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Testing a modified cognitive interview with category clustering recall in Iran

Ahmad Shahvaroughi

Department of Psychology, University of Tehran

Hadi Bahrami Ehsan

Department of Psychology, University of Tehran

Javad Hatami

Department of Psychology, University of Tehran

Arash Monajem

Department of Psychology, University of Tehran

Rui M. Paulo

School of Science, Bath Spa University

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Abstract

The Cognitive Interview (CI) has been an effective method for interviewing eyewitnesses often leading to changes in legislation and practice in many countries. This study was the first to employ the CI in Iran and test whether Category Clustering Recall (CCR) was superior to a free recall when incorporated within an investigative interview. A between-subjects design assigned 66 participants to one of three interview conditions after they watched a mock robbery. The participants were interviewed 48 hours later using either a Structured Interview (SI), the CI, or a Modified Cognitive Interview (MCI) that replaced free recall with CCR at the first retrieval attempt. Analysis of variance suggests CCR was more effective than free recall and the CI group recalled more information than the SI group, replicating the CI superiority effect. This has implications for law enforcement in Iran and Worldwide by suggesting these techniques can be used to enhance recall.

*Keywords:* Cognitive Interview, Category Clustering Recall, Free Recall, Modified Cognitive Interview, Iran

Eyewitness memory is malleable (Davis, Loftus, & Follette, 2001). Consequently, it can be affected by different internal sources such as schema activation (Thomassin & Alain, 1990) and arousal (Kramer, Buckhout, & Eugenio, 1990), and external sources such as post-event information (Loftus, Miller, & Burns, 1978) and memory conformity (Gabbert, Memon, & Allan, 2003). Inadequate interviewing techniques can often augment this problem, with police detectives who receive little or no training on how to conduct appropriate investigative interviews often conducting poor interviews and obtaining testimonies that lack relevant information (Ainsworth, 2002; Fisher & Geiselman, 2010; Fisher, Geiselman, & Raymond, 1987; Kebbell & Milne, 1998; Milne & Bull, 1999). Despite these shortcomings, witnesses' accounts can often determine the outcome of criminal investigations (Berresheim & Weber, 2003; Brown, Lloyd-Jones, & Robinson, 2008; Fisher, 1995) and influence courtroom decisions (Brewer & Wells, 2011; Winningham & Weaver, 2000). To address this issue, and with the aim of obtaining informative accounts from eyewitnesses, Fisher and Geiselman (1992) developed a set of interview techniques now known as the Cognitive Interview (CI).

### **The Cognitive Interview**

The original Cognitive Interview (Geiselman et al., 1984) included four cognitive mnemonics that were aimed at enhancing recall: the report everything instruction, mental reinstatement of context, the change order mnemonic, and the change perspective mnemonic. The *report everything instruction* consists of asking eyewitnesses to report everything that comes to their mind, even when they think that information might be irrelevant to the interviewer. *Mental reinstatement of context* consists of asking participants to mentally recreate the environmental and personal context of the event. This instruction is based on the encoding specificity hypothesis (Tulving & Thomson, 1973), which states that retrieval can be improved

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when the context of encoding is recreated at the time of retrieval. The *change order* mnemonic consists of asking participants to recall the event one more time in a different chronological order. The *change perspective* mnemonic requires the eyewitness to recall the event from a different perspective. These mnemonics were derived from the multiple trace theory (Bower, 1967) and aimed to increase the likelihood of eyewitnesses recalling additional information that was not recalled during the previous retrieval attempts. An enhanced version of the original CI, developed by Fisher and Geiselman (1992), includes several social and communicative components such as rapport building, witness-compatible questioning, mental imagery, and transferring control of the interview to the witness. Although this second version of the Cognitive Interview was first named the Enhanced Cognitive Interview, it is now commonly referred to as the Cognitive Interview (CI). For more information about this interview and its components, see Geiselman and Fisher (2014) or Memon, Meissner, and Fraser (2010).

Several experimental studies involving the CI have been conducted (see these two meta-analyses: Köhnken, Milne, Memon, & Bull, 1999; Memon et al., 2010). It has been found, across multiple studies, the CI can increase the amount of information eyewitnesses are able to recall in comparison with standard police interviews (i.e., interview protocols used by non-specialist police forces; Geiselman, Fisher, MacKinnon, & Holland, 1985) or the Structured Interview (i.e., a variant of the CI containing the same number of retrieval attempts but without the CI's key components and mnemonics; Koehnken, Thürer, & Zoberbier, 1994). This finding is commonly referred to as the CI superiority effect and has been replicated in many different studies (Memon et al., 2010) with different delays, ranging from minutes to years, between witnessing and recalling the crime (Brock, Fisher, & Cutler, 1999; Fisher, Falkner, Trevisan, & McCauley, 2000). The CI has also shown to improve recall from different groups of eyewitnesses such as

