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Combining Strategic Shifts and Comparable Ground-Truth Baseline Investigative Interviewing Techniques to Enhance Information Gathering and Facilitate Lie Detection

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A B S T R A C T

Background/aim: Lie detection is a difficult task, hence investigative interviewing techniques have been developed to facilitate it. In the present study, we combined two investigative interviewing approaches, the Shift of Strategy (SoS) and the Comparable Truth Baseline (CTB), to improve information elicitation and lie detection. *Method:* Participants underwent a three-phase interview about a mock criminal organisation. Mock truth tellers were instructed to be honest throughout, while lie tellers were instructed to be honest in the first phase (CTB) but to lie in the second phase (when SoS was applied) and in the third phase (when questioning without available evidence took place). *Results:* Findings revealed that lie tellers displayed significantly more statement-evidence inconsistencies than mock truth tellers during the SoS phase (Phase 2), but no difference appeared for within-statement inconsistencies. Furthermore, when considering only the free recalls (i.e., excluding the direct questions), mock truth tellers revealed a consistent number of pieces of information throughout the interview in the three free recalls, whereas lie tellers exhibited a marked decrease in the number of revealed pieces of information during Phases 2 and 3 compared to Phase 1 resulting in a significant quadratic effect. *Conclusions:* Our findings suggest that the combination of SoS and CTB shows potential for lie detection purposes but not for increasing the detailedness of interviewees' statements.

Combinando las técnicas de entrevista investigativa de cambio de estrategia y línea base para mejorar la obtención de información y facilitar la detección de mentiras

Palabras clave:
Obtención de información
Cambio de estrategia
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Uso estratégico de pruebas
Línea base de verdades comparables

R E S U M E N

Antecedentes/objetivo: La detección de mentiras es una tarea compleja, de ahí que se hayan desarrollado técnicas de entrevista investigativa para facilitarla. En este estudio se combinan dos enfoques de entrevista investigativa, el Cambio de Estrategia (CE) y la Línea Base de Verdades Comparables (LBVC), para mejorar la obtención de información y la detección de mentiras. *Método:* Se sometió a los participantes a una entrevista en tres fases sobre una organización delictiva simulada. Los participantes de la condición de testigos simulados que decían la verdad fueron instruidos para que fueran honestos en todas las fases y y a los del grupo de personas instruidas para mentir a ser honestos en la primera fase (LBVC) y mentir en la segunda (CE) y tercera fases (cuando se puso en duda su testimonio sin que existieran pruebas de ello). *Resultados:* Los resultados mostraron que los participantes de la condición de mentira prestaban declaraciones más inconsistentes con las pruebas que los participantes de la condición que decía la verdad durante la fase de LBVC (fase 2) pero no había diferencias en la consistencia interna de las declaraciones. Por otra parte, al considerar solo el recuerdo libre (es decir, excluyendo las preguntas directas) participantes simulados que decían la verdad relataron un número coherente de fragmentos de información en todas las fases de entrevista de recuerdo libre, mientras que los que mentían evidenciaron un descenso pronunciado en el número de fragmentos de información obtenidos durante las fases 2 y 3 en comparación con la fase 1, dando lugar a un efecto cuadrático significativo. *Conclusiones:* Los resultados sugieren que la combinación de las técnicas de entrevista investigativa CE y LBVC es potencialmente útil para detectar mentiras, pero no para aumentar la cantidad de detalles en las declaraciones de los entrevistados.

Several decades ago, psychologists, criminologists, and other scholars began to study deception and how to detect it. Initially, most studies explored whether there were specific cues in the body, face, and words that could help assess credibility (Vrij, 2008). Meta-analyses showed that nonverbal behaviour is not effective for lie detection, whilst verbal content has potential (Amado et al., 2015; Amado et al., 2016; Bond & DePaulo, 2006; Gancedo et al., 2021; Hauch et al., 2017; Hauch et al., 2016). See Vrij et al. (2022) for a review of these meta-analyses.

One interviewing technique that focuses on interviewees' verbal responses is the Strategic Use of Evidence (SUE) (Granhag & Hartwig, 2008, 2014), which can be used when the interviewer possesses

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evidence related to the crime (e.g., finger prints, CCTV footage). In a SUE interview, the interviewer asks questions related to the evidence they possess without presenting this evidence to the interviewee early in the interview (i.e. "Where were you today between 1 and 2 pm?" when CCTV footage shows that the suspect visited a specific shop during the time of a theft). The aim of SUE is to assess whether the interviewee's responses are in alignment or inconsistent with the available evidence. The statements of guilty suspects typically include more inconsistencies with the available evidence than the statements of innocent suspects (Granhag & Hartwig, 2014; Oleszkiewicz & Watson, 2021). Additionally, according to SUE, within-statement inconsistencies are also more likely to occur in lie tellers than in truth tellers. Within-statement inconsistencies occur when interviewees adapt their story once they believe an interviewer possesses evidence to align their statements with that believed evidence.

SUE's main aim is to elicit inconsistencies (both between evidence and statements and within statements) for lie detection purposes. Another important aim of an interview is to gather new information from the source. For this reason Luke and Granhag (2023) developed the Shift of Strategy approach (SoS). According to SoS, guilty suspects employ various strategies during an interview, such as omitting information that could incriminate them (Leal et al., 2023; Leal et al., 2024; Vrij et al., 2025) or distorting details to convince the investigator that they are telling the truth (Granhag & Hartwig, 2008, 2014). To do so, guilty suspects "gauge" what evidence the interviewer possesses against them and adapt their statement accordingly so that their statement is in alignment with the evidence they think the interviewer has. If interviewers effectively give the impression of holding more evidence than they do, a lying interviewee, to appear cooperative, might provide additional information that they believe is already known to the interviewer, although this is not the case.

