Eliciting information and cues to deception using a Model Statement:

Examining the effect of presentation modality

Abstract: (144)

Forensic interviewing involves gathering information from a suspect or eyewitness. Administering a Model Statement during an interview results in greater information elicitation, which can enhance lie-detection. Typically, a Model Statement is a highly detailed statement, on an unrelated topic to that of the interview. This study examined the effect of manipulating the modality of the MS, either by allowing participants to listen to (Audio-MS), or read (Written-MS) a Model Statement. A total of 162 (81 truth tellers, 81 liars) participants were randomly allocated to one of three interviewing conditions where they received either the Audio-MS, Written-MS, or No-MS (control condition). Truth tellers honestly reported a 'spy' mission, whereas liars performed a covert mission, and lied about their activities. Results showed both Model Statements were equally more effective at eliciting information and facilitating lie-detection, compared to a control condition. Theoretical and practical implications are discussed.

Key words: Model Statement; lie-detection; investigative interviewing; information gathering, modality

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If conversation partners do not know each other well, as is typical in forensic interviewing, they tend to provide short answers (Fisher, Milne, & Bull, 2011). This makes lie-detection difficult as verbal differences between truth tellers and liars are more likely to occur in longer statements (Vrij, Mann, Kristen, & Fisher, 2007). Proactively eliciting more information from interviewees can theoretically magnify such veracity differences (Vrij, Fisher, & Blank, 2015; Vrij, Fisher, Blank, Leal, & Mann, 2016). One technique for eliciting more detailed information from interviewees is via the Model Statement (Leal, Vrij, Warmelik, Vernham, & Fisher, 2015).

The Model Statement itself is a detailed example of a statement, on an unrelated topic to that of the interview, designed to modify the interviewee's expectations of the amount of detail required from their account**.** The Model Statement achieves this by directing attention to the social norm (and communication maxim) 'be sufficiently detailed' (see Eriksson, Strimling & Coultas, 2015; Grice, 1975) by providing a concrete and highly detailed exemplar of the level of detail the interviewee should provide (Harvey, Vrij, Leal, Lafferty, & Nahari, 2017; (citation removed for blind review)). Theoretically, in the absence of objective information, interviewees will compare themselves to others (Festinger, 1954). Thus, when interviewees do not know the required level of detail to report, the Model Statement should be used as a point of reference (Harvey et al, 2017; (citation removed for blind review)). Research has shown that interviewees disclose more information after being

presented with a Model Statement compared to control conditions (e.g. Ewens., et al, 2016; Hirn, Fisher, & Carol, 2012; Bogaard, Meijer., & Vrij, 2014 c.f. Brackmann, Otgaar, Roos af Hjelmsäter, & Sauerland, 2017). Therefore, a Model Statement elicits additional information, especially from truth tellers, in alignment with the core objective of interviewing: to obtain as much information from an interviewee as possible (Bull, 2010; Fisher, 2010).

Whereas truth tellers can use their memory to disclose information freely (adopting forthcoming 'tell it as it is' verbal strategies), liars must carefully manipulate the information they disclose to avoid detection, and thus prefer to adopt withholding 'keep the story simple' strategies (Hartwig, Granhag, Stromwall & Doering, 2010). Accordingly, liars may struggle to match the Model Statement's level of detail compared to truth tellers (citation removed for blind review).

Previous research has presented the Model Statement as an audio recording (Leal et al, 2015). However, alternative presentation modalities can be employed, such as a written presentation. There are theoretical reasons to predict that the effectiveness of a Model Statement as an information elicitation technique will vary as a function of presentation modality.

On the one hand, it is possible that an audio (versus written) Model Statement may more effectively draw attention to the norm 'be sufficiently detailed' (Grice, 1975), via acting as a more effective anchor for how detailed the statements should be. Anchoring is a reference point for a judgement that is typically associated with a stimulus or response scale (Markovsky, 1988). Anchoring effects are likely when people estimate quantities not readily available (Oppenheimer, LeBoeuf, & Brewer, 2008) – as is the case with forensic interviewing when individuals must estimate the level of information to provide. Interestingly, anchoring effects are more pronounced when the modality of the anchor and

outcome match (Strack, & Mussweiler, 1997). Conjecturally, the audio Model Statement (anchor in the audio modality) may elicit more detailed statements than the written Model Statement, by matching the modality of the outcome (the interviewee's verbal statement).