children (Holliday, 2003; Larsson, Granhag, & Spjut, 2003; Verkamp & Ginet, 2010), older adults (Mello & Fisher, 1996; Wright & Holliday, 2007), and eyewitnesses with intellectual disabilities (Gentle, Milne, Powell, & Sharman, 2013). Moreover, the CI superiority effect has been found in both laboratory and field studies (Clifford & George, 1996; Davis, McMahon, & Greenwood, 2005; Fisher, Geiselman, & Amador, 1989); with eyewitnesses of different educational backgrounds (Allwood, Ask, & Granhag, 2005; Stein & Memon, 2006); and different types of to-be-remembered events, from live staged events to mock crime videos (Gwyer & Clifford, 1997; Memon, Wark, Bull, & Köhnken, 1997). Regarding geographical generalizability, the CI superiority effect has been replicated in many developed countries (e.g., USA, UK, France, Italy, Australia, New Zealand, and Portugal) and developing countries, like Brazil and Mexico (Bensi, Nori, Gambetti, & Giusberti, 2011; Elizalde Monjardin, 2016; Ginet & Verkamp, 2007; Paulo, Albuquerque, Saraiva, & Bull, 2015; Stein & Memon, 2006).

### **Individual Components and Alternative Procedures**

Although these studies demonstrate the CI effectiveness as a holistic and complex interview protocol, this interview comprises different components, mnemonics, and instructions that might not always share the same level of efficacy. Thus, researchers have evaluated how each individual component in isolation has contributed towards the CI superiority effect (Memon et al., 1997; Milne & Bull, 2002). Procedures like rapport building (Vallano & Schreiber Compo, 2015), mental reinstatement of context (Milne & Bull, 1999), or an initial free recall (Lamb, La Rooy, Malloy, & Katz, 2011) were found to be generally efficient techniques to enhance recall. However, other mnemonics such as the change order and change perspective mnemonics seem only to be useful for some specific purposes and events (Boon & Noon, 1994; Dando, Wilcock, Behnke, & Milne, 2011; Davis et al., 2005). For example, although the change order mnemonic

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can be useful to increase cognitive load (Vrij et al., 2008) and improve recall for events where script associated assumptions can induce incorrect recall (Ginet & Py, 2001), these techniques are often ineffective, time-consuming, and difficult to use (Dando, Wilcock, & Milne, 2008).

Given these issues, several authors examined the effectiveness of Modified Cognitive Interviews excluding these two mnemonics or replacing them with various alternative mnemonics (e.g., Brunel, Py, & Launay, 2013; Colomb & Ginet, 2012; Paulo, Albuquerque, & Bull, 2016). Davis et al. (2005) tested a different version of the CI where the change order and change perspective mnemonics were replaced by two motivated recall attempts (i.e., additional free recall attempts with instructions highlighting the importance of providing multiple recall attempts to increase participants' motivation). The results indicated that the motivated recall attempts were more effective than the change order and the change perspective mnemonics in terms of enhancing recall. Colomb and Ginet (2012) tested how effective a number of different modified CIs with various mnemonics were in terms of enhancing recall. They examined whether an instruction they named Guided Peripheral Focus (i.e., guided retrieval strategy that is similar to a witness-compatible question but designed to introduce a free recall attempt and promote peripheral focus) could further enhance recall in comparison with the change perspective mnemonic. In line with previous research, they found no advantages for using the change order and change perspective mnemonics instead of multiple free recall attempts. They also found Guided Peripheral Focus to be more effective than the change perspective mnemonic in terms of increasing the quantity of information recalled, without compromising report accuracy. Another retrieval strategy called open depth instruction, encourages participants to provide an additional recall attempt while focusing on the peripheral information and the mental images of the event. Brunel et al. (2013) indicated that the open depth instruction could not only

improve recall in comparison with the change perspective mnemonic, but also in comparison with a second motivated recall attempt. Further, recent studies suggest self-generated cues (i.e., salient cues actively generated by the interviewee) can also be an effective method for enhancing recall as these are compatible with the witnesses' mental organization of the event rather than cues generated by the interviewer (Wheeler & Gabbert, 2017).

### **Category Clustering Recall**

Several studies have demonstrated that new instructions and techniques can be added to the Cognitive Interview to increase its effectiveness and replace less effective mnemonics (e.g., the change order and the change perspective mnemonics). Recently, Paulo et al. (2016) developed a new interview strategy they named Category Clustering Recall (CCR), based on the spreading-activation theory of semantic processing (Collins & Loftus, 1975). With CCR, eyewitnesses are asked to organize their recall into relevant information categories (i.e., person, action, object, location, conversation and sound). This is, eyewitnesses are first asked to recall what they remember about a specific category of the crime (e.g., person details) and then proceed to the next category (e.g., objects at the crime scene), and so forth. The authors found that if eyewitnesses organize the recall of a crime event this way, they are able to recall more information.

