (experienced detective) None (experienced detective)	16 18	59.2 66.7	11 9	40.7 33.3
Group 5	None (new recruits)	13	48.2	14	51.8
	Average of untrained in SCAN:	15.6	58.0	11.3	41.9

The findings revealed only limited variation between the three groups trained in SCAN. The infrequent SCAN users (Group 2) were marginally less successful than the other two SCAN trained groups (1 and 3) who were more familiar with the technique[13].

The results do, however, *imply* that those who had some training in SCAN judged the statement types more accurately than those officers who solely relied upon their detective experience and intuition (Groups 4 and 5 respectively). On average, the three SCAN groups correctly classified more statements (80%) and misclassified fewer statements (19.8%) than those untrained SCAN officers within Groups 4 and 5 (58.0% and 41.9% respectively).

Further analysis of the data demonstrated, however, that statistically significant differences in performance only existed between the three SCAN trained groups

[13] *Further analysis of the data using a series of Chi-square and Fisher's Exact tests confirmed this.*

and the newly recruited police officers (Group 5). No significant differences were found to exist between those who used SCAN to judge the statements and those who were untrained in SCAN, but possessed a great deal of detective experience (Group 4). This was a finding that deserved further consideration.

How the untrained officers assessed the statements

Each group was asked to identify what factors had influenced their decision to allocate the statement to a particular category. Assessments of the two groups with no SCAN training (Groups 4 and 5) were examined to explore what indicators they used to distinguish between truthful and deceitful statements. Lack of detail, contradictions within the statement and the absence of an appropriate alibi were frequently cited indicators of deception. It also emerged, however, that these two groups were also applying some of the SCAN criteria to their assessments without being aware of it. Analysis of the reasoning behind these judgements demonstrated that they actually applied seven SCAN criteria to their assessment of the statements. These were identified as:

- denial;
- out of sequence information;
- change in language;
- missing time/links;
- spontaneous corrections;
- structure of the statement; and,
- lack of commitment/memory.

For instance, a man suspected of setting fire to his house wrote a statement addressing this accusation. All five groups suggested that the man was being deceptive in his account of events, emphasising his lack of commitment to the sequence of events, and pointing out his poor memory.

The results suggest that SCAN may be providing assessors with a means of organising their assessments based upon their experience as an investigator. The lack of significant differences between the performance of the three groups trained in SCAN and the assessments made by the experienced detectives with no SCAN training (Group 4) supports this inference.

SCAN appears to provide a structure to assist the identification of deceptive indicators contained within a statement. Training in SCAN, and experience of applying the technique, may only have limited bearing on the accuracy of investigator's judgement. There appears to be insufficient evidence on the basis of this study to convincingly state that those trained in the SCAN technique will judge the statement types more accurately than those officers who rely on their intuition and experience.

We should, however, acknowledge the limited nature of this study. It is difficult to assess whether the accuracy of the SCAN assessors may not have been a result of SCAN training, but rather of investigative experience or experience with a large volume of questionable statements. It would be useful to conduct further research that tested the ability of officers to discriminate between deceitful and truthful statements before and after training in the SCAN technique. This would enable the effects of SCAN training to be measured more clearly.

What we can conclude, however, is that training and familiarity with the application of SCAN appears to facilitate the ability to discriminate between statement types. However, as so few *significant* differences exist, it is difficult to state what level of training and experience one should possess to employ the technique reliably and effectively.

Criteria used within SCAN

Frequency of use in the assessments of the statements

The final objective was to assess whether some of the SCAN criteria are more frequently applied in the detection of deception than others. Between them the three SCAN groups drew upon 13 SCAN criteria to judge the statements. These are listed alphabetically in Figure 2 below (see Section 3 for definitions of each of the criteria).

