Shahvaroughi, A, Bahrami Ehsan, H, Hatami, J, Shahvaroughi, MA and Paulo, RM

The cognitive interview: comparing face-to-face and video-mediated interviews

The Cognitive Interview: Comparing face-to-face and video-mediated interviews

Ahmad Shahvaroughi[1*], Hadi Bahrami Ehsan[1], Javad Hatami[1], Mohammad Ali Shahvaroughi[2], Rui M. Paulo[3]

[1]*Department of Psychology, University of Tehran, Tehran, Iran;*

[2]*Department of Criminology and Criminal Law, Shahid Beheshti University, Tehran, Iran;*

[3]*School of Psychology, Liverpool John Moores University, Liverpool, UK.*

*** Corresponding author:** Ahmad Shahvaroughi, Department of Psychology, University of Tehran; shahvaroghi5260@ut.ac.ir

***In press, the Journal of Criminal Psychology (Accepted 06-Jun-2022)*; Doi: 10.1108/JCP-10-2021-0041. This version has not undergone proof editing and might deviate from the published version.**

The Cognitive Interview: Comparing face-to-face and video-mediated interviews

Abstract

Purpose

Eyewitness testimony can determine the outcome of criminal investigations. The Cognitive Interview (CI) has been widely used to collect informative and accurate accounts. However, face-to-face interviews have been restricted during the current pandemic, raising the need for utilizing video-conferencing. We tested whether virtual interviews could produce elaborate accounts from eyewitnesses and if the CI superiority effect against a Structure Interview (SI) could be fully replicated online.

Design/methodology/approach

We used a 2 x 2 factorial design with interview condition (CI vs. SI) and environment (face-to-face vs. virtual) manipulated between-subjects. 88 participants were randomly assigned to one of the four conditions. Participants watched a mock robbery and were interviewed 48 hours later using either the SI or the CI. Both sessions were either face-to-face or online.

Findings

Participants interviewed with the CI recalled more information than participants interviewed with the SI, regardless of the interview environment. Both environments produced a comparable amount of recall. Report accuracy was high for all groups.

Originality/value

To our knowledge, this is the first study showing that the CI superiority effect can be replicated online and that a fully remote CI can produce elaborate accounts.

Practical implications

This can be crucial to inform police practices and research in this field by suggesting investigative interviews can be conducted virtually in situations like the current pandemic or when time and resources do not allow for face-to-face interviewing.

Keywords**:** Cognitive Interview, Investigative Interviewing; Eyewitness Memory, Face-to-face Interviews, Video-mediated Interviews, Structured Interview

Introduction

Eyewitness testimony can be a critical piece of evidence that determines the outcome of a criminal investigation (Fisher, 1995). However, eyewitness memory is prone to omissions and errors (Laney and Loftus, 2018). Further, the interviewing strategies used by the police to collect eyewitness accounts can play a critical role in the investigative process, affecting the quality and quantity of relevant information eyewitnesses are able to recall (Fisher and Schreiber, 2007). Despite this, police detectives often receive little training on how to conduct appropriate eyewitness interviews (Fisher, 1995; Fisher *et al*., 1987). To address this issue, Geiselman *et al*. (1984) developed a set of interviewing techniques, now known as the Cognitive Interview (CI), that increase the likelihood of obtaining accurate and complete accounts from eyewitnesses.

The cognitive interview

The original CI was based on two well-established memory principles concerning information retrieval: the encoding specificity principle and the multiple trace theory (Geiselman *et al*., 1986). The encoding specificity principle states that recreating the original context (where the information was encoded) at the time of retrieval increases the likelihood of remembering more details (Tulving and Thomson, 1973). Further, according to the multiple trace theory, there

may be several retrieval routes to the memory records, so using different paths provides the possibility of accessing more information (Bower, 1967; Tulving, 1974). From these principles, Geiselman *et al*. (1984) developed four mnemonics to enhance eyewitness statements: the report everything mnemonic, the context reinstatement mnemonic, the change order mnemonic, and the change perspective mnemonic. When using the *report everything mnemonic,* eyewitnesses are encouraged to report everything that comes to their mind, even smaller or peripheral details that might seem irrelevant to the investigation. The rationale behind using this mnemonic is that unrelated recall might activate relevant recall. Further, eyewitnesses might not know what information is important for the investigation, otherwise withholding relevant details during the interview (Paulo *et al*., 2013). The *context reinstatement mnemonic*, which is based on the encoding specificity principle, consists of asking eyewitnesses to mentally recreate the personal and environmental context of the encoded event during the interview. With the *change order mnemonic,* eyewitnesses are asked to perform another retrieval attempt, this time in a different chronological order (often the reverse chronological order). The *change perspective mnemonic* consists of instructing eyewitnesses to recall the event once more but from a different perspective (e.g., the perspective of another eyewitness). The change order and the change perspective mnemonics are based on the multiple trace theory and consist of different retrieval paths that can make additional information available to the eyewitness (Milne and Bull, 2002).

Fisher and Geiselman (1992) then developed an Enhanced version of the CI where they added several social and communicative strategies that highlight the importance of the interviewer-eyewitness relationship. The social and communicative components include building rapport, encouraging active eyewitness participation and control over the interview, witness-compatible questioning, and mental imagery (Fisher and Geiselman, 2010). Over the years,

several experimental studies have replicated the CI superiority over a standard interview (i.e., interview protocols used by non-trained law enforcement officers; Geiselman *et al*., 1985) or a structured interview (i.e., interview protocol that follows an identical format to the CI but does not comprise the four key cognitive mnemonics; Köhnken *et al*., 1995) in different populations such as children (Larsson *et al*., 2003), older adults (Prescott *et al*., 2011), or individuals with intellectual disability (Gentle *et al*., 2013). Moreover, The CI has been shown to improve eyewitness recall for different types of events (e.g., staged events and video recordings) in both laboratory and field studies (Davis *et al*., 2005; Fisher *et al*., 1989). The CI superiority effect also has been replicated in countries with different cultural backgrounds, e.g., USA, UK, Portugal, Brazil, and Iran (Paulo *et al*., 2015; Stein and Memon, 2006; Shahvaroughi *et al*., 2021). Moreover, the CI and its components have been widely used by many police forces to collect eyewitness accounts (Dando *et al*., 2009). However, the CI typically requires a face-to-face interview where the interviewer and the interviewee are present in the same interview room. Due to the current pandemic and other factors (e.g., eyewitnesses living in remote locations, limited space to interview multiple eyewitnesses; Brown *et al*., 2021), the traditional face-to-face interview might sometimes be difficult to perform soon after the event. Thus, it might be important to utilize other methods (e.g., remote interviewing) to collect eyewitnesses' testimonies soon after the event and reduce the detrimental effects of time delays.