In their first study, Paulo et al. (2016) compared the CI with a modified CI which contained CCR instead of the change order mnemonic during a second recall attempt. They also tested whether eye closure and appropriate open-ended follow-up questions could further improve CCR. Results indicated that participants interviewed with CCR during a second recall attempt were able to recall more correct information than the CI group who used the change order mnemonic instead. Moreover, report accuracy was high, and similar, for all groups. Eye

closure and follow-up questions did not improve recall when used in conjunction with CCR. In a follow up study, Paulo, Albuquerque, Vitorino, and Bull (2017) found that another modified CI with CCR instead of a witness-compatible questioning also produced more correct information. Paulo et al. (2017) also found that participants in the modified CI group reported additional details during their second retrieval attempt using CCR rather than their initial free recall. Thus, CCR has shown to enhance recall in comparison with other CI procedures such as the change order mnemonic, a witness-compatible questioning, or maybe even a free recall (although the authors did not compare these two procedures directly at the same interview phase).

Recently, Thorley (2018) tested if CCR could increase the recall performance in collaborative pairs and individuals in comparison with a free recall attempt. This study aimed to examine the benefits of free recall and CCR for collaborative eyewitness recall. For this, Thorley (2018) asked collaborative pairs of strangers, nominal pairs, and lone individuals, to watch a crime video and then recall the event after a short delay, using either a free recall or CCR. Results indicated that CCR was superior to a free recall for all groups of participants. This study provides initial evidence that CCR could be more effective than a free recall, which is important, from an applied perspective, given that an initial free recall phase is often included within investigative interviews (Dando et al., 2008; Kebbell, Milne, & Wagstaff, 1999). Nevertheless, no study to date has compared CCR with free recall when both these techniques are included in a CI protocol. Thorley (2018) compared these two strategies when used as the sole forms of retrieval without any additional instructions, mnemonics, and retrieval attempts that would usually be included in an appropriate investigative interview. However, CCR's superiority over a free recall has never been tested in a more ecologically valid setting where these preliminary instructions and mnemonics are included. For instance, one of these mnemonics (mental

reinstatement of context) has shown repeatedly to enhance recall in subsequent free recall tasks (Milne & Bull, 1999) but might not have the same effect on clustering retrieval tasks due, for instance, to the possibility of the clustering process interfering with the mental image of the event. The present study aimed to explore this issue, i.e., test CCR superiority over a free recall when both procedures are incorporated in a full investigative interview and combined with a range of compatible preliminary instructions, mnemonics, and procedures (e.g., establishing rapport and mental reinstatement of context) that constitute best practice in real investigative interviews. This can provide further insight on whether CCR can be used in real investigative interviews where such preliminary procedures and mnemonics would typically be included.

### **Cultural Characteristics and Research in Iran**

Although, as mentioned, the CI has been found to be effective in several developed and developing countries, no study has ever been conducted with an Iranian population that might be considerably different from the populations studied before. Previous research suggests cultural characteristics may affect how an eyewitness remembers and reports an event and may have implications for various memory mechanisms underlying memory for objects (versus context), memory for social contexts, autobiographical memories, and false memories (Anakwah, Horselenberg, Hope, Amankwah-Poku, & van Koppen, 2020; Gutchess, & Huff, 2016; Gutchess et al., 2006). A recent experiment by Anakwah et al. (2020) investigated the effects of cultural norms on eyewitness memory using a cross-cultural sample from Ghana and the Netherlands. Participants viewed photographs of different crime scenarios, one at a time, depicted in both cultural settings. Participants were then asked to recall what they remembered about the central and background details. Results indicated that the participants from the Netherlands reported more details than participants from Ghana. Moreover, participants from both cultural groups

reported more correct details when the crime scenario was depicted in their own native setting. Another experiment by Jobson and Cheraghi (2016) investigated the effects of cultural characteristics on autobiographical memories from British and Iranian survivors and found that British participants recalled more personal themed memories than Iranian participants, who recalled more social themed memories. Lastly, the type of categorization used in CCR might be particularly affected by cultural characteristics as individuals from Western cultures tend to rely more on categorization when processing and recalling information in comparison with individuals from Eastern cultures (Gutchess, & Huff, 2016; Gutchess et al., 2006; Ji, Zhang, & Nisbett, 2004; Schwartz, Boduroglu, and Gutchess, 2014; Unsworth, Sears, & Pexman, 2005). Schwartz et al. (2014) examined cross-cultural differences between Turkish citizens (Middle-Eastern culture) and American citizens (Western culture) and found that American citizens tend to rely more on category clustering during recall. Considering the impact cultural characteristics can have on memory, particularly on the use of category clustering (Schwartz et al., 2014), studying whether the CI and CCR are effective with an Iranian population is important to assure cultural characteristics do not impair their effectiveness and introduce these techniques to the Iranian police forces.