On the other hand, anchoring effects can occur even when the modalities of the anchor and outcome differ (Oppenheimer, LeBoeuf, & Brewer, 2008). Furthermore, beyond anchoring effects, the written Model Statement may have additional features that increase its effectiveness relative to the audio Model Statement. Firstly, the delivery modality of a Model Statement may influence the *memorability* of the information presented, as reading and listening involve different cognitive processes (*see;* Penney, 1989). When tested after delays of even a few seconds, human memory appears to have a bias towards remembering information presented in the visual (i.e. written) modality, compared to the acoustic (i.e. auditory) modality (Cohen, Horowitz, & Wolfe, 2009; Larsson & Bäckman, 1998; Sanchez, & Garcia-Rodicio, 2008). Modality literature has also shown that listening (compared to reading) often resulted in more idiosyncratic responses (Kintsch & Kozminsky, 1977), less accurate recall (Bigelow & Poremba, 2014; Lund, 1991), and more confabulations (Walker, 1975). This is perhaps because a higher level of information processing takes place when a subject is reading content, compared to listening to content (Green, 1981; Penney, 1989). As such, a written Model Statement presented at the start of an interview may be better remembered by individuals during the actual interview, and therefore during the interviewees' retrieval attempts. The written Model Statement may therefore provide superior point of reference, because interviewees can better remember how detailed the exemplar objectively was, and therefore how detailed they should be. This rationale should apply to truthful interviewees who pay attention to the Model Statement, as they can adopt forthcoming verbal strategy (Hartwig, Granhag, & Strömwall, 2007).

In contrast, liars are likely to respond differently to a Model Statement. Typically, liars will prepare and rehearse their lies in anticipation of being questioned (Colwell., et al, 2007; Granhag, Andersson, Strömwall, & Hartwig, 2004; Hartwig, Granhag, & Strömwall, 2007). Model Statements provide liars with a clear indication that the level of detail they should provide needs to be greater than anticipated. While deceptive interviewees often have time to prepare their stories in advance, the unanticipated requirement to disclose additional detail requires liars provide spontaneously generated, and unrehearsed, fabricated information. Spontaneous deceptions contain more cues to deception than rehearsed, prepared lies (DePaulo et al, 2003).

The Model Statement (when unanticipated) is only a threat to liars' credibility if they cannot disclose sufficient detail to match it. Therefore, while listening to the Model Statement, astute liars may realise that to appear as innocent, they must provide more detailed information to make their story sound plausible (as seen in Leal., at el, 2015). Ignoring the audio recording, provides liars with additional time and opportunity to add to, finalise, and rehearse their story. We speculate liars find it relatively easy to ignore audio information. However, when presented with a written Model Statement, liars must read the content, and then respond to the challenge of providing additional information, with little (if any) time to plan their story in advance.

Plausibly, the cognitive tasks associated with preparing a statement in advance (i.e. anticipating the questions that will be asked; remembering the general cover story; deciding what additional information to include) may be easier when the Model Statement is presented in an audio format, rather than written format. In the latter case, liars must *actively* engage and read the statement while being watched by an interviewer (making ignoring it difficult), whereas in the former case, liars can *passively* listen to the Model Statement (making ignoring it

easier). As a result of the reduced preparation afforded by a written Model Statement, liars may be forced to disclose more spontaneous statements, containing more cues to deception (DePaulo., et al, 2003; Vrij & Granhag, 2012; Vrij., et al, 2009).

Based upon the above theoretical considerations (and in line with literature), we predict that more information will be elicited when the audio recorded Model Statement (Audio-MS) is presented compared to a control condition (no-MS) (Hypothesis 1A), particularly for truth tellers (Hypothesis 1B). Based on these predictions, veracity classification rates will be higher in the Audio-MS condition compared to the control (Hypothesis 1C).

Similarly, more information will be elicited when the written version of a Model Statement (Written-MS) is presented, compared to a control condition (no-MS) (Hypothesis 2A), particularly for truth tellers (Hypothesis 2B). Based on these predictions, veracity classification rates will be higher in the Written-MS condition compared to the control (Hypothesis 2C).

Finally, a direct comparison of both Model Statements should reveal a stronger effect of information elicitation in the Written-MS condition compared to the Audio-MS condition (Hypothesis 3A), particularly for truth tellers (Hypothesis 3B). Veracity classification rates should be higher in the Written-MS condition compared to the Audio-MS condition (Hypothesis 3C).

Method

Design

A 2 (Veracity: Truth teller vs. Liar) x 3 (Model Statement Modality: Written-MS vs. Audio-MS vs. No-MS) between factors design was used. The No-MS condition contained a standard 'tell me everything' instruction only. The Written-MS and Audio-MS conditions contained the same report everything instruction – with the addition of the Model Statement.

Participants

A power analysis using G*Power (Faul, Erdfelder, Lang & Buchner, 2007; *for justification see* Head, Holman, Lanfear, Kahn, Jennions, 2015), assuming a medium effect size of $f = 0.25$ (a = 0.05) for six groups, indicated a sample size of 158 would be sufficient for an acceptable power of 0.80 (Cohen, 1992). A total of 162 participants (54 females, 108 males) aged between 18 and 60 ($M = 21.90$, $SD = 6.47$, 95% CI [20.89, 22.90]) from the University's student ($n = 150$) and staff communities ($n = 12$) took part in this study. A medium effect size was used as this is typical within the Model Statement literature (e.g. Ewens et al., 2016; citation removed for blind review; Vrij et al, 2017).

