

Translating theory into practice:

Evaluating a cognitive lie detection training workshop

Aldert Vrij¹

Sharon Leal

Samantha Mann

Zarah Vernham

Femke Brankaert

University of Portsmouth, Psychology Department

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflict of interest

ACKNOWLEDGEMENT

This work is funded by the High-Value Detainee Interrogation Group/J-FBI-10-009 awarded to the University of Portsmouth (UK). Any opinions, findings, and conclusions or recommendations expressed in this article are those of the authors and do not necessarily reflect the views of the U.S. Government.

¹ Correspondence about this article should be addressed to: Aldert Vrij, University of Portsmouth, Psychology Department, King Henry Building, King Henry 1 Street, Portsmouth, Hants, PO1 2DY, United Kingdom or via email: aldert.vrij@port.ac.uk

Abstract

A training workshop utilising the most up to date research in cognitive lie detection was designed and evaluated. For this evaluation, 27 experienced police detectives each interviewed one mock-suspect (a truth teller or liar) before training and another mock-suspect (a truth teller or liar) after training. Different mock-crimes were used in the pre- and post training interviews. The police detectives were free to interview the mock-suspect in any way they felt appropriate but were asked to try to incorporate (some of) the taught techniques in the post-training interviews. The detectives made veracity judgements and the interviews were transcribed and coded for the amount of detail elicited and the questions asked. Trainees' ability to distinguish truth tellers from liars improved, and so did the percentage of appropriate questions they asked. Trainees did not implement the taught techniques to an equal extent, but when they were used, the techniques enhanced the elicitation of information and discrimination between truth tellers and liars. The training study also revealed challenges, particularly difficulty in implementing the taught techniques into practice (detectives often thought they had used techniques taught in the training when they in fact not used them as they had been shown to do) and asking the right questions to elicit differences in detail between truth tellers and liars.

Translating theory into practice:

Evaluating a cognitive lie detection training workshop

DePaulo and her colleagues conclusively demonstrated that cues to deceit are typically faint and unreliable (DePaulo et al., 2003; DePaulo & Morris, 2004). Based on this meta-analysis several researchers examined whether investigators can *elicit new* or *enhance existing* cues to deceit through specific interview protocols (Vrij & Granhag, 2012). The two most extensively examined approaches to date are the Strategic Use of Evidence technique and the cognitive lie detection approach (see Granhag and Hartwig [2015], Hartwig, Granhag, and Luke [2014] and Vrij [2015] for overviews of this research).

We developed a cognitive lie detection training workshop which takes into account the results of more than 20 studies into the cognitive lie detection approach (Vrij, 2015). In this article we discuss the results of a study whereby we evaluated the workshop, but commence with a synopsis of the theoretical background of the cognitive lie detection approach.

The Cognitive Lie Detection Approach

The core of the cognitive lie detection approach is that investigators can *magnify* the differences in cognitive cues displayed by truth tellers and liars through interventions based on cognitive principles that make the liars' task more cognitively demanding. If successful, those interventions should result in liars displaying more diagnostic cognitive cues to deception (e.g., lack of detail or plausibility) and thereby facilitating lie detection. The cognitive lie detection approach comprises three components: (i) imposing cognitive load; (ii) encouraging interviewees to say more, and (iii) asking unexpected questions.

Imposing cognitive load is based on the well established empirical finding that in *interview settings* lying is typically more mentally taxing than truth telling (see for example fMRI research, Christ et al. 2009; Vrij & Ganis, 2014). Imposing cognitive load refers to

investigators' interventions aimed at making the interview setting mentally even more difficult. Liars, who require more cognitive resources than truth tellers, will have fewer cognitive resources left over. If cognitive demand is further raised, which could be achieved by making additional requests, liars may be less able than truth tellers to cope with these additional requests (Vrij, Granhag, Mann, & Leal, 2011). Ways to impose cognitive load discussed in the training are asking interviewees to tell their stories in reverse order (e.g., Evans, Meissner, Michael, & Brandon, 2013; Vrij et al., 2008), 'forced turn-taking', which is suitable when more than one person is interviewed at the same time (groups of liars and groups of truth tellers) (Vernham, Vrij, Mann, Leal, & Hillman, 2014), and engaging interviewees in a second task (e.g., watching a video of an unrelated event) while conducting the interview (Debey, Verschuere, & Crombez, 2012; Visu-Petra, Varga, Miclea, & Visu-Petra, 2013).

The second cluster of techniques is meant to encourage interviewees to provide more information. It will help truth tellers if they provide much information, because the richer an account is perceived to be in detail, the more likely it is to be believed (Bell & Loftus, 1989; Johnson, 2006). Moreover, the additional information truth tellers provide could give leads to investigators to check. Liars may find it cognitively too difficult to add as many details as truth tellers do. Alternatively, if liars do add substantial detail, the additional information may sound less plausible. In addition, liars may be reluctant to add more information out of fear that it will provide leads to investigators and, consequently, give their lies away. Hence, we expected that techniques to encourage interviewees to say more lead to truth tellers adding more (plausible) detail than liars. Empirical research has supported this premise to encourage interviewees to say more discussed in the training include the use of (i) an example of a detailed statement (Leal, Vrij, Warmelink, & Fisher, 2015), see also the 'social proof' literature (Bond & Smith, 1996; Cialdini, 1993), (ii) a supportive interviewer (e.g.,

Mann et al., 2012), (iii) deliberate mimicry of the interviewee (Shaw, Vrij, Mann, Leal, Fisher, & Granhag, 2015) and (iv) drawings (e.g., Roos af Hjelmsäter, Öhman, Granhag, & Vrij, 2014).

The third cluster of techniques relates to asking unexpected questions. A consistent finding in the deception literature is that liars prepare themselves for anticipated interviews, and see Tedeschini (2012) for a description of a real-world case. They do so by preparing possible answers to questions they expect to be asked (e.g., Hartwig, Granhag, & Strömwall, 2007). This strategy of preparing answers for possible questions makes sense. Planning makes lying easier -thereby combating, to some degree, the additional cognitive demand of lying- and so planned lies typically contain fewer cues to deceit than spontaneous lies (DePaulo et al., 2003).