Each of the 27 statements was scored using a two-point rating scale for each of the 13 criteria (0=absent; 1=present). If a group used a particular criterion more than once in their assessment of a single statement it would only score once. Therefore, the highest possible score that each group could obtain for one statement would be 13 (all SCAN criteria were employed in the assessment), and the lowest would be 0 (no SCAN criteria employed at all). As the criteria were used to indicate potential deception (rather than truthfulness), the higher the score, the more potential deception contained within the statement according to the assessor.

Figure 2 SCAN criteria used for the assessment of the statements	
• Change in language	• Spontaneous corrections
• Emotions	• Structure
• Improper use of pronouns	• Tense change
• Lack of commitment	• Time
• No denial	• Use of unimportant information
• Out of sequence information	• Unnecessary connections
• Social introduction	

The criteria used for the assessments were first compared across the statement types (truthful, inconclusive and deceitful) to establish if some were more frequently applied than others. This would help identify the extent to which the criteria used successfully discriminated between the different statement types.

Truthful indicators

SCAN relies on identifying indicators of deception. The groups predicted the truthfulness of a statement largely on the *absence* of SCAN criteria i.e. the lack of any indicators of deception. Hence, low SCAN scores identified truthful statements. A 'truthful' statement, for example, would be one that demonstrated a proper use of pronouns, provided a consistent account, denial of involvement and consistent use of tenses. Case study 1 provides an example of a correctly classified true statement by all three groups, and then presents the analysis they each carried out using the SCAN technique.

Case Study 1

This statement concerns a reported sexual assault. The victim claims that she willingly engaged in sexual intercourse with two men during the course of an evening. However, she then claimed that a third man came into her bedroom later in the evening and forced her to have sex against her wishes. The suspect was called in for interview and he later confessed and pleaded guilty in court.

After analysing the statement, via SCAN, all three groups felt that the victim was being truthful in her account of the incident.

Group 1 classified the statement as truthful on the basis of 2 SCAN criteria.

- The use of pronouns that served to denote a distance between herself and the offender - "he kissed me" as opposed to "we kissed" and "he proceeded to have sex with me" as opposed to "we had sex", when referring to the consensual sex between the other two men.
- The victim denies that it was consensual sex – "He kissed me I told him no…I asked him to stop several times and he didn't... I told him to leave me alone..".

Group 2 used 2 criteria:

- Consistent use of language.
- Proper use of pronouns as illustrated by Group 1.

Group 3 employed 3 different criteria:

- Consistent use of language.
- Proper use of pronouns as illustrated by Group 1.
- A commitment to this version of the offence

Inconclusive indicators

Each of the three SCAN groups classified only one statement as inconclusive (see Table 5). Both the occasional and the experienced users of SCAN (Groups 1 and 3) judged statement 11 as inconclusive, stating that not enough information was

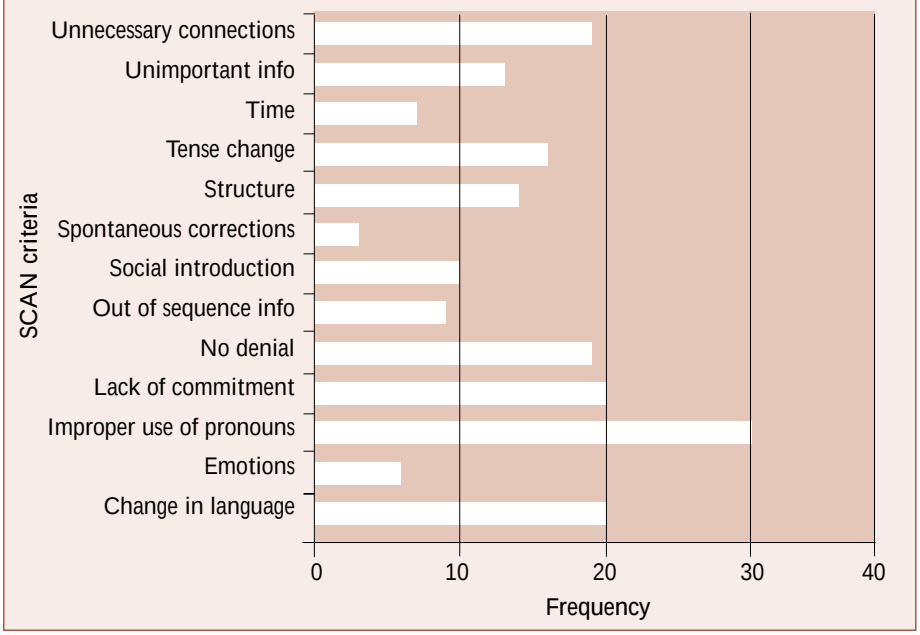
provided within the statement to make a conclusive judgement. The occasional SCAN officers (Group 1) did, however, comment on a missing pronoun ('I') which they felt to be a strong indicator of deception, but coupled with no change in tense and a denial of the allegation, could not arrive at a firm outcome. The infrequent SCAN users (Group 2) correctly classified statement 12 as inconclusive, stating that there may be something significant that occurred between 1pm and 1.30pm. However, they were unsure as to the significance of this time for the incident; more information was required.