SoS builds on the SUE framework by extending its strategic evidence disclosure approach. By presenting evidence strategically, SUE aims to elicit statement-evidence and within-statements inconsistencies for lie detection, whereas SoS aims to move interviewees from a withholding or denial strategy to a forthcoming and cooperative strategy. SoS is promising, because it aims to detect lies in the same way as SUE does and to collect new information from suspects (Luke & Granhag, 2023).

When considering collecting new information from suspects, SoS lie detection is possible only for information about which the interviewer already holds information (through the statement-evidence and within-statement inconsistencies components). No indication is given as to how the interviewer should assess veracity of the additional information provided by an interviewee about which the interviewer does not possess evidence. This means that for this purpose SoS must be employed together with existing lie detection tools and approaches that do not rely on evidence.

Verbal cues do discriminate between truth tellers and lie tellers. For example, truth tellers tend to provide more details than lie tellers (Hauch et al., 2017; Verschuere et al., 2023; Vrij et al., 2021). Yet, analyses of verbal cues to detect deceit can be problematic. One problem is how to account for interpersonal differences (Vrij, 2016). Research has shown that different people prefer to lie in different ways (Fernandes et al., 2023; Palena et al., 2021; Palena et al., 2023) and that several factors (e.g., sender, receiver, context) affect lie judgments (Caso et al., 2023; Caso et al., 2018; Levine et al., 2011). Efforts have been made to reduce the effects of interpersonal differences. One approach is the use of a Comparable Truth Baseline (CTB; see Vrij, 2016). The approach consists of an interviewer first obtaining a baseline of how interviewees speak and behave when telling the truth (the CTB statement) and then questioning the interviewee about the event under investigation (the target statement). The CTB and target statements are then compared. The CTB and the target statement must be comparable in terms of topic, stakes, emotional and cognitive involvement (Vrij, 2016) because these factors may influence speech. When the CTB and target statements are comparable, it is assumed that differences between the two statements could be indicative of deception with lie tellers more likely to show differences than truth tellers.

Research has shown that CTB results in veracity differences (Bogaard et al., 2022, 2023; Palena et al., 2018; Tomas et al., 2021; Verigin et al., 2021; Verigin et al., 2020). Also, CTB improves observers' lie detection accuracy both with laypeople (Bogaard et al., 2023; Bogaard et al., 2022; Caso, Palena, Vrij, et al., 2019) and police officers (Caso, Palena, Carlessi, et al., 2019) as observers.

The present study combined the SoS and CTB approaches in a SoS-CTB protocol to achieve two aims. First, to elicit inconsistencies between interviewees' statements and the evidence held by the interviewer via the SUE/SoS component. Second, to facilitate lie detection for the part of the statement about which the investigator possesses no evidence through the CTB component. This combined protocol includes three phases: a first phase where a CTB truthful baseline is obtained; a SUE/SoS second phase when evidence is presented strategically to elicit inconsistencies and to change the perceptions of the interviewee about the amount of evidence the interviewer possesses; and a third CTB target statement phase, where new information should be obtained about which the interviewer has no evidence thanks to the SUE/SoS phase and where veracity can be assessed through a comparison between this phase with the previous two phases. Our hypothesis was as follows:

*H*1. SoS/CTB combined protocol: There will be an interaction effect between Veracity and Phase on the number of revealed pieces of information. It is expected that i) lie tellers will reveal a higher number of unique pieces of information in Phase 1 than in Phases 2 and 3 and will reveal more unique pieces of information in Phase 3 than in Phase 2 (*H*1a); ii) whereas mock truth tellers will show no significant difference in the number of unique pieces of information reported in all the three phases (*H*1b). The study was preregistered[1] and followed the Helsinki declaration (General Assembly of the World Medical Association, 2014) and ethical approval was obtained from the University where the data were collected.

Method

Participants

Sixty participants (57% females, 43% males) were recruited for this study. Their age (M = 27.15, SD = 10.85, Mdn = 24) ranged from 19 years old to 65 years old; 50% were single, 33% were celibate/unmarried, 10% reported "other" and 7% were married. Regarding education, 47% had a high school diploma, 47% held a bachelor's degree, 3% had a doctorate or specialisation degree, 1.5% possessed a master's degree, and 1.5% had completed a first-level master's program. All participants were proficient in the language in which the interview was conducted.

Procedure and Design

The study used a 2 (Veracity condition: Mock truth tellers vs. Lie tellers, between-subjects) x 3 (Phase of the interview: Phase 1 vs. Phase 2 vs. Phase 3, within-subjects) factorial design. Participants in the truth telling condition were instructed to always tell the truth. Participants in the lie telling condition were instructed to tell the truth during Phase 1 but to lie during Phases 2 and 3 (see below). Because the reported information was learned from a case file rather than personally experienced, the truth tellers are not strictly speaking telling the truth so we refer to them as mock truth tellers. The mock truth tellers were required to reproduce the learned material accurately, whereas lie tellers were required to conceal or alter it. At Phase 1,

participants were interviewed about the activities of the criminal organisation, during Phase 2 about the members of the criminal organisation (other than the leader) and their roles, and during Phase 3 about the leader himself (see below). The dependent variables were: i) the frequency of inconsistencies between participants' statements and the available evidence during Phase 2 (statement-evidence inconsistencies) and ii) the number of pieces of unique information revealed by the interviewees in the three phases.