Virtual Interviews

The current pandemic and social distancing regulations raised restrictions on many of our daily activities, but also on eyewitnesses' ability to provide statements in court or in police stations with face-to-face interviews often being postponed (Dale and Smith, 2021; Kois *et al*., 2021; Ritscher, 2020). For instance, during the highest level of restriction in New Zealand,

investigative interviews regarding cases of alleged child maltreatment decreased by 90 percent compared to the month before the lockdown (Brown *et al*., 2021). Further, after the first lockdown in March 2020, most of the international, criminal, and civil trials in Germany were forced to stop (Ritscher, 2020). However, as addressed above, eyewitness memory is susceptible to distortion, and forgetting often increases as the retention interval increases. So, it is imperative to use virtual methods to conduct eyewitness interviews soon after the event to decrease delays and the potential harmful effects these can have on memory. Virtual interviews are an alternative method that has the potential to save police resources, allowing investigative interviews to occur shortly after the crime particularly, but not only, when facing pandemics or possible lockdowns. Even without social distancing regulations, the police might lack physical resources (e.g., appropriate interview rooms) to promptly interview all eyewitnesses. Eyewitnesses might also be reluctant to travel to a police station due to the inherent health risks associated with a pandemic or due to other factors (e.g., living in a remote location). Thus, in situations where an eyewitness might feel more comfortable providing an account from home, this might be advantageous because being relaxed and calm during retrieval is known to elicit more detailed and accurate accounts (Fisher and Geiselman, 1992; Paulo et al., 2013). Virtual interviews could be conducted without requiring the physical presence of the eyewitness, circumventing such problems. However, there are possible limitations that can hinder the use of virtual interviews (Brown *et al*., 2021). For example, the implementation of social and communicative techniques (e.g., rapport building and the use of non-verbal cues) might be somehow challenging to implement in a virtual environment and compromise the quantity and quality of information recalled. Establishing rapport (i.e., a positive relationship with the eyewitness; Vallano and Schreiber Compo, 2015) promotes eyewitness-interviewer coordination and trust, and facilitates the recall

of more accurate information (Collins *et al*., 2002; Vallano and Schreiber Compo, 2015). Although some social and communicative components might be feasible in remote interviews (e.g., transfer of control), there might be restrictions in others like rapport building with aspects like mutual eye-contact and the use of nonverbal cues being compromised in video-mediated communications (Brown *et al*., 2021). Thus, it is crucial to study whether video-conferencing technology can be used to conduct investigative interviews as an effective alternative to face-to-face interviews, and how this influences the quantity and quality of information eyewitnesses are able to recall.

Although previous studies addressed the benefits and pitfalls of using remote communication in other contexts such as psychotherapy sessions (Backhaus *et al*., 2012), neuropsychological assessments (Brearly *et al*., 2017), forensic assessments (Sales *et al*., 2018), and personnel recruitment (Blacksmith *et al*., 2016); only a few studies were conducted to test whether video-conferencing technology can be utilized during an investigative interview (Doherty-Sneddon and McAuley, 2000; Hamilton *et al*., 2017; Kuivaniemi-Smith *et al*., 2014; Nash *et al*., 2014). Doherty-Sneddon and McAuley (2000) studied the differences in the quantity and quality of information recalled between children interviewed face-to-face or in video-mediated meetings. 6-year-old and 10-year-old children witnessed a sequence of events in pairs and where then interviewed individually about the witnessed events (one child in each pair with a face-to-face interview and the other with a video-mediated interview). A phased approach was used in which all interviews began by asking a narrative report about the relevant events, followed by specific questions (from open-ended to closed questions), and then a series of leading and misleading questions. The results showed no difference between the face-to-face and video-mediated conditions in terms of the total number of correct information children recalled

during the full interview. However, 10-year-old children reported more information during the narrative phase of the interview when they were interviewed in-person. On the other hand, in the open-question phase, 10-year-olds reported more information in the video-mediated interview condition. Face-to-face interviews produced more incorrect information than the video-mediated interviews for both age groups. Further, younger children were more resistant to misleading questions when they were interviewed via video-mediated meetings. Another study by Hamilton *et al*. (2017) tested the effectiveness of video-mediated investigative interviews in 100 children aged 5-12 years. Participants actively participated in a series of events involving 12 target details. After one to two days delay, they were interviewed about the events with face-to-face or live video-mediated interaction, using an interview protocol based on the National Institute of Child Health and Human Development (NICHD; Lamb *et al*., 2007). Results indicated no differences between interview conditions in both the number and the accuracy of details recalled.

Other studies tested the effectiveness of video-mediated communication in investigative interviews with adults. For example, Nash *et al*. (2014) studied whether there were differences in the quantity and quality of information recalled between face-to-face and video-mediated investigative interviews. 77 adults were interviewed using a modified CI. Results showed no differences between interview groups on the number of correct and incorrect information recalled. Thus, video-mediated communication produced similar statements in comparison with face-to-face interaction. Kuivaniemi-Smith *et al*. (2014) used video-conferencing technology to examine the differences between face-to-face and virtual investigative interviewing in producing facial composite sketches of suspects. In the first session, participants saw a photograph of an unfamiliar person for 1 minute. In the second session, participants were interviewed using the CI and asked to describe the face they saw previously. The interviewer made a sketch based on the

description provided by each participant. Finally, a group of independent judges rated each sketch in 7 dimensions using a 7-point scale. Facial composite sketches produced via face-to-face communication were considered better than those created via video-mediated interviews. Thus, video-mediated communication may impair facial composites.

This limited number of studies addressing the use of video-mediated investigative interviews found inconsistent findings and indicated that further research is needed to determine the effectiveness of video-mediated communication during investigative interviews. Further, the only study that tested the effectiveness of a virtual CI in producing elaborate statements about an event with adult eyewitnesses (Nash *et al*., 2014) was performed using a professional video-conferencing network that required participants to be present in a professionally equipped room. However, in situations like the current pandemic, eyewitnesses might be restricted from leaving their home where there is less control over the interview environment. Further, Nash *et al*. (2014) used a modified CI, in which the change order and the change perspective mnemonics were excluded. Also, no control group (e.g., the SI) was included in their study. Therefore, the design of this study did not allow studying whether the CI superiority effect can be replicated in a virtual environment which is also important for researchers working in the field of investigative interviewing who suffered from similar constraints due the COVID-19 pandemic. Knowing whether well-known effects such as the CI superiority effect can be replicated using virtual experiments is key to understand how viable virtual data collection is in this field and allowing knowledge to advance even in situations like the current pandemic or when in-person data collection is not possible.

In the present study, we addressed these issues by conducting an experiment to study if interview modality (face-to-face vs. virtual) and interview protocol (CI vs. SI) affected the

quantity and quality of information eyewitnesses were able to recall. Our aims were to: (1) study if the CI superiority effect against a SI could be replicated in a fully online experiment; (2) test whether a video-mediated and fully remote CI could be effective to collect detailed accounts from eyewitnesses.

We expected the CI to produce more detailed accounts than a SI, without an increase in the proportion of errors and confabulations, therefore replicating the CI superiority effect (Köhnken *et al*., 1999; Memon *et al*., 2010). Further, we expected the first retrieval attempt, where all participants were expected to recall a higher number of (new) correct units of information, to be largely responsible for the CI superiority effect (Paulo et al., 2015). We also predicted that interviews conducted using a virtual environment would elicit a comparable amount of information and accuracy in comparison with face-to-face interviews (Doherty-Sneddon and McAuley, 2000; Nash *et al*., 2014).

