Breathe,

Relax,

Recognise.

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Abstract

Witness memory is fallible. Time and again, people convicted on the basis of witness testimony are exonerated when DNA is introduced into the case. Some of those convicted are sometimes chosen by multiple different witnesses from a line-up. Witness memory for the event and surrounding information has also been shown to be less than perfect, especially over time. However recent research has demonstrated a favourable effect of a short focussed meditation/breathing exercise on identification accuracy, with participants in such conditions being more accurate than a control group. Other research has also shown beneficial effects of eye closure, when witnesses are instructed to close their eyes for the duration of the interview.

The experiments reported in this thesis investigated the applied and theoretical aspects of focussed meditation and the eye closure effect. Experiment 1 examined the theoretical underpinnings of focussed meditation and whether it primed a global processing orientation which is conducive to face recognition. The study found that indeed, although not statistically significant, focussed meditation not only primed a global processing orientation but also led to quicker reaction times.

Experiment 2 extended the findings of study 1 to actual face recognition from a line-up. The results showed that focussed meditation did improve identification accuracy rates, however, focussed meditation did not show a beneficial effect on witness reports, which is incongruent with previous research in the area and something that was addressed in a study further on in the thesis.

Study 3 extended the focussed meditation to voice recognition, with the thinking being, that both faces and voices are processed in the same manner. Results of the study showed a beneficial effect of the focussed meditation instruction on voice recognition. In this particular study, eye closure was assessed in conjunction with focussed meditation and there were beneficial effects of both on recognition and witness reports.

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Study 4 examined an issue that arose during study 2 and 3. Previous research around focussed meditation had shown an additive effect of the instruction coupled with eye closure, leading to more accurate witness reporting, however, both study 2 and 3 of this thesis showed no such effect. It was therefore hypothesised that the issue had arisen due to the time between the initial focussed meditation instruction and the free recall section of the studies. Study 4 looked to address this situation by introducing the focussed meditation exercise prior to each of the facial recognition line-ups, the voice recognition line-up and

prior to both the free recall and cued recall sections of the study. The results showed that the introduction of the focussed meditation exercise, coupled with the eye closure, prior to each of the sections, did provide for more accurate reporting, thus suggesting that there is a time limit to the positive effects of focussed meditation.

Taken together as a whole, the findings suggest that focussed meditation primes global processing, which is congruent with both face and voice recognition. The findings also demonstrate that there is a time limit to the effects of focussed meditation and therefore an application in order to refresh, prior to each line-up and the reporting, could make a significant difference. The findings also showed the benefits of eye closure on witness reporting and also suggest a more cognitive load theory of eye closure.

Contents

CHAPTER 1

Introduction

1. Introduction

Programmes such as Criminal Minds, CSI, and Law and Order, amongst others, often portray the police as all-conquering, with interview techniques and procedures that inevitably lead to the successful and consistent capture and conviction of criminals. Within these programmes, witnesses are consistently found to remember the exact details of the crime they have witnessed, some going back years, with intricate detail, and always remember the face and correctly identify the perpetrator from a line-up. Suppose the witness does not remember every minute detail of the event or the suspect, investigators employ a technique that facilitates the recall and recognition of the crime and its culprit. In reality, this is not the case. Police are typically forced to rely upon witnesses whose memory for the event is imperfect, either through the decay of the memory over time or the integration of new and possibly false information through another medium. Several interview techniques have been created to improve the quality of the information provided by an eyewitness. The present thesis investigates the effectiveness of a memory enhancement technique, namely focussed meditation/breathing, which can be administered prior to an interview and indeed a line-up, be it face or voice. The focussed meditation instruction may have certain advantages over using no technique whatsoever. The technique may also be better than other interview techniques law enforcement regularly use, which will become apparent throughout this thesis.

1.2 Overview of thesis

The present section provides an overview of the whole thesis, giving the reader a brief introduction to each chapter.

1.2.1 Chapter 2: Navon Task

This chapter presents an experiment utilising the Navon Task in assessing the theoretical underpinnings of focussed meditation.

1.2.2 Chapter 3: Face Recognition

This chapter presents an experiment (1) exploring the efficacy of FM/FB in obtaining an accurate facial identification from a line-up after witnessing a crime. The experiment also extends to testing the efficacy of FM and eye-closure individually and combined in obtaining an accurate witness account of a crime on a free recall and cued recall test.

1.2.3 Chapter 4: Voice Recognition

This chapter contains experiment 2 and continues the theme of the previous chapter, in exploring the efficacy of the LIP, FM and EC, in obtaining an accurate vocal identification from a line-up after having viewed and heard a crime. The experiment continues the theme of the first experiment by testing the efficacy of FM and eye-closure both individually and combined in obtaining an accurate account of the crime on a free and cued recall test.

1.2.4 Chapter 5: Single versus Multiple Administrations

This chapter examines time constraints in experiment 3. The experiment compares a single administration of the FM and EC components of the LIP to multiple administrations. The experiment explores the effectiveness of delivering a single LIP administration at the beginning of an investigative interview, compared to delivering multiple administrations throughout the interview, for example, prior to each line-up, both face and voice. The experiment also continues the theme of the first two experiments by testing the effectiveness of the FM and EC components, both individually and combined, on free and cued recall tests. The experiment also tests the multiple and single administration of FM and EC on free and cued recall.

1.2.5 Chapter 6: General Discussion and conclusion

This chapter assesses the theoretical and practical implications of the reoccurring themes within this thesis. The limitations of the research and directions for future research are also addressed.

1.3 Introduction

Take a moment to think about a cherished childhood memory. Try to remember it in as much detail as possible. Try to recall every single nuanced event. Think of where you were. Think of who was there with you. Do you recognise everyone? Can you remember all you saw, the different smells, the things you heard, maybe the tastes? Was the wind blowing? Could you hear the rustle of the leaves? Do you remember how you felt? Were you happy and laughing? Perhaps you were slightly anxious or frightened? Do you remember everything?

Popular culture would have one believe that memory is like a camera or a hard disk drive, saving every moment in excruciating detail to be recalled in full, without error, at a later date. As previously mentioned, this is a familiar scenario in film and television. People perform extraordinary feats of memory, recall a criminal event in exact detail, and provide an indistinguishable portrait of the perpetrator's face, thus providing indisputable proof of a suspect's guilt. However, in reality, this is not the case. It is more likely that law enforcement agents and agencies are forced to rely on witnesses whose memory of the event is less than perfect. When assisting police in their investigations, numerous interview techniques and methods have been created to improve the overall quantity and quality of the information obtained from witnesses.

1.4 A Brief History of Eyewitness Testimony

Eyewitness testimony is crucial in bringing criminal proceedings against suspected perpetrators of crime (Brewer & Wells, 2011; Wells, 1984) . Witnesses are approached by police and requested to provide details of the event they saw. Along with providing details of the crime, witnesses are generally asked to describe the suspect verbally (Schooler,1995: Wells, 1985)). At a later date, witnesses could be recalled to view a line-up procedure, which, in the UK, usually entails sequentially viewing nine photographic images before being asked to choose whom they think the suspect may be.

However, in his influential book "On the witness stand", Münsterberg (1908 as cited in Vredeveldt, 2011) highlighted the fallibility and suggestibility associated with memory. The book emphasised the impact of suggestive questioning on a witness's memory and drew attention to the relationship between confidence and the accuracy of said memory, issues that are still relevant (Quinlivan et al., 2012; Sauer et al., 2008; Semmler et al., 2004; Wixted & Wells, 2017) .

The criminal justice system is heavily reliant on the testimony of eyewitnesses when capturing and convicting perpetrators of a crime. The evidence provided by an eyewitness is still considered the primary basis for obtaining convictions against suspects. In some cases, an eyewitness' testimony can be the critical factor between a "guilty" or a "not guilty" verdict.