The Model Statement

The Model Statements used in this study were a variation of the emphasised spatial and temporal Model Statement created by (citation removed for blind review), and thus is a more detailed iteration of the Model Statement compared to that utilized by Leal and her colleagues (2015). The written and audio recorded Model Statement contained the same content. The Written-MS consisted of 328 words, the Audio-MS

recording played for 1 minute and 51 seconds. The audio recorded Model Statement was narrated by a 28 year old, British, male from the Psychology department. The content of the Written-MS and Audio-MS were entirely the same.

Procedure

Participants were recruited via adverts on the University's online participant pool and through the use of posters. Individuals arrived at the laboratory at pre-arranged times and were informed that the study involved taking part in a secret mission, whereby they would have to report details about this mission to an intelligence officer. Each participant was then given an information sheet about the study and was asked to sign an informed consent form if he/she was happy to take part. After providing informed consent, each participant was randomly assigned to either the truthful or deceptive condition and to a Model Statement condition (*see below*).

Truth tellers (n = 81) were informed that they would take part in an intelligence-gathering mission involving the monitoring of a 'female target' at a nearby location. They were provided with a photograph of the female target they should monitor and instructed to buy a drink in the café where the target was expected to be (after returning the receipt to the experimenter they were reimbursed). Participants were then told that if the target arrived to observe her actions closely but without attracting suspicion. It was explained to them that there was a small window of opportunity in which the target would be at that location, and if she did not arrive within 15 minutes then they should return to the laboratory. In reality, the target never arrived.

Liars (n = 81) were informed that they would take part in an intelligence-gathering mission involving the retrieval of a vital USB stick containing 'sensitive' data. They were instructed to go to a pickup point and to locate an academic book without raising suspicion. Concealed inside the book was the USB stick with 'secret data' on it, which they were instructed to retrieve and return to the experimenter.

Upon completing the mission participants were given a pre-interview questionnaire that collected demographics such as age, gender, and motivation levels 'to what extent do you feel motivated to appear convincing during your interview' (*7-point Likert scale '1- not at all' to '7- completely')*. Next, participants were instructed that they would have to convince the interviewer that they were telling the truth, and if they failed to do so then they would be asked to hand write their statement (this would never occur). Truth tellers were instructed to be honest and report what they remembered from their mission. Liars were instructed not to reveal details of their mission but to come up with a cover story based on bullet points from the truth teller task indicating (i) what the target looked like, (ii) details about the location, (iii) details of any items purchased to avoid suspicion, (iv) the approximate time spent at the location, and (v) to assume the target never arrived. Liars were allowed to freely add details that could encourage the interviewer to believe them. Procedures where liars are provided with information they should use as the bases of a cover story (often a task completed by participants in a truth telling condition) are common in deception research (e.g. Nahari & Vrij, 2014; Granhag, Strömwall & Jonsson, 2003; citation removed for blind review; for a similar comparison see Hudson, Vrij, Akehurst, & Hope, 2019).

All participants were given the opportunity to prepare before the interview. A signification difference emerged between accepting preparation time $\chi^2 = (1, n = 162) = 102.545$, $p = <.001$, Cramer's $V = .863$ (which corresponds to a large effect size, Cohen, 1988) with the

majority of truth tellers (n = 76/81) declining preparation time and the vast majority of liars (n = 69/81) accepting preparation time. Furthermore, for those who decided to prepare themselves, no significant difference emerged between truth tellers (M = 384.20 seconds, SD = 157.56, 95% CI [188.56, 597.83]) and liars (M = 373.14 seconds, SD = 164.17, 95% CI [333.71, 412.58]) for the duration of preparation time, $t(72) = .146$, $p = .885$, d = 0.07, 95% CI [-0.84, 0.97].

After preparation, each participant was then taken to a different room to be interviewed by an 'intelligence officer' (who was blind to veracity conditions). The interviewer was a 24 year old male from the Psychology department. Next, each participant was randomly allocated to one of three conditions: An (i) Audio-MS condition (n = 54), (ii) a Written-MS condition (n = 54), or a (iii) control condition (n = 54) where No-MS was used.

In all conditions, the participants were informed that the interviews would be audio recorded to allow for transcribing. All three interviewing conditions used the same free-recall instruction: "Please could you tell me, in as much detail as you possibly can, everything that happened between the time you left the experimenter next door and the time you returned back to her. Don't worry about repeating yourself and just focus on telling me everything. I will not ask you any further questions so please tell me everything you remember". The Model Statement conditions included one sentence introducing the Model Statement before this question, and one sentence after hearing or reading the model statement, instructing them to take this into account, but everything else remained the same (*see below)*.

Audio-MS

Participants in the audio-MS condition received the following sentence before being played the Model Statement: “Now, I know it’s sometimes difficult to know exactly how much detail I am looking for, so before you provide your answer, I will play a recording of a Model Statement about a race day event. Listen carefully and make a mental note of the amount of details included.” After listening to the Model Statement, the following sentence was used, before the free-recall question: “As you could hear, he included a lot of detail about a lot of different things”.