Method

Participants

We have conducted an a priori power analysis using G*Power 3.1 (Faul *et al*., 2009) to calculate the minimum sample size required to test the differences between groups using analysis of variance. An estimate of the CI superiority effect size over a structured interview (d = 1.09) reported in a meta-analysis review (Memon *et al*., 2010) and an alpha of .05 were used. Results indicated that a minimum of 19 participants per group would be needed to achieve a high power of .95. To account for participants who might need to be excluded from the analysis, a total of 89 participants were recruited from a university in Tehran. One participant in the virtual CI group was excluded due to internet issues that disrupted the interview. Thus, 88 participants, 61

females and 27 males, with an age range from 19 to 35 years (M = 21.78, SD = 2.89) were included in this study. The face-to-face Structured Interview group had 14 female participants and eight male participants, aged between 20 to 34 years (M = 22.09, SD = 3.25). The face-to-face CI group had 17 female participants and five male participants, aged between 19 to 35 years (M = 21.86, SD = 3.55). The virtual Structured Interview group had 16 female participants and six male participants, aged between 20 to 32 years (M = 21.86, SD = 2.57). The virtual CI group had 14 female participants and eight male participants, aged between 19 to 30 years (M = 21.32, SD = 2.15).

Design

The present study used a 2 (interview condition: CI vs. SI) × 2 (environment: face-to-face vs. Virtual) between-subjects experimental design. The dependent variables were the number of units of information recalled and recall accuracy (proportion of correct information computed by dividing the number of correct units of information a participant recalled by the total number of details they recalled).

Materials

Mock crime video

The stimulus event was a video recording (4 min and 58 s long) edited from the eighth episode of the Iranian TV drama "Sleep and Wake" (Sadatian, 2002) that contained varied and substantial information and was successfully used in previous eyewitness memory studies (Shahvaroughi *et al*., 2021). This video shows two males and one female walking inside a bank, checking for security guards, and carrying out a robbery. The robbers then escape after shooting a guard and monitoring the security camera and police radio.

Virtual interview platform

All virtual interviews were conducted using Skyroom (Khahani *et al*., 2020), that facilitates private communications using virtual rooms. This online meeting platform was used because it contains different functionalities (e.g., limiting the number of participants present in a meeting, sharing and adjusting the quality of videos, etc.) that allowed all virtual interviews to be appropriately conducted.

Interview protocols

The interview protocols were initially translated and adapted from Milne and Bull (2003) and used in previous studies with an Iranian population (Shahvaroughi *et al*., 2021). The guidelines to properly conduct the CI were followed (e.g., Fisher and Geiselman, 1992; Milne, 2017). All the CI and the SI protocols included six primary phases: (1) preliminary phase; (2) first retrieval; (3) open-ended questioning; (4) second retrieval; (5) third retrieval (for new information only); and (6) closure. The only differences between these two protocols (CI vs. SI) were the four cognitive mnemonics, the transfer of control instruction, and mental imagery, i.e., only the CI included these techniques (see Table I). A full description of the interview protocols is included as a supplemental material.

Insert Table I

Procedure

Ethical approval was granted by the University's ethics committee. Participants were first given information about the study (including aspects like confidentiality, right to withdraw, etc.) and then asked for their informed consent if they wished to participate. The experiment consisted of two separate sessions. Sessions were either in person (face-to-face conditions), or online

(Virtual conditions) using the Skyroom meeting platform (Khahani *et al*., 2020). Face-to-face and virtual data collection were conducted in similar conditions, i.e., we replicated the conditions in our face-to-face data collection room online (e.g., participants in the virtual groups were asked to be in a quiet room, use monitors with at least a 15" screen for watching the video, wear headphones for both sessions, etc.).

First, general information about the study was given to all participants and, if they accepted to participate, they were randomly assigned to one of the four interview conditions (SI, CI, VSI, or VCI).

In the first session, participants in the face-to-face conditions came to our lab and viewed the video recording while the researcher was present to ensure they observed the full video without interruptions. Participants in the virtual conditions viewed the video during a first virtual meeting using the Skyroom software (Khahani *et al*., 2020), while the researcher was present to ensure they were engaged in the task and saw the video without interruptions.

The second session took place approximately 48 hours later. Each participant was interviewed according to his/her interview group. In this session, participants in the face-to-face conditions came to the lab for the second time and were interviewed in person. Participants in the virtual conditions received an invite message for a virtual interview session and were interviewed in second virtual meeting.

A trained interviewer who had followed several courses on the CI and other investigative interviewing techniques performed all the interviews. The interview protocols were followed verbatim when possible, with only minor adjustments (e.g., witness-compatible questioning

needs to be adapted according to the participants' previous recall). All interviews were audio-recorded.

Scoring and Coding. A comprehensive list identifying all relevant details in the video recording was first compiled. We identified 433 units of information that were categorized according to six categories of information that are relevant for investigations (Paulo *et al*, 2016): (1) 114 person-related details; (2) 112 action-related details; (3) 102 object-related details; (4) 51 location-related details; (5) 36 conversations-related details; and (6) 18 sound-related details. The audio-recordings of each participant were then coded following the template scoring technique used by Paulo *et al*. (2016). Participant's recall was divided into units of information and registered in a written format. Details that did not concern the witnessed event (e.g., 'I was sitting on a white chair'), subjective statements (e.g., 'The robber was young'), and opinions (e.g., 'He was gorgeous') were disregarded. Details were only scored the first time they were mentioned (Prescott *et al*., 2011). Units of information were then checked against the list of details previously compiled and classified as either correct, incorrect (e.g., saying the gun was black when it was brown) or confabulation (mentioning a detail or event that was not present or did not happen), as well as according to one of the six categories of information mentioned above.

Inter-rater reliability. For checking the reliability of our coding procedure, a subset of 22 interviews (25%) were randomly selected from all groups and coded independently by a second researcher who received training on using our scoring and coding methods but was naïve to the aims of the study and blind to the experimental conditions. Intraclass correlation coefficients (ICC) were calculated for correct information, incorrect information and confabulations, and for the six information categories (person, action, object, location, conversation, and sound). Results

indicated high inter-rater reliability in which the ICC ranged between .969 and .999 with an overall ICC of .988.

Results

Bonferroni corrections were applied when multiple statistical tests were carried out on a single data set to control for Type I error. Otherwise, an alpha level of .05 was used (Field, 2013).