Deceptive indicators

Overall, 63% of statements were classified as deceptive by the three SCAN groups (see Table 5). Figure 3 presents a graphical breakdown of the aggregate use of the 13 SCAN criteria in predicting statements as deceptive[14].

[14] These figures refer to the predicted assessment of the statements, not their actual classification.

Figure 3 Frequency of usage of SCAN criteria by the three groups in judging deceptive statements



*Based on Groups 1 -3

Overall, the most frequently cited indicators of deception used by the groups were: the improper use of pronouns (30); lack of commitment (20); change in language (20); the use of unnecessary connections (19); no denial of the incident (19). The least frequently cited were: spontaneous corrections (3); the placing of emotion within the statement (6); time (7); and, out of sequence information (9). There may be a number of reasons for the frequency of use of different SCAN criteria.

- *Reflection of general language behaviour*
  It may be that the more frequently occurring indicators reflect language behaviour in general, or a particular bias within the sample statements.

- *Some criteria are more effective indicators of deception*
  While it is unlikely that there is any one SCAN criterion that is a particularly effective measure of deception, the data reveal the possibility that some criteria may be stronger indicators of deception than others. Further analysis of the assessments by the three SCAN groups[15] demonstrated that of the 13 SCAN criteria, 'tense change', 'no denial' and the 'use of unnecessary connections' were significantly more present in deceptive statements than truthful or inconclusive ones.

- *Some criteria are more recognisable than others*
  It could be possible that rather than being more effective, the more frequently occurring indicators are in fact those which are more readily recognisable in a statement. For instance, the identification of an improper use of pronouns, recognising a change in language and establishing that the author has not actually denied the offence would not be difficult to detect with a minimum of training. However, some of the less frequently cited criteria, such as identifying out of sequence information within the text and the placing of emotion, may present more of a challenge to the SCAN analyst.

Consistency of the application of SCAN criteria in assessing deceptive statements

We can get a clearer understanding of the application of the different criteria by examining the three groups' usage of criteria in classifying deceptive statements. Table 8 illustrates how many of the 13 criteria were drawn upon by each of the three groups across the statements that they identified as deceptive.

[15] Using a series of Kruskal-Wallis one way analysis of variance tests.

Table 8 Frequency of the SCAN criteria by Groups 1-3 across their statements assessed as 'deceptive'

	Usage of criteria in statements judged 'deceptive'					
	Group 1 (n=23) Occasional SCAN users		Group 2 (n=22) Infrequent SCAN users		Group 3 (n=17) Experienced SCAN users	
	No.	%	No.	%	No.	%
Change in language	9	39.1	4	18.2	7	41.2
Emotions	4	17.4	1	4.5	1	5.9
Improper use of pronouns	13	56.5	8	36.4	9	52.9
Lack of commitment	8	34.8	7	31.8	5	29.4
No denial	9	39.1	2	9.1	8	47.1
Out of sequence information	4	17.4	2	9.1	3	17.6
Social introduction	5	21.7	1	4.5	4	23.5
Spontaneous corrections	3	13.0	0	0.0	0	0.0
Structure	2	8.7	3	13.6	9	52.9
Tense change	11	47.8	0	0.0	5	29.4
Time	4	17.4	1	4.5	2	11.8
Use of unimportant info.	7	30.4	4	18.2	2	11.8
Unnecessary connections	13	56.5	3	13.6	3	17.6
Total	92		36		58	
Average number of criteria used per statement:	4.0		1.6		3.4	