Thus eyewitness testimony can be said to have a substantial impact on the outcome of trial proceedings, especially when the witness appears to be confident in what they are saying and reliance on said testimony is high (Wells et al., 1979). Both jurors and those working in the legal profession often overestimate the credibility of eyewitness testimony and view it as a trustworthy account of the circumstances surrounding the crime committed (Pawlenko et al., 2013; Rodriguez & Berry, 2014; Slane, 2022). However, even though many consider eyewitness testimony as a credible interpretation of events (Shermer et al., 2011), it has been responsible for more wrongful convictions than all other causes combined in the US (The Innocence Project (US), 2022). According to the Miscarriages of Justice registry at Exeter University (2022), more than 300 people, sentenced to more than 600 years of jail time, have been exonerated due to miscarriages of justice. Of those miscarriages, almost 200 were due to problems arising from eyewitness testimony. There were 50 incidents of faulty eyewitness testimony from the victims and 147 being due to other witnesses. Of those 147, 25 were due to problems with identification. For example Dwaine Simeon George was convicted for murder in 2002, after having been identified by a witness; Dwaine served 12 years and was exonerated when the identification evidence was looked at again and deemed to be not of evidentiary standard. A further example is John Kamara, convicted of murder in 1981, served 20 years, exonerated due to faulty eyewitness identification. The dangers associated with eyewitness testimony and its reliability has been debated by psychologists for over a century.

Why is eyewitness testimony unreliable? There are several reasons why this could be. It could be due to characteristics of the witness, such as intelligence, or the characteristics surrounding the event, such as lighting or other environmental distractions (Rodriguez & Berry, 2010). Unreliability could also be credited to post-event happenings, such as the post-event information or post-event procedures conducted by police (Quinlivan et al., 2012; Semmler et al., 2004; Smalarz & Wells, 2014a; Smalarz & Wells, 2014b; Steblay et al., 2014). These variables that influence eyewitness testimony can be split into estimator variables and system variables (Wells, 1977). Estimator variables lie outside the justice system's control such that there is no control over them. Examples include the other-race effect, stress and environmental distractions, and system variables. However, are those that the justice system does have control over, such as line-ups or, as is the concern of this thesis, investigative interviewing procedures.

1.5 Estimator and System Variables

Gary Wells (1978) proposed two types of variables crucial to eyewitness research, and Wells distinguished between them. One set of the variables was controllable in a criminal case, and the other set of variables were outside the domain of law enforcement and ultimately out of their control. This section briefly discusses both sets of variables.

1.5.1 System Variables

Wells (1978) suggested that system variables are those that are, or can be, under the control of the justice system and law enforcement. These include line-ups and the factors that influence line-ups, including composition, instructions given to the witness prior to the line-up, and feedback given after the line-up (Bradfield et al., 2002; Brewer & Wells, 2006; Steblay et al., 2014; Wells et al., 1998). There are two types of line-ups: sequential and simultaneous (Lindsay & Wells, 1985; Wells, 1984; Wells & Seelau, 1995; Wells & Turtle, 1986, also see Steblay et al., 2011 for a review). The sequential line-up presents its members one at a time and thus forces the witness to make an absolute judgement (Lindsay & Wells, 1985; Luus & Wells, 1991; Pozzulo et al., 2008; Sauer et al., 2008; Wells et al., 1998), an absolute judgement involves the witness choosing a member of the line-up that best matches the memory the witness holds of the perpetrator (Clarke et al., 2011; Moreland & Clark, 2019).

The simultaneous line-up involves seeing all members simultaneously, and the witness then makes a relative judgement when choosing a possible suspect (Lindsay & Wells, 1985). A relative judgement involves the witness selecting the member who most resembles the perpetrator relative to the other members of the line-up; effectively, the witness can compare all members of the line-up against each other and then choose the one that is least dissimilar to the suspect (Clarke et al., 2011). However, the problem with relative judgments arises if the police have an innocent suspect in a line-up compared to the other members, also called foils, which have little resemblance to the actual perpetrator (Smith et al., 2018; Wells, 1984; Wells et al., 2015).

This is where the following system variable becomes of paramount importance, and that is the instructions given to the witness prior to the line-up (Clarke et al., 2009). The instructions given to the witness prior to line-up administration can influence how said witness views the identification task and how they decide whether to make a choice and whom to identify (Brewer & Wells, 2006; Rodriguez & Berry, 2014; Wells & Seelau, 1995) as such instructions such as “the suspect may or may not be in the line-up” are vital (Clarke et al., 2009; Malpass & Devine, 1981)

1.5.2 Estimator Variables

System variables are (or can be) under the justice system's control, whereas the justice system cannot control estimator variables. Examples of estimator variables include stress, weapon effect and the other-race effect (for further information on system and estimator variables outside this thesis's scope, see Fulero, 2009 & Wells, 1978).

1.6 A Very Brief History of Ear-witness Testimony

The main focus of witness research has revolved around eyewitness testimony, its various pitfalls, and how they can be overcome, from line-up diagnostics to face recognition. Conversely, there has not been a similar or proportional amount of research on earwitness testimony and voice recognition (Philippon et al., 2007). If we factor in verbal overshadowing, the amount of papers decreases further. This is a surprising lack of literature considering, that according to Deffenbacher et al. (1989), the first instance of a witness identifying a suspect by their voice happened as far back as 1660 in England. Since then, earwitness testimony has been accepted since that time. Effectively courts and the judiciary have treated ear witness testimony the same as eyewitness testimony, and some of the same issues surrounding eyewitness testimony are apparent in ear witness too. There are instances across case law of the judiciary taking into account accent, time, environment and familiarity as variables that could impair successful ear witness testimony. Similar estimator and system variables that affect eyewitnesses are also present for earwitness testimony (Smith e al., 2020)

1.7 A Brief History of Investigative Interviewing

1.7.1 The Reid Technique

Less than a century ago, Western civilisations deemed it appropriate to inflict physical pain on suspects and witnesses to elicit information pertaining to a crime (Vredeveldt, 2011). Fortunately, towards the end of the twentieth century, violent methods' use declined, replaced by investigative interview techniques that relied more on psychology than "torture".

An early example of this new psychological direction in interviewing was the Reid Technique, first published in Criminal Interrogation and Confessions in 1962 by Inbau and Reid. They advocated for a non-coercive technique that relied on psychological tactics. The authors maintained that the text had Supreme Court approval and was considered the quintessential book for the professional investigator/interrogator. Gudjonssen and Pearce

(2011) noted that the primary method was split into two-stage processes. The first stage was a non-accusatory interview, also known as a behavioural analysis interview, and the second stage was a nine-step accusatory approach. This comprised of maximisation, which included such techniques as intimidation, exaggeration of the seriousness of the crime and presenting false evidence. A further component was indeed the opposite of maximisation, minimisation. This included such techniques as downplaying the severity of the crime, implying leniency.

The Reid Technique has been incredibly popular amongst professional interviewers; Gudjonssen and Pearse suggest that at the time of their publication in 2011, the technique was the most popular method in the USA, and different versions of it have been used worldwide, including in the UK. The technique was initially designed for interviewing suspects; however, the authors have advised that it can be used in forensic settings such as depositions and witness interviews to gather information (Reid & Inbau, 2011). However, despite its reputation as the quintessential technique of investigative interviews, many psychologists have highlighted its injurious effects on witnesses and suspects, aside from its detrimental effect on judicial outcomes (Cleary & Warner, 2016; Spierer, 2017. The Reid Technique has been shown to increase the risk of false confessions, leading to the jailing of innocent persons, thus wasting valuable resources (Gallini, 2010; Gudjonssen & Pearce, 2011; Loney & Cutler, 2016)

1.7.2 Forensic Hypnosis

Until the 1980s, hypnosis was widely thought to be an effective memory enhancement technique and a valuable investigative tool that could be used by police when interviewing witnesses to a crime (Wagstaff, 2009, Wagstaff et al., 2004, Wagstaf & Wheatcroft, 2011). The hypnotic interview typically involved establishing rapport, attempting to induce a hypnotic state and then further deepening the state. Instructions are also provided to facilitate memory retrieval, such as focussing on an early childhood experience, commonly known as regression (for further information, see Wagstaff, 1981).

The opinions on the effectiveness of hypnosis have been mixed, with some hailing it as an incredible memory enhancement technique (Vredeveldt, 2011). A good example of this is the case of Arthur Nebb in 1961. Nebb had shot his wife and her lover and was arrested and charged with first-degree murder. During the trial, Nebb maintained that he did not remember the event. As such, his lawyers suggested using hypnosis as a tool to help Nebb remember the details of the day. The judge presiding over the case allowed Nebb to be hypnotised on the witness stand (no jurors witnessed the hypnosis and questions). After being hypnotised, Nebb remembered everything that transpired that day (note that Nebb had been hypnotised several times prior to the court date). The judge allowed the testimony under hypnosis to be the basis of a plea deal, thus suggesting the witness statement was as reliable as someone who had not been hypnotised (Winter, 2012).