To determine the required sample size, GPower was used (Faul et al., 2007). With a modest effect size (Cohen's $f = 0.20$[2]), an alpha of .05, a power of .90, two groups (veracity conditions) and three-repeated measures (Phases), a total minimum sample size of 56 participants was needed.

Participants were recruited through convenience sampling from a university community, including both students and non-student members of the general population. All participants were instructed to play the role of someone having knowledge about a criminal organisation. Such information was provided to the participants via a casefile that dealt with three main themes: information concerning the activities of the criminal organisation (discussed in Phase 1 of the interview), about its members (discussed in Phase 2 of the interview), and about its leader (discussed in Phase 3 of the interview). Each of the three themes included eight pieces of information. Interviewers had information about all eight pieces of information for the criminal organisation discussed in Phase 1 and about four pieces of information for the members discussed in Phase 2. Interviewers had no information about the leader discussed in Phase 3.

Participants were randomly assigned to a Veracity condition after finishing reading the case file, ensuring that encoding of the material was not influenced by the veracity instructions. Mock truth tellers were instructed to tell the truth throughout the interview, whilst lie tellers were instructed to tell the truth when discussing the activities of the criminal organisation (Phase 1, which served as the CTB baseline statement), but to lie about the members of the criminal group (Phase 2) and the leader of the criminal group (Phase 3). Specifically, lie tellers were instructed to give the idea that they had no information about the members of the criminal group and its leader, while trying to appear credible. They were not given information what to do or say to appear credible. Once participants confirmed that they understood the instruction, they were taken to the interviewing room.

Interview

The interview started with the interviewer putting the participant at ease, by asking how the participant felt and explaining how the interview would be structured. The interview was split in three sections. In Phase 1, the interviewer asked the interviewee to report in a free recall as much information as possible about the activities of the criminal organisation. This served as the CTB baseline statement. Once participants finished talking, they were asked to report in a free recall as much information as possible about the members of the organisation (Phase 2). Once participants finished talking, the interviewer asked specific questions about each of the eight pieces of information that appeared in the case file. Then, for each of the four pieces of information about which the interviewer held evidence, participants were either informed that their statement was in alignment with the evidence or that there was an inconsistency between their statement and the evidence. In this latter case, the interviewer prompted the interviewee to discuss the inconsistencies (one at a time) in a non-judgmental way (e.g., "The information you provided on […] does not align with the evidence we have. Could you help us understand this difference?"). Hence, the SUE/SoS was applied during Phase 2 to make the participants aware that the interviewer held evidence. In Phase 3, the interviewee was asked to report in a free recall as much information as possible about the leader of the organisation. Once the participant finished talking, the interviewer asked questions about each of the eight pieces of information concerning the leader of the group. Unknown to the interviewee, the interviewer held no evidence about these pieces of information. Therefore, SUE/SoS was applied only in Phase 2 to create the impression that the interviewer possessed evidence about information discussed in Phase 2. We anticipated that this impression would carry over to Phase 3, leading interviewees to believe the interviewer might also have evidence about the leader, even though none existed. This strategic approach was expected to make interviewees more forthcoming (providing more information) in Phase 3 compared to what they had disclosed in Phase 2. In essence, the tactical application of SUE/SoS in Phase 2 was designed to influence interviewee behaviour in the subsequent Phase 3. Phases 1 and 3 were the common procedure in a CTB protocol whereas Phase 2 was the common procedure in a SUE/SoS interview. The innovative aspect of the protocol was to combine the SUE/SoS and CTB approaches.

Post-interview Questionnaire

After the interview, participants were asked to complete a post-interview questionnaire truthfully. Participants were asked to report socio-demographic information (age, gender, marital status and education) and to answer questions regarding each of the 24 pieces of unique information about the criminal organisation. They were then asked to report on Likert-scales ranging from [1] *not at all* to [7] *very much*, their level of motivation to perform well in the interview ("How motivated were you to perform well in the interview?"), preparation for the interview ("How much did you prepare for the interview?"), amount of lying about the activities of the criminal organisation ("How much did you lie during the interview when discussing the activities of the criminal organisation?"), about the members of the organisation ("How much did you lie during the interview when discussing the members of the criminal organisation (other than the leader) and their roles?") and about the leader of the organisation ("How much did you lie during the interview when discussing information about the leader?"), and experienced level of cognitive load during the interview ("How mentally taxing did you find the interview?").

Coding

The dependent variables were the total number of unique pieces of information reported in Phases 1, 2 and 3, and statement-evidence inconsistencies in Phase 2. Pieces of information referred to the 24 pieces of information included in the file the participants read. Statement-evidence inconsistencies were defined as pieces of information contradicting the evidence (e.g., saying that the leader of the criminal organisation drove an Alfa Romeo whilst he drove a Jaguar). The dependent variables were coded by two independent coders who were blind to the experimental hypotheses, experimental conditions and aims of the study. The coders were provided with a checklist that listed all 24 pieces of information included in the file the participants read. Using the checklist, the coders counted the number of (i) unique pieces of information that the interviewees revealed across the three Phases, (ii) statement-evidence inconsistencies in Phase 2, which was the only phase where the interviewer could disclose evidence strategically and identify contradictions between participants' statements and the evidence held, and (iii) within-statement inconsistencies in Phase 2, defined as contradictions with previous statements after evidence disclosure. Inconsistencies were counted only in Phase 2 because this is the only phase were the SUE/SoS was applied.