The distribution of the individual criteria across the statements (see Table 8) revealed that they were not being applied consistently by all three groups. While all three groups frequently used 'improper use of pronouns' and a 'change in language' to assess deception, there were marked differences in the application of other SCAN criteria. For example, 'tense change' was employed as an indicator of potential deception in nearly half (47.8%) of the statements assessed as deceptive by the occasional users of SCAN (Group 1). This was in contrast to the infrequent SCAN users (Group 2) who did not apply this criterion to *any* of the statements they judged as deceptive. In addition, experienced users of the SCAN technique (Group 3) frequently cited the 'structure of the statement' (in 52.9% of deceitful

statements) in their evaluation compared with the other two SCAN trained groups (Groups 1 and 2) who applied it in only 8.7% and 13.6% of deceptive statements respectively.

It was also evident that there were marked differences in the average usage of criteria by the groups. Given their increased experience and familiarity with applying SCAN, we may have expected the experienced SCAN users (Group 3) to have used more criteria in their assessments of deception than the other two SCAN trained groups. In fact, this was not the case. Occasional SCAN users (Group 1), on average, classified a statement as deceptive on the basis of four criteria; experienced SCAN users (Group 3) used approximately three criteria per statement, while infrequent SCAN users (Group 2) drew upon only two criteria.

Part of the discrepancy between the groups in the application of different SCAN criteria might simply reflect the use of criteria to *incorrectly* assess statements as deceitful. We would expect that if the technique were reliable, each of the three groups would, to a greater extent, apply the same criteria to each statement. This was explored using only those statements accurately identified as deceptive by all three groups (15 in all)[16]. It was then possible to determine the extent to which the assessors employed the same criteria towards their assessment of some statements.

[16] *This analysis was not carried out on the truthful and inconclusive statements as there were so few criteria applied to their assessment.*

Table 9 illustrates the level of consistency found between the groups. It shows the number of statements where all three groups agreed as to the presence of a SCAN criterion in a particular statement; where only two of the three groups agreed; and, finally where there was no agreement between the three groups. A percentage of agreement between the assessors can then be determined to give an estimate of consistency.[17]

[17] *Due to the design of this study, it was not possible to conduct a correct test of inter-rater reliability.*

Relatively low levels of agreement were found between the groups as to the criteria employed in accurate assessments. On only 9 occasions did all three SCAN groups use the same specific criteria to accurately classify a deceptive statement. Instead, many of the same statements were being judged as deceptive using different criteria. This can be seen in the high percentage scores where there was no agreement between the three groups. This is particularly relevant for those statements that applied to the criteria of 'out of sequence information', 'spontaneous corrections' and 'time'; no two groups applied them to any one of the statements within the sample.

Table 9 Consistency of application of SCAN criteria on deceptive statements

SCAN criteria	Number of occasions where criteria used on same statement				Percentage of occasions where criteria used on same statement		
	All groups agree	Two groups agree	No groups agree	Total	All groups agree	Two groups agree	No groups agree
Change in language	2	2	4	8	25	25	50
Emotions	0	1	4	5	0	20	80
Improper use of pronouns	4	3	3	10	40	30	30
Lack of commitment	0	4	6	10	0	40	60
No denial	1	2	6	9	11	22	66
Out of sequence information	0	0	7	7	0	0	100
Social introduction	0	1	3	4	0	25	75
Spontaneous corrections	0	0	2	2	0	0	100
Structure of statement	1	1	5	7	14	14	72
Tense change	0	2	8	10	0	20	80
Time	0	0	2	2	0	0	100
Use of unimportant information	1	1	4	6	17	17	66
Unnecessary cinnections	0	2	9	11	0	18	82
Total	9	19	63	91			