Written-MS

Participants in the Written-MS condition received the following sentence before being given the Model Statement to read: “Now, I know it’s sometimes difficult to know exactly how much detail I am looking for, so before you provide your answer, I will show you a written Model Statement about a race day event. Read this carefully and make a mental note of the amount of details included.” After reading the Model Statement, the following sentence was used, before the free-recall question: “As you can see, he included a lot of detail about a lot of different things”.

Participants in the Written-MS condition were presented with the Model Statement script to read. The interviewer secretly recorded the time it took each person to read the Model Statement. No differences emerged between truth tellers (M = 58.33, SD = 29.86, 95% CI [44.74, 71.92]), and liars (M = 57.48, SD = 22.72, 95% CI [47.13, 67.82]) in the time it took them to read the written version of the Model Statement, $t(40) = .105$, $p = .917$, $d = 0.03$, 95% CI [-0.50, 0.57]. A Pearson correlation was conducted to determine the relationship between reading time

and correct Multiple-Choice Questions total for liars and truth tellers. No correlation emerged for liars (r = -.2.64, n = 27, p = .192), or truth tellers (r = -.188, n = 27, p = .349).

After the interview

Upon completion of the interview, a post interview questionnaire was provided, which gathered information on motivation levels 'To what extent did you feel motivated to appear convincing during your interview' (7-point Likert scale '1- not at all' to '7- completely'); likelihood of handwriting their statement 'What did you think was the likelihood of having to handwrite your statement' (7-point Likert scale '1- not at all' to '7- completely'); truthfulness rating 'To what extent did you tell the truth during your statement' (percentage scale ranging from 0% to 100%), and whether or not they saw the target in the *café* 'Did you see the target' (yes/no).

Participants in the Model Statement conditions were accessed on how much information they could remember using multiple choice questions, e.g. 'Please circle two of the following, which you heard during the model statement recording' (a) Kath the marketing director took a photo, (b) two cars collide, it was loud, (c) Tom owned the vehicle, the person recalling the event gave him a thumbs up, (d) Jason owned the vehicle, the person recalling the event gave him a thumbs up, (e) there was an ice-cream truck where cold drinks could be purchased. (In the example provided answers [a] and [c] are correct).

Next, participants were asked if they prepared a strategy for the interview and if so to elaborate on this. Finally, participants were debriefed, thanked and compensated for their time.

Coding

All statements were rated by one coder (blind to the experimental conditions) who scored the occurrence of total detail. Total detail refers to the combined total of: i) spatial detail, ii) temporal detail, iii) perceptual detail, iv) and action detail. Spatial details relate to information about locations or the spatial arrangements of people and/or objects, e.g. 'I went towards the café'; temporal details relate to information about when the event happened or explicitly describes a sequence of events, e.g. 'then I ordered a drink'; perceptual details relate to information about what was seen, heard, felt, tasted, and smelt during the described activities, e.g. 'The woman said *"*do you want milk*"*'; and action details relate to information that explicitly describes an action or the process of actions performed by the interviewee, e.g. 'I walked back from the café'.

A second coder (also blind to the experimental conditions) coded a random selection of 30 statements (25%). Inter-rater reliabilities between the two coders for the occurrence frequency of details were measured via intra/class correlation coefficients (ICC). The ICC was high and therefore satisfactory for total detail [ICC] = .876.

One coder read all the strategies reported by the participants and designed a coding scheme system based on these answers. A total of 17 separate answer categories emerged for strategies, and a further eight emerged as reasons why the participant did not prepare a strategy. A second coder, after being informed about the coding scheme, was given a sample of 63 participants' responses to code and place into the appropriate category. The inter-rater reliability between the two coders was good, Kappa = 0.79, 95% CI [0.67, 0.83] (p<0.001). Discrepancies in coding were identified and resolved by both coders, during a meeting.

Results

Analysis Plan

We report the effect size for each ANOVA using Cohen's *f, f*= $\sqrt{[\eta p^2/(1- \eta p^2)]}$, for Model Statement conditions, and we used Cohen's *d* for all other contrasts, as recommended by Lakens (2013) and Cohen (1988). Cohen's *f* is an extension of Cohens *d* which allows for a comparison of more than 2 groups.

Supplementary Analysis.

For additional analysis of veracity manipulation check, tests of motivation, Model Statement manipulation check, target manipulation check, and information manipulation check, see the supplementary analysis section. We provide a verbal description of these results in this section. Truth tellers reported that they predominantly spoke the truth (97.53% $_{truthfulness}$), whereas liars reported that they predominantly lied (9.51% $_{truthfulness}$). The participants were highly motivated to appear convincing during the interview (M = 5.80 on a 7-point Likert scale), with no differences emerging between truth tellers and liars. Truth tellers thought more than liars that they would be believed by the interviewer and liars thought more than truth tellers that they would be asked to produce a handwritten statement. There was no significant difference between truth tellers and liars who reported observing the target.