Preparing for answers has a limitation. It will be fruitful only if liars correctly anticipate which questions will be asked. Investigators can exploit this limitation by asking questions that liars do not anticipate. Though liars can refuse to answer unexpected questions by saying “I don’t know” or “I can’t remember”, such responses will create suspicion if they are about central aspects of the target event. A liar, therefore, has little option other than to fabricate a plausible answer on the spot, which is cognitively demanding. For liars, expected questions should be easier to answer than unexpected questions, because liars can give their planned and rehearsed answers to the expected questions but they need to fabricate answers to the unexpected questions. The difference liars experience in cognitive load while answering these two sets of questions should become evident in their verbal responses. In contrast, truth tellers experience similar levels of cognitive load while answering expected and unexpected questions, and they should produce more comparable answers to the expected and unexpected questions than liars. Research supports the unexpected questions approach, and examples of unexpected questions include spatial questions (Vrij et al., 2009), questions about processes (e.g., planning

of a trip) rather than outcomes (e.g., purpose of a trip) (Mac Giolla, Granhag, & Liu-Jönsson, 2013), and asking the same question twice in different formats (Leins, Fisher, & Vrij, 2012; Leins, Fisher, Vrij, Leal, & Mann, 2011).

Training Performance Indicators

To evaluate the training we examined three performance indicators: (i) Accuracy in discriminating truth tellers from liars, (ii) the total amount of detail provided by the mock-suspects, and (iii) the types of questions the trainees (police detectives) asked the mock-suspects. In lie detection studies 50% accuracy can be expected just by flipping a coin because the target person is either lying or telling the truth. Bond and DePaulo's meta-analysis revealed an average accuracy rate of 54% in correctly classifying truth tellers and liars, which is only just above the level of chance. Vrij (2008) examined the accuracy rates obtained by professionals (e.g., police officers, police detectives, customs officers, secret service agents) in lie detection studies. The average accuracy rate across 30 samples was 56% for detecting truths and 56% for detecting lies (56% total accuracy). Although in 29 of those studies observers passively watched video fragments of truth tellers and liars rather than actively interviewed them, Hartwig, Granhag, Strömwall, and Kronkvist (2006) found a 57% total accuracy rate when police detectives actually interviewed mock suspects.

Deception research has shown that truth tellers typically give more detail than liars (DePaulo et al., 2003; Masip, Sporer, Garrido, & Herrero, 2005; Vrij, 2008). Liars may lack the imagination to conjure up details that sound plausible (Köhnken, 1996, 2004; Leal, Vrij, Warmelink, Vernham, & Fisher, 2015). Liars may also be reluctant to give detail as they run the risk that such detail can be proven false by an investigator (Hartwig, Granhag, & Strömwall, 2007; Nahari, Vrij, & Fisher, 2012, 2014) and liars may want to limit the amount of false information they provide so that they have less false information to remember and report in case they are interviewed again (Vrij, 2008). Since the techniques taught in the

training are more difficult to cope with for liars than truth tellers, we predicted that truth tellers would be more detailed than liars, particularly after training (Hypothesis 1).

Oxburgh, Ost and Cherryman (2012) evaluated 26 police interviews with suspected child offenders in England and Wales. They found that open-ended, probing and encourage/acknowledge questions (so called *appropriate questions*) related to obtaining more information. This supports previous research that has shown that open-ended questions and probing questions are the most productive in terms of eliciting information (Fisher, Falkner, Trevisan & McCauley, 2000; Griffiths & Milne, 2006; Sternberg, Lamb, Orbach, Esplin, Mitchell, 2001). They are productive because they elicit free recall (Snook et al., 2012), because interviewees are allowed to collect their thoughts in their own way, instead of being distracted by the interviewer asking other directed questions (Powell, Fisher, & Wright, 2005) and because they give interviewees time to think, which will lead to more elaborate retrieval of memory (Powell et al., 2005). Oxburgh et al. (2012) also found that closed, leading, multiple at once, forced choice, echo and opinion/statement questions (so called *inappropriate questions*) resulted in less information being obtained. This, again, supports previous research that closed questions lead to less information (Myklebust & Bjorklund, 2006). Leading questions are also considered inappropriate to use during investigative interviewing mostly because they are suggestive (Griffiths & Milne, 2006), and the often misleading information embedded in these questions can be incorporated into a person's memory and could eventually lead to false recall in later stages of the interview process (Gudjonsson & Clark, 1986).

Oxburgh et al. (2012) found that only 29% of the questions asked were appropriate questions. Indeed, asking open-ended questions is not common in investigative interviewing, and, instead, police officers tend to use closed, forced choice, multiple at once and other inappropriate questions (e.g., Bull & Soukara, 2010; Smith, Powell & Lum, 2009; Snook &

Keating, 2011). Based on Oxburgh et al.'s findings in England and Wales we expected that around 29% of questions asked would be appropriate. The techniques employed in the cognitive lie detection approach consist solely of appropriate questions (mainly open-ended questions) and, as such, we expected that the detectives would use more appropriate questions after training than before, and, in particular, more open-ended questions (Hypothesis 2). Four of the taught techniques can easily be detected by reading the transcripts: (i) model statement, (ii) reverse order, (iii) drawings and (iv) spatial questions.¹ We examined whether using these four techniques in the interviews would be related to accuracy in distinguishing between truth tellers and liars. Since these techniques have been shown to elicit differences between truth tellers and liars we expected that this would be the case and therefore expected a positive correlation between using the taught techniques and accuracy in distinguishing between truth tellers and liars (Hypothesis 3).

Method

Participants

Interviewers. A total of 27 police detectives (15 men) attended the training and took part in the interview study. Ages ranged from 27 to 58 years with an average age of $M = 44.30$ ($SD = 7.28$). Their length of service ranged from 7 to 30 years with an average length of $M = 18.81$ ($SD = 5.89$). In England and Wales, there are five tiers of interview training for officers (tier 5 is the highest level of training). Most detectives ($n = 16$) were tier-3 trained for interviewing suspects, four interviewers were tier-2 trained, one officer was tier-4 trained and four officers were tier-5 trained (the remaining two officers did not indicate their training level). This level of training had no effect on the accuracy rates reported in the Results section or on the type of questions asked. Twenty-two detectives judged themselves as experienced in interviewing suspects (score of 4 or higher on a 5 point Likert scale).

Most detectives ($n = 14$) were tier-2 trained for interviewing witnesses, six interviewers were tier-3 trained, and four officers were tier-5 trained (the remaining three officers did not indicate their training level). Nine detectives judged themselves as experienced in interviewing witnesses (score of 4 or higher on a 5 point Likert scale).

Interviewees. A total of 54 interviewees (35 women) acted as mock suspects in the training study (27 interviewees took part pre-training and 27 interviewees post training). The sample was made up of undergraduate students and university staff. Their age ranged from 18 to 61 years with an average age of $M = 31.80$ ($SD = 13.85$).

The Training Workshop

Police detectives were recruited through a police detective training coordinator associate. The training content was briefly explained in an email that was sent to approximately 50 police detectives through this coordinator with the request to email the first author directly if interested in attending. The training and study was held over five days and on each day between four and six trainees participated. The training was delivered by the first three authors of this paper and started at 10am with a one hour discussion of the '*pitfalls in lie detection*' (difficulties and errors made in lie detection) derived from Vrij (2008) and Vrij, Granhag and Porter (2010) (see Appendix 1).