### **Current Study**

The aim of the present study was to compare how effective three interview protocols were at enhancing eyewitnesses' recall when applied to an Iranian population. One group of participants was interviewed with a CI (CI group), a second group of participants was interviewed with a Structured Interview (SI group), and a third group of participants was interviewed with a Modified CI (MCI) that included CCR instead of a free recall (See Table 1). As previous research suggests the change order and the change perspective techniques are often

unable to improve recall in comparison with a free recall attempt (Colomb & Ginet, 2012; Davis et al., 2005) the change order and change perspective techniques were replaced by a single free recall attempt in the MCI condition to see whether a shorter interview protocol could also be effective (See Table 1).

Insert Table 1

This study allowed a direct comparison between CCR and a free recall when both procedures are used at the first retrieval phase of a full investigative interview and combined with a range of compatible preliminary instructions, mnemonics, and procedures (described in the method section) that are recommended in real police interviews. This study also allowed us to test if the CI superiority effect can be replicated with an Iranian population. Based on the literature, three main hypotheses were established: (i) the CI will elicit more correct recall than the SI without compromising report accuracy. That is, similarly to what was found with other populations (Elizalde Monjardin, 2016; Paulo et al., 2015; Stein & Memon, 2006), the CI superiority effect will be verifiable with an Iranian population; (ii) participants who use CCR during the first retrieval attempt (i.e., MCI group) will recall more information at this stage of the interview than participants who perform a free recall attempt (CI and SI groups), without a compromise in report accuracy (Manning & Kahana, 2012; Thorley, 2018); (iii) a second free recall task (MCI group) can be more effective for eliciting additional information than the change order mnemonic (Boon & Noon, 1994; Dando et al., 2011; Davis et al., 2005).

## **Method**

### **Participants**

An a priori power analysis was conducted using G\*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009) to calculate the sample size necessary to test the difference between the CI and SI group means using a one-tailed test. An alpha of .05 and an estimate of the CI superiority effect size over a structured interview ( $d = 1.09$ ) reported in a recent meta-analysis review (Memon et al., 2010) were used. Results showed that 19 participants per group would be required to achieve a high power of .95. To account for participants who might later need to be excluded from the analysis, a total of 66 students from a university in Tehran, 49 females and 17 males, with an age range from 19 to 35 years ( $M = 21.64$ ,  $SD = 3.57$ ) took part in the study. All participants were recruited through posters, flyers, and word of mouth. Participants were randomly allocated to three interview conditions with 22 participants in each group. The Structured Interview (SI) group had 14 female participants and eight male participants with an age range from 20 to 34 ( $M = 22.09$ ,  $SD = 3.25$ ), The CI group had 17 female participants and five male participants with an age range from 19 to 35 ( $M = 21.86$ ,  $SD = 3.55$ ). The MCI group had 18 female participants and four male participants with an age range from 19 to 29 ( $M = 20.95$ ,  $SD = 2.23$ ).

### **Design**

The present study employed a between-subjects experimental design. The main independent variable was interview condition with three levels: (1) SI; (2) CI; and (3) MCI (see Table 1). The dependent variables were the number of units of information recalled and recall accuracy (proportion of correct information, i.e., the number of correct units of information a participant recalled divided by the total number of units of information she/he recalled).

### **Materials**

The participants watched the video on a Samsung 55" LED screen. The video recording was edited from the eighth episode of the Iranian TV drama 'Sleep and Wake' (Sadatian, 2002) and was 4 minutes and 58 seconds long. This video shows two males and one female walking inside a bank, checking for security guards, and carrying out a robbery. Afterwards, the robbers escape while monitoring the camera and police radio. Participants were asked whether they had previously viewed this video with only one participant responding positively. As his performance in terms of recall (e.g., recall quantity and accuracy) was similar to the other participants in his group (CI condition) his data was kept in the analysis.

### **Procedure**

The University's ethics committee granted ethical approval for this study. All participants took part in two separate sessions. In the first session, participants were randomly allocated to one of the three interview conditions (SI, CI or MCI). Then, general information about the study was given to the participants and, if they accepted to participate, they were shown the video recording. The second session took place approximately 48 hours later and each participant was interviewed with the SI, the CI, or the MCI (described below). Interviews were audio recorded.

**Interview conditions.** All interview protocols were translated and adapted from Milne and Bull (2003), and Paulo et al. (2016). The guidelines to apply the CI were followed (e.g., Fisher & Geiselman, 1992; Milne, 2017).

The CI and SI protocols included the same number of retrieval attempts and had six main phases: (1) preliminary phase; (2) first recall; (3) open-ended questioning; (4) second recall; (5) third recall (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, as only the CI enclosed these techniques. All other procedures like rapport building (i.e., building a positive interpersonal relationship by greeting and welcoming participants, addressing neutral topics, and thanking participants for their contribution to this study) and appropriate questioning (e.g., witness-compatible questioning) were used in all interview conditions as these are now considered key procedures to conduct an adequate investigative interview and included in most appropriate interview guidelines, like the PEACE (Preparation and planning; Engage and explain; Account; Closure; Evaluation) model (Clarke, Milne, & Bull, 2011; Milne, Shaw & Bull, 2007), the Achieving Best Evidence (ABE) guidance (Ministry of Justice, 2011), and the National Institute of Child Health and Human Development (NICHD) protocol (Lamb, Orbach, Hershkowitz, Esplin, & Horowitz, 2007). In the MCI protocol, the free report was replaced with the CCR technique and the third retrieval attempt was not conducted to see whether a shorter interview protocol would be effective. All other procedures in the MCI protocol (i.e., open-ended questioning, transfer of control, context reinstatement and mental imagery) were similar to the CI condition (See Table 1). A full description of the interview protocols is included in the appendix.