Participants paid sufficient attention to the Model Statement and answered most multiple-choice questions about them correctly. No difference emerged between truth tellers and liars, or between the Model Statement conditions. Truth tellers said more (in terms of the number of words) than liars. Participants in the No-MS condition used fewer words than those who listened to a Model Statement (Audio-MS), or those who read a Model Statement (Written-MS). The Model Statement conditions did not differ from each other.

Participants in the Model Statement conditions reported that hearing or reading a Model Statement did not make them say more details that they normally would have – had they not received the exemplar. Similarly, participants in the Model Statement condition reported that the Model Statement did not result in them providing less detail than they normally would have. Thus, the Model Statement effectiveness at prompting more details was not recognised by those participants who heard or read it.

Information Manipulation Check

Statement Memorability. Participants were asked to answer a series of multiple-choice questions about the Model Statement content, with '6' as the highest score possible (all answers correct). A 2 (Veracity) x 2 (Model Statement Modality) ANOVA revealed no significant main effects for Veracity, $F = .008$, $p = .928$, $d = 0.02$, 95% CI [0.36, 0.39]. A statistically significant main effect emerged for Model statement modality, $F(1, 104) = 10.19$, $p = .002$, $d = 0.60$, 95% CI [0.21, 0.99], with those in the Written-MS answering more answers correctly ($M = 4.93$, $SD = 1.10$, 95% CI [4.64, 5.21]), than those in the Audio-MS condition ($M = 4.28$, $SD = 1.05$, 95% CI [3.99, 4.56]). This finding was expected, as we predicted that the Written-MS would be more *memorable* than the Audio-MS.

The Veracity X Model Statement modality interaction effect was significant, F (1, 104) = 6.06, p = .015, f = 0.24. Truth tellers answered more questions correctly when they read the Model Statement (Written-MS) (M = 4.67, SD = .83, 95% CI [44.26, 5.07]) than when they heard the Model Statement (Audio-MS) (M = 4.52, SD = 1.16, 95% CI [4.12, 4.92), d = 0.15, 95% CI [0.39, 0.68]. The same was found for liars. Liars answered more questions correctly when they read the Model Statement (Written-MS) (M = 5.19, SD = 1.27, 95% CI [4.78, 5.59]), compared to when they heard the Model Statement (Audio-MS) (M = 4.04, SD = 0.90, 95% CI [3.63, 4.40]) condition, d = 1.75, 95% CI [0.46, 1.60]. This was expected as we proposed that liars would have to pay more attention to the Written-MS, compared to liars who listened to the Model Statement.

Strategies Developed.

We analysed whether or not participants reported preparing a verbal strategy for use during the interview. A significant difference emerged between Veracity conditions for preparing an interview strategy with more liars (n = 38/81, 46.91%) than truth tellers (12/81, 14.81%) reporting to have implemented a strategy, χ^2= (1, n = 162) = 19.556, p = <0.001, Cramer's V = .347.

Out of 17 strategies reported, several were related to the amount or type of information disclosed (see table 1). Liars widely differed in the strategies they reported to use during the interview, but the four most popular strategies reported by liars were to 'embed lies' (19.00%), 'control body language' (16.70%), 'provide spontaneous answers' (14.30%), and 'rehearse a story' (14.30%). Truth tellers overwhelmingly reported using the 'just tell the truth' strategy (77.30%).

As table 2 shows, liars who did not use a strategy often felt they did not know what the interviewer would ask (38.00%) or felt that they did not know any effective strategies to use (33.30%). Truth tellers overwhelmingly reported that they did not use a strategy because they felt they did not need one (81.80%), consistent with the transparency literature (Gilovich, Savitsky, & Medvec, 1998).

[Insert Table 1 about here]

[Insert Table 2 about here]

Hypothesis testing

In addition to reporting Null Hypothesis Significant Testing (NHST), we also used Bayes Factor (BF) scores to determine how strongly our data supported the hypothesis (*see* Dienes, 2016; Wagenmakers, Morey, & Lee, 2016). As table 3 shows, unlike NHST, computing Bayes Factors allows researchers to interpret the strength of evidence for or against a given hypothesis.

[Insert table 3 about here]

Frequency of Total Details.

A 2 (Veracity) X 3 (Model Statement Modality) ANOVA with the frequency of total details as the dependent variable showed a main effect for Veracity, F (1, 156) = 37.29, $p < .001$, $d = 0.92$, 95% CI [.59, 1.24], with truth tellers reporting more total detail than liars. For the means, *SD,* 95% CI, and effect sizes of each experimental condition, see Table 4. Additionally, there was a statistically significant main effect for Model Statement Modality, F (2, 156) = 7.98, $p = .001$, $f = 0.32$. Tukey Post Hoc test revealed that participants in the Audio-MS condition provided

The Written-MS and Audio-MS did not differ from each other, $p = .697$. Thus, Hypothesis 3A was not supported. Bayesian analysis revealed that the data was more in support of the null hypothesis, rather than the alternative hypothesis ($BF_{10} = 0.21$).