Table 1. Manipulation Checks

Variable	Mock truth tellers *M* (*SD*) [95% CI]	Lie tellers *M* (*SD*) [95% CI]	*t*	*df*	*p*	*d* [95% CI]
Motivation to perform well	6.10 [5.67, 6.53] (1.16 [0.92, 1.55])	5.93 [5.45, 6.41] (1.28 [1.02, 1.73])	-0.53	57.36	.599	-0.14 [-0.64, 0.37]
Preparation for interview	4.83 [4.22, 5.45] (1.64 [1.31, 2.21])	4.23 [3.66, 4.81] (1.55 [1.23, 2.08])	-1.46	57.79	.151	-0.38 [-0.89, 0.13]
Lying about criminal activities	1.37 [1.01, 1.73] (0.96 [0.77, 1.3])	1.33 [0.88, 1.79] (1.21 [0.97, 1.63])	-0.12	55.19	.907	-0.03 [-0.54, 0.48]
Lying about collaborators	1.20 [0.99, 1.41] (0.55 [0.44, 0.74])	6.23 [5.86, 6.61] (1.01 [0.8, 1.35])	24.03	44.95	< .001	6.20 [4.98, 7.42]
Lying about the boss	1.30 [0.99, 1.61] (0.84 [0.67, 1.12])	6.27 [5.84, 6.69] (1.14 [0.91, 1.54])	19.21	53.15	< .001	4.96 [3.94, 5.98]
Cognitive load during interview	4.23 [3.62, 4.85] (1.65 [1.32, 2.22])	4.93 [4.4, 5.47] (1.44 [1.14, 1.93])	1.75	56.88	.086	0.45 [-0.06, 0.96]
Recall performance	18.93 [17.4, 20.46] (4.09) [3.26, 5.5]	16.10 [14.69, 17.51] (3.77 [3.00, 5.07])	-2.79	57.62	.007	-0.72 [-1.24, -0.20]

Inter-rater reliability was calculated as Intraclass Correlation Coefficients (two-way random, 2, 1). For the number of revealed pieces of unique information, ICC was .96 for Phase 1, .93 for Phase 2 and .97 for Phase 3. For statement-evidence inconsistencies, ICC was .92. For within-statement inconsistencies (used in exploratory analyses, see below), ICC was .91. The ICCs thus indicated good inter-rater agreement.

Data Analysis

All analyses were conducted in R (version 4.5.3). An alpha level of .05 was used as the threshold for statistical significance. As a manipulation check, an ANCOVA was conducted with Veracity as the independent variable, recall performance during Phase 2 as a covariate, and statement-evidence inconsistencies as the dependent variable. An additional exploratory ANCOVA was conducted for within-statement inconsistencies using the same structure. Effect sizes are reported as partial eta squared (η^2_p) for ANCOVAs and Cohen's *d* for group comparisons.

To test *H*1, a linear mixed model (LMM) was conducted with Veracity and Phase as fixed effects, their interaction, and participants' intercepts as a random effect. Recall performance was entered as a time-varying covariate, assessed separately for each phase. An identical LMM was conducted as an exploratory analysis using free recall responses only.

When effects of interest were non-significant, we computed the Bayes Factor (BF_{01}) to quantify evidence in favour of the null hypothesis. Values of BF_{01} between 1 and 3 indicate anecdotal evidence for the null hypothesis, values between 3 and 10 indicate moderate evidence, values above 10 indicate strong evidence, and values of BF01 < 1/3 indicate evidence for the alternative hypothesis (Wagenmakers et al., 2018).

Results

Manipulation Checks

We ran a series of *t*-tests with Veracity as the independent variable and the variables reported in Table 1 as the dependent variables. As Table 1 shows, there was no significant difference for motivation, preparation, and lying about criminal activities, whilst there was a significant difference for lying about the members of the criminal organisation other than the leader and the leader himself. This indicated that our experimental paradigm worked well as lie tellers did lie more than mock truth tellers in Phases 2 and 3, as instructed. Regarding recall performance on the post-interview questionnaire administered after the interview, participants correctly recalled *M* = 17.52 (*SD* = 4.16, 95% CI [16.44, 18.59]) pieces of information out of 24. This measure assessed how much of the case file material participants recalled correctly and was used as a manipulation check and covariate, not as a dependent variable. Unexpectedly, mock truth tellers exhibited significantly better recall performance than lie tellers, with a large effect size (see Table 1). This result could be interpreted considering research on the effects of lying on recall. For example, Otgaar (2018) found that lying negatively affected recall of what interviewees said during the interview. However, it could also be the result of individual differences. We controlled for recall performance in our analyses by introducing it as a covariate. The covariate was not pre-registered because the veracity effect on recall performance was unexpected. When testing the inconsistencies, we entered recall performance during Phase 2 as the covariate; when testing the number of details, we entered three time varying covariates, that is recall performance during Phase 1, Phase 2 and Phase 3. Last, no participant exceeded 2.2 times the IQR, hence no participant was deemed as an outlier.