However, as a forensic tool, hypnosis has largely been discredited over the decades due to several contributing factors (Wagstaff et al., 2004). Even though favourable effects have been demonstrated in specific experiments, most research has shown that a hypnotic procedure does not significantly improve witness recall over a standard, non-hypnotic procedure (Wagstaff, 2009).

Detailed reviews of the literature on hypnosis have shown that any improvements facilitated by hypnosis have tended to be concerning certain stimuli, most notably staged crimes, with little to no improvement in other areas of eyewitness testimony (Wagstaff et al., 2014; Winter, 2012). However, any improvements have come with a concomitant increase in incorrect details and inflated confidence in the responses, irrespective of accuracy (Wagstaff, 2009).

Several reasons have been put forward to explain the increase in incorrect responses and inflated confidence. Due to the nature and expectations that hypnosis poses, one such theory is that participants may lower the threshold at which they report details, effectively recounting information they may, under normal circumstances, reject due to uncertainty (Vredeveldt, 2011; Wagstaff et al., 2004; Wagstaff, 2009).

1.7.3 The Cognitive Interview

With forensic hypnosis proving controversial in the 1980s and standard interviews also proving to be not as competent as they could be, a new interview technique was welcomed and somewhat needed by law enforcement to improve the quality of witness statements. After having reviewed the literature and observed investigators in the field interviewing witnesses, Geiselman et al. conducted numerous studies, and the two researchers, in conjunction with law enforcement, proposed the Cognitive Interview (1985). The CI is a non-suggestive interview that focuses on the witness (Dodier et al., 2021). The first version of the CI included several instructions to help witnesses remember more by taking a more active role in the interview. The components included instructions to (a) report everything, (b) reinstatement of context, (c) recall the event in a different order and (d) change perspective (Crossland et al., 2020).

The first component, report everything instruction asks witnesses to report as much they can recall about the incident (Fisher et al., 1987; Geiselman et al., 1984; Geiselman et al., 1985). The witness is asked to report everything regardless of how confident the witness is in the information they provide, the rationale being they may report something that is corroborated by a different witness, or it may trigger other memories (Bekerian & Dennett, 1993; Brunel et al., 2013; Davis et al., 2005; Geiselman et al., 1985). The second component of the CI, reinstatement of context is based on Tulving and Thompson's encoding specificity principle (1973). This particular component asks the witness to mentally recreate the environmental conditions, physical, mental and emotional, surrounding the event; the rationale being that context reinstatement provides additional cues that aid in retrieval of the memory (Bekerian & Dennett, 1993; Dando et al., 2009; Fisher et al., 1987; Fisher & Geiselman, 2010; Geiselman et al., 1984; Geiselman et al., 1985). It has been suggested that this particular component is the most successful at retrieving information (Clifford & Gwyer, 1999; Dando et al., 2009; Memon & Bull, 1991; Sharman et al., 2021). The next component, recalling the event in a different order, asks the witness to recount the events in more than one order, this could be from the end to the beginning, or from the middle to the end or the beginning (Davis et al., 2005). The rationale being, that changing the order of recall provides for alternative retrieval paths that can trigger more detail. However it has been suggested that this particular component interferes with the context reinstatement instruction, because of temporal changes (Bekerian & Dennett, 1993). Finally, change perspective asks the witness to recall the incident as if they were viewing it from another's perspective, for example the witness could be asked to recall the incident as if they were standing behind the incident (Ginet et al., 2018; Vredeveldt, 2011). While the technique proved to be more successful than a standard interview by increasing the amount of accurate information given by witnesses without increased confidence in incorrect responses (Ashkenazi & Fisher, 2022; Davis et al., 2005; Ginet et al., 2019; Olivier et al., 2021), the researchers felt that the technique could be further improved by introducing several more social and communicative elements that would improve the experience and make the interview more focussed on the witness (Paulo et al., 2020).

The enhanced version of the CI (ECI) introduced new components that, as previously mentioned, created a more witness focused experience (Geiselman et al., 1992). Elements such as establishing rapport, witness compatible questioning, explaining the process, and asking the witness not to guess when relaying information were included (Ginet et al., 2019). The newer version of the CI, adopted by numerous law enforcement agencies worldwide, has been shown to improve accuracy and the amount of information retrieved with only small increments in false information but without a concomitant increase in fabricated information (Fisher & Geiselman, 2010; Geiselman & Fisher, 2014; Paulo et al., 2013; Paulo et al., 2020). Most studies generally compare the ECI to a standard interview, which comprises possibly a free recall instruction and specific questions regarding the incident. Certain components of the CI, and therefore the ECI, have proven to be more effective than others.

Indeed Dando et al. (2011) found that the components reverse order and change perspectives were less effective than a free recall to report everything (for a fuller review, see Dando & Milne, 2009; Memon & Bull, 1999).

While multiple studies have found the ECI an effective tool in the investigator's toolbox (Memon et al., 2010; Meissner, 2021), many have raised issues with the interview technique (Kohnken et al., 1999). One of the issues raised is that the sheer amount of components included in the technique renders it difficult to implement due to the time-consuming aspect (Clarke, 2005; Dando et al., 2008; Scott et al., 2015; Walsh & Bull, 2010). Another issue raised, again regarding time, is how difficult the technique is to teach and, therefore, the cost it takes to train officers (Kebbel et al., 1999). As such, some researchers have highlighted the need for a shortened version (Bensi et al., 2011; Wagstaff et al., 2004, 2011,), given that the technique comprises multiple mnemonic instructions, of which some seem to be duplicated. As previously mentioned, there has been some evidence that not all the mnemonic procedures effectively increase the amount of accurate information. One variable that has not been taken into account is the need to think about the time-consuming aspect for witnesses, too, as in how long can they sit and focus. So perhaps a shortened version of the ECI could be effective for both investigators and witnesses alike.

1.7.4 The Liverpool Interview Protocol (LIP): Towards a shortened version of the Cognitive Interview

As previously discussed, Forensic hypnosis used to be considered an effective tool that investigators could use to facilitate memory. However, specific problems were identified, such as inflated confidence and false memories, that resulted in it being viewed with a certain degree of scepticism within the legal profession (Hammond, Wagstaff & Cole,2006). The CI is a technique that evolved from and eventually replaced hypnosis. Nevertheless, issues have been identified with this method, such as the process being time-consuming and complex for the interviewer and the interviewee, impacting its effectiveness as an investigative tool (Wagstaff et al.,2004). Out of the CI and hypnosis, specific components have been developed and refined into a protocol that includes eye closure, focussed breathing, context reinstatement and reporting everything to facilitate and improve memory retrieval, and beneficial effects have been reported (Wagstaff et al.,2011).

1.7.4.1 Focussed Breathing/Meditation

Among others, Wagstaff et al. (2011) have noted multiple similarities between the CI and techniques used by hypno-investigators. They suggested that it was worthwhile in further examination of specific components that could be used on their own, without the tag of hypnosis, which has proved to be problematic (Wagstaff et al., 2004a, 2004b). Furthermore, its benefits are felt by law enforcement agencies, as it is less time-consuming to both teach and administer. For example, they noticed key resemblances between standard hypnotic procedures and meditation, such as focussing one's attention on a neutral target, like one's breathing, while ignoring distractors.

Wagstaff noted that such a procedure, requesting the witness to focus on their breathing, could encourage a global model of information processing and right hemisphere activation, necessary for processing certain types of information, such as faces and emotionally salient information. Indeed studies by Wagstaff and colleagues have shown a beneficial effect on face recognition (Hammond et al., 2006, Wagstaff et al., 2004). The idea that an FM exercise is beneficial for face recognition has been furthered by Frowd et al. (2017) and Giannou et al. (2020).

Furthermore, FM has aided concentration (Van Leeuwen et al., 2012). Attentional resources are limited (cognitive load) and therefore limit information processing. Directing attention from one source to another can be a slow process. Meditation could be used to allocate and then re-allocate attentional resources. For example, focused attention on breathing narrows the amount of objects one has to attend to. Kubose (1976, as cited in Valentine & Sweet, 1999) found that participants with no prior experience of meditation, after a short course in breath counting (focussed breathing), were better able to ignore irrelevant stimuli and find a target stimulus.