Recall quantity

First, a 2 × 2 multivariate analysis of variance (MANOVA) was conducted to examine if interview condition (CI vs. SI) and environment (face-to-face vs. virtual) had an effect on eyewitness memory, which comprised three measures: 1) the number of correct units of information recalled; 2) the number of errors committed; and 3) the number of confabulations committed. This found a significant main effect of interview condition, F (3, 82) = 16.01, $p <$ .001, *Wilk's* Λ = .63, η_p^2 = .369, but no environment effect, F (3, 82) = 1.34, p = .266, *Wilk's* Λ = .95, η_p^2 = .047, nor interaction effect, F (3, 82) = .95, p = .420, *Wilk's* Λ = .97, η_p^2 = .034. Univariate ANOVAs found that participants in the CI group (M = 71.64, SD = 22.84, 95% CI [64.69, 78.58]) recalled more correct units of information than participants in the SI group (M = 46.82, SD = 10.98, 95% CI [43.48, 50.16]), F (1, 86) = 41.71, $p <$ .001, η_p^2 = .332, thus, replicating the CI superiority effect (see Table II). However, there was no effect of interview condition on the number of errors, F (1, 86) = .85, p = .359, η_p^2 = .010, nor confabulations, F (1, 86) = 0.09, p = .762, η_p^2 = .001, committed throughout the interview.

In sum, participants who were interviewed with the CI (in both face-to-face and virtual environments) recalled a higher number of correct details than participants who were interviewed with the SI, without committing more errors and confabulations. This supports that a virtual CI can be effective in enhancing recall.

Insert Table II

Next, we conducted a mixed 2 × 4 ANOVA to see if interview condition (CI vs. SI) and interview phase (First retrieval attempt vs. Witness-compatible questioning vs. Second retrieval attempt vs. Third retrieval attempt), had an effect on the number of correct units of information newly recalled. Preliminary and closure phases were excluded from the analysis because participants did not provide any information on these phases. Interview 'environment' was not considered in this and subsequent analyses regarding the quantity of information because the effect was non-significant in the multivariate ANOVA.

We found a significant main effect of interview condition, F (1, 86) = 42.42, $p < .001$, η_p^2 = .330, interview phase, F (1.258, 108.210) = 377.09, $p < .001$, η_p^2 = .814, and an interaction effect between interview condition and interview phase, F (1.258, 108.210) = 42.19, $p < .001$, η_p^2 = .329. Regarding the main effect of the interview condition, as previously reported, participants in the CI group recalled more correct units of information than participants in the SI group (see Table II). Regarding the main effect of interview phase, pairwise comparisons revealed participants recalled significantly more correct information in their first retrieval attempt (phase 2: M = 42.75, SD = 20.98) than during the witness-compatible questioning phase (phase 3: M = 5.88, SD = 3.13), $p < .001$, second retrieval attempt (phase 4: M = 8.20, SD = 4.66), $p < .001$, and third retrieval attempt (phase 5: M = 2.41, SD = 3.27), $p < .001$. Also, participants recalled more

correct units of information during their second retrieval attempt (phase 4) than during the witness-compatible questioning phase (phase 3), $p < .001$, and third retrieval attempt (phase 5), $p < .001$. Participants also recalled more correct information during the witness-compatible questioning phase (phase 3) than during their third retrieval attempt (phase 5), $p < .001$. We then conducted four independent t-tests to understand the interaction effect between interview condition and interview phase. Bonferroni corrections were used, i.e., an alpha level of .012 was used to avoid type 1 error (Field, 2013). No differences were found between participants in the CI group and participants in the SI group in phase 3 (Witness-compatible questioning), t (86) = .99, p = .327, d = 0.21, phase 4 (Second retrieval attempt), t (86) = 1.52, p = .132, d = 0.32, and phase 5 (Third retrieval attempt), t (86) = 1.04, p = .299, d = 0.22. However, in the second phase of the interview (First retrieval attempt), participants in the CI conditions (who received the report everything and context reinstatement instructions) recalled a higher number of correct units of information in comparison with participants in the SI group, t (60.41) = 6.94, p < .001, d = 1.48 (see Table II).

In sum, participants (in both interview conditions) recalled more (new) correct details in their first retrieval attempt than in the subsequent interview phases, with participants who were interviewed with the CI recalling more correct details than participants who were interviewed with the SI. This supports the first retrieval attempt may be largely responsible for the CI superiority effect.

Lastly, a multivariate ANOVA (MANOVA) was conducted to examine if interview condition had an effect on the number of correct units of information recalled operationalized according to information category, which included five measures (person, action, object, location, and auditory details). This found a significant difference in recall performance

according to the interview condition, F (5, 82) = 11.12, $p < .001$, *Wilk's Λ* = .60, $\eta_p^2 = .404$. Univariate ANOVAs found that participants in the CI group recalled more correct person-related details, F (1, 86) = 29.61, $p < .001$, $\eta_p^2 = .256$, action-related details, F (1, 86) = 25.31, $p < .001$, $\eta_p^2 = .227$, object-related details, F (1, 86) = 24.39, $p < .001$, $\eta_p^2 = .221$, and location-related details, F (1, 86) = 36.56, $p < .001$, $\eta_p^2 = .298$, than participants in the SI group (see Table III). However, no interview condition effect was found for the number of correct auditory-related details, F (1, 86) = .99, $p = .322$, $\eta_p^2 = .011$.

Insert Table III

In sum, the CI increased the number of correct details recalled concerning all categories of forensically relevant information, except for the number of auditory details which was similar (and low) for both groups.

Report accuracy

We then conducted a 2 × 2 ANOVA to examine if interview condition (CI vs. SI) and environment (face-to-face vs. virtual) had an effect on report accuracy (the ratio between the number of correct units of information recalled over all units of information recalled). No significant main effect of environment, F (1, 84) = 2.59, $p = .111$, $\eta_p^2 = .030$, nor interaction effect, F (1, 84) = 2.74, $p = .102$, $\eta_p^2 = .032$, was found. However, for interview condition, results showed that the accuracy of the CI (M =.957, SD = .02, 95% CI [.950, .964]) was higher than the SI (M =.941, SD = .04, 95% CI [.928, .953]), F (1, 84) = 5.43, $p = .022$, $\eta_p^2 = .061$. To further explore this effect of interview condition on accuracy, we then conducted a mixed 2 × 3 ANOVA to examine if interview condition (CI vs. SI) and interview phase (First retrieval

attempt vs. Witness-compatible questioning vs. Second retrieval attempt) had an effect on report accuracy. Phase 5 (Third retrieval attempt) was excluded from the analysis because thirty participants in both conditions did not recall new information at this phase. No significant interview condition effect, F (1, 86) = .76, p = .386, η_p^2 = .009, interview phase effect, F (1.658, 142.556) = 3.14, p = .056, η_p^2 = .035, nor interaction effect, F (1.658, 142.556) = .03, p = .952, η_p^2 < .001, were found. Report accuracy was high for all interview conditions and interview phases (see Table IV).

Insert Table IV

Discussion

The present study addressed the effectiveness of two interview protocols (CI or SI) when conducted in two different environments (face-to-face or virtually). As predicted, results showed that both environments produced a comparable amount of recall with similar accuracy (Nash *et al*., 2014). Further, we found that participants interviewed with the CI recalled a higher number of correct units of information than participants interviewed with the SI, without compromising the accuracy of their accounts and regardless of the environment (Köhnken *et al*., 1999; Memon *et al*., 2010). This suggests the CI superiority effect can be replicated using online data-collection. Further, it suggests a virtual CI can, in some circumstances, be a valuable tool for police investigations.

