The Influences of Gradual and Late Disclosure of Evidence and Guilt and Innocence of a Suspect on Verbal Cues to Deception and Cognitive Load

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Module 12: BSc Thesis

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January 12, 2025

Abstract

Police interviews are an integral part of gathering investigation-relevant information, but the way police interviews are held differs greatly. This study looks at two interviewing tactics, and their roles in cognitive load and assessing deception. Specifically, the effects of evidence disclosure timing (gradual or late) and suspect status (guilty or innocent) on cognitive load and the verbal cues to deception were investigated. Cognitive load was assessed by a questionnaire that captured two elements of cognitive load: the suspect's ability to verbalize their thoughts and memory facilitation. The verbal cues to deception were divided into three categories: the total number of verbal cues, Statement-Evidence Inconsistencies (SEI), and Within Statement Inconsistencies (WSI). The research consisted of online experiments that included a simulated police interview and a questionnaire. Four 2x2 ANOVA's were performed to test the effects, one to test for cognitive load, and the other three for the respective categories of verbal cues to deception. It was found that disclosure timing had no significant effect on cognitive load or on any of the verbal cues related to deception. However, suspect status had a significant effect on cognitive load, the total verbal cues to deception, SEI, and WSI. There was no significant interaction effect of disclosure type and suspect status on cognitive load or verbal cues to deception, and a weak correlation was found between cognitive load and verbal cues to deception. Additionally, a weak correlation was found between the SEIs and WSIs. These findings contribute to research in the police interviewing process by showing that the evidence disclosure type, late or gradual, does not differentiate in impact on cognitive load. Furthermore, they are roughly equally effective in differentiating between innocent and guilty suspects.

The Influences of Gradual and Late Disclosure of Evidence and Guilt and Innocence of a Suspect on Verbal Cues to Deception and Cognitive Load

Police interviews are an essential part of gathering investigation-relevant information. The aim is to build a reliable case, and to avoid mistakenly incriminating an innocent suspect (Chin et al., 2022). In police interviews, detection of deception is necessary to prevent wrongfully assigning guilt to innocent persons. The way deception is detected is essential to how accurate it is. Navarro (2010) highlights this as he found that in 261 post-conviction exonerations police officers, judges, and prosecutors mistook certain body language for lying and guilt. How bad we humans are at lie detection is further emphasized by research, which shows that lay people have about a 50% chance of correctly assigning guilt, and experts are just modestly better (Bond & DePaulo, 2006; Hauch et al., 2016; Meissner & Kassin, 2000). Yet traditional non-verbal approaches are still often used to make veracity judgements, not only in everyday life, but also in some justice systems (Vrij et al., 2019). These non-verbal approaches are unreliable because there is no absolute evidence that these non-verbal cues can exclusively be linked to deception, and not to underlying emotional states such as fear or anxiety (Nortje & Tredoux, 2019). Therefore, research suggests we move away from such non-verbal approaches and indicate that verbal approaches are more promising in assessing veracity (Nortje & Tredoux, 2019; Vrij et al., 2019).

Verbal content can facilitate observers in differentiating between a lie and the truth, the previous 50% accuracy rate of correctly assigning guilt was increased to 63% when observers were exposed to an auditory medium. But when observers were exposed to a visual medium the accuracy rate was 52% (Bond & DePaulo, 2006). This increased accuracy rate was also found in lie-detection training related to speech content (Hauch et al., 2016). Besides increased accuracy rates, verbal content helps reduce lie bias. Removing access to verbal content results in the tendency to judge someone as a liar, because without verbal content observers have to depend on non-verbal stereotypes (Bond & DePaulo, 2006; Vrij et al., 2019).

Verbal Cues to Deception

In this study, the verbal content assessed is statement inconsistencies, which are contradictions a suspect makes when providing their account, and these statement inconsistencies are part of verbal cues to deception. A cue to deception is an observable behavior, expected to vary depending on whether a person is being truthful or deceiving, and they can vary from leg

movement to a person's friendliness to statement inconsistency (DePaulo et al., 2003). So, the statement inconsistencies are verbal cues used to indicate whether someone is lying or being truthful. In this study, two types of statement inconsistencies are researched: Statement-Evidence Inconsistency, or SEI, and Within-Statement Inconsistency, or WSI. SEI refers to a contradiction between what the suspect has stated and the known evidence, while a WSI refers to a contradiction between details provided in a suspect's full account (Oleszkiewicz & Watson, 2020).

Statement inconsistencies made by liars can be maximized by evidence disclosure tactics, to help observers or investigators differentiate between honest and lying suspects. Evidence disclosure is the sharing of known evidence or information with a suspect. The time point at which evidence is disclosed can differ from the beginning of the interview, to the end of the interview, or throughout the interview. The timing of evidence disclosure can play a role in the number of contradictions a suspect makes by managing the flow of information known to the suspect. Besides statement inconsistencies, evidence disclosure tactics also incorporate and influence cognitive load. This will be explained in more detail in the following sections.

Cognitive Load

Cognitive load is described by the APA dictionary (2024) as "the relative demand imposed by a particular task, in terms of mental resources required." Briefly, this means that tasks such as deception, verbalization, and recollection of an event, require mental resources, such as attention. According to the resource view (Wickens, 1991), task performances require resources, but these resources are limited in their availability. When tasks become more difficult, they require more resources, thus increasing cognitive load. Guilty suspects experience increased cognitive load because they perform more tasks that compete for similar resources than innocent suspects do. Additionally, innocent suspects hold the belief that their innocence is apparent, which is manifested in them providing a more detailed account of the event (Dando & Bull 2011; Lerner, 1980). Innocent suspects still experience cognitive load because they also have to recall an event, structure it, and verbalize it into a coherent story. However, research shows that innocent suspects experience cognitive load as less demanding than guilty suspects (Vrij et al., 2008).

This increased cognitive load guilty suspects experience can be observed by their shorter statements, this is assumed to be a result of the increased effort of working memory due to

constructing and verbalizing a deceptive account (Sporer & Schwandt, 2007). Next to shorter statements, guilty suspects also include fewer details in their statements to reduce the likelihood of contradicting themselves or the evidence known by the interviewer (McDougall & Bull, 2014). Additionally, by beginning the interview with fewer details, liars believe they have more flexibility to add detail later in the interview, and time to think about which details to add when asked (Dando & Bull, 2011). Furthermore, deception requires self-monitoring to appear honest, as well as monitoring of the interviewer to see if the lie is believed, this is an additional cognitive process that truth-tellers do not experience (Buller & Burgoon, 1996; DePaulo & Kirkendol, 1989). Finally, the increased cognitive load plays a role in thought suppression, making it harder for a guilty suspect to prevent unwanted thoughts, such as events of the crime, from coming to mind, combining this with having to suppress the urge to tell the truth, a guilty suspect has to be very effortful in verbalizing their account (Spence et al., 2001; Wegner, 1994). Overall, a guilty suspect requires more cognitive effort than an innocent suspect due to the aforementioned additional processes, which is why the working memory and cognitive load might interact with the number of verbal cues to deception (Dando & Bull 2011; McDougall & Bull, 2014).

By increasing the cognitive load in guilty suspects, the inconsistencies in their statements might become more apparent, prompting researchers to incorporate cognitive load in theoretical frameworks.

Strategic Use of Evidence Technique

One technique that incorporates cognitive load in its framework is the Strategic Use of Evidence technique or SUE. This is an interviewing technique where the interviewer withholds all evidence until the end of the interview, extracting a full account from the suspect first, after which evidence is disclosed. As a result, there should be contradictions between the lying suspect's account and the evidence, because SUE's framework differentiates between liars and truth tellers. These contradictions are the Statement-Evidence Inconsistencies, and they form reliable and testable cues to deception (Oleszkiewicz & Watson, 2020).