**Interviewer training.** A trained interviewer performed all the interviews. He received training from an expert in the CI who had followed several courses on investigative interviewing techniques. The training consisted of: (1) explaining the underlying theories and memory principles underlying investigative and cognitive interviewing; (2) explaining and demonstrating how to apply several investigative interviewing techniques, including the cognitive mnemonics and social components of the CI; and (3) feedback and review. A single interviewer conducted all the interviews and the interview protocols were followed verbatim with only a few minor adjustments (e.g., witness-compatible questioning needs to be adapted according to the

participant's previous recall). These procedural decisions were made as we considered their advantages (e.g., ensuring experimental control and consistency in terms of applying the protocols across participants) outweighed possible disadvantages (e.g., possible lack of ecological validity or inability to compare the results across different interviewers).

**Coding.** A comprehensive list of details in the video was first compiled and all units of information identified in the video were categorized as referring to (1) persons; (2) actions; (3) objects; (4) locations; (5) conversations; and (6) sounds, resulting in a list of details with 433 units of information. The audio-recordings from each participant were then coded using the template scoring technique from Memon et al. (1997). Participant's recall was divided into units of information and registered in a written format. Information 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. All units of information were scored only the first time they were mentioned (Prescott, Milne, & Clark, 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 information categories mentioned above.

**Inter-rater reliability.** In order to assess the reliability of coding, 17 (25.5%) interviews were randomly selected and coded independently by a researcher who was naïve to the aims of the experiment and the hypothesis. The independent coder was familiar with the method of interview coding and had access to the crime video. 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 .979 and 1.000 with an overall ICC of .989.

## Results

### Overall Recall Quantity According to Interview Condition

First, we conducted a multivariate ANOVA to see if interview condition had an effect on recall performance which consisted of three measures: 1) number of correct units of information recalled; 2) number of errors committed; and 3) number of confabulations committed. This found a significant difference in recall performance according to interview condition,  $F(6, 122) = 7.40$ ,  $p < .001$ , *Wilk's  $\Lambda$*  = .54,  $\eta_p^2 = .27$ . Univariate ANOVAs found an effect of interview condition on the number of correct units of information recalled,  $F(2, 65) = 19.43$ ,  $p < .001$ ,  $\eta_p^2 = .38$ . Games-Howell's post hoc comparisons showed significant differences between all interview conditions. Participants who were interviewed with the SI ( $M = 48.27$ ,  $SD = 12.49$ , 95% CI [42.73, 53.81]) recalled a lower number of correct units of information than participants who were interviewed with the CI ( $M = 69.36$ ,  $SD = 26.45$ , 95% CI [57.63, 81.09]),  $p = .006$ , 95% CI [5.71, 36.47], or the MCI ( $M = 92.77$ ,  $SD = 28.76$ , 95% CI [80.02, 105.52]),  $p < .001$ , 95% CI [27.98, 61.02]. Participants in the CI group recalled fewer correct units of information than participants in the MCI group,  $p = .020$ , 95% CI [3.16, 43.66]. There was no effect of interview condition on the number of errors,  $F(2, 65) = .20$ ,  $p = .818$ ,  $\eta_p^2 = .01$ , nor confabulations,  $F(2, 65) = 1.06$ ,  $p = .351$ ,  $\eta_p^2 = .03$ , committed throughout the interview.

In sum, participants who were interviewed with the MCI recalled a higher number of correct units of information in comparison with participants who were interviewed with the CI or the SI. Participants who were interviewed with the CI also recalled a higher number of correct

units of information in comparison with the SI group, thus replicating the CI superiority effect. No differences in terms of the number of errors and confabulations were found.

### **Recall Quantity According to Interview Phase and Interview Condition**

We then conducted a mixed  $3 \times 3$  ANOVA to see if interview condition (SI, CI, or MCI) and interview phase (Phase 2: First recall attempt; Phase 3: Witness-compatible questioning, or Phase 4: Second recall attempt) had an effect on the number of correct units of information recalled. Phase 1 (Rapport and preliminary instructions) was excluded from this analysis because it was a preliminary phase where participants were not asked to recall any information. Phase 5 (Third recall attempt) was also excluded because the MCI condition did not contain this interview phase (see table 1).