Van Leeuwen and colleagues found that FM did aid in concentration when utilising a Navon-style letter task. The research also showed that people utilising the FM responded quicker to targets. Therefore it could be suggested that focussed breathing (meditation) speeds and enhances the ability to switch between targets. The same research also found that novice meditators attended to the global letters quicker than the local ones, thus suggesting that FM has a global precedence effect.

1.7.4.2 Eye Closure

While EC is not the main focus of this thesis, a brief review follows. Research has shown there to be a beneficial effect of FM and eye closure on both free recall and cued recall responses (Wagstaff et al. 2004a, 2004b), particularly in regards to visual imagery (Wagstaff et al., 2011). Vredeveldt et al. (2011) have suggested two theories as to why EC facilitates better recall in free and cued recall tasks. Firstly, the cognitive load theory

(Glenberg, 1997) (see 1.7.4.2.1) posits that a finite amount of cognitive resources are available to process the information. Thus, closing one's eyes reduces the amount of concurrent information being processed, freeing up resources for other actions, reducing cognitive load and removing modality-specific interference from the environment (Mastroberardino & Vredeveldt, 2014; Vredeveldt, Baddeley & Hitch, 2011). There have been competing theories about whether this beneficial effect was specific to visual details, thus supporting a modality-specific interference hypothesis, or if the effect was extended to auditory or other modal details, thus supporting the cognitive-load hypothesis. Previous research in the auditory response domain has shown mixed results. Some studies have shown equivalent beneficial effects for the recall of visual and auditory details. Vredeveldt et al. (2015) showed that eye closure significantly affected auditory responses, with participants in that condition providing more correct details than a control group. However, earlier research had shown no significant effects of eye closure on auditory details (Vredeveldt, Baddeley & Hitch, 2012, 2014). Indeed, a series of studies by Perfect et al. (2008) showed that in specific experiments, eye closure enhanced recall of auditory details. However, in a different experiment, eye closure showed no beneficial effect on recalling auditory details.

1.7.4.2.1 Cognitive Load Theory

Cognitive load theory taken from Glenberg's (1997; Glenberg, Schroeder & Robertson, 1998) embodied cognition account, which postulates that the monitoring of (perception) the world around us competes with the concurrent task of encoding those perceptions into memory, as such both are competing for cognitive resources. It has been suggested that if one disengages from the distractions in the environment by way of eye closure, some of those cognitive resources could be freed up and allocated elsewhere, thus, perhaps, aiding in the ability to recall more details. Interestingly high working memory load (cognitive load) impaired local processing but acted opposite to global processing when local distractors were in place (Ahmed & Fockert, 2012). (A review of global/local processing can be found later in this chapter).

1.7.4.2.2 Modality Specific Theory

The modality-specific theory postulates that the specific distraction is relevant to the specific modality (Vredeveldt, 2011; Vredeveldt et al., 2011). For example, eye closure will help recall visual information only and not recall other sensory information, and auditory distraction will interfere with remembering auditory memories.

Reducing visual environmental distractions improves visual imagery. Some regions in the brain are active for visual perception and imagery; thus, reducing the load in one can facilitate the other, and visual imagery can increase the likelihood of remembering visual memories (Vredeveldt et al., 2012). Eye closure reduces general cognitive load increasing concentration. Findings again in line with previous that suggest both general and specific. Dependent on the nature of the recalled event. Eye closure had a more significant effect on eye rather than ear memories. Ear closure had no significant effect (Barsalou et al., 2003)

1.8 UK witness interviewing guidelines

There has been much criticism of police interviews and the way they are conducted, with numerous researchers finding issue with the process (Geiselman et al., 1989, Kebbell et al., 1999). This prompted a number of government inquiries which in turn led to legislative reform. A 1981 Royal Commission on Criminal Procedure highlighted the deficiencies and also the lack of formal standards in police interviews (Scott et al., 2014). The commission resulted in the Police and Criminal Evidence Act of 1984 (PACE) (Gudjonssen, 2003). PACE introduced "an ethical framework for police interviewing" (Scott et al., 2014, p356), that focussed on ensuring the interviewees were given the chance to provide free and accurate accounts of the incident, and also that investigators were open minded when conducting interviews, ensuring they were fair and gave special consideration to children and other vulnerable populations (Schollum, 2017). Following on from PACE, a report by Baldwin (1992) appeared to be the watershed moment that led to change. Baldwin highlighted the issues surrounding interviewing and it was found that investigators were routinely lacking in preparation, employing poor interviewing techniques, such as repetitiveness, and asking closed ended questions. Officers were also found to be exerting undue pressure and failing to establish the facts or follow up on leads (Adam & Golde, 2019). In response to the criticism from researchers and the judiciary, the Home Office and the Association of Chief Police Officers, developed the PEACE model (Clarke & Milne, 2001, Ministry of Justice, 2022).

1.8.1 The P.E.A.C.E model

PEACE (Akca et al., 2021; College of Policing, 2022; Heydon 2012) is the mnemonic used to describe the five stages of the interviewing model: Planning and preparation, Engage and explain, Account, Closure and Evaluation (Oxburgh et al., 2011, Walsh & Milne, 2008). The first steps, planning and preparation are crucial to the interview. Preparation relates to several specifics of the interview, including familiarity with the case, the content of questions (Scott et al., 2014), and also the style of question, for example open-ended questions; preparation also includes such details as to where the interview takes place, seating arrangements and the length of the interview (McGurk et al., 1993). Effectively, the preparation and planning stage is supposed to optimise the conditions to facilitate an accurate witness account (Clarke, 2005). The second phase, engage and explain, is employed in order to make the witness feel comfortable and to ensure the witness understands what is going to happen during the interview (Collins et al., 2002; Milne & Bull, 2003). A witness that feels comfortable will more likely be willing to engage in conversation (Brimbal et al., 2021; Vallano & Compo, 2011). Effectively engage and explain is an attempt to build rapport with the witness and foster some form of relationship (Akca et al., 2022; Collins & Carthy, 2018; Walsh & Bull, 2011). The investigator should be aware of any special needs relating to the witness and should also explain and verify that the witness understands the process (Adams & van Golde, 2020).

The next phase is Account. This is the phase whereby the witness gives their account of what happened. This should be done without interruption (free recall), this phase also includes the investigator, after actively listening to the account, challenging and clarifying the information provided by the witness (Walsh & Bull, 2010). Following on from clarifying the account, closure is the final phase to happen in the presence of the interviewee. At this point, the investigator summarises what has been discussed and said during the interview, the interviewee is also asked if there is anything else they would like to add or if there is anything that they would like to change (Walsh & Bull, 2008). This then brings the interview to an end in a clear manner before ending the interview and allowing the witness to leave after having thanking them for attending (McGurk et al., 1993). The final phase of the PEACE model is evaluation, occurs after the interview has finished and involves looking at all the information gathered and placing it within the context of the incident that has been reported (Scott et al., 2015).

1.8.1.1 A.D.V.O.K.A.T.E

A significant phase of the PEACE model is the planning and preparation phase, as previously mentioned, the planning phase includes preparing questions for the interview in order to gather accurate information about the incident. When gathering the information, it is important that investigators ask certain questions and they should apply the mnemonic ADVOKATE (MoJ, 2022) when doing so. ADVOKATE came into being as a result of an appeal in the case of R vs Turnbull and Camelo in 1976 (Tudor-Own, 2016). Turnbull and Camelo were arrested for burglary and they were both charged and convicted of the offence.

The two convicts appealed the decision on the basis that the guidance given by the judge to the jury was incorrect in relation to the efficacy of witness testimony. The appeal was dismissed and the convictions were upheld, however a new set of guidelines was introduced as to what specific information must be requested from the witness, represented by the ADVOKATE mnemonic (Kebbel, 2010).

The use of the mnemonic ADVOKATE is encouraged when interviewing witnesses in order to elicit more information and is considered as best practice (MoJ, 2022).

A - Amount. How long (time) did the witness observe the event for.
D - Distance. How far away was the witness from the event.
V - Visibility. How good was visibility (time of day, street lighting, weather).
O - Obstructions. Were there any obstacles in the way of the witness and event.
K - Known. Was the suspect previously known to the witness, were they familiar.
A - Any reason to remember. Was there some specific reason the witness remembers the event.
T - Time lapse. How much time passed between witnessing the event and recalling the details.
E - Errors or material discrepancies. Is the witness account reliable, have there been any mistakes.