SUE is built upon the knowledge that liars and truth tellers differ cognitively in two ways: 1. Liars are aware that they are being dishonest, and 2. Liars act deliberately to appear credible which can be experienced as more effortful (DePaulo, 1992; DePaulo et al., 2003). Due to these differences, a liar's cognitive resources may be utilized by attempts to avoid revealing emotions, as well as self-regulation and considerations of the attempts' success (Ekman, 2009).

Theoretical Background of the Strategic Use of Evidence Technique

The theoretical framework of SUE is built upon the theory of self-regulation. SUE uses self-regulation theory to explain why both innocent and guilty suspects engage in self-regulatory activities and why guilty suspects change their strategies (Granhag & Hartwig, 2008; Oleszkiewicz & Watson, 2020). Self-regulation occurs on a day-to-day basis and refers to a dynamic process of deciding on a goal and taking action to achieve said goal, whilst tracking progress throughout the process (Carver & Scheier, 1998). In some events, active and conscious interference is needed to achieve a goal (Inzlicht et al., 2020). For example, when a threat is sensed, self-regulatory strategies are evoked, particularly when there is a lack of knowledge of the threat (Granhag & Hartwig, 2008). Both innocent and guilty suspects will then use strategies to combat the threat, in this context the police interview, to achieve the goal of appearing innocent (Granhag & Hartwig, 2008).

To explain these self-regulatory strategies, SUE differentiates between cognitive and behavioral methods, generally speaking, a suspect can use strategies from both categories to gain either behavioral or cognitive control over the situation (Granhag & Hartwig, 2008). In SUE, however, the focus is on gaining cognitive control, for example by asking for more information when evidence is presented. SUE specifically focuses on two types of cognitive control: information control and decision control. Information control is obtained by gathering information about the threat, aiming to reduce the threat by predicting what will happen. Decision control refers to the perceived control due to decisions made about how to engage with the threat (Granhag & Hartwig, 2008).

Differences Between Guilty and Innocent Suspects' Behavior

Guilty and innocent suspects are the same in the sense that they perceive the police interview as a threat, thus both use self-regulatory strategies, and both aim to gain cognitive control through managing information and decision control (Granhag & Hartwig, 2008).

However, guilty suspects behave differently than innocent suspects. A reason for this is that they face a different problem than innocent suspects. A guilty suspect has more crime-relevant information, when this information becomes known it is clear that they are guilty (Granhag & Hartwig, 2008). Thus, their problem is that all information becomes known to the interviewer, while an innocent suspect wants all information to become known to the interviewer.

Because a guilty suspect holds more crime-relevant information, they will decide (decision control) on what to admit, deny, or avoid during the interview. This decision is partially based on the outcomes of their information control activities, a guilty suspect would not benefit from avoiding a topic that they think the interviewer already knows (Granhag & Hartwig, 2008). This leaves pieces of information of which the guilty suspect is unsure whether it is known by the interviewer. Leaving the guilty suspect with three strategies regarding these crucial pieces of information, namely avoid, not mentioning the piece of evidence when providing the account, deny, denying knowing about the evidence when asked, or escape, refusing to speak after being asked about the evidence (Granhag & Hartwig, 2008; Oleszkiewicz & Watson, 2020). Innocent suspects want all information to become known, so they will not opt for the aforementioned strategies (Granhag & Hartwig, 2008). They use more forthcoming strategies and address critical information directly in their statements (Hartwig et al., 2010).

Apart from using avoidance, denial, and escape strategies, guilty suspects differ from innocent suspects in the way they prepare for a police interview. A guilty suspect tends to prepare the interview, needing to gain information control to avoid self-incrimination and to guide decision control (Granhag & Hartwig, 2008). Whereas an innocent suspect believes their innocence will be clear enough. These differences in strategies and planning are partially why SUE works, by withholding the evidence at first, the guilty suspects are more unsure about what to avoid in their account, whereas this does not affect the innocent suspects.

Because innocent suspects use more forthcoming strategies, they are likely to have fewer inconsistencies in their statements than guilty suspects, who use different strategies and have reduced information control due to information withheld by the interviewer. These statement inconsistencies found in the interviews can be used as a diagnostic cue to deception (McDougall & Bull, 2014). Thus creating a testable and reliable cue to deception (Oleszkiewicz & Watson, 2020).

Tactical Use of Evidence Technique

The Tactical Use of Evidence Technique, or TUE, was developed with a slightly different theoretical framework than SUE. Instead of using SUE's late disclosure, TUE addresses each piece of evidence part by part, which is why it is also referred to as gradual disclosure. In TUE, the suspect is also asked to first provide their story, and then one piece of contrasting evidence is used to challenge the suspect at the time, followed by a request for the suspect to explain the

contradiction (van Beek & Bull, 2023). This process is repeated until all relevant information has been addressed and all evidence has been disclosed (van Beek & Bull, 2023). The gradual disclosure strategy dictates that interviewers constantly throughout the interview reassess how they can reach their goal of an effective and ethical interview, by managing the flow of the information (Dando & Bull, 2011). The TUE strategy suggests that information, whether it is incriminating or not, should be handled independently, meaning that one piece of information does not influence the other, and gradually, meaning that not all information should be revealed at once (Dando & Bull, 2011).

Cognitive Load in TUE

This strategy of independent and gradual handling of pieces of information aims to lower cognitive load in innocent suspects but not in guilty suspects. It is important to lower cognitive load in innocent suspects because performance, so for example the ability to remember details of the event, might be reduced as a result of increased cognitive load (Sisakhti et al., 2021). Cognition literature suggests that to retrieve memories, a summary of characteristic components of a certain event, for example, a robbery is stored in schemata (Sporer, 2016). These schemata do not use individual components, such as closing the door after you entered the house, but a pointer, or memory retrieval cue, to the schema (Graesser, 1981). TUE aims to reduce cognitive load in innocent suspects by facilitating retrieval cues to the schemata throughout the interview.

By handling pieces of information independently, it is aimed to target a specific schema, for example entering the house, without adding cues of other schemas to prevent details from being overlooked. Gradually handling pieces of information aims to build upon previous information and gain more crime-specific information, only going to the next piece of information when the previous has been fully discussed. This prevents suspects from having to go back to a topic, recall the event, remember what they told the interviewer, and then explain the inconsistency, which occurs multiple times in late disclosure, or SUE. Handling pieces of information independently and gradually, should thus reduce the number of statement inconsistencies innocent suspects make, as the memory retrieval cues are provided immediately to help them recall complex information, reducing the cognitive load.

Systematic Use of Evidence Disclosure vs Tactical Use of Evidence Disclosure

To date, there is no clear empirical conclusion on which framework is overall better. Some studies suggest that gradual disclosure leads to more statement inconsistencies than late or

early disclosure (Dando & Bull, 2011; Dando et al., 2015). However other studies found more statement inconsistencies in late disclosure of evidence than in gradual disclosure of evidence (Sorochinski et al., 2014). Additionally, it remains unclear whether TUE actually results in less cognitive load in the innocent suspect (Sandham et al., 2020).

To date, there are few direct comparisons between SUE and TUE, and the limited findings for either framework do not show a clear advantage for either of the strategies (Oleszkiewicz & Watson, 2020). Therefore this study aims to compare late and gradual disclosure of evidence in the number of verbal cues to deception (Statement-Evidence Inconsistencies and Within Statement Inconsistencies) and in the amount of cognitive load.