The pitfalls section was followed by 30 minutes lunch, which was followed by a 4.5 hour '*Opportunities in lie detection*' section (the cognitive lie detection approach), which included the introduction of ten techniques as well as demonstrations, videos and exercises. Table 1 provides brief descriptions of the ten techniques taught in the training, whereas Appendix 1 provides brief descriptions of the demonstrations, videos and exercises.

Training Evaluation

Procedure

Interviewers. After arrival at 9am the police detectives were invited to complete a brief questionnaire about themselves (age, gender and experience in interviewing). They were then asked to interview a mock-suspect in the way they would normally do (or as close as they could to normal given the experimental procedure). They were told that they had 30 minutes maximum for the interview and that the interview would be audiotaped. They were given background information about the mock-crime scenario (see Appendix 1). After the interview they completed a short questionnaire in which they made a dichotomous veracity judgement (What do you think the veracity status of the suspect was? Truth teller or liar) and indicated the extent to which they thought the interviewee had told the truth (on a scale ranging from 0% to 100%). The training started at 10am.

After the training (which finished at 4pm), the detectives were asked to interview another mock-suspect. This time they were asked, if possible, to incorporate (some of) the techniques taught in the training. They were again given background information about the mock-crime scenario (see Appendix 1), which was always another scenario than the pre-training scenario. After the interview they completed again a short questionnaire, including the same two questions as reported above (veracity judgement and telling the truth judgement). We also asked the detectives whether they had used the techniques we taught them in the training (yes/no). Note that in this study the trainees actively interviewed a mock-suspect, in contrast to most other training studies where trainees passively watch and assess video fragments of truth tellers and liars who were interviewed by someone else (Driskell, 2012), but see Hartwig et al., (2006) for a training study in which trainees also actively interviewed mock-suspects. Four different interview rooms were available for the police detectives, which means that four interviews could take place at the same time. The

detectives were randomly allocated to the mock-suspects.

We used two different mock-crime scenarios in the study (the restaurant scenario and secret meeting scenario) and each detective was exposed to both scenarios, and the order in which this occurred (morning or afternoon) was counterbalanced. Unknown to the detectives, they each interviewed one truth teller and one liar. When their interviewee was telling the truth or lying (morning or afternoon) was also counterbalanced. At the end of the day, after the second interview, the officers were told that they had interviewed one truth teller and one liar and received feedback about their veracity judgements. No information was given to the police detectives about the base rates, but they were told that we had recruited multiple truth tellers and multiple liars for each scenario.

The restaurant scenario was derived from Strömwall, Granhag, and Jonsson (2003) and Vrij et al. (2009) but differed from those studies in that participants stayed in the restaurant individually rather than in pairs. The secret meeting scenario was derived from Shaw, Vrij, Leal, & Mann (2014) but differed from that study in that the participant saw a videotape of the meeting rather than attending the meeting. The secret meeting scenario method used is identical to Ewens et al. (2014).

Interviewees. Participants were recruited by email and online advertisements at the university. Interviewees were unaware that the interviewers were taking part in a cognitive lie detection training workshop, and they were given no instructions on how to approach the interview. On arrival, participants were randomly allocated to the restaurant or secret meeting scenario and to the truth or lie condition. The instructions given to the participants in both scenarios are described in Appendix 1.

Both truth tellers and liars were then told that it is important to convince the interviewer that they were truthful and that they would receive £10 as a reward if they did so.

If the participant did not convince the interviewer s/he would have to write a report about his/her whereabouts during the last 15 minutes. The participant was then taken to the interview room where the interview took place.

After the interview, participants completed a post-interview questionnaire, which measured motivation, likelihood of receiving £10, likelihood of writing a statement, and how difficult they thought the interview was. To measure motivation participants were asked to what extent they were motivated to perform well in the interview on a 5 point Likert scale (1 = not at all motivated to 5 = very motivated). Likelihood of receiving the £10 or writing a statement was measured on 7 Likert point scales (1 = not at all to 7 = totally). Cognitive load experienced during the interview was measured with three questions: (i) I felt that the interview required a lot of thinking, (ii) I felt that the interview was mentally difficult, and (iii) I had to concentrate a lot during the interview. Answers were given on 7-point Likert scales (1 = disagree to 7 agree). These three questions were clustered into one 'cognitive load' index (Cronbach's alpha = .78).

The interviews in both scenarios were audio recorded and subsequently transcribed. All interviewers and interviewees signed informed consent forms prior to the study and were given a debriefing form after the study. All interviewees were given £10.

Coding

All coders were blind to the hypotheses and experimental conditions of the study.

Total Detail. A coder read the transcripts and coded them for number of details. Detail included all the perceptual details (information about what the examinee saw or heard); spatial details (information about the spatial arrangement of people and/or objects); and temporal details (information about when the event happened or an explicit description of a sequence of events). We clustered these different types of detail into one 'detail' category

as no hypotheses were formulated about the sub-categories. Thus the sentence ‘There was a black napkin on the table’ would be coded as four details. A second coder coded a random sample of 10 transcripts (19%). Inter-rater reliability between the two coders was excellent (ICC = .95).

Questions asked.

For coding the questions asked by the detectives in the interviews we used Griffiths and Milne’s (2006) categorisation of question types in forensic investigative interviewing: (i) open-ended questions (questions mostly beginning with “Tell”, “Describe” or “Explain”), (ii) probing questions (questions beginning with one of the five WH words “who”, “where”, “when”, “which” or “why” or beginning with “how”), (iii) closed questions (questions that can only be answered with “yes” or “no”), (iv) leading questions (where the question suggests an answer to the interviewee), (v) forced choice questions, (questions that force the interviewee to choose between two or more options), (vi) echo questions (repeating the information given by the interviewee but phrased as a question), (vii) encourager or acknowledge questions (questions or statements that encourage interviewees to continue talking “Mmmm”, “Uh-huh”, “Ah right, thank you”, “Yeah, carry on”), (viii) multiple questions at once (multiple questions at the same time without giving the interviewee the opportunity to respond between the questions) and (ix) opinion or statement questions (expressions of opinions or statements put to the interviewee) (Snook, Luther, Quinlan, & Milne, 2012).

Following Oxburgh et al. (2012), a coder read the transcripts and coded them for the questions asked and made a distinction between *appropriate questions* (open-ended questions, probing questions and encourager/acknowledgement questions) and *inappropriate questions* (closed questions, forced choice questions, leading questions, multiple questions at once, opinion/statement questions and echo questions). A second coder coded a random

sample of 15 transcripts. Inter-rater reliability between the two coders was excellent ($ICC = .99$ for both appropriate and inappropriate questions).