1.8.1.2 Limitations of the PEACE model

Following the introduction of the PEACE model, initial evaluations of the process and its training methods was conducted by McGurk et al. in 1993, during the implementation period of the new process. Their study found that there were improvements in certain areas of interviewing skills, such as the questions being asked and also listening skills. Indeed Mcgurk et al. found that those trained in the PEACE model performed better in interviews than the control group (Walsh & Bull, 2008). However, a further study by Bull and Cherryman (1996) showed no such findings, indeed the study showed multiple issues, the same deficiencies that were reported with the cognitive interview, failure to establish a relationship/rapport, asking inappropriate questions and failing to summarise properly. The results showed a failing in several domains of the PEACE model, including planning, engagement, account and closure. However, as Walsh and Bull note, these studies were conducted at the beginning of the implementation of the PEACE model therefore suggesting it was too early to rely on the results.

Subsequent studies carried out by Clarke and Milne (2001) and Griffiths and Milne (2006) found some beneficial effects the PEACE model, most notably in the domains of planning and explain, there still evident shortcomings, with investigators not performing well in the engage domain, effectively they were failing to build a relationship/rapport. The studies also highlighted failings with regards to appropriate questioning. Both studies also issues regarding the account and closure domains. Indeed a further study by Griffiths (2008) continued to show deficiencies in the planning stage. Similar results have been shown in further studies; Clarke et al. (2011) found no differences between investigators trained in the PEACE model and those using a standard interview. One of the main criticisms of the PEACE model, is the same as the problems levied at the cognitive interview, the technique is overlong and too complicated, and investigators only use a few of the components, therefore not utilising the full power of the method (Akca et al., 2022; Dando et al., 2008). While it may appear that multiple studies show the issues facing the PEACE model, MacDonald et al. (2017) found that officers trained in the PEACE model were achieving more successful interview outcomes than a standard interview, especially in the domains of planning and engagement.

1.8.2 Current witness interviewing guidelines

According to the College of Policing (2022), a witness interview should follow the structure of the P.E.A.C.E framework as outlined above, and utilising the ADVOKATE mnemonic. However, the Ministry of Justice (2022), in their Achieving Best Evidence in Criminal Proceedings guidance, suggest a comparable framework, with most directions being compatible to both frameworks. For example, both frameworks have a planning and preparation phase. The framework suggested in the Achieving best evidence guidance includes the phases, planning and preparation, establishing rapport (engage and explain), a free narrative account (account/free recall), closing the interview (closure) and finally, evaluation.

1.9 Global/Local Processing

A natural scene usually contains a multitude of different objects and patterns that can be deconstructed and organised hierarchically (Conci et al., 2011; Dalrymple, Kingstone, & Handy, 2009). For example, a face has a nose, eyes and ears. The capacity to differentiate between the diverse hierarchical levels of the whole and the component parts of the said whole is essential when processing one's sensory world (Ouimet, Foster, & Hyde, 2012). To that end, systems have evolved to enable one to engage with these multiple hierarchical levels and flexibly alternate between and process the different levels (Dalrymple, Kingstone, & Handy, 2009). Processing itself denotes how an individual perceives or attends to information (Mok & Morris, 2012), and one of the fundamental debates in perception and cognition is how individuals process the information they are presented with from their surroundings and the relationship between wholes and their constituent parts (Kimchi, 1992; Love, Rouder, & Wisniewski, 1999; Miller, 1981a). The question is whether the processing of the information is regarded as either being global to local, whereby the whole is perceived firstly and then deconstructed into the local details, or local to global, whereby the element is constructed from the details into a whole or global picture (Kimchi, 1992; Love, Rouder, Wisniewski, 1999). For example, if one perceives the trees before the forest or the forest before the trees (Beaucousin et al., 2011; Forster, 2012; Navon, 1977). The debate can be traced back to two schools of thought, the Gestalt and the Structural (Kimchi, 1992). Structuralists maintained that objects were recognised, identified, and categorised by distinguishing their component parts, which are then constructed into the whole (Andres & Fernandes, 2006; Kimchi, 1992;), effectively concentrating on the details or local elements (Mik & Morris, 2012). Alternatively, some Gestaltists maintained the hypothesis that, in the initial stages of processing, the whole and their parts are perceived simultaneously (Navon, 1977), while others maintained that the whole is perceived firstly, followed by the parts (Kimchi, 1992).

The global-local paradigm was one model designed to test the aforementioned theories, specifically in visual perception (Andres & Fernandes, 2006). Initially introduced by Kinchla (Andres & Fernandes, 2006; Kinchla, 1974) and subsequently utilised by Navon (1977), the experiment involved participants being presented with various hierarchical stimuli, which were typically a larger letter representing the global aspect, constructed of smaller letters, representing the local aspects (Andres & Fernandes, 2006; Beaucousin et al., 2011; Blanca & Alarcon, 2002; Navon, 1977). During the task, participants are instructed to either respond to the global, larger letters, or the smaller, local letters, by pressing an assigned key on a computer keyboard. The stimuli could either be congruent, both elements in the structure the same, for example, a letter H made up of smaller Hs, or incongruent, whereby the elements are conflicting, for example, a large H constructed of a smaller letter, typically an S. The use of these hierarchical stimuli tests would allow the reaction times (RT) to be analysed in both selective and divided attention tests. A global advantage would be noted when the global level of the stimulus was identified quicker and more accurately than the local level, and vice versa for the local to the global condition. This test also measured, in selective attention, the interference effect caused by the difficulty in distinguishing between the two levels of the stimuli when the information was incongruent (Blanca & Alarcon, 2002).

Therefore when participants were requested to identify the local element, there would be a global interference if accuracy rates and RTs were slower and thus influenced by the incongruent identity and vice versa.

Navon (1977) demonstrated in his experiment a finding that has been replicated on numerous occasions, that in reaction time tests, participants recorded faster times at identifying the larger letters (global) than when identifying the smaller letter (local). However, when asked to identify a smaller (local level) letter, where the large (global level) letter was incongruent, participants responded significantly slower. This indicates that information at the global level impedes the processing of the information at the local level, thus suggesting a sequential pattern to information processing (Bouvet et al., 2011; Ouimet, Foster, & Hyde, 2012). This implies that a global level of processing either precedes the local level or is finished processing quicker than the local level (Christman, 2001) and that global processing could also be automatic (Bouvet et al., 2011), thus suggesting a global precedence effect (GPE) (Navon, 1977).

Several theories have been put forward to explain the global precedence phenomena. Navon (1981, 2003) has suggested that global precedence may occur because the global information processed is sufficient to recognise the object. That is to say, it fits in with the knowledge and schemas one holds of the world (Beaucousin et al., 2011; Dijkstra, van der Pligt, van Kleef, & Kerstholt, 2012). Shulman, Sullivan, Gish, and Sakoda's (1986) spatial frequency theory proposes that two different channels are involved in the perception of global and local information favouring low-level or global over high-level, or local, frequencies of a presented stimulus. Another possible explanation posits that perceptually, the global level is easier to perceive than the local level. Thus, the global level is processed quicker than the local level (Andres & Fernandes, 2006) or simply that the visual system makes global features available prior to local features becoming apparent (Miller, 1981b). Moreover, several theories postulate that the differences in processing occur post perception, that is, both levels are perceived concurrently, but, at a more advanced stage in identifying the stimulus, global forms are processed quicker than the local elements (Andres & Fernandes, 2006).

However, again utilising the Navon (1977) style task of hierarchical stimuli, subsequent studies have shown different results. In contrast to the results of the previously mentioned studies by Navon (1977), Thomas and Forde (2006) found a local processing precedence. Their study showed that participants recorded faster RTs in the processing of local information and showed a significant local to global interference on a selective attention task, which coincided with previous research by Heinze, Hinrichs and Scholz (1998). These studies thus challenge the theory that global information is processed prior to local information and the overall GPE (Robertson, 1996). Moreover, there have been studies that propose that the global and local levels are processed in tandem. In contrast, others have demonstrated that the global/local precedence could be reversed or modified using different experimental conditions (Blanca & Lopez-Montiel, 2009). For example, by manipulating the size of the stimuli, increasing or decreasing the space between the stimuli (Perfect, Weston, Dennis, & Snell, 2008) and altering the angle of the stimuli (Poirel, Pineau, & Mellet, 2008). All of these aforementioned experimental parameters have demonstrated that a global or a local precedence effect can be altered by manipulating the properties of the stimulus or the method of testing (Dalrymple, Kingstone, & Handy, 2009).