Hypotheses

It is expected that guilty suspects have a higher number of both types of statement inconsistencies. This is expected because guilty suspects have to rely on internal scripts instead of solely their memory as innocent suspects do, these internal scripts can be hard to follow throughout the interview as more evidence is revealed and thus it is expected that inconsistencies will be present as a result (Chan & Bull, 2014). Secondly, guilty suspects adopt strategies such as avoid, deny, and escape when evidence is addressed, whereas innocent suspects use more forthcoming tactics (Granhag & Hartwig, 2008). As a result, it is expected that guilty suspects are more likely to avoid or deny crucial details resulting in a higher number of total statement inconsistencies.

When evidence is disclosed gradually rather than late, it is expected that more statement inconsistencies are found in suspects' accounts. Because the gradual approach aims to limit a deceptive suspect's verbal options from the beginning of the interview. The evidence is revealed and challenged gradually, which disrupts the deceiving suspect's ability to construct and verbalize a whole and unchallenged account of the evidence (Dando & Bull, 2011). Thus, deceiving suspects will be unable to maintain a consciously created lie script, becoming entwined in their story (Hines et al., 2010; Porter & Yuille, 1996). This results in more statement inconsistencies as the internal script becomes increasingly difficult to follow.

It is expected that guilty suspects experience a higher amount of cognitive load than innocent suspects, as they have to cope with limitations in the working memory when lying because they utilize more mental processes that are competing for resources than innocent suspects (Dando & Bull, 2011; Wickens, 1991). Furthermore, deceivers have to self-monitor to

ensure the deception is believable and deceivers have to monitor the interviewer as well to gauge if the lie is believed, these processes add strain to cognitive load (Buller & Burgoon, 1996; DePaulo & Kirkendol, 1989). As a result, it is expected that guilty suspects will have a higher score on cognitive load than innocent suspects, as innocent suspects should not experience the additional cognitive constraints of deception.

When evidence is exposed late rather than gradually, it is expected that suspects will experience more cognitive load. Because TUE uses gradual disclosure as a way to provide memory retrieval cues, whilst the suspect is still generating the account, reducing the number of statement inconsistencies due to memory errors. But, SUE uses a semi-locked approach, which does not provide memory retrieval cues until the account is fully closed, which can increase the number of statement inconsistencies due to memory errors instead of deception. It is expected that the lack of memory retrieval cues due to SUE's semi-locked approach will result in a higher cognitive load. Mainly, this difference in cognitive load is expected for innocent suspects, and not as strongly for guilty suspects. Because the deceivers view the memory retrieval cues as a threat. The guilty suspects, need to manage their deception, and when a new memory retrieval cue is introduced they need to reflect on what they want to reveal, thus readjusting their decision control and internal script. Thus, these memory retrieval cues are not expected to reduce cognitive load in guilty suspects.

Methods

Design

A 2 (suspect status: guilty or innocent) x 2 (evidence disclosure type: late or gradual) between-participants design was employed to investigate the effects of evidence disclosure type and suspect status on cognitive load and the number of statement inconsistencies (Statement-Evidence Inconsistencies and Within Statement Inconsistencies). Evidence disclosure type refers to the time point at which evidence is revealed to the suspect, where late refers to disclosing evidence after a full account has been taken from the suspect, and gradual refers to disclosing evidence throughout the interview. Statement-Evidence Inconsistencies refer to discrepancies between what a suspect states and the known evidence, whilst Within Statement Inconsistencies refer to discrepancies within a suspect's account. To test the hypotheses, online simulated police interviews were held, after which a survey was conducted.

Participants

The ideal sample size was calculated through a g-power analysis (Faul et al., 2007). To achieve the desired power of .80 in the main analysis and a desired effect size of Cohen's *f* .25, with a significance level of .05, there should be approximately 45 participants (n = 44.59) per condition. The sampling techniques used to recruit participants consisted of a combination of volunteer sampling and snowball sampling, participants were recruited through a database from the University of Twente, or by asking friends and family, and asked to refer the study to others. Participants who signed up through the university's database were rewarded with 1.25 credits. Participants had to be 18 years or older and proficient in English.

In total 68 responses were recorded, 67 participants were included in the analysis. One response was removed as one participant took the survey twice and skipped one of the questions. The sample consisted of 32 males and 35 females, with an age range of 18 to 30 and a mean age of 22.1 years (SD = 2.47). Of these participants 17 were guilty and received late disclosure, 17 were guilty and received gradual disclosure, 16 were innocent and received late disclosure, and finally 17 were innocent and received gradual disclosure.

Materials

Suspect Guilt Manipulation

Participants in the guilty condition got a description of a museum heist, displayed on the survey platform Qualtrics. The description started with a short background story, then the crime crew was introduced with pictures and a short description, finally, the objective of the heist, a painting, was shown after which text messages were displayed. The participants chose a response (2 options) per text message to make the experience more engaging. Throughout the text messages, the plan of the heist day was explained with the key details being: going separately to the museum, public transportation, hiding in the disabled toilet, and the creation of a system that overrules the silent alarm.

Participants in the innocent condition got a description of a museum visit with an introduction of the friend group, instead of a museum heist and crime crew. Other key details were the same, innocent participants also had a background in computer science and engaged in similar activities as the guilty participants, but they had an innocent explanation. The key details were used as pieces of evidence throughout the police interview.

To check whether the participants really read the text messages, a timer was placed by each text message to check how long a participant spent on the page, these timers were not

visible to the participants. If a participant simply skipped through the pages, the timers would indicate that the participant spent less time than the average. No participants were excluded on the basis of these timers.

The interview

Two interview schemes were created, one for gradual disclosure and one for late disclosure, see Appendix A for the full schemes. The schemes were created based on previous studies that used a similar methodology (Hartwig et al., 2014; Luke & Granhag, 2022; Nyström et al., 2024).

The gradual disclosure scheme consisted of three parts, the first part started with the interviewer's opening statement after which the participants described the day they visited the museum. The second part consisted of the interviewer asking the participant about key details, this was done in sequential order. This order is in terms of how proximally evidence connects the suspect to the crime, beginning with evidence that is not directly connected to the crime such as travel method (Oleszkiewicz et al., 2023). If the participant contradicted the evidence, this was challenged by disclosing the evidence, and an explanation was requested. The third and final part consisted of ending the interview, asking the participant if they had more to add, and thanking the participant.

For the late disclosure, after the participant provided their account and answered questions about key details, the suspect locked their account and, the evidence was disclosed. Other than that, the questions, order and introduction/closure were all the same as in the gradual disclosure scheme.

All interviews were conducted and recorded on Teams, and then transcribed on Amberscript.

Questionnaire

A questionnaire was created to operationalize the concept of cognitive load and test the hypothesis regarding cognitive load. Before filling out the questionnaire, participants saw a description that asked them to think about how each item related to their experience in the interview. This questionnaire was designed to capture two elements of cognitive load relevant to information disclosure in interviews; ability to verbalize and memory facilitation. This divide is based on research on cognitive load which argues that cognitive load has multiple factors (Shenhav et al., 2017; Vogels et al., 2014). The ability to verbalize and memory facilitation were

the most important of these factors in explaining cognitive load in the context of investigative interviewing.

Based on these two elements, 11 items were created, six in the category of ability to verbalize and five in the category of memory facilitation. The items were created by looking at definitions of cognitive load, memory elements of cognitive load, and verbalization elements of cognitive load and translating these findings into items. An example item for ability to verbalize is "Sometimes after giving an answer, I wished I could go back and restart or change my answer." An example item for memory facilitation is "I seemed to forget what I already told the interviewer and what I did not." The questionnaire used a 5-point Likert scale, where 1 represented strongly disagree and 5 represented strongly agree, thus how higher the scores, the greater the cognitive load experienced. For a full overview of the cognitive load questionnaire, see Appendix B.