The general guidelines issued during the COVID-19 pandemic raised restrictions on police forces and legal professionals' ability to collect eyewitness accounts in a timely manner (Brown *et al*., 2021; Kois *et al*., 2021). Eyewitness interviews were often postponed, raising concerns regarding the detrimental impact this can have on memory (Rubin and Wenzel, 1996).

Researcher's ability to perform in-person data collection was equally impaired, raising concerns whether online data-collection would be feasible for investigative interviewing studies. Virtual meeting platforms could circumvent such problems and be a viable alternative for interviewing eyewitnesses when in-person interviews are impractical or costly (Hamilton *et al*., 2017). However, virtual interviews/ experiments might also present limitations that could affect recall (Brown *et al*., 2021). For instance, the CI's social and communicative components (e.g., rapport building and use of non-verbal cues) might be difficult to accomplish during virtual meetings. Previous studies have shown contradictory evidence regarding the efficacy of using virtual environments for conducting eyewitness interviews. Some studies found virtual and in-person environments to be equally effective for collecting eyewitness testimonies (Doherty-Sneddon and McAuley, 2000; Hamilton *et al*., 2017; Nash *et al*., 2014) while others found that a virtual CI impaired the development of Facial composite sketches (Kuivaniemi-Smith *et al*., 2014). Further, only one study tested the efficacy of a virtual CI with adult participants (Nash *et al*., 2014) using a reduced version of the CI that required a professional video-conferencing technology and lacking a control group (e.g., the SI). Our study was the first to examine possible differences in recall between a full face-to-face CI and a full virtual CI while including a control group (i.e., the SI) for both environments. Further, virtual interviews were conducted in a virtual environment that did not require professionally equipped rooms that would be unavailable for most eyewitnesses, thus increasing ecological validity.

As predicted, participants interviewed with the CI recalled a higher number of correct units of information related to persons, actions, objects, and locations compared to participants interviewed with the SI (Köhnken *et al*., 1999; Memon *et al*., 2010). The CI did not increase the number of auditory information (i.e., conversations and sounds) recalled, which can be explained

by both groups (CI and SI) recalling a very low number of auditory details, possibly due to participants focusing on visual information and/ or the video itself containing fewer auditory details. Further the CI was more effective than the SI in both the face-to-face and the virtual environments. This provides evidence the CI superiority effect can be replicated in a virtual environment (Nash *et al*., 2014). Both conditions showed very high accuracy levels. This supports previous literature suggesting face-to-face and virtual interviews can be equally effective in terms of eliciting detailed and accurate information from adult eyewitnesses (Nash *et al*., 2014). The efficacy of video-conferencing technology has been demonstrated across a range of psychological and mental health settings (Backhaus *et al*., 2012; Brearly *et al*., 2017; Brown *et al*., 2021; Dale and Smith, 2021). For instance, Backhaus *et al*. (2012) conducted a systematic review to address how different aspects of video-conferencing affect psychotherapy, including feasibility, therapeutic relationship, and clinical outcomes. The results showed that video-conferencing psychotherapy was feasible and provided a strong therapeutic alliance with similar clinical outcomes. This supports the effectiveness of a virtual CI found in our study, by suggesting that communicative strategies used to establish therapeutic alliance, which are analogous to rapport building (e.g., active listening and use of non-verbal cues), can be successfully achieved in a virtual environment (Backhaus *et al*., 2012; Goldstein and Glueck, 2016).

Our study also supports previous literature (Davis *et al*., 2005) that found the CI superiority effect to be mainly related to the techniques and instructions provided in the first retrieval attempt (i.e., report everything and context reinstatement), with no differences found between the CI and the SI conditions regarding the quantity of information recalled in the second (change order vs. free recall) and third (change perspective vs. free recall) retrieval attempts.

This finding supports the change order and the change perspective mnemonics elicit a comparable amount of new information in comparison with additional free recall attempts. In fact, regardless of the procedure used, the second and third retrieval attempts produced only a small amount of new recall (Davis *et al*., 2005). A possible explanation is that after providing a complete initial account and answering witness-compatible questions, participants might be unmotivated or unable to recall more information regardless of the strategy used. This suggests shortened versions of the CI can be considered during time-critical situations (Paulo *et al*., 2016).

Limitations and Future Research

As with most laboratory research, the present study included various methodological limitations that should be considered carefully. For example, all interviews were conducted by a single interviewer who followed interview protocols verbatim with only a few minor adjustments. Also, we used a mock crime video and mock witnesses from a limited age range. These procedural decisions are common in this field (Davis *et al*., 2005) due to their advantages in ensuring experimental control and consistency in applying the protocols across participants. Further, we opted for a fully virtual procedure (i.e., both sessions) for the virtual interview conditions (CI and SI). This allowed us to study if the CI superiority effect can be replicated using virtual data-collection and control for a third variable (encoding and retrieval occurring in different environments). Although this was valuable to achieve our aims, it is unlikely to occur in real investigations and might lack ecological validity. Lastly, one participant in the virtual CI group was excluded due to internet issues that disrupted the interview. Although the decision to exclude this participant is reasonable from an experimental point of view, it is important to acknowledge that a possible limitation of virtual interviews in real settings is that the interviewer

loses control over the interview conditions, namely the equipment used, the interview room (e.g., no interruptions) and who else might be present and influencing the narrative.

Conclusion and Practical Implications

Video-conferencing technology has shown to be a reliable and cost-effective method to be used in forensic settings for both civil and criminal proceedings (Davis *et al*., 2015), namely to perform forensic assessments (Sales *et al*., 2018) or conduct pretrial release hearings (Davis *et al*., 2015). During the COVID-19 pandemic, the need for utilizing video-conferencing technology in correctional, forensic, and investigative settings increased, namely to conduct investigative interviews that were often delayed or even cancelled (Brown *et al*., 2021; Dale and Smith, 2021; Kois *et al*., 2021; Ritscher, 2020). Our study provides further evidence supporting the use of video-conferencing technology for research and practice in this field. This can be crucial for police forces and researchers who might benefit from conducting virtual investigative interviews or virtual data-collection not only due to the current pandemic, but also due to other constraints such as time and resources. This can be particularly relevant when multiple eyewitnesses need to be interviewed in a short time but there are limited resources to do so (e.g., lack of appropriate interview rooms or technical support). In these situations, virtual interviews can have advantages namely preventing the need to postpone interviews which can affect recall. Further, virtual interviews might be particularly helpful for eyewitnesses who might not be able to travel to the police station (e.g., living in remote locations) or may feel anxious doing so (e.g., children). Anxiety during retrieval may have detrimental effects on memory and virtual interviews can, in certain situations, help providing witnesses the relaxed, comfortable, and familiar environment that is key for eliciting detailed accounts.