As a further manipulation check, an ANCOVA was conducted with Veracity (truthful vs. deceptive) as the independent variable, recall performance during Phase 2 as a covariate, and the number of statement-evidence inconsistencies during Phase 2 as the dependent variable. The analysis revealed a significant Veracity main effect, $F(1, 57) = 134.80$, $p < .001$, $\eta^2_p = .70$[3], with lie tellers (*M* = 3.43, *SD* = 1.10, [95% CI 3.02, 3.85] reporting more statement-evidence inconsistencies than mock truth tellers (*M* = 0.50, *SD* = 0.86, 95% CI [0.18, 0.82], *d* = 2.96, 95% CI [2.21, 3.71], whilst the effect of the covariate was not significant, $F(1, 57) = 2.39$, $p = .127$, $\eta^2_p = .04$. These results indicate that participants complied with the veracity instructions and should therefore be read as a check on the experimental manipulation rather than as a test of the effectiveness of the protocol.

*H*1. Unique Information Across Phases

To test *H*1, a linear mixed model (LMM) was conducted to examine the effects of Veracity (truthful vs. deceptive, between-subjects), Phase (Phase 1, Phase 2, Phase 3, within-subjects), and their interaction on the number of unique pieces of information reported during the interview.[4] Furthermore, we entered recall performance as a time-varying covariate. This was allowed using LMM which, unlike a standard mixed-design ANCOVA assuming a single time-invariant covariate, allows for the use of such time-varying covariates. Participants' intercepts were modelled as a random effect (ICC for the random effect = 14.7%).

Results indicated a significant effect for the time varying covariate, $b = 0.34$, $t(163.13) = 4.32$, $p < .001$ and a significant Phase main effect, (linear: $b = 1.97$, $t(130.61) = 6.45$, $p < .001$; quadratic: $b = -2.20$, $t(120.01) = -7.55$, $p < .001$). The quadratic negative effect suggests an inverted U-shaped curvilinear pattern of information disclosure across phases.

The Veracity main effect was also significant, $b = -0.85$, $t(63.92) = -2.79$, $p < .01$. On average, lie tellers reported more unique information (*M* = 20.87, *SD* = 4.44, 95% CI [19.21, 22.52]) than mock truth tellers (*M* = 19.30, *SD* = 2.83, 95% CI [18.24, 20.36], *d* = 0.42, 95% CI [-0.09, 0.93]) across all phases. Note that the 95% confidence interval of the effect size included '0' which suggests that the Veracity effect was not significant. The Veracity x Phase interaction effect was not significant, (linear: $b = -0.52$, $t(123.90) = -1.24$, $p =$

.218, BF_{01} = 3.22; quadratic: b = 0.71, t(120.97) = 1.71, p = .090, BF_{01} = 1.53), indicating that the pattern of disclosure over time did not differ significantly between veracity groups. Therefore, no follow-up comparisons within each veracity group were conducted. Hypotheses 1a and 1b were thus not supported.

Exploratory Analyses

Within-statement Inconsistencies

The manipulation check focusing on statement-evidence inconsistencies is in line with the prediction made by the SUE/SoS approach, although it mainly reflects compliance with the veracity instructions. Nonetheless, as said above, the SUE framework also predicts the presence of within-statement inconsistencies, as interviewees adapt their stories once they are confronted with statement-evidence inconsistencies. We therefore included an exploratory analysis of within-statement inconsistencies. They reflect contradictions within a single response (Phase 2) and are thought to better capture the cognitive complexity and adjustment behaviours associated with deception than statement-evidence inconsistencies (Granhag & Hartwig, 2008). If SUE/SoS leads lie tellers to adapt their narratives mid-response, such inconsistencies should emerge more frequently among lie tellers.

An ANCOVA was conducted with Veracity (truthful vs. deceptive) as the independent variable, recall performance for Phase 2 as a covariate, and the number of within-statement inconsistencies during Phase 2 as the dependent variable. The analysis revealed a non-significant effect for the covariate, F(1, 57) = 2.19, p = .145, η^2_p = .04. Similarly, the main effect of Veracity was not significant, F(1, 57) = 0.18, p = .670, η^2_p = .00, BF_{01} = 2.55. Lie tellers (M = 0.17, SD = 0.38, 95% CI [0.03, 0.31] reported a similar number of within-statement inconsistencies as mock truth tellers (M = 0.23, SD = 0.77, 95% CI [-0.06, 0.52]), d = -0.11, 95% CI [-0.62, 0.40].

These results suggest that, contrary to the predictions of the SUE/SoS framework, lie tellers did not exhibit more within-statement inconsistencies than mock truth tellers. Specifically, the negligible effect size, the non-significant p-value, and the Bayes Factor all converge to support the absence of a Veracity effect. This indicates that the SUE/SoS manipulation, as implemented in this study, did not elicit the type of narrative instability that within-statement inconsistencies are expected to reflect.

Revealed Information in Free Recall Only

The primary preregistered analysis for $H1$ focused on both free recall and cued recall responses and did not support our hypothesis. Yet, since research has shown that free recall in various formats is crucial to elicit information and assess credibility (Memon et al., 2010; Palena et al., 2024; Paulo et al., 2016), we decided to examine whether free recall alone would yield the predicted effects. An exploratory linear mixed model (LMM) was conducted to examine the effects of Veracity (truthful vs. deceptive, between-subjects), Phase (Phase 1, Phase 2, Phase 3, within-subjects), and their interaction on the number of unique pieces of information reported during the interview but only in the free recalls as dependent variable. Recall performance in the three phases was entered as a time-varying covariate, and participants intercepts were modelled as a random effect (ICC for the random effect = 30.9%). The analysis revealed a significant effect for the time varying covariate, b = 0.50, t(178.31) = 7.14, p < .001 and a significant Phase main effect, (linear: b = -1.16, t(129.19) = -4.67, p < .001; quadratic: b = 1.27, t(119.34) = 5.39, p < .001). The Veracity main effect was also significant, b = 1.12, t(63.05) = 3.72, p < .001, with lie tellers (M = 9.57, SD = 3.77, 95% CI[8.16, 10.98] reporting significantly fewer pieces of information than mock truth tellers (M = 14.37, SD = 4.60, 95% CI [12.65, 16.09], d = -1.14, 95% CI [-1.69, -0.59].