There was no interaction effect for Veracity X Model Statement Modality, F (2, 156) = 1.85, $p = .161$, $f = 0.15$. However, this interaction effect was not an appropriate test for Hypothesis 1B and 2B, because the interaction statistic ($p = .170$) may refer to *any* type of interaction. As we predicted a directional effect with specific group differences, a more informative test was required to statistically test for significant differences between truth tellers and liars in each of the three experimental conditions (see Nahari & Ben-Shakhar, 2011). For truth tellers, a significant Model Statement Modality effect occurred, F (2, 78) = 5.45, $p = .006$, $f = 0.37$. Tukey Post Hoc tests revealed that truth tellers in the Audio-MS condition reported more total detail than those in the control condition ($p = .042$). This supports hypothesis 1B. To examine how strongly our data supported the hypothesis, we also calculated a BF score. Bayesian analysis showed *substantial evidence* in support of the alternative hypothesis ($BF_{10} = 4.22$), compared to the null hypothesis.

Truth tellers in the Written-MS condition also provided more total detail than those in the control condition ($p = .007$), thus supporting hypothesis 2B. To examine how strongly our data supported the hypothesis, we also calculated a BF score. Bayesian analysis showed *strong evidence* in support of the alternative hypothesis ($BF_{10} = 19.04$), compared to the null hypothesis. The Audio-MS and Written-MS did not differ significantly, $p = .781$, $BF_{10} = 0.32$, thus Hypothesis 3B was not supported.

For liars, the Model Statement Modality main effect was not significant, F (2, 78) = 2.97, $p = .057$, $f = 0.28$. Tukey Post Hoc tests, revealed no differences within conditions, ALL *P's* > .062. Thus, the Model Statements were no greater than the control condition at eliciting more total details for liars.

[Insert Table 4 about here]

We tested the ability of overall detail to discriminate between truth tellers and liars in the (i) Audio-MS, (ii) Written-MS, and (iii) No–MS conditions by running discriminant analyses. In all cases, *veracity* was the classifying variable. We present the cross validated leave-one-out results.

[Insert Table 5 about here]

In Table 5, particularly interesting for Hypotheses 1C, 2C and 3B, are the comparisons between the Audio-MS, Written-MS and No-MS. As Table 5 shows, in the Audio-MS condition more truth tellers and liars were classified correctly based on total details (75.9%) than in the No-MS condition (64.8%), supporting Hypothesis 1C. In addition, in the Written-MS condition more truth tellers and liars were classified correctly based on total details (70.4%) than in the No-MS condition (64.8%), supporting Hypothesis 2C. The Audio-MS and Written-MS appeared equally effective at classifying veracity, therefore hypothesis 3C could not be supported.

Receiver Operating Characteristic (ROC) analyses

To complement the series of discriminant analyses, we also conducted three ROC analyses for overall detail. This is because, unlike discriminant analysis, the Area Under the Curve (AUC) of a ROC curve (with 1 - specificity, i.e. false positive rate, plotted on the x-axis and sensitivity, i.e. true positive rate plotted on the y-axis) provides a measure of the diagnosticity of the criterion as a whole, and allows for a direct comparison of

all conditions. Figure 1 shows the ROC analysis for the audio Model Statement. Figure 2 shows the ROC analysis for the Written Model Statement. Figure 3 shows the ROC analysis for the control condition.

[figures 1, 2 and 3 about here]

As figures 1-3 show, the AUC was higher for the Audio-MS (AUC = .776, *SE* = .065) and Written-MS (AUC = .825, *SE* = .057), compared to the standard ‘tell me everything’ instruction used in the control condition (AUC = .696, *SE* = .071).

Discussion

This study examined the effect of presentation modality on the Model Statements ability to elicit information, and cues to deception, from honest and deceptive interviewees. Contrary to our predictions, no differences emerged between the classical audio recorded format of a Model Statement, and our new written version**.** That is, both Model Statements were similar in terms of how much detail they elicited from interviewees, which allowed for similar accuracy rates for distinguishing between truth tellers and liars.

We predicted that the written Model Statement would be more effective than the audio recorded version based on the increased attention participants (particularly liars) must use during the interview. Furthermore, we theorised that this attentional increase would enhance the Model Statements memorability (aiding truth tellers), and force more spontaneous detail to be elicited (allowing for deceptive cues to increase).

Typically, in the Model Statement literature participants are provided with an audio recording of a Model Statement (where liars can easily ignore information). This is consistent with the literature showing liars to be as effective at eliciting more information, appearing as convincing as truth tellers (see Leal et al, 2015). We proposed that as liars in the written Model Statement condition must read the Model Statement while being watched by the interviewer, that this will prevent them from ignoring the task and rehearsing or planning for additional spontaneous information – making the written Model Statement more effective for detecting lies. This was predicted because the unanticipated requirement to disclose additional detail requires liars provide spontaneously generated, and unrehearsed information which provide more cues to deception (DePaulo et al, 2003). To test our conjecture, we analysed liars memory performance concerning the Model Statement as a function

of presentation modality. We found that liars answered more questions about the Model Statement correctly in the written condition, compared to those in the audio condition. Thus, although liars who were presented with a written Model Statement did indeed pay more attention to their task (i.e. the Model Statement), this increased memorability did *not* result in enhanced Model Statement effectiveness. It is possible that the task of being more detailed was equally difficult for liars who read a Model Statement compared to those who listen to one. This would be consistent with the finding that liars in both Model Statement conditions provided statements contain fewer details, compared with truth tellers.