The highest degree of consistency was in the 'improper use of pronouns', but this only achieved a 40% level of agreement on ten statements. In their assessment of four statements (statements 2, 9, 22 and 27), all three groups applied an 'improper use of pronouns' to judge them as deceptive. Two of the groups agreed with their use for evaluating a further three statements (statements 10, 16 and 20), with 'improper use of pronouns' being used by only one group to assess statements 11, 12 and 7.

The low levels of consistency identified in this analysis indicate that a diversity of SCAN criteria were being used to assess instances of potential deception contained within a statement. These poor levels of consistency could be attributed to a number of factors. First, they could partly be a function of SCAN and its application. Assessors may not be applying the full range of SCAN criteria towards the identification of potential instances of deception. Once an instance of deception

has been identified using a criterion, the remaining criteria may not have been used to reinforce the assessment. Secondly, although this study used genuine statements, it was carried out under test conditions. The assessors may not have analysed the statements in as much depth as they would in an investigative context. Finally, poor training, lack of familiarity and experience with using the SCAN technique and a variability of understanding the criteria definitions between the groups may also have had an impact. Better levels of training and more regular use of the technique may serve to increase levels of agreement between assessors, thus improving its inter-rater reliability.

4. Conclusions and recommendations

Conclusions

The main aim of this research was to evaluate the effectiveness of the SCAN technique. The results of the study have illustrated the *potential* of SCAN to discriminate between truthful and deceitful statements. The three SCAN trained groups were able to correctly identify a minimum of 80% of the four truthful statements and 75% of the twenty deceptive statements. Lower levels of accuracy existed for the three inconclusive statements partly due to the reluctance of the officers to use that category within their assessments and the nature of the category. The results demonstrated a higher success rate in comparison with those obtained by Driscoll (1994). Although he did not conduct a 'blind' assessment of the statements, his study correctly identified 73% of 'apparently accurate' (true) statements and 58% of 'doubtful' (deceptive) statements using ten SCAN criteria.

A total endorsement of the technique would, however, be unwise. These results may overstate the SCAN technique's ability to assess potential deception. Other issues have to be considered in relation to these findings. In particular, we need to be cautious about how we interpret these results and the practical implications for using the SCAN technique. These concerns would need to be addressed before the technique can be seriously considered within an investigation, even within the present constraints of the UK legal context.

Interpretation of the results

Training in SCAN or experience as a detective?

The results of this study demonstrated that the three groups of SCAN trained officers (Groups 1 to 3) *appeared* to perform better in comparison with the untrained officers within Groups 4 and 5 (see Table 4). *All* five groups, however, were able to discriminate between truthful and deceitful statements above the level of chance. Statistically significant differences in performance were only identified between the three SCAN groups and the newly recruited police officers who had no training in the SCAN technique (Group 5); no statistically significant differences were found between the three SCAN groups and the experienced detectives (Group 4). Therefore, while SCAN trained officers were able to discriminate between truthful and deceitful statements with a degree of accuracy, so too were the experienced detectives, untrained in the SCAN technique.

The experienced detectives of Group 4 may have been drawing upon their investigative experience when assessing the statement types. The findings revealed that this group of officers, when faced with 'uncontaminated' statements, used intuitively some of the SCAN criteria in their assessments, although in an informal

and unstructured way. The SCAN technique could, therefore, be an organised methodology which officers can apply to detect potential deception within a statement. This evidence suggests that training officers in the SCAN technique may help to develop the necessary skills in detecting potential instances of deception without officers having to acquire years of detective experience to do so.

An alternative interpretation of the results could be that the three SCAN trained groups (Groups 1-3) were also tending to draw formally upon their experience as investigators rather than applying any SCAN criteria. The low levels of consistency in the use of the SCAN criteria by the three SCAN groups might lend some support to this interpretation. This present study, however, has not been able to fully separate out the influence of training in the SCAN technique and detective experience.