A significant Veracity by Phase interaction also emerged, (linear: b = 1.33, t(123.00) = 3.91, p < .001; quadratic: b = -0.94, t(120.24) = -2.82, p < .01). Follow-up analyses showed that lie tellers provided significantly more pieces of information in Phase 1 than in Phase 2 (p < .001) and Phase 3 (p < .001), whilst the difference between Phases 2 and 3 was not significant (p = 0.289, BF_{01} = 3.30). Mock truth tellers maintained a stable level of number of pieces of information across phases (Phase 1 vs. Phase 2, p = .833, BF_{01} = 5.26; Phase 1 vs. Phase 3, p = 1, BF_{01} =5.00; Phase 2 vs. Phase 3, p = 0.188, BF_{01} = 4.76), see Table 2.

Furthermore, simple effect analyses showed that the linear and the quadratic effects were significant only for lie tellers (mock truth tellers, linear: b = 0.23, t(125) = 0.69, p = .494, BF_{01} = 4.21; quadratic: b = 0.80, t(127) = 1.35, p = .181 BF_{01} = 1.44; lie tellers, linear: b = -1.65, t(135) = -4.57, p < .001; quadratic: b = 3.12, t(125) = 5.29, p < .01).

Although the pre-registered analysis did not reveal a significant Veracity × Phase interaction, thereby not supporting Hypothesis 1, the expected U-shaped pattern for lie tellers predicted by $H1$ emerged in this exploratory analysis focusing exclusively on free recall responses (Figure 1).

Table 2. Mean Number and Standard Deviations (with 95% CIs) of Unique Pieces of Information Provided across the Three Interview Phases (Phase 1, Phase 2, and Phase 3) in Free Recall, Separately for Mock Truth Tellers and Lie Tellers

Veracity	Phase	Mean [95% CI]	*SD*
Lie tellers	1	4.93 [4.25, 5.62]	1.84
	2	2.17 [1.61, 2.72]	1.49
	3	2.47 [1.79, 3.14]	1.81
Mock truth tellers	1	4.77 [4.21, 5.32]	1.48
	2	4.73 [3.91, 5.55]	2.20
	3	4.87 [4.10, 5.63]	2.05

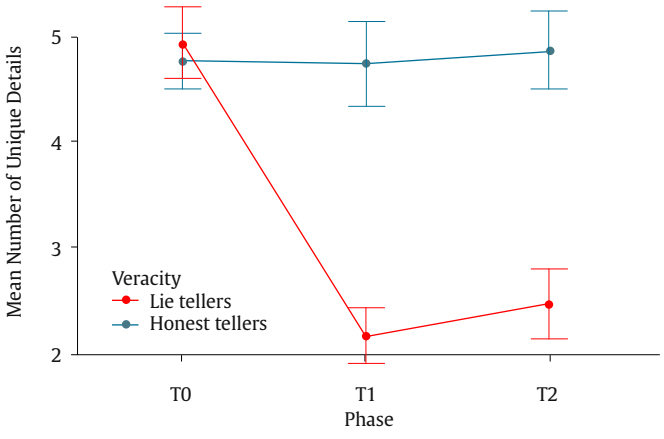


Figure 1. Mean Number of Unique Pieces of Information Reported in Free Recall across the Three Interview Phases for Lie Tellers and Mock Truth Tellers.

Discussion

We found that lie tellers reported more statement-evidence inconsistencies than mock truth tellers. This outcome served as a check on the experimental manipulation rather than as a test of the protocol. This effect could be the result of the veracity instruction where we instructed lie tellers to give the impression that they had no information about the members of the criminal group and its leader.[5] We did not find support for the exploratory prediction since lie tellers reported a similar number of within-statement inconsistencies as mock truth tellers. This latter result

is inconsistent with previous research showing that using SUE, compared to presenting evidence early in the interview, resulted in lie tellers showing more within-statement inconsistencies than mock truth tellers (Granhag et al., 2013).Within-statement inconsistencies are theoretically important in the SUE framework as they are thought to capture the real-time adjustment of deceptive narratives when suspects realise the interviewer possesses incriminating evidence. Several studies have found support for this theoretical assumption. For example, Granhag et al. (2013) found that gradual disclosure of evidence resulted in the highest degree of within-statement inconsistency for guilty suspects compared to early disclosure techniques. Similarly, studies examining small groups of suspects (Granhag et al., 2015) found that late disclosure of evidence encouraged more within-statement inconsistencies in guilty suspects than early disclosure, especially when evidence was strong.