To determine the reliability of the questionnaire, an exploratory factor analysis was conducted, the specific factor loadings of the scale can be found in Appendix C. Additionally, the internal consistency of the questionnaire was analyzed, the Cronbach's Alpha of Factor 1, memory facilitation was .84 and the Cronbach's Alpha of Factor 2, ability to verbalize was .56, the Cronbach's Alpha of the overall scale was .82. This indicates that the items in the scale all measure the construct cognitive load, but the ability to verbalize had a low score, resulting in using the combined scale.

Procedure

The study was approved by the Board of Ethics of the BMS faculty of the University of Twente (approval number: 240758). Throughout the interview there were three different roles, suspect, experimenter, and interviewer. The experimenter had the role of welcoming the participant and closing the study, the interviewer had the role of interviewing the participant, and the suspect was the participant.

After a participant signed up for the study and joined the call, the experimenter welcomed the participants, while the interviewer turned off their camera and microphone to prevent unnecessary noise and distractions. Then the experimenter explained the procedure, offered space for any questions, and asked the participant to indicate consent on the online form.

The participant was randomly assigned to either the innocent or guilty condition by Qualtrics. Whilst the interviewer chose the type of evidence disclosure used, through sequential

allocation. The first participant was given the gradual condition, the next late, and so on. To assure that all conditions were evenly represented in the sample, the order of evidence disclosure type sometimes had to be switched to align with the randomization in Qualtrics.

After indicating consent, the participants were told to read the instructions until they had to enter a password, to prevent the participant from being able to skip forward to the questionnaire without completing the interview. The instructions started with an overview of characters, then background information about the character they were playing, and details of their day. In the guilty condition, the museum heist, the participant stole a painting with a group of people and created a device to deter the alarm system. In the innocent condition, the museum visit, the participant was invited for a job interview at the museum and visited the museum with friends beforehand.

After reading the scenario and information, the participant was again offered to ask any questions and was explicitly asked for permission to record audio and video footage, they were informed that only the audio recording would be used in the study. Then the participant was interviewed by the interviewer, and the experimenter muted themselves and turned off their camera.

At the end of the interview, the participant was thanked and asked if they had something else to add before closing the interview. After which the interview was concluded, and the interviewer turned off the camera and microphone again. The recording of the interview was uploaded to Amberscript for transcription. The transcriptions were later used to count the number of statement inconsistencies for further analysis.

After the interview, the participants were given the password to fill in the questionnaire, which contained questions about rapport, cognitive load, demographics including neurodiversity, and overall experience. Participants also filled in their assigned participant number and condition number. Finally, the participants were reminded that they could withdraw from the study by sending their participation number without needing to provide a reason.

Data Analysis

For the verbal cues to deception, the Statement-Evidence Inconsistencies were counted if a participant contradicted the piece of evidence, or failed to account for the piece of evidence. In total, the interviewer held seven pieces of evidence, so statement-evidence inconsistencies could range from 0 to 7. The Within-Statement Inconsistencies were counted if a participant

contradicted a previous statement regarding the evidence, the expected range was also 0 to 7, but could be higher if a participant contradicted themselves multiple times about the same piece of evidence. Cognitive load was analyzed through the survey responses, and ranged from 1 to 5.

To analyze the data, the program R-Studio was used with version Rversion 4.4.0 and the packages “haven”, “broom”, “dplyr”, “tidyverse”, “car”, “pwr”, “ggplot2”, “psych”, “stats”, and “tidyr” were used to clean and analyze the data.

Then, the assumption of homogeneity was tested with a Levene’s test and the assumption of normality was tested with a Shapiro Wilk test and visualized with histograms.

Next, a 2x2 ANOVA was conducted to analyze the effect of suspect status on cognitive load, disclosure type on cognitive load, and the interaction effect between suspect status and disclosure type on cognitive load.

For the verbal cues to deception, three 2x2 ANOVA’s were conducted to analyze the effect of suspect status on SEI, WSI, and the total number of statement inconsistencies, the effect of disclosure timing on the three categories of verbal cues, and finally the interaction effect between suspect status and disclosure timing on the three categories of verbal cues.

Results

Descriptive Statistics

Table 1 presents the overall means, standard deviations, and correlations of cognitive load, total number of verbal cues to deception (Total Cues), Within Statement Inconsistencies (WSI), and Statement-Evidence inconsistencies (SEI). The cognitive load was normally distributed and did not violate the assumption of homogeneity of variance. But the cues to deception were all positively skewed. The total cues to deception had a slight positive skew (0.48), the Statement-Evidence Inconsistencies cues had a moderate positive skew (0.93), and the Within Statement Inconsistencies cues also had a moderate positive skew (1.22). The assumption of homogeneity of variance was only violated for WSI specifically ($p < .05$). The histograms of the distributions can be found in Appendix D. The data does not confirm to normality as it is count data and not continuous data, so the data should follow a different model, but this is beyond the scope of the present study.

Table 1

Descriptive Statistics and Correlations Across All Conditions

	M	*SD*	Cognitive Load	WSI
Cognitive Load	3.18	0.66		
Total Cues	1.85	1.64	.12	
SEI	1.33	1.28	.07	.28
WSI	0.52	0.75	.15	

N = 67
SEI = Statement Evidence Inconsistency
WSI = Within Statement Inconsistency
Cognitive Load on a Likert scale of 1 to 5, SEI and WSI range from 0 to 7

Hypotheses Tests

To test the hypotheses four 2x2 ANOVA's were performed to test the effects of the independent variables suspect status (innocent or guilty) and disclosure type (gradual or late) on the dependent variables cognitive load, total number of verbal cues to deception (Total Cues), Statement-Evidence Inconsistencies (SEI), and Within Statement Inconsistencies (WSI). The interaction between suspect status and disclosure timing was also analyzed. Table 2 presents the means and standard deviations of the dependent variables effected by the independent variables, as well as the *F* test statistics from the 2x2 ANOVA's. The last row presents the interaction between the independent variables suspect status and disclosure type on the dependent variables.

Cognitive Load

There was significant evidence that suspect status had an effect on the perceived cognitive load of participants, see Table 2 for the group means, standard deviations, and *F*-test statistics. Participants in the guilty condition experienced a higher level of cognitive load than those in the innocent condition. There was no evidence that disclosure type had an effect on the perceived cognitive load of participants. Participants exposed to evidence gradually experienced a similar level of cognitive load as those exposed to evidence late. There was no evidence that the interaction between suspect status and disclosure type had an effect on the perceived cognitive load.

Cues to Deception

There was evidence that suspect status had a significant effect on the total number of verbal cues to deception participants displayed, see Table 2 for the group means, standard deviations, and *F* test statistics. Participants in the guilty condition displayed more statement inconsistencies than participants in the innocent condition. A similar effect was found on the number of Statement-Evidence Inconsistencies (SEI) participants displayed. Participants in the guilty condition displayed more SEI's than participants in the innocent condition. Finally, a similar effect was found on the number of Within Statement Inconsistencies (WSI) participants displayed. Participants in the guilty condition displayed more WSI's than participants in the innocent condition.

There was no evidence that the type of disclosure timing had an effect on either SEI's, WSI's nor the total number of verbal cues to deception. Participants in the gradual condition displayed a similar number of SEI's, WSI's, and total number of verbal cues as participants in the late condition. Furthermore, there were no interaction effects found between suspect status and disclosure type on the total number of verbal cues to deception, SEI's, or WSI's.

