The effect of odour in remembering events

Theoretical background
Reports of a criminal event provided by witnesses are crucial for legal investigation, so police officers need to obtain as much accurate and detailed information as possible from witnesses (e.g., Milne & Bull, 1999). However, episodic memory is vulnerable to forgetfulness, resulting in recall performance that typically decreases with time (e.g., Schacter, 2001), but unfortunately, in forensic settings, there is often a lengthy delay between the criminal event occurrence and the eyewitness report (Blandón-Gitlin & Pezdek, 2009). Episodic memory consists of many different types of information (e.g., spatial and temporal), originating from our senses. This information can be used to provide memory cues, that is, items that ‘trigger’ recall and help us to achieve a more accurate witness report. In line with this, psychologists have developed interview techniques with the aim of enhancing eyewitness recall. The Enhanced Cognitive Interview (ECI; Geiselman et al., 1984), which is characterized by the use of mnemonic techniques, and the Structured Interview (SI), which requires witnesses to recall the event many times, are the most important popular interviews. The efficacy of ECI techniques has been shown with adults (e.g., Brock, et al., 1999), with older people (e.g., McMahon, 2000), in remembering different kinds of events (e.g., road accidents, Ginet & Verkampt, 2007; attempted car thefts, Campos & Alonso-Quecuty, 1999), and with varying witness delays (from 30 minutes to 6 months, e.g., Larsson, et al., 2003). Although information from all senses may be used as cues, in the ECI ‘visual’ or ‘auditory’ details are primarily used as triggers to improve the event recall, whereas ‘olfactory’ details have rarely been used (Roos af Hjelmsäter et al., 2015; Magnusson & Landstrom, 2017).

The few studies about the presence of a pleasant odour during an event (e.g., Magnusson & Landström, 2017) have shown contrasting results: sometimes it improves the event recall and sometimes it does not and, to our knowledge, there are no studies about unpleasant odour during an event.

Aims and Hypotheses
Based on literature results, the main aim of the project will be to analyse in more detail the effect of odour, both pleasant and unpleasant, in remembering an event by interviewing witnesses using SI and ECI.
Specifically, the following hypotheses will be tested:
1) Might the presence of an odour, regardless his pleasantness or unpleasantness, improve the retrieval of the event? Specifically, we assume that the presence of an odour could improve the number of correct details remembered and causing a drop of errors (i.e., wrongly describing something that was present in the event) and confabulations (i.e., reporting something that was not present in the event).
2) Does the presence of a pleasant/unpleasant odour help in keeping track of the memory over different time delays, for instance after a week, regardless the kind of interview used?
3) Does the presence of an odour has a different effect in relation to the type of interview (ECI and SI)? Specifically, we hypothesize that the use of ECI cognitive techniques associated with an odour would improve the recall compared to the use of a simple free recall as in SI.

Methods
The research is based on a mixed 3X2X2 experimental design: 3 odour conditions (pleasant, unpleasant, no odour), 2 interview modes (ECI and SI) and 2 recall times (after the event and one week later).
The GPower 3.1. analysis (Faul, et al., 2007) suggested a sample of 176 participants, who will be recruited at the University campus through notices on bulletin boards. All the participants will watch a video about a bank robbery (Bensi et al., 2011). While watching the video, participants will be
randomly assigned to one of three odour conditions (44 participants for each one): pleasant/unpleasant/no odour. The odours will be chosen according to literature about pleasant/unpleasant classification (e.g., Ball et al., 2010). After the viewing, within each of the three groups, half of the individuals will be interviewed using the ECI and half of them with the SI. Each group will be interviewed immediately after viewing the video and after one week. Finally, in order to verify if the classification of the odour is consistent with literature, each participant, in the odour conditions, will be required to rate the pleasantness, arousal and familiarity of the odour (Ball et al., 2010).

The ECI used the following mnemonic techniques: 1) re-contextualization: witnesses have to mentally recreate the event as well as their physiological and emotional states at the time of the crime; 2) mental images: witnesses have to form a mental image of the main events occurred and to describe it; 3) change of order: witnesses have to recall the event in a different chronological order; 4) change of perspective: witnesses have to recall the event from a different perspective, compared to the one they were in during the event. Indeed, the SI does not require the use of mnemonic techniques, but only three different free recalls of the event. The experimental procedure will last about 30 minutes. The odour will be administered to the participants using double-band patches, which will be placed under the nostrils (Ball et al., 2010).

The data will be analyzed using SPSS 23.0 package. The analyses will evaluate the effects of experimental conditions (odour and interview) on the number of correct details, errors and confabulations. The tutor agrees to request approval of the research project to the ethics committee of the University of Bologna.

**Expected results and Implications**

As regards the first hypothesis, the presence of the odour is expected to improve the quality of recall, meaning a greater number of elements correctly reported and a lower number of confabulations and errors.

The second hypothesis suggests that the presence of both (pleasant and unpleasant) odours can improve the retrieval not only immediately but also after one week, making mnemonic decay slower, compared to odourless condition and regardless the kind of interview.

The last hypothesis investigates how the odour associated to the type of interview can further improve the recall; specifically thanks to its mnemonic techniques, the ECI is expected to help the retrieval, in both pleasant and unpleasant odour condition.

Previous research has showed that the recall of an event can be significantly improved through witness’ physical or mental context reinstatement. The present research analyses whether the presence of an odour improve the context reinstatement because the odours are able to evoke older memories and keep them longer, and thus may serve as a potent memory cue in legal settings.

In this way, the present research could significantly improve the development of context reinstatement technique in order to elicit a greater number of accurate information relevant to the investigation.
References

Plan of activities
The project activities will be divided in two stages regarding theoretical and methodological aspects. In the first two months of the research project, the research fellow will perform an accurate literature review about the following topics:
- Efficacy and employment of ECI and SI in memory recall and criminal investigation
- Influence of ‘odours’ on memory
As regards the second stage, starting from the third month of the research project, the research fellow will carry out the following activities:
- Training on ECI and SI procedures
- Selection of the odours to use in the experimental protocol, according to the previous literature
- Enrolment of participants (4°-7 month)
- Data analysis (8° month)
- Discussion of the data obtained and preparation of a paper (9-12° month).