The lack of veracity differences for within-statement inconsistencies in our study could be explained in several ways. First, our specific implementation of the SUE/SoS protocol might not have created sufficient effect on lie tellers to adapt their stories mid-interview. Research by McDougall and Bull (2015) demonstrated that the timing and manner of evidence disclosure significantly affected how suspects adapted their narratives. Specifically, McDougall and Bull suggested that gradual disclosure of evidence affect lie tellers because they tend to modify their accounts during interviews, resulting in more within-statement inconsistencies compared to early disclosure techniques. McDougall and Bull' research suggested that incrementally revealing evidence prompted lie tellers to repeatedly adjust their stories, generating detectable inconsistencies that our protocol may not have effectively elicited. Second, the nature of our mock crime scenario, involving knowledge regarding a criminal organisation rather than a direct personal involvement in a crime, might have made it easier for lie tellers to maintain consistency in their denials without needing to adapt their statements when challenged. Third, our interview protocol might not have incorporated sufficient or appropriate opportunities for lie tellers to modify their statements after evidence was disclosed. Luke and Granhag (2023) found that the specific manner of challenging inconsistencies significantly impacted statement modifications. They argued that non-accusatory challenging of inconsistencies (where interviewers present contradictions in a neutral, non-judgmental manner and invite explanations rather than confronting suspects) is particularly effective in prompting narrative adjustments and revealing within-statement inconsistencies. While our protocol included prompting interviewees to discuss inconsistencies in a non-judgmental way, we may not have sufficiently implemented the specific questioning techniques that encourage suspects to elaborate on and potentially modify their accounts after evidence disclosure. The timing of follow-up questions after presenting inconsistencies, the phrasing of challenges, and the interviewer's demeanour have all been shown by Luke and Granhag to be critical elements in eliciting within-statement inconsistencies. These considerations concern the design of the disclosure procedure and should not be read as a recommendation to increase pressure on interviewees. Our data do not speak to the effects of interviewer pressure. Inconsistencies that emerged only after such pressure would be attributable to the intervention itself rather than to deception and should be avoided.

We did not find the SoS approach to be effective for its primary purpose as predicted in Hypothesis 1: to provide novel information. Instead, lie tellers maintained a withholding strategy throughout the interview. This finding aligns with Oleszkiewicz and Watson's (2021) meta-analytic work, which demonstrated that strategic evidence use does not reliably make interviewees more forthcoming. Similarly, Luke and Granhag (2023) found only limited effectiveness for the SoS approach in eliciting additional information. The consistency of these results across studies suggests that the theoretical framework underlying SoS requires refinement, particularly regarding how suspects perceive and respond to strategic evidence disclosure.

The exploratory analyses on the free recall responses across the three phases revealed differences between mock truth tellers and lie tellers. Mock truth tellers maintained a consistent level of providing information throughout the interview. In contrast, lie tellers showed a marked decrease in the number of pieces of information revealed during Phases 2 and 3 compared to Phase 1 and a significant quadratic trend, although the pairwise comparison between Phases 2 and 3 was not significant. There are at least two explanations for the pattern shown by lie tellers. First, it could be that lying negatively affected recall performance (Otgaar et al., 2018). Second, perhaps lie tellers strategically adopted a withholding strategy to avoid being caught. For example, in CTB studies (Bogaard et al., 2023) lie tellers not only tend to show less detail in the target phase (when they lied) compared to the baseline phase (when they told the truth), but they also disclose less than mock truth tellers overall for multiple reasons: they strategically withhold verifiable details for fear of detection, avoid elaborating on core events that could be checked, and face greater cognitive demands when constructing a deceptive account (Verschuere et al., 2023; Vrij, 2016). Importantly, this occurs even when lie tellers are explicitly instructed to be as detailed as possible (Bogaard et al., 2023). Our current design does not enable us to shed light on which explanation is the most credible, but the results suggest that the strategic explanation played at least a role T.

The difference between Phases 1 and 3 in lie tellers, together with the significant quadratic effect for lie tellers only, suggested that the SoS approach may have strategically affected suspects' verbal behaviour, but not in the manner originally hypothesised. Rather than becoming more forthcoming, lie tellers appeared to become more cautious with providing information after experiencing evidence disclosure.

That this pattern of being reluctant extended to Phase 3 provides a novel theoretical contribution of our study. A drop in volunteering information in the phase after SUE/SoS is employed (Phase 3) compared to the phase before SUE/SoS is employed (Phase 1) indicates deceit whereas the same level of volunteering information between Phases 1 and 3 indicates truthfulness.

Several limitations of our study should be acknowledged. First, our experimental paradigm involved predominantly university students, playing the role of someone with knowledge about a criminal organisation rather than actual suspects with genuine stakes in the interview outcome. This may have influenced their counter-interrogation strategies, particularly regarding within-statement inconsistencies. Relatedly, participants in both conditions reported material learned for the purpose of the study rather than events they had personally experienced. The truth telling condition therefore reflects the accurate reproduction of assigned material and not truthfulness about autobiographical experience, so that the comparison concerns two ways of communicating the same learned content. This has two implications. First, the absence of veracity differences in within-statement inconsistencies may follow from the paradigm itself, because neither group had to reinterpret an autobiographical memory in the light of newly disclosed evidence, unlike participants in studies such as Granhag et al. (2013), who concealed actions they had genuinely performed. Second, the extension of our findings to interviewees who report personally experienced events remains tentative: the observed patterns of disclosure can be cautiously generalised to authentic truth tellers, but replication with paradigms grounded in autobiographical memory is required before firmer conclusions can be drawn. Moreover, our evidence might not have been perceived as sufficiently strong by participants to motivate them to change