While the global/local distinction has been seen above to apply to perceptual processing, it has also been suggested that the same distinction could also be applied to conceptual processing (Darwent, Fujita, & Wakslak, 2010; Mok & Morris, 2012; Forster & Dannenberg, 2010; Forster, Lieberman, & Shapiro, 2009). Forster (2009; Forster & Dannenberg, 2010) suggests that the same attentional procedures that govern perceptual processing also govern conceptual processing, and both are therefore linked (Goldstone & Barsalou, 1998). For example, a global processing orientation should support the inclusion of the different categories associated with a particular stimulus, offering a broader scope of information. However, a local processing orientation should exclude other associations and narrow the stimulus in scope (Forster, 2009; Forster, 2012; Mok & Morris, 2012). Novelty categorisation theory (Forster & Becker, 2012) suggests that when one meets with something new or unusual, the default processing style for the information is global, as one tries to assimilate the knowledge into existing knowledge structures or schemas (Forster & Dannenberg, 2010). In contrast, local processing attempts to locate the details that distinguish the information from others. In a study, Friedman, Fishbach, Forster and Werth (2003) demonstrated that priming a global perceptual processing orientation led participants to generate more unusual examples from several categories, such as fruits or vegetables, than when primed for local orientation. The study replicated results found by Friedman and Forster (2001), who found that participants generated more atypical uses for a brick after focussing on the global aspects of hierarchical letter tasks. This suggests that conceptual and perceptual processing reflect each other and that priming a specific processing orientation in one task can be carried over to another unrelated task (Darwent, Fujita, & Wakslak, 2010; Forster & Dannenberg, 2010; Huff, Schwan, & Garsoffky, 2011; Mok & Morris, 2012).

Not only has a carry-over effect been noted between perceptual and conceptual processing, but it has also been shown to exist between the encoding and retrieval of information. This particular instance is known as a processing shift (Schooler, 2002) and can be transfer-appropriate or inappropriate. That is, recognition performance could be impaired if the same processing orientation is not utilised at both the encoding and retrieval stage. An example of this is the verbal overshadowing effect, whereby describing a previously viewed non-verbal stimulus, for example, a face, elicits an over-reliance on verbal processes that subsequently interfere with and impair the recognition performance of further non-verbal stimuli (Finger, 2002; Melcher & Schooler, 1996; Schooler & Engstler-Schooler, 1990). In essence, the process of verbalising forces focus on local, verbalisable details, such as the shape of the eyes and mouth, and consequently shifts the processing orientation from global at the encoding stage to local at the retrieval/recognition stage (Lewis, Seeley, & Miles, 2009; Weston, Perfect, Schooler, & Dennis, 2008).

Schooler and Engstler-Schooler (1990) asked participants to view a short film of a bank robbery in which the perpetrator's face was evidently visible for the majority of the clip. After viewing the clip and taking a distractor task, participants were either assigned to one of two conditions. One group was required to write a detailed description of the culprit's face, mainly focussing on each facial feature; the participants in the second group were assigned to an unconnected task. All participants were then presented with a line-up and asked to identify whom they thought was the culprit. As faces are thought to be processed holistically/globally (Tanakah & Farah, 1993), it was hypothesised that those participants that provided a detailed verbal description of the face would prime a local processing orientation. That would, in turn, interfere with the subsequent recognition task and identification of the perpetrator from the line-up. It was found that participants assigned to the verbal description task performed significantly worse by making fewer correct identifications than those in the control group, therefore providing evidence for the verbal overshadowing effect (Perfect, Hunt, & Harris, 2002).

In an experiment by Macrae and Lewis (2002), aiming to illustrate the processing shift effect concerning the global/local paradigm, participants were requested to take part in a hierarchical stimulus task that utilised Navon letters after viewing a clip of a bank robbery (the same one used in the aforementioned Schooler and Engslter-Schooler experiment). Participants were either primed globally or locally. One group was required to attend to the global aspects of the hierarchical stimuli, while the other was required to focus on the local aspects. After viewing the clip and taking part in the task, participants were shown a line-up and asked to identify the person they thought was the perpetrator of the bank robbery clip. The results concurred with those of Schooler and Schooler-Englster (1990), with Macrae and Lewis finding that those participants primed locally performed significantly worse, providing fewer correct identifications than those primed globally and also the control group. Macrae and Lewis, however, also found that those primed globally outperformed the non-primed control group.

As detailed above, the distinctions and differences in global and local processing within the global/local paradigm have produced much research and instigated many debates. Another such area where there has been continuous debate is whether there are hemispheric differences in global/local processing. It has been postulated that the right hemisphere is more of a global/automatic processor, and the left hemisphere is thought of as more analytical or local in function (Boles, 1984; Chrisitie et al., 2012; Hubner & Studer, 2009; Kimchi & Merhav, 1991; Martin, 1979). Indeed studies have demonstrated that there are differences in global/local processing across brain hemispheres, with the right hemisphere being associated with a larger role in global processing and the left in local processing (Hubner & Studer, 2009; Martens & Hubner, 2013; McKone et al., 2010; Sanders & Poeppel, 2007). A study by Martin (1979), utilising a set of visual hierarchical stimuli, demonstrated a left hemisphere advantage when attending to the local elements and right hemisphere advantage when attending to global elements. This was a finding replicated by Sergeant (1982), who found a right visual field (RVF), left hemisphere advantage, for detecting the local elements of an image, and a left visual field (LVF), right hemisphere advantage for identifying the global properties of an image (Oken, Kishiyama, Kayye & Jones, 1999). Patients with brain damage, typically with lesions on the left hemisphere, have demonstrated deficiencies in identifying the local elements of a stimulus, and similarly, patients with lesions on the right-side brain have shown a detriment in processing the global form (Blanca & Lopez-Montiel, 2009; Bouvet, Rousset, Valdois, & Donnadieu, 2011; Huberle & Karnath, 2012; Kleinman & Gupta, 2008). Moreover, neuroimaging studies on young, healthy adults have shown greater activity in the right hemisphere when processing global information and more activity in the left hemisphere when processing local elements (Fink et al., 1996; Fink et al., 1997).

However, in contrast to the studies mentioned above, further research, especially by Boles (1984) and Boles and Karner (1996), has failed to reproduce the same results. In a study conducted by Johannes, Wieringa, Matzke and Munte (1996), it was demonstrated that the left –hemisphere has a bias to process both the local and global characteristics of a stimulus. In addition, Blanca and Alarcon (2002) conducted a study using hierarchical stimuli. The results showed arousal in both the left and right hemispheres, suggesting both hemispheres can process the global and local elements. Thus, there was no evidence for hemispheric specialisation suggesting hemispheric symmetry.

Most of the previously mentioned global/local processing studies have been conducted in the visual perception domain. However, the auditory domain has been considered to have corresponding attributes to the visual domain, meaning auditory stimuli are thought to be processed hierarchically (Bouvet, Rousset, Valdois, & Donnadieu, 2011; Justus & List, 2005; Sanders & Poeppel, 2007). Like visual processing, research has suggested that there are hemispheric differences in auditory processing (Justus & List, 2005) that are comparable to visual processing. Studies of brain-damaged patients with lesions on the left hemisphere have typically shown a deficiency in detecting the faster temporal changes and lower frequencies, the local elements. In contrast, patients with lesions on the right hemisphere have shown difficulty in detecting the slower changes and higher frequencies in pitch direction. This suggests a right hemisphere preference for global processing and a left hemisphere preference for local processing (Bouvet, Rousset, Valdois, & Donnadieu, 2011).

Not only have studies shown differences in global/local processing across domains, but it has also been suggested that priming either a global or a local processing orientation in one modality, such as the auditory or gustatory (Lewis, Seeley, & Miles, 2009), olfactory and haptic domains (Forster, 2011, 2012) can influence the processing orientation in another. Forster (2011), for example, demonstrated a carry-over effect between the auditory and visual modalities. Participants were presented with either fluent poems representing the global aspect or fragmented and disorganised, representing the local aspects. In a subsequent visual task, those participants that had listened to the fluent/global poem outperformed the control group on a global visual task, and those participants in the local condition that had listened to the fragmented/local poem performed better than the control group on the local task. Forster (2011) also demonstrated the same results in the haptic, gustatory and olfactory modalities, with priming a processing style in one domain influencing subsequent processing styles in another.