We found a significant main effect of interview condition,  $F(2, 63) = 20.63, p < .001, \eta_p^2 = .39$ , interview phase,  $F(1.103, 70.656) = 272.62, p < .001, \eta_p^2 = .81$ , and an interaction effect between interview condition and interview phase,  $F(2.206, 143.52) = 21.92, p < .001, \eta_p^2 = .41$ . As mentioned above, participants in the MCI group recalled a higher number of correct units of information in comparison with participants in the CI and the SI groups. Also, participants in the CI group recalled a higher number of correct units of information than participants in the SI group. Regarding the main effect of interview phase, pairwise comparisons revealed participants recalled significantly more correct information in their first recall attempt (phase 2:  $M = 54.76, SD = 29.81$ ) than during the witness-compatible questioning phase (phase 3:  $M = 4.97, SD = 2.64$ ),  $p < .001$ , and second recall attempt (phase 4:  $M = 8.73, SD = 4.48$ ),  $p < .001$ . Participants also recalled fewer correct units of information during the witness-compatible questioning phase (phase 3) than during their second recall attempt (phase 4),  $p < .001$ .

To explore the interaction effect, we conducted three univariate ANOVAs comparing the three interview conditions (SI, CI, and MCI) regarding the number of correct units of information elicited at each interview phase separately (Phase 2: First recall attempt; Phase 3: Witness-compatible questioning, and Phase 4: Second recall attempt). There was no effect of interview condition on the number of correct units of information recalled for phase 3 (witness-compatible questioning),  $F(2, 63) = .38, p = .682, \eta_p^2 = .01$ , and phase 4 (second recall attempt),  $F(2, 63) = 2.37, p = .101, \eta_p^2 = .07$ . This suggests the witness-compatible questioning phase (phase 3) produced similar levels of correct recall regardless of the mental imagery instruction (CI and MCI groups only). It also suggests using a free recall (SI and MCI groups) instead of the changer order mnemonic (CI group) during the second recall attempt (phase 4) produced similarly low levels of recall (see Table 2).

However, for phase 2 (first recall attempt), we found an effect of interview condition on the number of correct units of information recalled,  $F(2, 63) = 22.45, p < .001, \eta_p^2 = .42$ . Games-Howell's post hoc comparisons revealed that, at phase 2, participants in the SI group recalled fewer correct units of information than participants in the CI group,  $p = .004, 95\% \text{ CI } [6.42, 35.95]$ , and the MCI group,  $p < .001, 95\% \text{ CI } [30.43, 62.93]$  (see table 2). Participants in the CI group also recalled fewer correct units of information than participants in the MCI group,  $p = .009, 95\% \text{ CI } [5.57, 45.43]$  (see table 2). In sum, in phase 2 (first recall attempt), participants in the MCI group recalled a higher number of correct units of information about the crime than participants who were interviewed with the CI or the SI. This suggests using CCR during the first retrieval attempt (MCI group) was more effective than using free recall (CI and SI groups). Lastly, participants who were interviewed with the CI recalled a higher number of correct units

of information than the SI group during phase 2, suggesting that free recall was more effective when combined with the CI mnemonics (CI group only).

Insert Table 2

### Report Accuracy

Regarding report accuracy, we conducted a mixed  $3 \times 3$  ANOVA to see if interview condition (SI, CI, or MCI), as well as interview phase (Phase 2: First recall attempt; Phase 3: Witness-compatible questioning, and Phase 4: Second recall attempt), had an effect on report accuracy (the ratio between the number of correct units of information recalled over all units of information recalled). We found a main effect of interview phase,  $F(1.438, 93.47) = 5.41, p = .012, \eta_p^2 = .08$ , but no interview condition effect,  $F(2, 63) = 2.40, p = .099, \eta_p^2 = .07$ , nor interaction effect,  $F(2.875, 186.94) = .37, p = .766, \eta_p^2 = .01$ . Regarding the main effect of interview phase, pairwise comparisons showed that recall accuracy during the first recall attempt (phase 2:  $M = .96, SD = .004, 95\% \text{ CI } [.95, .97]$ ) was higher than during the witness-compatible questioning phase (phase 3:  $M = .90, SD = .02, 95\% \text{ CI } [.86, .94]$ ),  $p = .014$  (see table 3). No other significant differences were found. Report accuracy was high for all interview conditions and interview phases (see table 3).

Insert Table 3

### Discussion

The present study accomplished three main goals. First, to examine whether the Cognitive Interview (CI) superiority effect could be replicated with an Iranian population. Findings suggested that the CI increased the quantity of information participants were able to

recall in comparison with a Structured Interview (SI) and without compromising report accuracy. Further analysis revealed the first recall attempt, where the CI protocol included the report everything mnemonic and the context reinstatement mnemonic, might be largely responsible for this effect. Secondly, to investigate if Category Clustering Recall (CCR) could be more effective than an initial free recall when incorporated in a full investigative interview. The present results suggest that participants who performed CCR (MCI condition) were able to recall a higher number of correct units of information in comparison with participants who instead provided an initial free recall (SI and CI groups). A final goal of the study was to examine whether a free recall could be superior to a recall in the reverse chronological order (change order mnemonic) when used during a second recall attempt. Results indicated that both the free recall instruction and the change order mnemonic elicited similar low levels of new information when used at a later phase of the interview (phase 4: second recall).