For four techniques, which can be easily noticed by reading the transcripts ((i) model statement, (ii) reverse order, (iii) drawings and (iv) spatial questions), one of the trainers coded the number of times the detectives had used each of those techniques in the way we taught them to use it. For example, for the use of the model statement the detective first needed to elicit a free recall from the participant via an open-ended question (followed by further questioning, optional), followed by the model statement and then again an open-ended question eliciting a free recall. For the use of drawings, the detective should have asked the mock suspect ‘Please sketch everything you could see when.....’ (Vrij, Leal, et al., 2010). A second coder coded a random sample of 10 transcripts. Inter-rater reliability between the two coders for the cluster of four techniques was excellent ($ICC = .90$). The number of questions based on these four techniques asked in the post-training interviews ranged from 0 to 10 ($M = 3.37$, $SD = 3.62$).

Interview length. The average length of the interviews was 27 minutes and 43 seconds ($M = 1667.02$, $SD = 524.64$). A 2 (Training) X 2 (Veracity) X 2 (Scenario) ANOVA with length of interview as dependent variable revealed a Training, $F(1, 46) = 4.80$, $p = .033$, $d = .61$, and Scenario main effect, $F(1, 46) = 10.96$, $p = .002$, $d = .86$. All other effects were not significant (all F 's < 2.52 , all p 's $> .12$). The pre-training interviews ($M = 30$ minutes and 32 seconds, $SD = 404.51$, 95% CI [1623.78, 2014.91]) were longer than the post-training interviews ($M = 25$ minutes and 24 seconds, $SD = 590.99$, 95% CI [1319.14, 1710.27]), and the secret meeting interviews ($M = 31$ minutes and 28 seconds, $SD = 495.36$, 95% CI [1689.32, 2063.71]) were longer than the restaurant interviews ($M = 24$ minutes and 29 seconds, $SD = 473.87$, 95% CI [1270.33, 1644.72]).

Design

The experiment involves three factors, Training, Veracity and Scenario. Since a limited number of police detectives were available to us, a within-subjects design was employed. As happens in field studies, we had to adjust the experimental design to the knowledge that we had to run the study and carry out the training all in one day. As a result, we could not employ a full within-factorial design, in which each detective interviews four interviewees (one truth and one lie in each of the two scenarios) pre-training and four interviewees post training. In fact, there was only just enough time for each detective to carry out one interview pre-training and a second interview post-training. We ran within-subjects ANOVAs for Training to test the effect of training on the police questioning, as in these analyses Veracity and Scenario are not important factors. Veracity matters when analysing accuracy rates and detail and we therefore subsequently carried out between-subjects ANOVAs (Training X Veracity X Scenario) to test the effect of training, veracity and scenario on accuracy rates and detail. Note that introducing Training as a between-subjects factor meant that we had less statistical power for that factor than we would have had if we had treated it as a within-subjects factor.

Results

Motivation, Likelihood of Receiving an Incentive and Receiving a Penalty, and Experienced Cognitive Load

Four 2 (Training: before or after training) X 2 (Veracity: truth or lie) X 2 (Scenario: restaurant or secret meeting) ANOVAs were conducted on the four manipulation checks. The analysis for motivation did not reveal any significant effects (all F 's < 2.51, all p 's > .12). The average motivation score was very high ($M = 6.19$, $SD = .79$ on a 7-point Likert scale). The analysis for the likelihood of receiving an incentive revealed a main effect for Veracity, $F(1, 46) = 7.30$, $p = .01$, $d = .76$, with truth tellers judging the likelihood as higher ($M = 5.30$, $SD = 1.49$, 95% CI [4.71, 5.88]) than liars ($M = 4.15$, $SD = 1.54$, 95% CI [3.56, 4.73]). All

other effects were not significant (all F 's < .85, all p 's > .36). The analysis for the likelihood of receiving a penalty did not reveal a significant effect (all F 's < .1.63, all p 's > .20). Finally, the analysis about levels of cognitive load experienced resulted in a main effect for Training, $F(1, 46) = 5.30, p = .026, d = .62$, with interviewees who were interviewed after training ($M = 5.32, SD = .92, 95\% \text{ CI } [4.84, 5.80]$) experiencing more cognitive load than those who were interviewed before training ($M = 4.57, SD = .92, 95\% \text{ CI } [4.09, 5.04]$).

Police officers' accuracy

A 2 (Training) X 2 (Veracity) X 2 (Scenario) ANOVA with accuracy in classifying truth tellers and liars as dependent variable revealed significant main effects for Training, $F(1, 46) = 4.06, p = .050, d = .32$ and Veracity, $F(1, 46) = 58.61, p < .001, d = 2.79$ and a significant Training X Veracity interaction effect, $F(1, 46) = 4.06, p = .05, \eta^2 = .08$. Post-training total accuracy ($M = .74, SD = .45, 95\% \text{ CI } [0.56, 0.92]$) was higher than pre-training total accuracy ($M = .59, SD = .50, 95\% \text{ CI } [0.41, 0.78]$); and truth accuracy ($M = 1.00, SD = 0, 95\% \text{ CI } [0.87, 1.13]$) was higher than lie accuracy ($M = .33, SD = .48, 95\% \text{ CI } [0.20, 0.47]$). Post-training total accuracy (74%) was significantly higher than chance (50%, $t(26) = 2.801, p = .009$) and significantly higher than the average accuracy rate obtained by professionals in 30 lie detection samples (56%, Vrij, 2008), $t(26) = 2.103, p = .045$. Pre-training total accuracy (59%) did not differ from chance ($t(26) = .961, p = .345$) nor from the average accuracy rate obtained by professionals in 30 lie detection samples, ($t(26) = .338, p = .738$). The lie accuracy rate (33%) did not differ significantly from chance ($t(26) = 1.803, p = .083$), but was significantly lower than the average lie accuracy obtained by professionals in 30 lie detection samples (56%, Vrij, 2008), $t(26) = 2.45, p = .021$.

The significant Training X Veracity interaction effect revealed that truth accuracy was the same before ($M = 1.00, SD = 0, 95\% \text{ CI } [1.00, 1.00]$) and after ($M = 1.00, SD = 0, 95\% \text{ CI } [1.00, 1.00]$) training, but that lie accuracy increased from $M = .15 (SD = .37, 95\% \text{ CI } [-0.11,$

0.41]) pre-training to $M = .50$ ($SD = .51$, 95% CI [0.25, 0.75]) post-training. The pre-training lie accuracy rate (15%) was significantly below chance, $t(12) = 3.32$, $p = .006$, and significantly below the 56% accuracy rate obtained on average in deception studies with professionals $t(12) = 3.90$, $p = .002$, whereas the post-training lie accuracy rate (50%) was at chance level $t(13) = .000$, $p = 1.00$, and did not differ significantly from the 56% accuracy rate obtained on average in deception studies with professionals $t(13) = .43$, $p = .67$.