The findings obtained from the study clearly show that we need to consider further the extent to which the ability to correctly assess the truthfulness or otherwise of a statement is a mixture of training in the SCAN technique and/or experience as a detective. It would be necessary to undertake further research to compare the performance of SCAN trained police officers against SCAN trained civilians to answer this question convincingly.

Reliability of SCAN

If the SCAN technique can be used as a reliable means of differentiating between truthful and deceptive statements, then we would expect SCAN assessors to be able to use the technique consistently with one another. When the results of this study were analysed to assess levels of agreement in the use of SCAN criteria on particular statements, low levels of consistency were identified. Since the assessors are frequently coding the statements using different criteria, this suggests that two different assessors could come to different conclusions about different parts of the same statement. Furthermore, these findings raise the question of whether the individuals have been either trained appropriately or were applying their training inappropriately in a practical setting. It does have to be acknowledged, however, that the low levels of consistency could, in part, be attributed to the artificial nature of this experiment (the assessors had to make an overall classification of truth and deceit). Further assessment of the inter-rater reliability of the SCAN criteria is required.

Validation of the SCAN technique

Hitherto the validity of the SCAN technique has largely been derived from personal testimonies of users rather than empirical evidence. This reflects the tendency for

some investigators to apply any technique that is available even when research evidence is limited to support its use within an investigative context. Investigators need to be careful about how they apply the SCAN technique to the detection of potential areas of deception until additional empirical evidence has been generated.

Implications of using SCAN

Legal implications

There are legal implications for using the SCAN technique within the UK policing environment. The present system of statement taking within the UK results in what Sapir refers to as a 'contaminated' statement, and the analysis of such statements is more likely to produce unreliable results (Sapir, 1987). To obtain an uncontaminated statement, the individual is asked to write an account of the event *in their own words* before they recall any details to an officer; there is no preparation or coaching involved in constructing the account. However, as the law currently stands within the UK, it is unlikely that this process would be permissible for *suspect* statements.

Uncontaminated *witness or victim* statements could be obtained in accordance with the principles of SCAN, requiring only a procedural change in the way that allegations of crime are investigated. If there is, however, sufficient evidence to identify that witness/victim as a potential suspect, there may be implications for applying SCAN under Section 76 and 78 of P.A.C.E. (disclosure and gathering unfair evidence). Once there are reasonable grounds to suspect a person they must be cautioned and consequently any statements made would be fully discloseable. In some instances, this could prove a significant obstacle to prosecution. Since SCAN is employed to detect deception, obtaining a statement that will be assessed using SCAN implies that the individual is initially suspected of deceit.

Against the current legal background, it would appear that SCAN's use is limited to dealing with victims or witnesses only. For instance, there may be real scope, even within the present legislative framework, for applying the technique to suspected cases of false allegations. The feasibility and consequences of its application would, however, need to be explored in more depth.

Procedural and resource implications of introducing the SCAN technique

The main procedural implication of applying SCAN would be the requirement of the individual to write their own statement at the earliest opportunity without any police or other influence[18]. All officers (including probationary police officers), therefore, would need to be aware of its existence so as not to 'contaminate' the individual at an early stage. This could prove difficult in practice as police are

[18] *Although it might be useful to explore how the SCAN technique performed on statements obtained through the cognitive interview.*

encouraged to discuss events with individuals (victims, witnesses etc) as soon as possible after an incident, whether to comfort them and/or to obtain evidence. In addition, within an investigative context, it is often important that details of an incident are circulated as quickly as possible to ensure evidence and intelligence are collected as quickly as possible. Having to delay this process while the individual writes their account could have implications for the investigative process. Obtaining the uncontaminated statement, however, is, according to those that use SCAN, not a time consuming process. Statements obtained in this manner are usually a great deal shorter than those obtained using the current UK system of statement taking. The average length of a statement in this study was 197 words.