The Cognitive Interview (CI) has become one of the most widely used techniques for interviewing cooperative witnesses and suspects. Importantly, the CI superiority effect has replicated in many different countries such as the USA, the UK, Australia, France, Italy, and Portugal (Bensi et al., 2011; Ginet & Verkampt, 2007; Paulo et al., 2016). However, no study had previously tested the CI's effectiveness with the Iranian population. As addressed in the introduction, previous studies (Anakwah et al., 2020; Jobson & Cheraghi, 2016; Millar, Serbun, Vadalía, & Gutchess, 2013; Wang, 2009) found there are cultural characteristics that can affect cognitive functions like memory and change the way information is recalled. Anakwah et al. (2020) found that there are cross-cultural differences in the way that people remember and report a crime scenario. Jobson and Cheraghi (2016) found Iranian participants might be influenced by a culture of interdependence and consequently recall less personal themed memories and more

social themed memories than British participants who are instead influenced by a culture of independence. Moreover, categorization can be affected by cultural characteristics (Gutchess et al., 2006; Ji et al., 2004; Schwartz et al., 2014; Unsworth et al., 2005). Individuals from western cultures tend to rely more on categorization when processing and recalling information while individuals from Eastern/Middle Eastern countries are less likely to use this strategy spontaneously during recall (Gutchess et al., 2006; Schwartz et al., 2014). Although it was beyond the scope of this study to address how/why cultural characteristics can influence episodic memory and categorization, we aimed to study whether the effectiveness of the CI and CCR was not impaired by the aforementioned factors, possibly influencing recommendations for best practice. The present study replicated the superiority effect of the CI and CCR with an Iranian population (Köhnken et al., 1999; Memon et al., 2010; Paulo et al., 2015; Sharman & Powell, 2013; Stein & Memon, 2006). The importance of this finding is twofold. Firstly, the current results provide more evidence that the CI superiority effect is consistent across different cultures, supporting previous studies (Bensi et al., 2011; Elizalde Monjardin, 2016; Ginet & Verkampt, 2007; Paulo et al., 2015; Stein & Memon, 2006); Secondly, in a practical sense, the findings of the present study provide evidence to support the use of the CI and CCR by Iranian law enforcement agencies (discussed below).

Increasing the amount of information eyewitnesses are able to recall with the use of new retrieval strategies is another important aspect addressed in this study (Fisher & Geiselman, 1992; Milne & Bull, 1999). Many authors have tried to develop new techniques to improve recall (e.g., Brunel et al., 2013; Colomb & Ginet, 2012). Paulo et al. (2016) developed the Category Clustering Recall retrieval strategy which has shown to be more effective than the change order mnemonic (Paulo et al., 2016), a witness-compatible questioning (Paulo et al., 2017) and an

initial free recall used as the sole form of retrieval (Thorley, 2018). Nonetheless, CCR's superiority over a free recall attempt has never been tested in a more ecologically valid setting where both procedures are incorporated in a full investigative interview and combined with a range of compatible preliminary instructions, mnemonics, and procedures (e.g., establishing rapport and mental reinstatement of context) that now constitute best practice. Mnemonics like the mental reinstatement of context have been found to improve subsequent free recall tasks (Milne & Bull, 1999) but might not have the same effect when clustering is involved, e.g., due to the possibility of this process interfering with the use of these mnemonics, instructions, and procedures (e.g., disrupting the mental image of the event). The present study addressed this issue and found participants who were interviewed with CCR (MCI group) instead of a free recall (CI group) during their first retrieval attempt provided more correct information, without an increase in the number of errors or confabulations committed. Therefore, although an initial free recall is considered an essential retrieval strategy for conducting appropriate investigative interviews and included in most appropriate interviewing protocols (Davis et al., 2005; Kebbell et al., 1999), the present study revealed that CCR is effective when incorporated in a full investigative interview and could be used as an alternative retrieval strategy to further enhance the amount of correct information eyewitnesses are able to recall. It is interesting to note that the number of information elicited by CCR in a single recall attempt was so impressive that it was similar to the number of information elicited by a full CI protocol comprising multiple retrieval attempts and mnemonics. Nonetheless, it is equally important to clarify that these findings do not support using CCR at all times. Investigative interviewing techniques and retrieval strategies should be viewed as a toolbox, instead of as an all-or-nothing approach. It is the interviewer's responsibility to choose what techniques and mnemonics are helpful for a specific interview, as

well as the best time to use them (Fisher, Milne, & Bull, 2011). Thus, although CCR might particularly helpful for some investigations, e.g., to obtain more person-related information about the crime (Thorley, 2018), free recall might be particularly helpful in other cases, e.g., when the narrative is going to be presented as evidence in court and needs to be easily understood by a jury or a legal professional.