On one hand, we predicted that a written format of a Model Statement would be more memorable than an audio recorded version, which should help truth tellers to be more informative. There is a substantial body of empirical research that suggests that written material should be easier to comprehend and remember when compared with an audio format (Bigelow & Poremba, 2014; Cohen, Horowitz, & Wolfe, 2009; Park, 2004). Our data supports this conclusion: we found that interviewees who read the Model Statement remembered more about the Model Statement content (using multiple choice questions) than those who listened. This shows support that the written Model Statement was more rememberable. However, based on our findings, it appears that memorability is *not* a feature responsible for the effectiveness of the Model Statement in eliciting more information.

On the other hand, we conjectured that an audio Model Statement would function as a more effective anchor (compared to the written Model Statement) by better directing interviewees attention to the need to be detailed. Theoretically, individuals need to focus their attention to an anchor in order for it to have an effect (Chapman & Johnson, 2002; Mussweiler & Strack, 1999), therefore an anchors effectiveness should vary as a function of allocated attention. Our findings show that interviewees directed *less* attention to the audio recorded (versus written) Model

Statement. It is therefore especially curious that we found no effect of interview condition on the level of detailed reported by suspects. This suggests that attention allocation is also *not* a feature responsible for the effectiveness of the Model Statement.

Previous research has found that the Model Statement resulted in greater elicitation for *all* interviewees, regardless of their veracity condition (e.g. Bogaard et al., 2014; Ewens et al., 2016; Leal et al., 2015). The current findings break from this pattern. As hypothesised, only truth tellers reported additional information in the Model Statement conditions compared to the control condition where a standard 'tell me everything' instruction was used. This is a novel interaction effect, only reported by one previous study in the deception literature (citation removed for blind review; for similar observations, see Vrij, Leal & Fisher, 2018; Leal, Vrij, Deeb & Jupe, 2018). One possible explanation for this is that the variation in Model Statement content (i.e. type of detail) has a direct effect on interviewees' verbal reporting. (citation removed for blind review) constructed a Model Statement to either be more dense in spatial or temporal information. This study used a variation of their Model Statement, but without specifically emphasised content. As such, this balance of spatial and temporal information may still be more detailed than previously used Model Statements (e.g. Ewens et al., 2016; Leal et al., 2015) and may account for the current findings. Future research should empirically test this hypothesis.

Practical implications

Researchers indicate that the Model Statement technique is being used by police and intelligence officials (Vrij, Leal, Mann, Vernham, & Brankaert, 2015;.Vrij et al., 2018). The Centre for Research and Evidence on Security Threats (CREST) website provides advice on how to

create a Model Statement (see https://crestresearch.ac.uk/resources/model-statement-technique/). Yet, it remains unclear *how* a Model Statement functions. Specifically, the dimensions of a Model Statement used by interviewees to regulate their own statements are not yet known. That is, we do not know which features of a Model Statement are responsible for the information elicitation effect. As the critical features of a Model Statement are unknown, we argue that it is unlikely that a new Model Statement can be created and used in practice without risk. The majority of the Model Statement literature in ineffective at aiding lie-detection (e.g. Ewens et al., 2016; Vrij et al, 2017), with some studies showing that the Model Statement actually helped liars to prepare statements that made them look more like truth tellers (e.g. Bogaard et al., 2014; Harvey et al., 2017; Leal et al., 2015). Future research should address this.

Study limitations

In the current study liars were asked to create a fabrication based on a cover. However, empirical research has shown that when liars have the chance, their preferred strategy is to create fabricated statements by embedding lies within genuine truthful information (Leins, Fisher, & Ross, 2013). Our data shows that some liars used an embedding strategy - reporting that 9.51% of their statement was constructed using truthful information. Additionally, the most popular strategy reported by liars (19%) was to embed their lies within truth. However, we should acknowledge that in certain scenarios, liars will be able to use embedding strategies more readily, and therefore the findings of the current study may not necessarily apply. Future research should explore this possibility.

Conclusion

This study compared the effectiveness of two Model Statements, specifically a written version of the Model Statement, compared to the classical audio recorded format. This research extends the existing literature in three critical respects. First, Model Statements presented using ether written or audio format affected the verbal behaviour of interviewees equally. This was despite the written Model Statement being more memorable, and suggests that this dimension of the Model Statement is not critical to its success as an information elicitation technique and/or lie detection aid. Second, the Model Statements in this study affected truth tellers and liars differently, facilitating lie detection. This finding was in contrast to previous research showing both truth tellers *and* liars report more information after a Model Statement (Leal et al., 2015; Ewens et al., 2016; Harvey et al., 2017; see Vrij et al., 2018). Third, these results demonstrate a need for researchers to identify the mechanism by which the Model Statement elicits information from interviewees. To provide robust principals directing optimal Model Statement construction and usage, researchers should identify the features of a Model Statement used by interviewees to calibrate their own verbal output. Therefore, although practitioners may find the Model Statement technique useful in the field, the scientific mechanism and/or features underpinning its effectiveness remains unknown and open to further investigation.