Table 2

Group Means and Standard Deviations per Condition and Raw Scores from a 2x2 ANOVA

Independent Variables	Dependent Variables							
Suspect Status	**Cognitive Load**		**Total Cues**		**SEI**		**WSI**	
	M	SD	M	SD	M	SD	M	SD
Innocent	2.99	0.72	0.73	0.76	0.53	0.62	0.18	0.39
Guilty	3.36	0.57	2.94	1.54	2.09	1.29	0.85	0.86
Raw Scores	$F = 5.87$, $df = 1$, $p = .022$*		$F = 53.72$, $df = 1$, $p = < .001$*		$F = 37.23$, $df = 1$, $p = < .001$*		$F = 16.31$, $df = 1$, $p = <.001$*	
Disclosure Type	**Cognitive Load**		**Total Cues**		**SEI**		**WSI**	
	M	SD	M	SD	M	SD	M	SD
Gradual	3.26	0.73	1.82	1.62	1.32	1.25	0.50	0.75
Late	3.09	0.59	1.88	1.69	1.34	1.33	0.55	0.75
Raw Scores	$F = 1.11$, $df = 1$, $p = .297$		$F = 0.01$, $df = 1$, $p = .943$		$F = 0.01$, $df = 1$, $p = .912$		$F = 0.05$, $df = 1$, $p = .830$	
Interaction Effect	**Cognitive Load**		**Total Cues**		**SEI**		**WSI**	
	M	SD	M	SD	M	SD	M	SD
Innocent/Gradual	3.02	0.78	0.77	0.75	0.59	0.62	0.18	0.39
Innocent/Late	2.97	0.66	0.69	0.79	0.47	0.64	0.19	0.40
Guilty/Gradual	3.50	0.60	2.88	1.58	2.06	1.30	0.82	0.88
Guilty/Late	3.21	0.50	3.00	1.54	2.12	1.32	0.89	0.88
Raw Scores	$F = 0.53$, $df = 1$, $p = .452$		$F = 0.10$, $df = 1$, $p = .748$		$F = 0.13$, $df = 1$, $p = .725$		$F = 0.02$, $df = 1$, $p = .890$	

$N = 67$

Discussion

This study aimed to test the effects of suspect status and evidence disclosure type on the amount of cognitive load experienced by participants, as well as the number of verbal cues to deception they displayed, Statement-Evidence Inconsistencies (SEI), and Within Statement Inconsistencies (WSI). Guilty suspects experienced more cognitive load than innocent suspects, guilty suspects also displayed more statement inconsistencies, both SEIs and WSIs, than

innocent suspects. Disclosure timing of evidence (late or gradual) did not impact these dependent variables, this indicates that the disclosure types, do not differ in experienced cognitive load or in the number of statement inconsistencies displayed, but a guilty suspect status does impact these variables. Finally, when looking at the interaction between suspect status and disclosure type, there was no difference found in the number of displayed statement inconsistencies or experienced cognitive load.

Verbal Cues to Deception

It was hypothesized guilty suspects would display more verbal cues to deception than innocent suspects. This hypothesis has been accepted. As in prior research this study found that guilty participants used avoidance and denial strategies more frequently, whilst innocent participants used more forthcoming strategies (Granhag & Hartwig, 2008). The use of avoidance and denial is apparent in the higher number of SEIs for guilty participants, they tended to avoid speaking about topics, but when confronted with the evidence changed their account. Concurrent with other studies the present study concludes that guilty suspects produced more verbal cues to deception than innocent suspects (Dando & Bull, 2011; Dando et al., 2015; Granhag & Hartwig, 2008; Oleszkiewicz & Watson, 2020).

It was expected that participants in the gradual condition would display more verbal cues to deception than participants in the late condition. This hypothesis was rejected, no difference was found in the number of cues to deception between gradual and late disclosure, this finding confirms other findings that also found no difference (Oleszkiewicz & Watson, 2020). Thus, it might be possible that there is no difference between gradual and late disclosure in terms of produced statement inconsistencies. This suggests that both interviewing tactics might be equally effective in acquiring verbal cues to deception, and so both should work effectively in an investigative interview.

However, one of the reasons why the present study found no difference in the number of verbal cues to deception could be because the interviewers in the present study were not as experienced as in the studies that produced the finding that gradual disclosure leads to more cues to deception (Granhag et al., 2015; Dando & Bull, 2011; Dando et al., 2015). So their control of the flow of the interview might be more unreliable than with experienced interviewers. Furthermore, all three studies that do find a difference in the number of verbal cues to deception have a larger sample size, around 150 participants. Additionally, in the aforementioned studies,

the dependent variable is veracity, which is a more general statement the interviewer makes regarding the suspect's guilt or innocence (Dando & Bull, 2011; Dando et al., 2015). However, the present study uses statement inconsistencies which are a more tangible and measurable cue to deception. These statement inconsistencies form a reliable cue to deception, as compared to a more general judgment of guilt or innocence. However, these differences in measures make it more difficult to compare the results accurately.

Cognitive Load

It was hypothesized that guilty suspects would experience more cognitive load than innocent suspects. This hypothesis has been accepted. Deceptive participants must deal with more concurrent cognitive processes and restrictions in the working memory which was expected to result in a higher score on cognitive load (Dando & Bull, 2011; Wickens, 1991). This occurred in the present study as guilty participants scored a significantly higher mean score on cognitive load than innocent participants. This finding is in line with other research in the strategic and tactical interviewing context (Dando & Bull, 2011, Dando et al., 2015; Granhag & Hartwig, 2008; Vrij et al., 2006; Spence et al., 2006). The finding that deceptive participants score higher on cognitive load than innocent participants is also in line with more general research of cognitive load in deception (Vrij et al., 2008).

It was expected that participants in the late condition would experience a higher mean score on cognitive load than participants in the gradual condition. Actually, it was found that the type of evidence disclosure did not impact the participants' score on cognitive load. The expectation was that gradually handling pieces of evidence would help the innocent suspect in memory retrieval, and thus reduce cognitive load, however, no differences were found in the experienced cognitive load for the disclosure type. This might be because the interviewer still probed the participants in the late condition before disclosing evidence, thus the participants already (partially) addressed the key details. This might have facilitated the memory retrieval cues for the participants in the late condition.

Furthermore, the present study found a weak correlation between cognitive load and statement inconsistencies, what this could indicate is that cognitive load might not be a determinant in the number of statement inconsistencies as thought. If this weak correlation is confirmed by other studies, then this could hint at support for SUE's theoretical framework, as

TUE's framework heavily relies on cognitive load being a key reason for differences in statement inconsistencies.

Limitations

The first limitation of this study concerns the sample size, the present study has 67 participants, and the ideal sample size for this study would be 45 participants per condition, so 180 in total. This could be a potential explanation why disclosure type did not impact cognitive load, when looking at the means there is a small difference, but not enough to warrant statistical significance. A larger sample size is needed to confirm whether this difference is statistically irrelevant, which the present study shows, or if it is actually significant.

The underlying notion of the use of cues to deception is that they are more visible in guilty suspects because they experience more cognitive load (DePaulo et al., 2003; Vrij et al., 2008; Zuckerman et al., 1981). Yet the present study finds no correlation between the two, which might be due to the smaller sample size.

The second potential limitation regards the characteristics of the participants. Current research in cognitive load in deception is still biased toward young and often highly educated participants, whilst research in working memory and cognitive functioning usually uses a much broader sample. This bias is not only visible in the present study but also in multiple noteworthy studies in the field of investigative interviewing (Dando & Bull, 2011; Granhag et al., 2015; McDougall & Bull, 2014). Working memory plays an important role in deception and the cognitive load associated with deception. As aging occurs the functioning of working memory declines (Maldonado 2016; Mattay et al., 2006). This might make deception and the evidence disclosure timing less cognitively demanding for younger participants. Working memory also plays a large role in learning, and thus later on in life the level of education (Alloway & Copello, 2013). A sample with highly educated participants might have better performing working memory in general, and thus these participants might experience lower cognitive load when compared to lower educated participants.