As detailed above, Forster (2011), amongst others, demonstrated that the global/local processing paradigm was cross-modal (Lewis, Seeley, & Miles, 2009; Melcher & Schooler, 1996). In addition, Schooler (2002), as previously mentioned, demonstrated that differences in processing at the encoding and retrieval stages impair subsequent recognition performance in the visual domain (verbal overshadowing effect). A question thus arises as to whether this processing shift could occur across other modalities. To this end, Lewis, Seeley, and Miles (2009) conducted a study that required participants to take a wine tasting test. After tasting the wine, participants were assigned to one of two conditions, either providing a verbal description of the wine or participating in a non-related task. All participants were then presented with a selection of wines to taste and required to identify the previously tasted wine. It was found that participants who described the wine performed significantly worse on the subsequent recognition task than those participants who had not provided a description. It is said that the experience of drinking wine is a combination of different factors that make up the whole, such as taste and smell. It has also been proposed that memory for olfaction and gustation share the same global processes as a memory for faces. However, some experience elements are not easily analysable (Melcher & Schooler, 1996). Thus, as with the Schooler and Engstler-Schooler experiment, the description forced a local processing style that later interfered with a subsequent recognition task that required a global processing orientation. Hence, the same global/local distinctions in the visual modal can be applied to the olfactory/gustatory modal (Lewis, Seeley, & Miles, 2009).

Although the global/local paradigm, as shown above, has been seen to be cross-modal and has also instigated many debates regarding a GPE, or hemispheric specialisation, several factors have been shown to influence whether an individual utilises global or local processing orientation. These influences include such factors as mood (Enea & Dafinoiu, 2013; Eyal & Fishbach, 2010; Forster & Dannenberg, 2010), age (Bialystok, 2010), culture (McKone et al., 2010), and gender (Kimchi, Amishav, & Sulitzeanu-Kenan, 2009). Indeed research has suggested that there are differences in the way males and females process information, with males more likely to adopt a holistic or global strategy and females more likely to adopt a more featural or local strategy (Kimchi, Amishav, & Sulitzeanu-Kenan, 2009; Razumnikova & Volf, 2011). Research on hemispheric specialisation has implicated possible distinctions in global/local processing between genders. Females tend to outperform males on verbal tasks connected to the left hemisphere, and males outperform females on visual-spatial tests, a task that utilises the right hemisphere (Roalf, Lowery, & Turetsky, 2006). A study by Razumnikova and Volf (2011), again utilising hierarchical stimuli, found a preference for a global, right hemisphere style of processing for males and a more local, left hemisphere processing strategy for females.

Not only has gender been associated with differences in the processing of global and local stimuli, but age also has been shown to have an effect. Preferences for the global over local aspects of stimuli have been shown as early as four months old (Colombo, Freeseman, Coldren, & Frick, 1995, as cited in Bialystok, 2010), with infants showing more sensitivity to global forms (Bialystok, 2010). Ageing has been associated with a decline in certain aspects of cognitive function, and specific hypotheses have suggested a deficit in global processing and other tasks requiring greater involvement of the right hemisphere (Oken, Kishiyama, Kayye & Jones, 1999).

While it has been demonstrated that there are differences in processing regarding gender and age, research has also established differences in processing styles regarding culture. When comparing Eastern to Western cultures, researchers have found differences in the strategies used to process information (Forster & Dannenberg, 2010; Masuda & Nisbett, 2001). It has been suggested that Eastern cultures are more likely to utilise a more global processing style, in that they are more aware of the context, not only in perception but also in memory and reasoning. On the other hand, Westerners have shown a tendency to a more analytical style of processing focusing more on the local details (Kiyokawa et al., 2012; Masuda & Nisbett, 2001; McKone et al., 2010). The nature of Eastern cultures, being more collectivist and focussing on the community as a whole, is said to make them more aware of the background and the surroundings, as opposed to the more individualistic, self-reliant ideals of Western cultures. Hence it has been suggested that collectivist ideals prime a more global/holistic style of processing, and individualistic ideals prime a more local processing orientation (Daividoff, Fontineau, & Fagot, 2008; Forster & Dannenberg, 2010). Studies have demonstrated that collectivist ideals could influence global/local processing, whereby a processing orientation has been primed by using pronouns such as "we" and "our". Participants' performances on subsequent hierarchical stimulus tasks have demonstrated that the pronouns mentioned above have engendered a global style of processing, resulting in faster response times to the global aspects, as opposed to when having been primed using individualistic pronouns such as "I" and "mine" (Kuhnen, Hannover & Schubert, 2001; Lin & Han, 2009). Further to culture, religious beliefs, which go beyond the individualistic/collectivist society, have been shown to influence processing style (Colzato, van den Wildenberg & Hommel, 2008), with those of a religious persuasion performing better on local processing than a global processing task, as compared to those of a non-religious persuasion. This suggests that culture and other social practices affect perceptual and conceptual processing (Forster & Dannenberg, 2010).

Studies have shown that all of the above factors can influence or prime a specific processing orientation. In addition, the emotional state has been cited as affecting processing (Forster & Dannenberg, 2010; Gasper & Clore, 2002; Srinivasan & Hanif, 2010). Mood, in particular, has been proposed as a factor that influences global/local processing (Basso, Schefft, Ris, & Dember, 1996; Davidson, Schaffer, & Saron, 1985). A positive mood generally leads individuals to focus on the global details and adopt a broader perceptual scope, and a negative mood leads to a more local focus and a narrower perceptual scope (Forster & Dannenberg, 2010; Johnson, Waugh, & Friedrickson, 2010). Davidson, Schaffer and Saron (1985) demonstrated that depressed participants performed significantly worse on right hemisphere/global processing tasks, such as a facial recognition task, than controls did. Gasper and Clore (2002) requested sad and happy participants to complete the Kimchi-Palmer (1982) global/local focus test. This test comprises hierarchical stimuli consisting of large triangles or squares, the global figure, constructed from smaller triangles or squares, represents the local aspect. The task involved participants being presented with a standard figure alongside two other figures. The two other figures were either congruent with the standard figure at the global or local level, and participants were requested to indicate which of the two was most comparable to the standard figure. The findings suggested that participants in a happy mood were more likely to attend to the global aspects of the stimuli. In contrast, participants in a sad mood showed a local preference. This finding was replicated by Schmid et al. (2011), who also found that participants in a happy mood utilised global strategies, and those in a sad mood adopted a more local strategy, thus concurring with established theories that positive moods trigger a more automatic and global. In contrast, negative moods promoted a more local or analytic style of processing (De Vries, Holland, & Witteman, 2008; Enea & Dafinoiu, 2013; Gasper & Clore, 2002).

Lastly, global/local processing distinctions have been seen to have implications within the domain of social cognition and communication (Forster, 2011; Woltin, Corneille, & Yzerbyt, 2012; Woltin, Corneille, Yzerbyt, & Förster, 2011). Woltin, Corneille, and Yzerbyt (2012) posited that priming a global processing orientation would lead to a broader understanding of communicative interactions than priming a local one. Therefore those primed globally would be able to successfully perceive the overall context of the communications, thus facilitating a better understanding. Recent research has also demonstrated that not only is better communication facilitated by priming a specific processing orientation, global, but empathy could be increased and stereotyping decreased by allowing people to process information in a more individualistic way through priming a local processing style (Woltin, Corneille, Yzerbyt, & Förster, 2011).

The GPE having an effect on empathy and therefore face recognition is an exciting topic and one that does not have vast amounts of research dedicated to it. However, Giannou et al. (2020) have demonstrated a link between empathy, compassion, a relaxed state, and recognising faces successfully. This could be taken as support for Ready and Bothwell (1997), who found that participants suffering anxiety or heightened anxiety and neuroticism failed to recognise faces correctly. While this is interesting and could provide ideas for further face recognition research, it is not within the scope of this thesis.