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Table 1. *Interviewees self-reported strategies as a function of veracity.*

Liars (*n* = 42)			**Truth tellers (*n* = 22)**		
Developed Strategy	Frequency†	Percentage	Developed strategy	Frequency	Percentage
Embedding	8	19.0	Just 'tell the truth'	17	77.3
Report minimal detail	1	2.4	Maintain eye contact	3	13.6
Report uncheckable details (e.g. emotions)	3	7.1	Report lots of details	1	4.5
Provide plausible details	2	4.8	Provide spontaneous answers	1	4.5
Consistency	3	7.1			
Don't hesitate	1	2.4			
Remain confident	2	4.8			
Maintain eye contact	4	9.5			
Controlled facial expressions	5	11.9			
Control body language	7	16.7			
Provide spontaneous answers	6	14.3			
Rehearse a story	6	14.3			
Pause to imitate remembering	2	4.8			

† The sum exceeds 100.0% as each individual liar could contribute more than one strategy.

Table 2. *Truth tellers and liars rational for not preparing a strategy prior to the interview.*

Liars (*n* = 18)			**Truth tellers (*n* = 44)**		
Developed Strategy	Frequency†	Percentage	Developed strategy	Frequency†	Percentage
Felt they are too complicated	3	16.7	Don't know any	4	9.1
Didn't know what the interviewer would ask	7	38.9	Wanted to be natural	1	2.3
Don't know any strategies	6	33.3	Preferred to be spontaneous	3	6.8
Didn't need one ("as I'm convincing")	3	16.7	Didn't need one ("as I'm convincing")	36	81.8

† The sum exceeds 100.0% as each individual liar could contribute more than one strategy.

Table 3. *Interpretation scheme for the Bayes Factor (BF), as proposed by Jeffrey's (1961) and modified by Lee and Wagenmakers (2013).*

Bayes factor BF_{10}	**Interpretation**
> 100	Extreme evidence for H_1
30 – 100	Very strong evidence for H_1
10 – 30	Strong evidence for H_1
3 – 10	Moderate evidence for H_1
1 – 3	Anecdotal evidence for H_1
1	No evidence
1/3 – 1	Anecdotal evidence for H_0
1/3 – 1/10	Moderate evidence for H_0
1/10 – 1/30	Strong evidence for H_0
1/30 – 1/100	Very strong evidence for H_0
< 1/100	Extreme evidence for H_0

Table 4. *Total amount of detail reported as a function of veracity and interviewing condition.*

		Truth teller	Liar	Total
Audio-MS	*M*	108.22	61.59	84.91
	SD	63.55	34.36	55.81
	95% CI	[90.50, 125.95]	[43.87, 79.32]	[72.37, 97.44]
	$t(40.01) = 3.35$, $p = .001$, $d = 0.91$, 95% CI [.34, 1.46], $BF_{10} = 22.26$			
Written-MS	*M*	118.89	57.93	88.41
	SD	64.55	34.95	59.91
	95% CI	[101.16, 136.61]	[40.20, 75.65]	[75.87, 100.94]
	$t(40.04) = 4.32$ $p > .001$, $d = 1.19$, 95% CI [.59, 1.75], $BF_{10} = 296.60$			
No-MS	*M*	69.07	42.44	55.76
	SD	45.00	20.30	37.10
	95% CI	[51.45, 86.80]	[40.20, 75.65]	[43.23, 68.29]
	$t(36.16) = 2.80$, $p = .007$, $d = 0.76$, 95% CI [.20, 1.30], $BF_{10} = 6.27$			

Note: Bayes Factor was conducted to show support for the prediction that truth tellers would provide more overall detail than liars.

Table 5. *Discriminant analysis for the frequency of Total Detail as a Function of Model Statement Modality*

	Accuracy rate			Wilks Lamba	Chi square	Canonical Correlation	P value	F value
	Truths (%)	Lies (%)	Total (%)					
Audio Model Statement	59.3	88.9	**75.9**	.822	10.084	.422	.001**	11.248
Written Model Statement	59.3	81.5	**70.4**	.736	15.766	.514	<.001***	18.625
No Model Statement [control]	48.1	81.5	**64.8**	.869	7.246	.362	.007*	7.856

Note: Accuracy rates from significant discriminant function appear in *** 0.05, ** 0.01, *** 0.001**

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Figure 1. ROC curve with (AUC) for total detail in the audio Model Statement condition.

Figure 2. ROC curve with (AUC) for total detail in the written Model Statement condition.

Figure 3. ROC curve with (AUC) for total detail in the control condition.