The third potential limitation regards the language barrier the participants experienced when participating in the simulated police interview. Almost none of the participants had English as their native tongue. This has two possible implications for the study, the first being that speaking a foreign language adds to the already higher cognitive load of deception (Suchotzki & Gamer, 2018; Zhang et al., 2020). This means the scores of cognitive load from the present study

might be inflated by the added cognitive demand of speaking a foreign langue. The second implication is that speaking a foreign language might impact the number of statement inconsistencies. Speaking a foreign language might result in confusing certain terms, for example in the present study tram and train were confused for metro, resulting in a Statement-Evidence Inconsistency when it is just a mix up of words.

The fourth and final potential limitation regards the artificial nature of the study. The interviewers in the present study were not experienced in interrogation. Other studies in evidence disclosure use much more experienced interrogators/interviewers (Dando & Bull, 2011; McDougall & Bull, 2014). The expertise of the interviewer is important to know, first of all, for applying the evidence disclosure frameworks to actual police interviews and secondly, experienced interviewers might be better at managing the flow of the conversation and timing of the questions (Dando & Bull, 2011). However, the present study did use interview scripts based on previous research to compromise for a lack of experience. Another part of the study's artificial nature is that participants did not actually commit the crime, so this removes a lot of pressure on the participants, as there is nothing at stake if they do get caught in a lie. This might result in different experiences in cognitive load when comparing them to real criminals.

All in all, the present study has provided clear support for the effects of suspect status on both cognitive load and the number of verbal cues to deception, though there was no effect found for the timing of evidence disclosure. Some limitations of the present study can be used as stepping stones for future research. To make research on the cognitive load of the evidence disclosure frameworks as generalizable as possible, future research should use more diverse samples than present studies do. This includes studying language barriers and their role in investigative interviewing, to assess whether the number of statement inconsistencies and cognitive load differs for native versus non-native speakers. Because in practice, suspects diver greatly in age, occupation, and language proficiency.

Artificial Intelligence Statement

Several AI tools were used in the present study. The first tool used is ChatGPT for coding in R studio, when an error message came up the error was placed in ChatGPT for help. After which, the code was double checked and adjusted if necessary. Furthermore ChatGPT was used for structuring of sentences to improve the flow of the text and to make the text easier to read, ChatGPT was also used to interpret sentences from other studies to make it more understandable. The second tool used is Grammarly, this tool was used for correct grammar, spelling, and punctuation. Grammarly was also used to check the flow of the sentences to make them more concise.

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Appendix A

Interview Schemes

Scheme 1

Gradual Condition Interview Scheme

Part 1 – Opening and initial free narrative

Hello, my name is NAME.

I am investigating an incident at the Natural History Museum in Berlin. There has recently been some criminal activity there. A painting has been stolen and we have reason to believe you may have been involved.

Because of that, I need to ask you some questions about your recent visit there. Please answer our questions as fully as you're able to. This is your chance to give your side of the story so we don't make any wrong decisions.

1. I want to go through each piece of what happened part by part, but first can you let me know in as much detail as possible about your visit to the museum?

Topic 1 - Establishing they were at the museum

As for late, skip questions where evidence is accounted for in the initial story.

1. First can you tell me about how you travelled to the museum?

2. Is there any reason you'd do anything special with your clothing on the day you visited the museum?

If any evidence is omitted or contradicted, challenge after these two questions

E.g.

1. "I ask you because we have train tickets in your name for the U5 metro indicating that you travelled to the Museum on the day of the theft. Can you explain for me what you were doing travelling toward the museum?"

2. We have CCTV footage of you wearing what seems to be a disguise entering the museum, and that doesn't really match the story you've given us so far. Can you help us to understand the discrepancy?

Possible contradictions and clarifications to note for probing:

Method of travel – **you have tickets showing they were on the U5 metro line to Berlin.**

Your have CCTV of the suspect entering the museum alone.

Topic 2 – Expertise

1. One thing we wanted to ask you about was your background, can you tell us a bit about your education and profession?

2. Can you tell us any more about your expertise in physical security measures, like alarm systems?

If they have not yet mentioned a reason to know about or purchase tools and materials for physical security:

3. To clarify, you are saying that there is no reason why you would need access to materials for building physical security devices?

If any evidence is omitted or contradicted, challenge after three questions are asked

1. We have reason to believe you would have the capability to build a device that could prevent the museum security from working properly. Is there anything you can tell us about that?

If this remains unexplained:

2. We know you have an education in computer science, have worked building security for museums in the past, and we have financial records showing you have ordered the parts that would be needed to build a device like the one used to interrupt the alarm systems in this theft. Can you explain why you decided to not tell us about this?

Possible contradictions and clarifications to note for later probing:

Do they mention they studies computer science and security – **you know about their study and employment history in security design.**

Do they explain why they might have ordered parts to make physical security devices – **you have financial records showing they purchased equipment needed to make a device to interrupt the museum security systems.**

Topic 3 – Group membership

If they have not mentioned meeting anyone at the museum:

1. Did you meet anyone at the museum?

If they still deny meeting anyone/fail to describe them:

2. To confirm, you're saying you were alone at the museum and didn't meet anyone?/Can you tell me any more about the people you were with? (If not after latter, thanks them and move on)

If any evidence is omitted or contradicted, challenge after two questions are asked

1. We have reason to believe you were planning to meet with some others at the museum, and we also suspect these people might also be involved in the heist. Do you want to tell me any more about anyone you might have met at the museum?

If this remains unexplained:

2. We have phone records showing you were in contact with one other person about meeting them at the museum, and that you planned to meet some others there. We also believe these people have some expertise that would be needed to perform a heist. Can you tell us any more about your plans to meet people at the museum?

Possible contradictions and clarifications to note for later probing:

Claiming to be alone.

Lying about/not mentioning being in contact with the other people.

Topic 4 – Activities within the museum

Depending on if they already explained being in in the disabled toilet:

1. While you were in the museum, did you need to use the bathroom at any point? (ask to elaborate if they only say yes)

If they deny:

2. Again, just to make sure I have your story right, you're saying you did not visit the bathroom while you were there

If they indicate any bathroom other than the disabled one in the basement:

3. Again, just to make sure I have your story right, you're saying you only visited that bathroom, and no others?

Depending on if they already explained being in room 3.06 or being by "the monk by the sea"

4. Did you go to the third floor of the museum?/You mentioned going to the third floor of the museum can you remind us what you were doing there?

If they deny (only the bits that are appropriate, e.g. if they admit being at the third floor but deny being at the painting):

Toilet fingerprints

5. You indicated that you were never in the basement disabled persons bathroom, but we have some information indicating you were in that room. Can you help me to understand why our information conflicts with your story?

If unexplained:

6. We have your fingerprints from multiple surfaces in that bathroom. Can you help me to understand how that could have happened if you were not in that room?

CCTV of the group in the room

7. We have additional information that indicated that you were in room 3.06, by the painting that was stolen. Can you explain why our information doesn't match with what you've told us?

If unexplained:

8. We recovered some CCTV footage that someone had attempted to delete showing you in that room with a group of people that match some our other suspects. Can you explain for me why we would have that footage if you were not in that room or by the painting?

Possible contradictions and clarifications to note for later probing:

Not mentioning being in the disabled toilet **– You have their fingerprints showing they were in the disabled toilet**.

Not mentioning being on 3rd floor/by painting – **you have CCTV they thought they had deleted showing the group together in front of the painting and being on the third floor before the heis**t.