their stories. Research by Sellers and Kebbell (2009) indicated that suspect motivation to account for evidence and provide additional information varied based on evidence strength, with stronger evidence prompting greater motivation to explain inconsistencies or adapt narratives or even confess than weaker evidence. If our participants perceived the evidence as relatively weak, this could explain the lack of within-statement inconsistencies and addition of new pieces of information in Phase 3 compared to Phase 2 we observed in lie tellers. Second, our interview protocol used a fixed order of phases (CTB baseline, SUE/SoS, questioning without evidence) which may have created order effects. Future research should consider counterbalancing the topics discussed in each phase to control for potential differences in memorability or saliency across topics. Third, we found that mock truth tellers showed a significantly better recall performance than lie tellers on the post-interview questionnaire. This recall measure is separate from our dependent variable: it assessed retention of the case file material after the interview was completed and was used solely as a covariate to control for individual differences between groups, not as an outcome on which any of our conclusions rest. The source of this group difference remains uncertain: it may reflect individual differences in recall capacity unevenly distributed across conditions despite random assignment, or it may reflect the effect of lying on recall performance, as research has shown that denial can negatively affect recall of interview-related material (Otgaar et al., 2018). Future research should examine whether individual differences in recall capacity, or the act of lying itself, moderate the patterns of information disclosure observed in strategic interviewing paradigms. Fourth, we did not include a no-SUE control condition in the experimental design. We chose not to do this because our focus was on testing whether a combination of SUE/SoS and CTB would be effective in an integrated approach. Future research should include appropriate control conditions to isolate the specific contribution of the SUE technique in this combined interviewing framework and to determine whether the effects we observed are enhanced by the strategic use of evidence or would appear similarly in standard interviewing approaches. Fifth, the time interval between participants receiving the case file and the start of the interview was not systematically recorded. However, recall performance was assessed and included as a (time-varying) covariate in the analyses, which partially accounts for individual differences in familiarity with the material at the time of the interview. Finally, the preregistered protocol included a second experiment in which observers would judge the veracity of senders from the current study, with a coached condition based on a decision rule derived from the predicted U-shaped pattern of information disclosure. As this pattern was not supported in the preregistered analysis, the decision rule cannot be derived and Experiment 2 cannot be implemented as designed. Future research should examine whether the pattern of disclosure emerging from free recall responses identified in the exploratory analyses can serve as a basis for training lie detection observers.

Conclusions

This study was the first attempt to integrate the Shift of Strategy (SoS) and Comparable Truth Baseline (CTB) approaches for enhanced deception detection. Our findings showed that when using a SUE-based approach in Phase 2, lie tellers displayed more statement-evidence inconsistencies than mock truth tellers. Yet, SoS did not induce suspects to become more forthcoming as theorised. Instead, it made lie tellers (but not mock truth tellers) less forthcoming and this reluctance to be forthcoming extended to the phase after SoS was employed: Lie tellers were less forthcoming in the phase after SoS was introduced than in the CTB phase before SoS was introduced whereas SoS had no effect on honest tellers' forthcomingness when comparing the CTB phase with the phase after SoS. In other words, we found that adding CTB to SUE/SoS revealed deceit about new information albeit in a way we did not predict.

Conflict of Interest

The authors of this article declare no conflict of interest.

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Notes

[1]https://osf.io/sp3t8/?viewonly=e04483b72d5149b5851d63fd63b0054f

[2]Although the veracity effect size for the SUE approach was found to be large (d = 1.72, Oleszkiewicz & Watson, 2021), the effect sizes for CTB were usually smaller. Recent studies on CTB have reported effect sizes ranging from small (d = 0.05) to occasionally larger (d = 1.20) (see Bogaard et al., 2022; Palena et al., 2018). For this reason, we decided to enter a smaller effect size (compared to SUE) for the a-priori sample size calculation.

[3]The pre-registered analysis without recall performance as covariate also revealed a significant Veracity main effect, $F(1, 58) = 131.60$, $p < .001$, $\eta^2 = .70$.

[4]The pre-registered analysis without recall performance as a covariate, yielded a significant Phase main effect, $F(2, 171) = 16.14$, $p < .001$, $\eta^2_p = .16$, but not a significant Veracity main effect, $F(1, 171) = 3.37$, $p = .068$, $\eta^2_p = .02$ or a Veracity × Phase interaction effect, $F(2, 171) = 0.76$, $p = .471$, $\eta^2_p = .00$.

[5]In this respect our instruction differed from the typical SUE instruction where no information is given what information lie tellers should not report. This adaptation was motivated by two main considerations. First, standard SUE paradigms involve mock crimes enacted by participants, who are then asked to deny their involvement; in the present study, participants had no personal involvement to deny, as their knowledge of the criminal organisation derived from a case file, so the functional analogue of denial was the concealment of learned information. Second, concealment and omission are arguably more representative than outright denial of the deceptive strategies employed by sources and informants in intelligence and organised crime contexts (Leal et al., 2023; Vrij et al., 2025).

Author contributions

Conceptualisation: First (LuC) and Second (NP) authors. Methodology: First (LuC), Second (NP), and Third (AV) authors. Formal Analysis: First (LuC) and Second (NP) authors. Resources: Second (NP) and Last (LeC) authors. Writing – Original Draft: First (LuC), Second author (NP) and Third (AV) authors. Writing – Review & Editing: All authors. Supervision and Project administration: Last (LeC) authors.

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