A 2 (Training) X 2 (Veracity) X 2 (Scenario) ANOVA with the percentage scale (0% - 100%) whether the interviewee was telling the truth as dependent variable revealed a significant main effect for Veracity, $F(1, 46) = 8.95$, $p = .004$, $d = .99$ and a significant Training X Veracity interaction effect, $F(1, 46) = 4.12$, $p = .048$. Truth tellers were thought to be telling the truth more ($M = 82.59$, $SD = 12.28$, 95% CI [76.50, 88.85]) than liars ($M = 66.26$, $SD = 20.74$, 95% CI [63.53, 75.88]). Regarding the interaction effect, simple contrast tests revealed that pre-training the interviewers thought that truth tellers ($M = 80.00$, $SD = 11.77$, 95% CI [72.60, 87.40]) and liars ($M = 75.38$, $SD = 15.06$, 95% CI [67.70, 83.07]) were equally truthful, $F(1, 46) = .794$, $p = .381$, $d = .34$. Post-training, however, truth tellers ($M = 85.38$, $SD = 12.66$, 95% CI [72.93, 97.84]) were seen as more truthful than liars ($M = 63.57$, $SD = 24.05$, 95% CI [52.87, 74.27]), $F(1, 46) = 8.49$, $p = .007$, $d = 1.19$.

This 'telling the truth' variable also gives further insight into why the detectives obtained 100% accuracy rates in judging truths. Police detectives were lenient towards interviewees and made truth judgements even when they thought that the participant had not been entirely truthful. One officer who classified the interviewee as truthful on the dichotomous veracity question found the interviewee only 50% truthful on the veracity scale and five officers who classified the interviewee as truthful found the interviewee only 60% truthful on the veracity scale.

Police Detectives' Questions

The detectives asked on average $M = 85.93$ questions ($SD = 32.60$) during an interview. A paired-sampled t-test revealed that the number of questions asked before ($M = 98.71$, $SD = 36.00$, 95% CI [82.55, 114.87]) and after the training ($M = 78.11$, $SD = 56.97$, 95% CI [50.51, 89.40]) revealed a marginally significant effect, $t(26) = 1.79$, $p = .084$, $d = .44$, with a tendency to ask fewer questions after than before the training. In terms of the appropriateness of the questions, a significantly higher proportion of questions was considered appropriate (according to the investigative interviewing guidelines) post-training ($M = .40$, $SD = .09$, 95% CI [0.35, 0.45]) than pre-training ($M = .36$, $SD = .08$, 95% CI [0.33, 0.39]), $t(26) = 2.435$, $p = .022$, $d = .47$, which supports Hypothesis 2. Both the pre-training $t(26) = 4.27$, $p < .001$, and post training $t(26) = 4.66$, $p < .001$ percentages were significantly higher than the 29% obtained by Oxburgh et al. (2012). Of the three types of appropriate questions (open-ended questions, probing questions and encourager/acknowledgements) only open-ended questions yielded a significant difference between pre- and post training, $t(26) = 3.25$, $p = .003$, $d = .43$ (for the other two categories, both t 's < 1.16 , p 's $> .25$). In pre-training, fewer open-ended questions ($M = .067$, $SD = .039$, 95% CI [0.052, 0.083]) were asked than in post-training ($M = .089$, $SD = .06$, 95% CI [0.065, 0.113]).

We coded the transcripts for the presence of four of the taught techniques (model statement, reverse order, drawings and spatial questions). A significantly higher proportion of questions based on these four taught techniques were asked post-training ($M = .071$, $SD = .09$, 95% CI [0.036, 0.108]) than pre-training ($M = .002$, $SD = .01$, 95% CI [-0.002, 0.005]), $t(26) = 4.54$, $p < .001$, $d = 1.38$. In fact, only one detective in the pre-training interview asked one or more questions based on a taught technique in the pre-training interview, whereas 18 detectives asked one or more questions based on a taught technique in the post-training interviews. These 18 detectives elicited significantly more details with questions based on the taught techniques ($M = 10.92$ details per question, $SD = 12.26$, 95% CI [4.82,

17.02]) than with their other questions ($M = 1.64$, $SD = .92$, 95% CI [1.18, 2.09]), $t(17) = 3.22$, $p = .005$, $d = 1.41$. Finally, we correlated the proportion of questions based on the taught techniques with (total) accuracy in discriminating between truth tellers and liars (post-training interviews only). The correlation was significant, $r(27) = .44$, $p = .021$, indicating that the more frequently police detectives asked questions based on the taught techniques, the more accurate they became in distinguishing between truth tellers and liars. This supports Hypothesis 3.

We had also asked the police detectives whether they thought they had used each of the taught techniques in their post-training interviews. The police detectives indicated that, in the post-training interviews, they had used a variety of the techniques taught in the training, with asking interviewees to draw being the most frequently mentioned of the techniques (see Table 1). Returning to the four techniques we coded for in the transcripts (model statement, reverse order, drawings and spatial questions), 26 of 27 detectives thought themselves to have used at least one of these four taught techniques in their post-training interviews. Our objective coding revealed that of these four techniques the detectives actually used on average $M = .96$ ($SD = .19$, 95% CI [0.89, 1.03]) techniques, whereas the detectives subjectively reported that they had used significantly more of these techniques ($M = 2.59$, $SD = 1.01$, 95% CI [2.19, 2.99]), $t(26) = 9.14$, $p < .001$, $d = 2.72$.

Detail elicited in the interviews

A 2 (Training) X 2 (Veracity) X 2 (Scenario) ANOVA with detail as dependent variable resulted in a main effect for Scenario, $F(1, 46) = 15.46$, $p = .000$, $d = 1.33$, with all other effects being not significant (all F 's < 1.19 , all p 's $> .28$). The restaurant scenario elicited more detail ($M = 171.88$, $SD = 78.51$, 95% CI [149.43, 194.33]) than the secret meeting scenario ($M = 103.82$, $SD = 23.95$, 95% CI [85.42, 130.32]). The absence of a

significant Veracity main effect and a significant Training X Veracity interaction effect means that Hypothesis 1 is rejected.

The fact that we found no difference between truth tellers and liars in providing detail contradicts the general trend in deception research that truth tellers provide more details than liars. We examined the possibility that the police detectives asked many questions that were irrelevant for lie detection purposes. For example, in the restaurant scenario a key difference between truth tellers and liars was that truth tellers stayed for about 15 minutes in the restaurant, whereas liars did not. Detectives asked many questions about what happened before they entered the restaurant (54% of the questions were about this topic) but they are irrelevant for lie detection purposes because liars' and truth tellers' activities did not differ from each other before they entered the restaurant. Only 11% of the questions were related to what happened within the restaurant, but, again, questions were asked that are not suitable for lie detection purposes. For example, several detectives asked participants to describe the layout of the restaurant, but since liars also had been to the restaurant, they were also able to do this.