Part 4 – closing

1. That's all the questions I have for now, I wanted to thank you for coming in and talking to us. Is there anything else you want to add before I close the interview?

Then we are finished for now. Please stay here with us and my colleague will be with you shortly and explain the next steps.

Scheme 2

Late Condition Interview Scheme

Part 1 – Opening and initial free narrative

Hello, my name is NAME.

I am investigating an incident at the Natural History Museum in Berlin. There has recently been some criminal activity there. A painting has been stolen and we have reason to believe you may have been involved.

Because of that, I need to ask you some questions about your recent visit there. Please answer our questions as fully as you're able to. This is your chance to give your side of the story so we don't make any wrong decisions.

1. First, can you let me know in as much detail as possible about your visit to the museum?

Part 2 – Probing and locking the account

Topic 1 - Establishing they were at the museum

If they admit being at the museum and in Berlin within the opening statement, then these items can be omitted.

If not then they need to be disclosed to prove that we know they were there – a way to get the ones who want to be too clever to engage properly with the task:

1. Thank you for giving me an overview of your day, but you don't discuss being at the museum and we have reason to believe you were in Berlin and at the museum at the time of the event. Can you tell us what you were doing there and what you did while you were there?

If still deny being there:

2. I'm sorry, but we have train tickets in your name travelling to Berlin before the event, and CCTV footage of you entering the museum. So we have a discrepancy here with what you're saying and the evidence we have. Please let me know what you were doing during the visit to the museum.

Possible contradictions and clarifications to note for later probing:

Method of travel – you have tickets showing they were on the U5 metro line to Berlin.

Your have CCTV of the suspect entering the museum alone.

Did they describe and explain wearing the disguise shown in the CCTV?

Topic 2 – Expertise

1. One thing we wanted to ask you about was your background, can you tell us a bit about your education and profession?

2. Can you tell us any more about your expertise in physical security measures, like alarm systems?

If they have not yet mentioned a reason to know about or purchase tools and materials for physical security:

3. To clarify, you are saying that there is no reason why you would need access to materials for building physical security devices?

Possible contradictions and clarifications to note for later probing:

Do they mention they studies computer science and security – you know about their study and employment history in security design.

Do they explain why they might have ordered parts to make physical security devices – you have financial records showing they purchased equipment needed to make a device to interrupt the museum security systems.

Topic 3 – Group membership

If they have not mentioned meeting anyone at the museum:

1. Did you meet anyone at the museum?

If they still deny meeting anyone/fail to describe them:

2. To confirm, you're saying you were alone at the museum and didn't meet anyone?/Can you tell me any more about the people you were with? (If not after latter, thanks them and move on)

Possible contradictions and clarifications to note for later probing:

Claiming to be alone.

Lying about/not mentioning being in contact with the other people.

Topic 4 – Activities within the museum

Depending on if they already explained being in in the disabled toilet:

1. While you were in the museum, did you need to use the bathroom at any point? (ask to elaborate if only say yes)

If they deny:

2. Again, just to make sure I have your story right, you're saying you did not visit the bathroom while you were there

If they indicate any bathroom other than the disabled one in the basement:

3. Again, just to make sure I have your story right, you're saying you only visited that bathroom, and no others?

Depending on if they already explained being in room 3.06 or being by "the monk by the sea"

4. Did you go to the third floor of the museum?/You mentioned going to the third floor of the museum can you remind us what you were doing there?

If they deny (only the bits that are appropriate, e.g. if they admit being at the third floor but deny being at the painting):

5. Just to check my understanding, you're saying you did not go up to the third floor and did not view the painting "The monk by the sea"?

Possible contradictions and clarifications to note for later probing:

Not mentioning being in the disabled toilet – **You have their fingerprints showing they were in the disabled toilet**.

Not mentioning being on 3rd floor/by painting – **you have CCTV they thought they had deleted showing the group together in front of the painting and being on the third floor before the heist**.

Part 3 – Evidence disclosure

Can skip items that are fully addressed in the initial account

If ALL evidence is accounted for (possible in innocent condition) then these questions can be skipped.

If in the first prompt the suspect gives an account thank them and say that this conforms with the evidence piece by disclosing it. E.g. "That makes sense, we have some CCTV of you entering the museum wearing what looks like a disguise, which seemed odd to us. Let's move on to the next thing".

If they still do not explain the evidence after the direct disclosure of the evidence remain polite and non-confrontational, but make it clear that what they have said contradicts the evidence held.

E.g. “Your story doesn’t really align with he evidence we have, but let’s move on to the next thing”.

Thank you for giving us your account. Some of the things you said don’t align with some of the evidence we have, so I wanted to give you another opportunity to explain what happened.

Topic 2 – Expertise

1. We have reason to believe you would have the capability to build a device that could prevent the museum security from working properly. Is there anything you can tell us about that?

If this remains unexplained:

2. We know you have an education in computer science, have worked building security for museums in the past, and we have financial records showing you have ordered the parts that would be needed to build a device like the one used to interrupt the alarm systems in this theft. Can you explain why you decided to not tell us about this?

Topic 3 – Group membership

1. We have reason to believe you were planning to meet with some others at the museum, and we also suspect these people might also be involved in the heist. Do you want to tell me any more about anyone you might have met at the museum?

If this remains unexplained:

2. We have phone records showing you were in contact with one other person about meeting them at the museum, and that you planned to meet some others there. We also believe these people have some expertise that would be needed to perform a heist. Can you tell us any more about your plans to meet people at the museum?

Topic 4 – Activities within the museum

1. You indicated that you were never in the basement disabled persons bathroom, but we have some information indicating you were in that room. Can you help me to understand why our information conflicts with your story?

If unexplained:

2. We have your fingerprints from multiple surfaces in that bathroom. Can you help me to understand how that could have happened if you were not in that room?

3. We have additional information that indicated that you were in room 3.06, by the painting that was stolen. Can you explain why our information doesn't match with what you've told us?

If unexplained:

4. We recovered some CCTV footage that someone had attempted to delete showing you in that room with a group of people that match some our other suspects. Can you explain for me why we would have that footage if you were not in that room or by the painting?

Part 4 – closing

1. That’s all the questions I have for now, I wanted to thank you for coming in and talking to us. Is there anything else you want to add before I close the interview?

Then we are finished for now. Please stay here with us and my colleague will be with you shortly and explain the next steps.