A written statement is the only material required for SCAN and it can be analysed independently from the on-going investigation. Consequently, assessors trained in the SCAN technique do not need to be attached to each force. A small number of officers trained in SCAN can be called upon for assistance when required. Once the statement is acquired it can be faxed through for analysis. If SCAN were limited to serious offences only this would serve to further minimise the resources required.

Training implications

In this study the consistency with which the SCAN criteria were employed was found to be low. It therefore seems vital that consideration should be given to the adequate training of officers in the appropriate use of SCAN. It is essential for officers to fully understand the conditions under which the technique can be applied and to understand its limitations. The findings of this study suggest that trained assessors might understand the criteria differently, which may lead to differing conclusions on the same statement.

Secondly, as with the development of many new skills, it is imperative that officers regularly practise using the SCAN technique, and obtain feedback as to its use within the interviewing process. It should be limited therefore to a small number of officers so as to enable them to develop the necessary expertise. Officers trained in the SCAN technique would need to be proficient at analysing statements since the result of misinterpretation could have a significantly detrimental effect on both the suspect/victim, the investigation and the outcome at court. Ensuring that several officers independently examine the statements before submitting a group report of the results could help to improve the accuracy and reliability of the technique in practice. Whilst this would have resource implications, it is widely practised in those countries that employ the SCAN technique towards the detection of deception.

Research implications

This study should only be considered as a preliminary examination of the SCAN technique and its effectiveness in detecting instances of potential deception. Further research needs to be conducted with a more representative sample of both truthful and deceptive statements. This study was heavily weighted towards deception with 20 deceitful statements and only 4 truthful statements; the amount of truthful statements should ideally equal the number of deceptive statements. Increasing the number of assessors within each group would also enable differences in individual performance to be examined in more detail.

Additional research to separate out the influence of training in the SCAN technique from detective experience would be helpful. Clarifying the precise impact of SCAN training might involve detectives assessing the statements using their experience, and then comparing performance after training in the SCAN technique (any improvements in accuracy might then be attributed to the SCAN training). Research comparing the performance of SCAN trained police officers against SCAN trained civilians could also help to identify the respective influences of training in SCAN and detective experience.

Research could also focus usefully on the reliability of the individual SCAN criteria. It would be useful to explore the level of agreement between assessors as to the presence or absence of each criterion within a statement (test for inter-rater reliability). The findings of this study suggest a need exists for redefining the SCAN criteria and making them more explicit. This will help ensure that the technique is applied appropriately.

Furthermore, can the SCAN criteria perform reliably if they are applied to statements from individuals who may be mentally ill; statements written through or translated by an interpreter; statements provided by an individual affected by drugs or alcohol; and, statements provided by children? Perhaps more work needs to be done on establishing normal or 'baseline' written behaviour for when an individual is being truthful or deceitful.

Recommendations

The study shows no clear evidence that the SCAN technique *significantly* improves an experienced investigator's ability to ascertain truth or deceit in written statements, although it does serve to highlight areas within an account that require clarification and can therefore be especially useful during the early stages of an investigation. This report has highlighted the need for caution before its widespread

introduction is considered. The conditions under which SCAN should be applied and the legal consequences of its application need to be fully understood. Consequently, the following points are recommended for consideration:

- SCAN may have value in the systematic analysis of selected victim and/or witness statements in the UK, although the legal implications of its use need to be further explored. ACPO should develop interim advice for forces on how and when SCAN might be applied.

- If the application and use of the SCAN technique do grow in the UK, consideration needs to be given to training issues. SCAN training would need to be delivered to a consistent, national standard. Thought should be given to the development of a small number of SCAN trained assessors who could develop their expertise for the service as a whole.

- In order to clarify the extent to which detectives draw upon their investigative experience in detecting deception rather than applying the SCAN criteria, further research should be undertaken to assess the impact of SCAN training and to compare the performance of SCAN trained police officers against SCAN trained civilians in a similar exercise.

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