References

Backhaus, A., Agha, Z., Maglione, M.L., Repp, A., Ross, B., Zuest, D., Rice-Thorp, N.M., Lohr, J., & Thorp, S.R. (2012). Videoconferencing psychotherapy: A systematic review. *Psychological Services, 9*, 111–131. https://doi.org/10.1037/a0027924

Blacksmith, N., Willford, J., & Behrend, T. (2016). Technology in the employment interview: A meta-analysis and future research agenda. *Personnel Assessment and Decisions, 2(1)*, 12-20. https://dx.doi.org/10.25035/pad.2016.002

Bower, G. (1967). A multicomponent theory of a memory trace. Spence, K.W. & Spence, J.T. (Eds.), *The psychology of learning and motivation: Vol. 1. Advances in research and theory*. Academic Press, Cambridge, MA, pp. 229-325.

Brearly, T.W., Shura, R.D., Martindale, S.L., Lazowski, R.A., Luxton, D.D., Shenal, B.V., & Rowland, J.A. (2017). Neuropsychological test administration by videoconference: A systematic review and meta-analysis. *Neuropsychology review*, *27*(2), 174-186. https://doi.org/ 10.1007/s11065-017-9349-1

Brown, D., Walker, D., & Godden, E. (2021). Tele-forensic interviewing to elicit children's evidence—Benefits, risks, and practical considerations. *Psychology, Public Policy, and Law, 27*(1), 17–29. https://doi.org/10.1037/law0000288

Brown, J.M. (2003). Eyewitness memory for arousing events: Putting things into context. *Applied Cognitive Psychology*, *17*(1), 93-106. https://doi.org/10.1002/acp.848

Collins, R., Lincoln, R., & Frank, M.G. (2002). The effect of rapport in forensic interviewing. *Psychiatry, Psychology and Law, 9,* 69–78. https://dx.doi.org/10.1375/pplt.2002.9.1.69

Dale, M.D., & Smith, D. (2021). Making the case for videoconferencing and remote child custody evaluations (RCCEs): The empirical, ethical, and evidentiary arguments for accepting new technology. *Psychology, Public Policy, and Law, 27*(1), 30–44. https://doi.org/10.1037/law0000280

Dando, C., Wilcock, R., Milne, R., & Henry, L. (2009). A modified cognitive interview procedure for frontline police investigators. *Applied Cognitive Psychology*, *23*, 698-716. https://doi.org/10.1002/acp.1501

Davis, M. R., McMahon, M., & Greenwood, K.M. (2005). The efficacy of mnemonic components of the cognitive interview: Towards a shortened variant for time-critical investigations. *Applied Cognitive Psychology*, *19*, 75–93. https://doi.org/10.1002/acp.1048

Davis, R., Matelevich-Hoang, B.J., Barton, A., DebusSherrill, S., & Niedzwiecki, E. (2015). *Research on videoconferencing at post arraignment release hearings: Phase I final report*. https://www.ncjrs.gov/pdffiles1/nij/grants/248902.pdf

Doherty-Sneddon, G., & McAuley, S. (2000). Influence of videomediation on adult– child interviews: Implications for the use of the live link with child witnesses. *Applied Cognitive Psychology, 14,* 379–392. https://dx.doi.org/10.1002/1099-0720(200007/08)14:4379::AIDACP6643.0.CO;2-T

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*, 1149-1160. https://dx.doi.org/10.3758/BRM.41.4.1149

Field, A.P. (2013). *Discovering statistics using IBM SPSS statistics*. Sage, London.

Fisher, R. P. (1995). Interviewing victims and witnesses of crime. *Psychology, Public Policy, and Law*, 1, 732–764. https://doi.org/10.1037/1076-8971.1.4.732

Fisher, R.P., & Geiselman, R.E. (1992). *Memory-enhancing techniques for investigative interviewing: The cognitive interview*. Charles C. Thomas, Springfield, IL.

Fisher, R.P., & Geiselman, R.E. (2010). The Cognitive Interview method of conducting police interviews: Eliciting extensive information and promoting therapeutic jurisprudence. *International Journal of Law and Psychiatry*, *33*, 321–328. https://doi.org/10.1016/j.ijlp.2010.09.004

Fisher, R.P., & Schreiber, N. (2007). Interview protocols for improving eyewitness memory. Toglia, M.P. Read, J.D. Ross, D.F. & Lindsay, R.C.L. (Eds.), *The handbook of eyewitness psychology, Vol. 1. Memory for events*, Lawrence Erlbaum Associates Publishers, New Jersey, pp. 53–80.

Fisher, R.P., Geiselman, R.E., & Amador, M. (1989). Field test of the cognitive interview: Enhancing the recollection of actual victims and interviewees of crime. *Journal of Applied Psychology, 74*, 722-727. https://doi.org/10.1037/0021-9010.74.5.722

Fisher, R.P., Geiselman, R.E., & Raymond, D.S. (1987). Critical analysis of police interview techniques. *Journal of Police Science and Administration*, *15*, 177-185.

Gabbert, F., Hope, L., & Fisher, R.P. (2009). Protecting eyewitness evidence: Examining the efficacy of a self-administered interview tool. *Law and Human Behavior, 33*(4), 298–307. https://doi.org/10.1007/s10979-008-9146-8

Geiselman, R.E., Fisher, R.P., Firstenberg, I., Hutton, L., Sullivan, S.J., Avetissian, I.V., & Prosk, A.L. (1984). Enhancement of eyewitness memory: An empirical evaluation of the cognitive interview. *Journal of Police and Science Administration*, *12*, 74–80.

Geiselman, R.E., Fisher, R.P., MacKinnon, D.P., & Holland, H.L. (1986). Enhancement of eyewitness memory with the cognitive interview. *The American Journal of Psychology*, *99*, 385-401. https://doi.org/10.2307/1422492

Geiselman, R.E., Fisher, R.P., MacKinnon, D.P., & Holland, H.L. (1985). Eyewitness memory enhancement in the police interview: Cognitive retrieval mnemonics versus hypnosis. *Journal of Applied Psychology*, *70*, 401–412. https://doi.org/10.1037/0021-9010.70.2.401

Gentle, M., Milne, R., Powell, M.B., & Sharman, S.J. (2013). Does the cognitive interview promote the coherence of narrative accounts in children with and without an intellectual disability? *International Journal of Disability, Development and Education*, *60*, 30-43. https://doi.org/10.1080/1034912X.2013.757138

Goldstein, F., & Glueck, D. (2016). Developing rapport and therapeutic alliance during telemental health sessions with children and adolescents. *Journal of child and adolescent psychopharmacology*, *26*, 204-211. https://doi.org/10.1089/cap.2015.0022

Hamilton, G., Whiting, E.A., Brubacher, S.P., & Powell, M.B. (2017). The effects of face-to-face versus live video-feed interviewing on children's event reports. *Legal and Criminological Psychology, 22,* 260–273. https://dx.doi.org/10.1111/lcrp.12098

Kebbell, M.R., & Wagstaff, G.F. (1999). The effectiveness of the cognitive interview. Canter, D. & Alison, L. (Eds.), *Interviewing and deception-Offender profiling series*, Vol. 1. Ashgate/Dartmouth, Aldershot, UK, pp. 23–39.