Appendix B

Cognitive Load Questionnaire

Figure B1

Beginning Statement to Cognitive Load Questionnaire

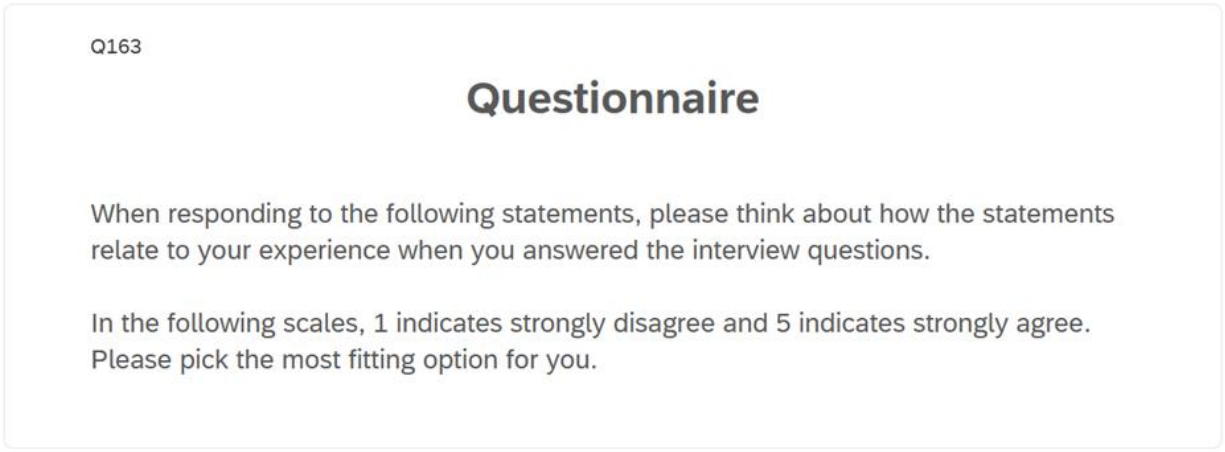
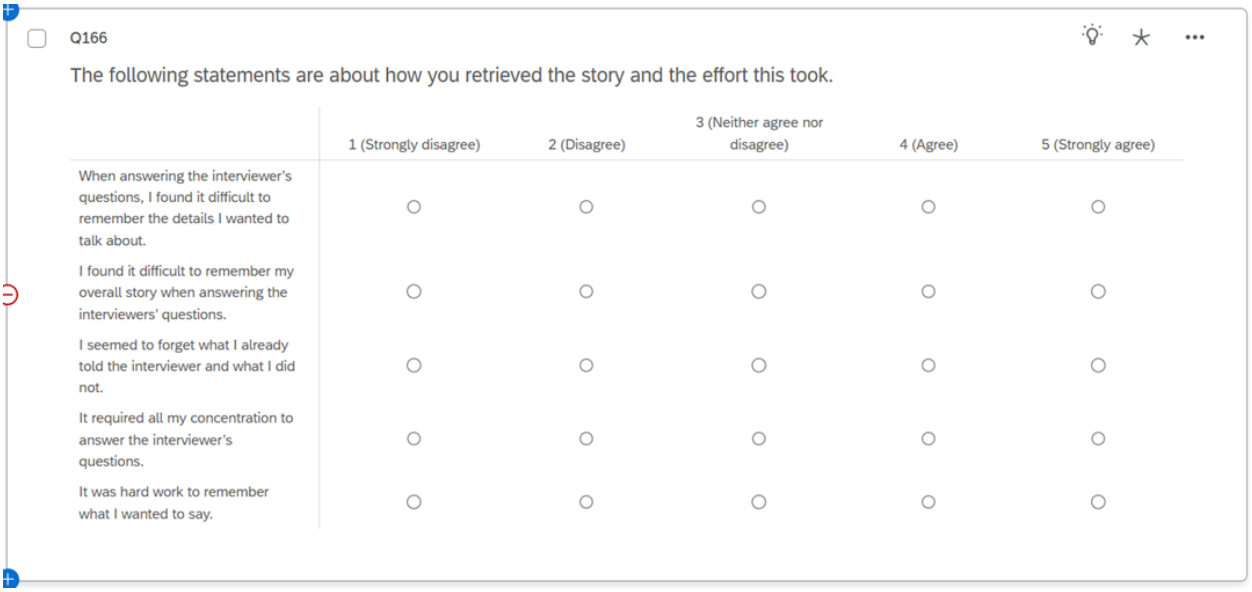


Figure B2

Ability to Verbalize Thought Processes and Story Part of Cognitive Load

Figure B3

Memory Retrieval Part of Cognitive Load



Appendix C

Factor Loadings for Factor Analysis Cognitive Load Scale

Call:

factanal(x = factor_data8, factors = 2, covmat = cor(factor_data8))

Uniquenesses:

Explaining_Order_Events	Oversharing_Information
0.547	0.948
Fully_Answering_Questions	Time_To_Think_About_Answer
0.595	0.679
Wanting_To_Restart_	Translating_The_Mental_Story_to_a_Statement
Or_Change_Answer	
0.809	0.277
Remembering_Details	Remembering_Overall_Story
0.491	0.289
Forgetting_What_Was_Told	Concentration_To_Answer_Questions
0.746	0.790

Effort_To_Remember_What_To_Say

0.379

Loadings:

	Factor1	Factor2
Explaining_Order_Events	0.648	0.182
Oversharing_Information	0.218	
Fully_Answering_Questions	0.566	0.291
Time_To_Think_About_Answer	0.540	0.170
Wanting_To_Restart_or_Change_Answer	0.297	0.321
Translating_The_Mental_Story_to_a_Statement	0.325	0.786
Remembering_Details	0.714	
Remembering_Overall_Story	0.841	
Forgetting_What_Was_Told	0.431	0.261
Concentration_To_Answer_Questions	0.269	0.370
Effort_To_Remember_What_To_Say	0.670	0.415

	Factor1	Factor2
SS loadings	3.153	1.296
Proportion Var	0.287	0.118
Cumulative Var	0.287	0.404

The degrees of freedom for the model is 34 and the fit was 0.64.

Appendix D

Histograms of Normality Distributions

Figure D1

Normality Distribution of Cognitive Load

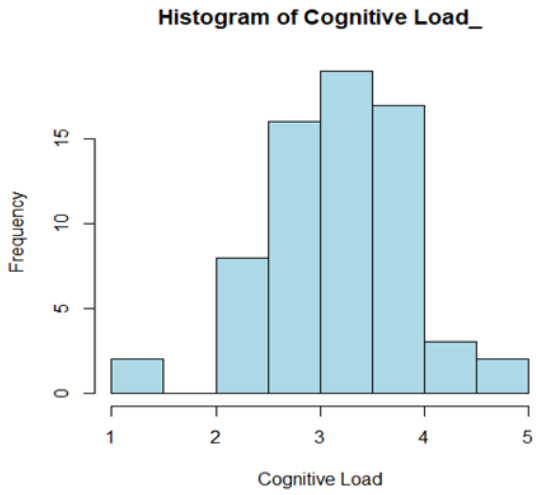


Figure D2

Normality Distribution of the Total Verbal Cues to Deception

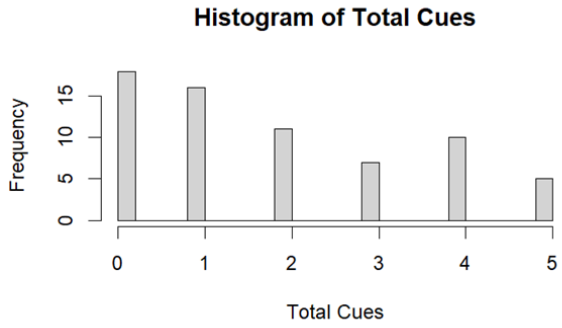


Figure D3

Normal Distribution of Statement-Evidence Inconsistencies

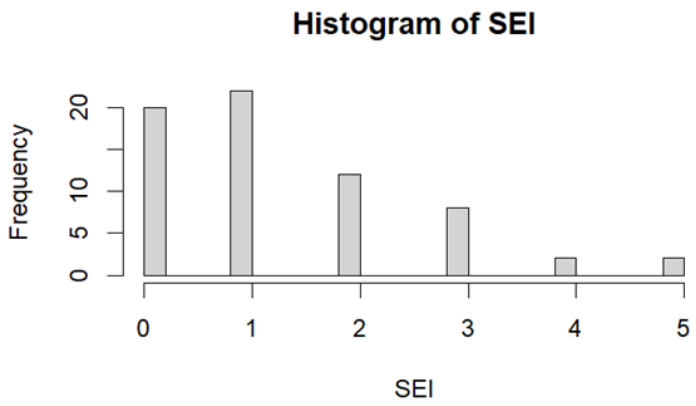


Figure D4

Normal Distribution of Within Statement Inconsistencies