Discussion

Accuracy

Police detectives were more accurate in distinguishing between truth tellers and liars after training (74%) than before training (59%). The pre-training accuracy did not differ from the accuracy rates typically obtained by professionals in lie detection studies (56%), whereas the post-training accuracy rate did. The Likert-scale judgements provided further evidence for improved ability in discriminating truth tellers from liars as a result of training. When distinguishing between truth and lie accuracy, it was found that the gain in total accuracy was entirely caused by increased lie accuracy (from 15% to 50%). The truth accuracy was perfect (100%) both before and after training. Of course, the 50% lie accuracy rate obtained after

training is still low and, in that respect, there is room for improvement. A possible explanation for the low lie accuracy rate is that liars in the two mock-crime scenarios did not just lie, but instead told a mixture of truths and lies. This reflects real life (Leins, Fisher, & Ross, 2013; Vrij, 2008) but makes lie detection more difficult than in scenarios where liars' stories are entirely fabricated, as typically happens in deception research (Vrij, 2008).

The increased lie detection accuracy as a result of training cannot be attributed to a reduced tendency to be truth-biased. A reduction in truth bias would necessarily mean that liars as well as truth tellers would be more frequently seen as liars. The latter did not occur. The perfect accuracy rates in detecting truths both pre- and post-training are remarkable and we have never seen this reported in the literature before. US literature suggests that American police officers are lie-biased (Meissner & Kassin, 2004), but research carried out in the UK suggested no bias amongst UK officers (Mann & Vrij, 2006; Mann, Vrij, & Bull, 2004, 2006; Mann, Vrij, Fisher, & Robinson, 2008). Our Likert scale findings suggest that the police detectives in our sample were lenient towards interviewees and made truth judgements even when they thought that the participant had not been entirely truthful. We do not know whether this leniency reflects daily practice but we would welcome it if it does. Once police detectives think that someone is lying to them, they tend to use more grilling interview styles (Kassin, Goldstein, & Savitsky, 2003) and may become less open-minded (Williamson, 1993). Research has demonstrated that the absence of grilling interview styles results in more accurate information (Fallon, 2015; Meissner, Redlich, Bhatt, & Brandon, 2012).

Police Questioning

In the pre-training interviews 36% of the questions asked by the police detectives could be considered appropriate (according to the investigative interviewing literature) and that percentage rose significantly to 40% in the post-training interviews. The increase in appropriate questioning was entirely due to an increase in open-ended questions, which was

expected as open-ended questions were used in the training. The training effect showed that discussing open-ended questioning in a training session has a positive effect, at least short term. These percentages of appropriate questions were significantly above the percentage (29%) obtained by Oxburgh et al. (2012) in their analysis of real-life interviews by English (and Welsh) police detectives. This means that our sample did relatively well. Yet, only a minority of questions were considered appropriate, which is a common finding in the investigative interviewing literature. To explain the relatively infrequent use of appropriate questions in investigative interviewing, Griffiths and Milne (2006) note that police training for investigative interviewing is relatively new, and that it takes time for new research findings to be recognised and incorporated into police training. Oxburgh and Dando (2011) give the following five explanations: (i) Police training manuals differ in their definitions of open-ended and closed questions which could cause confusion; (ii) an interviewer is inclined to maintain control over the interview; (iii) if in a specific interview an interviewer mainly seeks confirmation of known facts, specific questions is all that is required; (iv) interviewers may seek power over the interviewee: and (v) asking open-ended questions is an unfamiliar way of questioning.

We coded in the interview transcripts whether the police detectives had used each of four techniques we taught them to use: (1) model statement, (ii) reverse order, (iii) drawing, and (iv) spatial questions. We found two benefits of using our techniques. First, questions based on these techniques elicited more detail per question (10.92 details per question) than the other questions (1.64 detail per question), which is an important finding as eliciting detail is at the core of investigative interviewing (Bull, 2010; Fisher, 2010). Second, the more questions based on these four techniques were used in the interviews, the more accurate the police detectives became in correctly discriminating between truth tellers and liars. In other words, using the taught techniques enhanced (i) elicitation of information and (ii)

discrimination between truth tellers and liars. Even in the post-training interviews the number of questions related to the taught techniques was limited (7%), but we believe that this percentage looks worse than it actually is. Many questions related to the taught techniques are open-ended questions that invite free recall of the entire event (e.g., Please tell me in as much detail as possible what you saw in the video and start by describing what you saw at the end of the video”) and there are only a limited number of such questions that can be asked in a single interview.

Detail

This is the first deception experiment in which police detectives interviewed mock-suspects and in which it was examined how many details they elicited from truth tellers and liars. The findings go against the general trend in deception research in which it is typically found that truth tellers provide more detail than liars (Vrij, 2005, 2008; DePaulo et al., 2003; Masip, Sporer, Garrido, & Herrero, 2005). This was also the case in two recent studies where we used the secret meeting scenario (Shaw, Vrij, Leal, & Mann, 2014; Ewens et al., 2014). (We have never carried out a restaurant study in the format employed in this experiment.)

We believe that the questions asked by the police detectives are responsible for the absence of difference in detail between truth tellers and liars. In this experiment, reflecting real life, mock-suspects did not have to lie to each question and, for example in the restaurant scenario, could have answered questions truthfully about the person who brought them to the restaurant and the layout of the restaurant. Analyses of the content of the questions showed that the police detectives asked many questions about the confederate and about his interactions with the mock suspects. Even when we focussed on the part of the scenario in which truth tellers and liars should and did differ (what happened inside the restaurant), differences in detail between truth tellers and liars did not emerge, perhaps again due to asking the wrong questions. For example, some detectives asked participants to describe in

detail the layout of the restaurant, but since liars also had been in the restaurant, they were also able to do this, negating possible differences between truth tellers and liars.

A possible explanation for asking –for lie detection purposes- the wrong questions is the lack of training in the UK in lie detection. Reading police interview manuals suggest that in the US lie detection plays an important role in training (Inbau, Reid, Buckley, & Jayne, 2013) –albeit of poor quality according to experimental research by Kassin and Fong (1999) and Mann, Vrij, and Bull (2004) - but, as our trainees told us, lie detection training does not take place in the UK. The trainees reported that they have been taught that cues to deceit are generally unreliable (a statement backed up by research) and that they are instructed to focus on eliciting information instead.