Khahani, M., Khahani, R., Khahani, M., & Khahani, Y. (2020) Skyroom (Version 12) [Online software]. Mahbang fanavarihaie pars. https://www.skyroom.online/

Köhnken, G., Milne, R., Memon, A., & Bull, R. (1999). The cognitive interview: A meta-analysis. *Psychology, Crime & Law*, *5*, 3–27. https://doi.org/10.1080/10683169908414991

Köhnken, G., Schimossek, E., Aschermann, E., & Höfer, E. (1995). The cognitive interview and the assessment of the credibility of adults' statements. *Journal of Applied Psychology*, 80, 671– 684. https://doi.org/10.1037/0021-9010.80.6.671

Kois, L.E., Cox, J., & Peck, A.T. (2021). Forensic e-mental health: Review, research priorities, and policy directions. *Psychology, Public Policy, and Law, 27*(1), 1–16. https://doi.org/10.1037/law0000293

Kramer, T.H., Buckhout, R., & Eugenio, P. (1990). Weapon focus, arousal, and eyewitness memory. *Law and Human Behavior*, *14*, 167-184. https://doi.org/10.1007/BF01062971

Kuivaniemi-Smith, H.J., Nash, R.A., Brodie, E.R., Mahoney, G., & Rynn, C. (2014). Producing facial composite sketches in remote Cognitive Interviews: A preliminary investigation. *Psychology, Crime & Law, 20,* 389–406. https://doi.org/10.1080/1068316X.2013.793339

Lamb, M.E., Orbach, Y., Hershkowitz, I., Esplin, P.W., & Horowitz, D. (2007). Structured forensic interview protocols improve the quality and informativeness of investigative interviews with children: A review of research using the NICHD investigative interview protocol. *Child Abuse & Neglect, 31*, 1201-1231. https://doi.org/10.1016/j.chiabu.2007.03.021

Laney, C. and Loftus, E.F. (2018). Eyewitness memory. In Kocsis, R.N. (Ed.), *Applied Criminal Psychology: A Guide to Forensic Behavioral Sciences*. Charles C. Thomas, Springfield, IL. 199–228.

Laney, C., & Loftus, E.F. (2009). Eyewitness memory, Kocsis, R.N. (Ed.), *Applied Criminal Psychology: A Guide to Forensic Behavioral Sciences*. Charles C. Thomas, Springfield, IL, pp. 121-145.

Larsson, A.S., Granhag, P.A., & Spjut, E. (2003). Children's recall and the cognitive interview: Do the positive effects hold over time? *Applied Cognitive Psychology*, *17*, 203–214. https://doi.org/10.1002/acp.863

Loftus, E.F., Miller, D.G., & Burns, H.J. (1978). Semantic integration of verbal information into visual memory. *Journal of Experimental Psychology: Human Learning and Memory*, *4*, 19-31. https://doi.org/10.1037/0278-7393.4.1.19

Memon, A., Meissner, C.A., & Fraser, G. (2010). The cognitive interview: A meta-analytic review and study space analysis of the past 25 years. *Psychology, Public Policy, and Law*, *16*, 340–372. https://dx.doi.org/10.1037/a0020518

Milne, B. (2017). *The cognitive interview: A step-by-step guide*. Unpublished training manual.

Milne, R., & Bull, R. (1999). *Investigative Interviewing: Psychology and Practice*. Wiley, Chichester.

Milne, R., & Bull, R. (2002). Back to basics: A componential analysis of the original cognitive interview mnemonics with three age groups. *Applied Cognitive Psychology*, *16*, 743–753. https://doi.org/10.1002/acp.825

Milne, R., & Bull, R. (2003), Does the cognitive interview help children to resist the effects of suggestive questioning?. *Legal and Criminological Psychology*. 8. 21–38, https://doi.org/10.1348/135532503762871219.

Nash, R.A., Houston, K.A., Ryan, K., & Woodger, N. (2014). Remembering remotely: Would video-mediation impair witnesses' memory reports? *Psychology, Crime & Law, 20,* 756–768. https://dx.doi.org/10.1080/1068316X.2013.857669

Paulo, R.M., Albuquerque, P.B., & Bull, R. (2013). The enhanced cognitive interview: Towards a better use and understanding of this procedure. International Journal of Police Science & Management, 15, 190–199. https://doi.org/10.1350/ijps.2013.15.3.311

Paulo, R.M., Albuquerque, P.B., & Bull, R. (2016). Improving the enhanced cognitive interview with a new interview strategy: Category clustering recall. *Applied Cognitive Psychology*, *30*, 775–784. https://dx.doi.org/10.1002/acp.3253

Paulo, R.M., Albuquerque, P.B., Saraiva, M., & Bull, R. (2015). The enhanced cognitive interview: Testing appropriateness perception, memory capacity and error estimate relation with report quality. *Applied Cognitive Psychology*, *29*, 536–543. https://doi.org/10.1002/acp.3132

Penrod, S.D., Loftus, E.F., & Winkler, J. (1982). The reliability of eyewitness testimony: A psychological perspective. Kerr, N. L. & Bray, R. M. (Eds.), *The psychology of the courtroom*. Academic Press, Orlando, FL, pp. 119-168.

Prescott, K., Milne, R., & Clarke, J. (2011). How effective is the enhanced cognitive interview when aiding recall retrieval of older adults including memory for conversation? *Journal*

of Investigative Psychology and Offender Profiling, 8, 257–270. https://doi.org/10.1002/jip.142

Ritscher, C. (2020). COVID-19 and International Crimes Trials in Germany. *Journal of International Criminal Justice*, *18*(5), 1077-1080. https://doi.org/10.1093/jicj/mqaa055

Rubin, D.C., Wenzel, A.E. (1996). One hundred years of forgetting: A quantitative description of retention. *Psychological Review*, *103*, 734–760. https://doi.org/10.1037/0033-295X.103.4.734

Sadatian, J. (Producer). (2002). *Khab o Bidar* [Sleep and Wake] [Television Series]. Tehran: Naji honar.

Sales, C.P., McSweeney, L., Saleem, Y., & Khalifa, N. (2018). The use of telepsychiatry within forensic practice: a literature review on the use of videolink–a ten-year follow-up. *The Journal of Forensic Psychiatry & Psychology*, *29*, 387-402. https://doi.org/10.1080/14789949.2017.1396487

Shahvaroughi, A., Bahrami Ehsan, H., Hatami, J., Monajem, A., & Paulo, R.M. (2021). Testing a modified cognitive interview with category clustering recall in Iran. *Applied Cognitive Psychology*, 34, 148-159, https://doi.org/10.1002/acp.3747

Stein, L.M., & Memon, A. (2006). Testing the efficacy of the cognitive interview in a developing country. *Applied Cognitive Psychology*, *20*, 597–605. https://doi.org/10.1002/acp.1211

Tuckey, M.R., & Brewer, N. (2003). The influence of schemas, stimulus ambiguity, and interview schedule on eyewitness memory over time. *Journal of Experimental Psychology: Applied*, *9*, 101–118. https://doi.org/10.1037/1076-898X.9.2.101

Tulving, E. (1974). Cue-Dependent Forgetting: When we forget something we once knew, it does not necessarily mean that the memory trace has been lost; it may only be inaccessible. *American Scientist, 62*, 74-82. Retrieved from http://www.jstor.org/stable/27844717

Tulving, E., & Thomson, D. (1973). Encoding specificity and recall processes in episodic memory. *Psychological Review*, *80*, 352–373.