There are a number of possible explanations for why CCR increased the amount of information participants were able to recall. According to the spreading activation theory of semantic processing, long-term memory contains interconnected units of information that might be semantically associated (Collins & Loftus, 1975; Tulving, 1991). Thus, asking participants to recall details about one category of information at a time might increase recall of other related memories that might otherwise not be activated and recalled (Paulo et al., 2016; 2017). As an example, recalling an object like a desk, followed by chair and table might increase the likelihood of recalling another associated object like a counter, rather than a descriptive detail about a person or an action. Additionally, Manning & Kahana (2012) found participants often tend to organize their recall into similar semantic categories, either during encoding and/or retrieval. Thus, focusing on a specific category of information at a time during retrieval might be more congruent with how participants encode and recall information in comparison with other retrieval strategies such as the change order mnemonic, or even a free recall, as eyewitnesses are often unaware about what retrieval strategies are helpful or compatible with the way information is encoded, stored, and retrieved (Paulo et al., 2016; 2017).

This study compared the effectiveness of the change order mnemonic in comparison with a free recall attempt when used to obtain a second recall of the event. Our results indicated that both strategies produced similar (and low) levels of correct recall, with similar levels of

accuracy. Therefore, regardless of the retrieval strategy used, there was a limited number of new information being elicited during a second recall attempt. This finding is supported by previous studies suggesting this might be due to memory exhaustion (Bensi et al., 2011; Dando, Ormerod, Wilcock, & Milne, 2011; Davis et al., 2005; Memon, Cronin, Eaves, & Bull, 1995). Prior to a second recall, participants already provided an initial account and were subjected to a questioning phase. Thus, due to memory exhaustion, a second (and third) retrieval attempt used later in the interview might only be able to elicit low levels of additional recall regardless of the retrieval technique that is being used. This also supports the use of shortened versions of the CI as these can often be equally effective and should be considered during time demanding situations (Bensi et al., 2011; Davis et al., 2005).

### **Limitations and Future Research**

It is important to note the potential limitations of this study. Although preliminary instructions and mnemonics recommended in real investigative interviews were included in our interview protocols in an attempt to increase ecological validity, the task used a mock robbery that might still lack ecological validity. Thus, it is important to further test how effective CCR is when used during real police investigations. In addition, to understand if CCR can be used in a wide range of police investigations, it is necessary to test this retrieval strategy with other samples as the present study only used adults from a limited age range. That is, there may be some demographic differences in retrieval strategies that may be evident when using children and older adults.

### **Conclusion**

The present study provided further evidence supporting the use of Category Clustering Recall. It also provides initial evidence supporting the effectiveness of the CI (and CCR) with an Iranian population. It also supports the notion that second' and third' retrieval attempts are not always effective and can be excluded in time-demanding situations. To our knowledge, this is the first investigative interviewing study conducted in Iran and the first study to test CCR in comparison with a free recall when both are incorporated in a full investigative interview. This can be crucial for the Iranian police forces and other police forces worldwide who need to employ new methods to obtain as much information as possible from eyewitnesses.

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**Table 1**

Differences Between the Interview Protocols According to Interview Phase.

	<b>Phase 1</b>	<b>Phase 2</b>	<b>Phase 3</b>	<b>Phase 4</b>	<b>Phase 5</b>	<b>Phase 6</b>
	Rapport and Preliminary Instructions	First Recall Attempt	Witness-compatible Questioning	Second Recall Attempt	Third Recall Attempt (for new information)	Closure
<b>SI</b>	Without TF	Free Recall (Without RE and CR)	Without MI	Free Recall	Free Recall	x
<b>CI</b>	With TF	Free Recall (With RE and CR)	With MI	Reverse Order	Change Perspective	x
<b>MCI</b>	With TF	CCR (With RE and CR)	With MI	Free Recall	(None)	x

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

**Table 2**

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

Interview Phase	Correct Unit of Information					
	SI		CI		MCI	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Phase 2. First Recall*	32.14	11.25	53.32	25.67	78.82	28.63
Phase 3. Questioning	4.86	2.39	5.36	2.93	4.68	2.64
Phase 4. Second Recall	9.82	4.47	7.09	4.48	9.27	4.24
Phase 5. Third Recall	1.45	1.82	3.68	5.12	-	-

*Note.* SI, structured interview; CI, cognitive interview; MCI, modified cognitive interview; \* significant differences between interview groups: analysis of variance (ANOVA)

**Table 3**

Mean and Standard Deviation for the Recall Accuracy at Each Interview Phase according to Interview Condition

<b>Interview Phase</b>	<b>Recall Accuracy</b>					
	<b>SI</b>		<b>CI</b>		<b>MCI</b>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Phase 2. First Recall	.94	.04	.97	.02	.96	.02
Phase 3. Questioning	.86	.18	.92	.15	.91	.14
Phase 4. Second Recall	.91	.10	.93	.08	.97	.07
Phase 5. Third Recall	.81	.25	.93	.14	-	-

*Note.* SI, structured interview; CI, cognitive interview; MCI, modified cognitive interview