Difficulties in Training

The police training literature contains warnings about the difficulties of training investigative interview techniques and to make sure that trainees subsequently introduce them into their work practice (Powell et al, 2005). We experienced such difficulties. As our findings indicated, although the police detectives thought that they had implemented our techniques in the way we taught them, this often did not appear to be the case. This is a common finding in police research where, for example, a correlation of $r = .04$ ($p = .76$) has been found between police officers' proportion of asking open-ended questions and their self rating of their performance (Wright, Powell, & Ridge, 2007). Poor meta-cognition about someone's own performance or about what someone has learned hampers possible positive effects of training.

Powell et al. (2005) reviewed the effects of investigative interviewing training and concluded that in the most successful training studies the training was typically distributed over several day-long sessions separated by a break of several weeks and extending over an expansive period (e.g., 12 months). Another indicator of success was that participants

received expert feedback and instruction as a group as well as in individual sessions.

Although we gave the trainees instructions on how to incorporate our methods into their investigative interviews, we did not practice this in the training, so no expert feedback was given or individual sessions held. A final indicator of success is giving examples of good practice. Although in the training we showed videotapes of our interviews, the focus was more on listening to the answers the examinees gave to decipher deceit than on the exact formulation of the questions that elicited these answers. Another challenge is to ensure that trainees will not fall back to their common practice over time, a problem that can only be overcome by having refreshment training courses periodically (Powell et al., 2005).

Methodological Consideration

Due to the limited number of police detectives available to us (it is not easy to recruit police detectives to take part in a full-day event, given their busy schedules and other work commitments), we employed a within-subjects design and requested police detectives to interview mock suspects both pre-training and post-training. We do not think that this is problematic. A possible disadvantage is a rehearsal effect in interviewing suspects. That argument would have made sense for novice interviewers or layperson interviewers, but not for experienced police detectives who frequently carry out suspect interviews. In addition, we deliberately introduced two scenarios so that the detectives were investigating entirely different mock-crimes in the pre- and post training interviews. (This meant that the data could not be analysed with a full-within subjects design, but we felt that this was a compromise worth making.) Finally, we only gave the police detectives feedback about their veracity judgements in the mock-interviews after the post-training interview. The absence of feedback after the pre-training interview makes it unlikely that they learned anything from these initial interviews.

Practical Application

The study showed that a one-day cognitive lie detection training session yields positive effects in terms of the ability to detect truths and lies and eliciting information. We believe that this training could be a useful addition to police training in countries where no training in lie detection is provided (such as the UK). The fact that this training is based on psychological theory and research makes it more beneficial than many other lie detection training programmes available on the market and taught to practitioners, which have no such sound underpinning.

The current study also revealed limitations, particularly that the police detectives often thought they had implemented our techniques when they in fact hadn't, and their inability to ask questions that elicited different amounts of detail from truth tellers and liars. To overcome these limitations a longer training session is required which would pay more attention to these two points through demonstrations, exercises and face-to-face interactive sessions.

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Table 1. *Interviewers' Evaluation of the Taught Techniques*

	Used in study (N)
Imposing cognitive load	
Reverse order (Recall an event in reverse chronological order.)	10
Secondary task (Carry out two tasks simultaneously: Story telling and a second independent task.)	12
Forced turn-taking (One interviewee starts answering the question, and after a short period of time a second interviewee is asked to continue with the story. After a short period of time a third person (or the first person again) is asked to continue the story, and so on.)	0
Encouraging interviewees to say more	
Model statement (Let the interviewee listen to a very detailed answer to a question unrelated to the event under investigation.)	12
Supportive interviewer (An interviewer who smiles and nods his/her head.)	13
Mimicry (The interviewer mimics the posture/seating position of the interviewee.)	9
Drawings (Request to sketch -for example a location or an object- rather than providing a verbal recall of that location or object.)	21
Asking unexpected questions	
Spatial questions (Questions about the spatial arrangement of people and objects: 'Where did you and your friend sit in the restaurant?', 'Standing in the doorway looking to your left. What you could see?')	17
Processes versus outcomes (Outcomes refer to the end result: 'What are you going to do tonight?', 'What is the purpose of your trip?', whereas processes refer to reaching this end result: 'What made you decide to go to this particular film tonight?', 'What did you do to plan this trip?')	7
Asking the same question twice in a different format (Ask someone to (i) verbally recall the layout of a location followed by the request to (ii) sketch the layout of that location.)	17

Appendix 1. Information about the Training Workshop and Procedure.

Pitfalls in lie detection: Difficulties

- a cue akin to Pinocchio's growing nose does not exist
- liars try to fool investigators through countermeasures
- liars embed their lies in truthful stories
- lack of adequate feedback about the accuracy of veracity judgements made in real life
- some people are good liars

Pitfalls in lie detection: Errors

- the incorrect use of heuristics
- paying attention to the wrong cues (e.g., increase of movements whereas liars typically move less than truth tellers)
- the Othello error - interpretation of signs of nervousness in truth tellers as a sign of deceit
- overemphasis on nonverbal cues
- failing to take into account inter- and intra-individual differences

Demonstrations, videos and exercises used in the training workshop

Demonstrations

- A demonstration showing that hard thinking leads to a decrease in movements (Pitfalls section).
- A demonstration showing that people are typically unaware of being mimicked (Opportunities section).

Videos

- Videos showing that Bill Clinton blinked less when he lied compared to telling the truth (Pitfalls section).
- Videos showing that in specific interview situations liars tend to move less than truth tellers (Pitfalls section). Videos based on Vrij's (1993, 1994, 1995) research paradigm.
- Videos showing the effect of turn-taking on truth-telling and lying pairs (Opportunities section). Videos based on Vernham, Vrij, Mann, Leal, and Hillman's (2014) research paradigm.
- Videos showing the effect of using a model statement on the amount of information given by truth tellers and liars (Opportunities section). Videos based on Leal, Vrij, Warmelink and Vernham's (2015) research paradigm.

Exercises

- A lie detection test by paying attention to nonverbal behaviour. Two trainees took part as liar and truth teller, the others were observers (Pitfalls section).
- A lie detection test by using the model statement. Two trainees took part as liar and truth teller, the others were observers (Pitfalls section).
- A lie detection test based on observing drawings. The drawings were taken from Vrij et al. (2010) and the trainees were observers.

Background given to the detectives about the two scenarios

Restaurant scenario. A blue computer tablet has been stolen from an office in the last 15 minutes and your role is to examine this crime. The suspect you are going to interview has

either spent the last 15 minutes in a local restaurant called (name restaurant) (truth tellers); or went briefly to that restaurant, stole the computer tablet after leaving that restaurant, and pretend to have stayed in the restaurant for the last 15 minutes (liars). The participant went to the restaurant with a person called Gary to meet another person, Chris, who was not actually there. Your task is two-fold: (1) Try to obtain as much information as possible from the suspect about his/her stay at the restaurant, and (2) decipher whether s/he has taken the computer tablet from an office in this building. Remember, liars also have visited the restaurant, albeit briefly. We will now give you pictures of i) the interior of the restaurant where the suspect has been (truth tellers for about 15 minutes and liars only briefly) and ii) the office from where the computer tablet was taken. Truth tellers are aware that they are suspected of having stolen a computer tablet from this building.