Vallano, J.P., & Schreiber Compo, N. (2015). Rapport-building with cooperative witnesses and criminal suspects: A theoretical and empirical review. *Psychology, Public Policy, and Law*, *21*, 85–99. https://doi.org/10.1037/law0000035

Wixted, J.T., Mickes, L., & Fisher, R.P. (2018). Rethinking the reliability of eyewitness memory. *Perspectives on Psychological Science*, *13*, 324-335. https://doi.org/10.1177/1745691617734878

Table I

Differences Between the Interview Protocols According to Interview Phase.

	Phase 1	**Phase 2**	**Phase 3**	**Phase 4**	**Phase 5**	**Phase 6**
	Rapport and Preliminary Instructions	First Retrieval Attempt	Witness-compatible Questioning	Second Retrieval Attempt	Third Retrieval Attempt (for new information)	Closure
SI	Without TF	Free Recall (Without RE and CR)	Without MI	Free Recall	Free Recall	x
CI	With TF	Free Recall (With RE and CR)	With MI	Change Order	Change Perspective	x

Note. SI, structured interview; CI, cognitive interview; TF, transferring control of the interview; RE, report everything; CR, context reinstatement; MI, mental imagery; x, no differences between interview conditions

Table II

Mean and Standard Deviation for the Number of Correct Units of Information Newly Recalled at Each Interview Phase according to Interview Technique and Interview Condition.

Interview Phase	Correct Units of Information							
	Structured Interview				Cognitive Interview			
	Face-to-face		Virtual		Face-to-face		Virtual	
	M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
Phase 2. First Retrieval*	32.14	11.25	28.36	8.36	53.32	25.67	57.18	17.25
Phase 3. Questioning	4.86	2.39	6.23	2.76	5.36	2.93	7.05	3.97
Phase 4. Second Retrieval	9.82	4.45	8.09	4.30	7.09	4.48	7.82	5.23
Phase 5. Third Retrieval	1.45	1.82	2.64	3.03	3.68	5.12	1.86	1.58
Total	48.27	12.49	45.36	9.29	69.36	26.46	73.91	18.90

* $p < .001$

Table III

Mean, Standard Deviation, and 95% Confidence Intervals for the Number of Correct Units of Information Recalled According to Interview Condition and Category of Information.

Category of Information	Interview Condition					
	Structured Interview			Cognitive Interview		
	M	***SD***	***95%CI***	***M***	***SD***	***95%CI***
Person*	14.02	5.30	[12.41, 15.63]	21.11	6.83	[19.04, 23.19]
Action*	18.89	5.48	[17.22, 20.55]	26.07	7.72	[23.72, 28.42]
Object*	5.68	2.55	[4.91, 6.46]	10.43	5.85	[8.65, 12.21]
Location*	4.05	1.98	[3.44, 4.65]	9.23	5.33	[7.58, 10.83]
Auditory	4.18	2.54	[3.41, 4.95]	4.80	3.20	[3.82, 5.77]
Total*	46.82	10.98	[43.48, 50.16]	71.64	22.84	[64.69, 78.58]

* $p < .001$

Table IV

Mean, Standard Deviation, and 95% Confidence Intervals for the Recall Accuracy at Each Interview Phase according to Interview Condition.

	Recall Accuracy					
	Structured Interview			**Cognitive Interview**		
Interview Phase	***M***	***SD***	***95%CI***	***M***	***SD***	***95%CI***
Phase 2. First Retrieval	.96	.04	[.94, .97]	.97	.02	[.96, .97]
Phase 3. Questioning	.92	.15	[.88, .97]	.94	.12	[.90, .97]
Phase 4. Second Retrieval	.93	.09	[.90, .96]	.94	.08	[.91, .96]
Total	.95	.04	[.93, .96]	.96	.02	[.95, .97]

Supplemental Material

Full Description of the Interview Protocols

During phase 1 (rapport and preliminary instructions), the interviewer established rapport and explained the interview aims and instructions (e.g., not to guess) to all participants regardless of the interview group. Further, the CI protocols included the transfer of control instruction: *(...) it was you who saw the video and have all the critical information (...) I will not interrupt you (...) you can tell me what happened in the order you wish and pause whenever you want*.

During phase 2 (first retrieval attempt), all participants were asked to provide a free recall regarding the event in any order and at the pace they desired. However, only the CI protocols included the report everything and the context reinstatement instructions before initiating the free recall: *(...) please tell me everything you remember about the video with as much detail as possible (...) everything that comes to your mind (...) even the details that might seem irrelevant to you (...) but first, please focus on the day you watched the video (...) think about what you were doing that day (...) now imagine the crime scene in your mind and try to get a clear picture (...) very clear (...) think of how you were feeling (...) all the objects you saw (...) all the sounds you heard (...) all the persons that were present in the video (...) when you are ready and have a clear picture of the event in your mind, please tell me everything you remember with as much detail as possible*.

During phase 3 (Witness-compatible questioning), the interviewer asked all participants to answer two open-ended questions compatible with their report (e.g., please describe the female perpetrator — if the participant previously reported seeing a female perpetrator). All participants were reminded not to guess. However, the mental imagery instruction was used only

for the CI groups: *Can you please close your eyes (…) think about a scene in which you saw the female perpetrator clearly (…), and when you have a full picture of her in your mind, please describe her with as much detail as possible.*

During phase 4 (second retrieval attempt), participants were asked a second time to report what they remembered about the event. All participants were encouraged to give this second report, and the importance of such procedure was explained. Participants in the SI conditions were asked to provide a second free recall of the event in any order and at the pace they desired. Participants in the CI conditions were asked to recall the event in reverse chronological order: *(…) I would like you to tell me again everything you remember about the video, but this time in a reverse order (…) first focus on the last episode that you remember (…) what happened just before that? (…) and before that? (…)*.

During phase 5 (third retrieval for new information only), participants from both the SI and the CI groups were asked to focus on the event once again and try to recall any further details. In the CI conditions, the change perspective mnemonic was used. Instead of asking participants to recall the event from the perspective of another eyewitness, a variation of this technique was used and participants were asked to recall the event from the perspective of an actor performing in a theater play (Milne, 2017): *(…) please focus one more time on the event (…) this time imagine the event as a theater play (…) a play which displays a criminal event (…) now imagine that you are a character of this show (…) adopt his/her perspective (…) review all scenes (…) and tell me if you can remember anything else*.

In the last phase (closure), all participants were appreciated for their hard work and cooperation, and neutral topics were again discussed.