Secret meeting scenario. You are a member of an intelligence agency who is going to interview an individual who has seen video-footage of a secret meeting which is of great importance to the agency but which is now lost. In that meeting a possible location is discussed where to install a spy device. Your task is to obtain as much information as possible about 1) the spy device, and 2) where it will be installed. It could be that the interviewee has been told that s/he can trust you and, if so, the interviewee will give you accurate information. It could also be that the interviewee has been told that s/he cannot trust you and, if so, the interviewee will give you a mixture of accurate and inaccurate information. Although you have no information about the location and device the interviewee is unaware of this and believes that you have some information, but s/he has no idea what this information actually is. S/he has therefore been told that the best strategy is to give you a mixture of accurate and inaccurate information. Your task is two-fold: (1) Try to obtain as

much information about the meeting from the interviewee as possible and (2) decipher whether s/he is lying to you. Remember, liars will not lie to you all the time but will give you a mixture of accurate and inaccurate information.

Instructions given to the interviewees in the restaurant and secret meeting scenarios

Participants in the *restaurant scenario* were taken by a confederate to a certain restaurant under the ruse of meeting another person. When arriving in the restaurant the confederate told the participant that the other person was not there. The confederate bought a drink for the participant and himself and asked the participant to sit down and to wait for him to return (truth tellers) or went back with the participant to the experimenter room, where the experimenter instructed the participant to steal a computer tablet from an office (liars). After 15 minutes the confederate collected the participant (truth teller) from the restaurant and brought the participant to the experimenter room.

Truth tellers were then told a computer tablet was stolen in the building and that they were one of the suspects. They would be interviewed about their whereabouts in the last 15 minutes, the time they were in the restaurant, and were asked to tell the interviewer that they were in the restaurant and to convince the interviewer that they were there.

Liars were also told that they were suspected of having taken the computer tablet and that they would be interviewed about their whereabouts during the last 15 minutes. They were instructed to deny having taken the computer tablet but to tell the interviewer that they were in (name restaurant) during the last 15 minutes (the restaurant they briefly went to with

the experimenter). The reason for staying in the restaurant was that the experimenter asked them to stay there and to wait for him.

Participants in the *secret meeting scenario* took on the role of a security officer and saw video footage of a secret meeting between three people in which a vote was taken on a suitable location to plant a spy device. In the video two locations were discussed and a third location was mentioned but not discussed because one person had to leave. Once the video had finished the participants were allocated to the truth telling or lying condition. *Truth tellers* were informed that the footage they had just watched had disappeared and the agency had launched an investigation. The agency believed they had a mole working for them and it was of the utmost importance that the investigators knew as much detail about the video as they could. Truth tellers were told to fully cooperate with the investigators, to be completely truthful and to answer the questions to the best of their knowledge.

Liars were informed that the footage they had just viewed had disappeared and that the agency had launched an investigation because they needed to know in as much detail as possible what had happened in the video. Liars were told it was now their responsibility to recall that information in an interview, and that the intelligence agency believes they have a mole working for them. This mole could be the investigators the liars are going to talk to so the information cannot be disclosed to them. Liars were told the investigators knew the device would be placed somewhere, but they do not know where. So, above all, they must *not* reveal the location that was selected to hide the spy device and their objective was to mislead the investigators. Liars were told, when asked to describe the location that was *selected*, they must provide some false, decoy information. They were told to use the third location, which was not discussed, as the location that was selected to plant the device. As no information

was provided in the meeting about a third location, liars needed to invent these details. In total, they needed to make up three bits of information: First, the location of the building where the device would be planted. Second, within that building specifically where the device would be planted, and thirdly a reason why it is a suitable location. Liars were also told they needed to mislead the investigators about the device. The investigators know something about the device but they do not have all the details, and it is not clear what they know. Because of this, liars needed to provide *some truthful* and *some false* information about the device. This will help them appear cooperative without having to tell them everything. How much truthful and false information they gave was up to the participants.²

¹ Several techniques cannot be assessed based on transcripts (supportive interviewer and mimicry) and others are not suited to the scenarios we used. That is, forced turn taking can only be employed with pairs of interviewees and ‘process versus outcomes’ is only suitable when people plan their actions. A secondary task was never employed. ‘Asking the same question twice in a different format’ only occurred in a normal order – versus reversed order and normal order versus drawings format and that was already accounted for in the coding under those two headings.

² In this study truth tellers and liars were given detailed instructions. In the restaurant scenario truth tellers were instructed to report that they spent time in the restaurant (rather than being given the vaguer instruction ‘to demonstrate their innocence’) and in the secret meeting scenario they were instructed to be ‘completely’ truthful. We gave the explicit instruction in the restaurant scenario because we were afraid that not all truth tellers would understand what to do if they were simply asked to ‘demonstrate their innocence’ which, subsequently, would introduce experimental noise. In intelligence settings it is often desirable that agents from the

same agency are entirely truthful to each other and we wanted to reflect that situation. Of course, this does not imply that all truth tellers told the interviewers all they remembered. Research has demonstrated that cooperative witnesses often do not provide all the information they remember (Vrij, Fisher, & Hope, 2014).

Liars in the restaurant scenario were instructed to say that they had been in the restaurant and in the secret meeting scenario they were instructed to tell a mixture of truths and lies. The instruction in the restaurant scenario was given so that we could compare the truth tellers' and liars' stories, and that it would not be obvious to the detective who would be lying (without such an instruction, liars who denied having been to the restaurant would then be easily and correctly classified as liars). The liars in the secret meeting scenario were instructed to provide some truthful information because (i) they were instructed to appear cooperative and (ii) were told that the investigator had some information about the meeting they had witnessed. Such a situation (the interviewee's task is to appear cooperative and the interviewer may have information about the topic of investigation) is common in intelligence interviews (Vrij & Granhag, 2014). Of course, this means that we gave liars in the secret meeting scenario a difficult task to complete. However, the difficulty of the truth tellers' task should not be underestimated either, as they were instructed to remember and subsequently report back details of a meeting in which quite a lot of information was provided.

We instructed the police detectives after the training to implement, where possible, some of the techniques they had learnt during the training. We did not give them a stricter instruction (implement as many techniques as you can in the interview). The reason was that this would make the interviewing forced and artificial, something we wanted to avoid. Of course, this means that we do not know why the detectives did not use all the techniques:

Was it the case that they did not comprehend them sufficiently to implement them or did they think it was not appropriate or necessary to implement them?