In conclusion, Navon has demonstrated the GPE, which has been replicated on many occasions in numerous studies, has been shown to depend on various factors such as angle and size, among others. However, further studies have negated the GPE. Differences in global-local processing are hemispheric, with the LH being a local processor and the RH being global. However, certain studies have demonstrated either the opposite or no such distinction. The global/local paradigm has also been shown to be cross-modal and not limited to visual perception but auditory, gustatory, haptic and olfactory too. Global/local processing is active in both the percept and concept and that processing could be influenced by several factors, including age, gender, culture and mood. The implications for the distinction in global/local processing are wide-ranging from Witness Research (see Macrae & Lewis, 2002 and Perfect, Dennis, & Snell, 2008) where global processing is of paramount importance, the research suggests that priming a global processing orientation leads to successful outcomes. There are implications too in the disciplines of Social Psychology (see Forster, Lieberman, & Kuschel, 2008), especially how one views oneself concerning others and makes social judgements (see Woltin, Corneille, Yzerbyt, & Förster, 2011) and even, improved communicative understanding (see Woltin, Corneille, & Yzerbyt, 2012).

1.10 Face Recognition

When asked to point out the suspect in court, "I shall never forget that face", proclaimed Dorothy Canady, a witness in a murder trial, before pointing to a jury member and claiming they were the perpetrator. Peter Fell, was convicted of double murder in in 1981, an eyewitness had identified him, he served 17 years in jail. Peter was exonerated in 2001, when it was made known that the eyewitness had identified several possible suspects and wasn't absolutely certain about any of them. In one of the most egregious miscarriages of justice due to faulty eyewitness identification, Victor Nealon was convicted of rape in 1996. The main evidence was line-up identifications. Only one out of seven witnesses picked Nealon out of the line-up, another wasn't sure and a third identified Nealon, after seeing him with a solicitor at the police station. However, there four other witnesses who did not identify Nealon from the line-up. The victim did not participate in the line-up. DNA testing in 2009, showed the DNA present on the victim was of an unidentified male and not Nealon. Victor Nealon was exonerated in 2009 (Evidence based Justice, 2022).

History is littered with innocent people convicted of crimes based on false witness testimony and wrongful identification. The Innocence Project in the US estimate that 75% of all wrongful convictions are due to faulty eyewitness testimony. The UK based Evidence Based Justice also maintain that high percentage of those exonerated of a crime have been misidentified from a line-up procedure, some picked out by more than one witness

An essential part of crime investigation is identifying a possible perpetrator of a crime. Faces provide a vast amount of socially relevant information, from showing emotions, as evidenced by Darwin (1859) and later by Ekman (1980), to the race and ethnicity of the person. However, as has been learned over the last 20 years, mistaken identification of faces is one of the leading causes of wrongful incarceration (the Innocence Project). The question, therefore, must be asked, how can this problem be overcome?

In order to address the problem of mistaken identification, one must first understand how faces are recognised and processed. As far back as the end of the 19th Century, Galton (1879, as cited in Tanaka & Farah, 1993) advanced the position that it was the culmination of individual features rather than the individual features themselves that were necessary for face recognition (for a review see Tanaka et al., 2016).

However, the evidence for or against face being processed globally was somewhat ambiguous. That is, there lacked clear evidence to support the theory. In their now seminal paper, "Parts and wholes in face recognition", Tanaka and Farah (1993) demonstrated through a series of experiments that participants were more successful at identifying faces when presented with all the features than they were when presented with a single feature (see Tanaka & Simonyi, 2016 for a review of the literature).

Since then, this theory has been tested multiple times, with researchers adopting the upright versus inverted faces paradigm and the whole/parts paradigm to show that faces are processed holistically. Typically in these studies, participants are presented with unfamiliar upright faces as well as inverted faces. Participants are found to recognise the upright faces more accurately than the inverted ones, thus suggesting that the whole face in its normal configuration is required for recognition. This paradigm has been supported by more recent studies, including by Tanaka et al. (2019), who found a significant effect for holistic processing in upright faces.

Wong et al. (2021), in a paper regarding the other-race effect, also utilised similar methods, i.e. unfamiliar faces tasks and whole/part recognition tasks. Their findings did support the consensus that faces are processed holistically. Of particular interest were the findings that the ORE did not influence global /local processing of faces, and indeed faces were seen to be processed holistically.

1.11 Voice Recognition

Faces provide a vast amount of socially relevant information, and much information can be extracted from looking at the face. Tanakah and Farah (1993) showed that faces are processed holistically or globally. Faces are recognised via cumulative features to create a whole. However, can the same be said for voices? Voices also carry a vast amount of socially relevant information and, like faces, contain many parts that make up the whole, from the pitch and accent to intonation; voices are very complex (Mann et al., 1979)

Research by Blank et al. (2011) has shown that the voice recognition area of the brain is situated in the right hemisphere, in close proximity to the face recognition module. This also happens to be the same hemisphere that contains the areas for memory of emotional events (Wagstaff et al., 2009) and is also thought to be the hemisphere that processes global information (Schooler, 1990). Therefore could it be that both voices and faces are processed globally? Further to this, a 1982 study by Van Lancker and Canter showed that, in patients with brain damage, voice recognition is lateralised to one specific hemisphere of the brain, the right side, particularly for unfamiliar voices. Thus, suggesting that the voice recognition module is situated in the right hemisphere

Yovel and Belin (2013) have suggested that voices and faces are encoded similarly. Cumulating evidence from several areas of research, including neuroscience and neuropsychology, Yovel and Belin concluded that although faces and voices have very distinct physical properties, the face and voice recognition modules work similarly.

1.12 The Verbal Overshadowing Effect

Research has also demonstrated that differences in the encoding and retrieval stages of memory have been seen to impair visual recognition and recall performance and memory for auditory and olfactory details (Perfect et al., 2002; Schooler & Schooler, 1990, Schooler, 2002; Vanags et al., 2005 Wilson et al., 2018). Cognitive psychology suggests there are two distinct ways in which one perceives and conceptualises the world (Lloyd-Jones et al., 2006). Over the last few decades, research has demonstrated the beneficial effects of different retrieval techniques that can be administered to individuals to enhance memory performance within witness research (Vredeveldt et al., 2011). Research has also shown the detriments and benefits of priming a specific processing orientation, specifically on face recognition and visual memories (Baker & Reysen, 2020; Brandimonte & Collins, 2008; Holdstock et al., 2022) , through verbalisation and the verbal overshadowing effect, within the same paradigm. The focus of this research is to investigate the role of global/local processing in memory enhancement techniques, utilising the Liverpool Interview Protocol (LIP) components: eye closure, focussed breathing and context reinstatement. For example, it has been proposed that focussed breathing primes a more global, right-hemisphere processing orientation (Ready & Bothwell, 1997; Wagstaff et al., 2004). FB has also been shown to reduce, and in some cases completely reverse, the global precedence effect (GPE), in addition to improved reaction times on both global and local processing tasks (Van Leuwen et al., 2012). These findings possibly suggest that FB facilitates improvements in the allocation of attention and the ability to adjust processing style from global to local speedily, and vice-versa.

Previous memory research has often demonstrated that verbal rehearsal of information provides for improved results at a later time (Huff & Schwan, 2008; Jung & Chong, 2014; Sporer et al., 2016). However, a series of experiments conducted by Schooler and Engstler-Schooler in the early 1990s showed that this is not always the case. Over the course of their experiments, participants were shown a short video of a burglary in progress. Participants were then required to undertake a filler test during a twenty-minute delay before the following section of the experiment. After waiting for the required 20 minutes, participants were either asked to provide a detailed verbal description of the perpetrator's face or continued with the filler task aspect of the study. For the final part of the experiment, all participants were asked to choose the suspect from a line-up of 8 similar faces. The study results showed that those participants who provided a detailed description of the robber were significantly less likely to identify the suspect than those who provided no description correctly.

Both Schooler and Engstler-Schooler (2002) noted that previous memory research had primarily concentrated on utilising verbal stimuli that lent them suitably to verbal rehearsal and also elaboration. That is, the stimuli used were easy to describe. In the Schooler study, the stimuli consisted of items that were difficult to describe, mainly the face. It was hypothesised that verbal rehearsal would strengthen memory performance only if the stimulus were easily described (Meissner & Brigham, 2001; Meissner et al., 2001; Schooler & Schooler, 1990). If the stimulus did not lend itself to verbal description easily, then subsequent recognition performance would be impaired, mainly if the sole purpose of said description is to differentiate one target from a line-up of distractors (Lloyd-Jones & Brown, 2008; Macrae & Lewis, 2002; Wilson et al., 2018). Subsequent research regarding the description of faces has provided similar results, with most studies showing impaired performance in face recognition after having provided a detailed description of the perpetrator's facial features (see Meissner & Brigham, 2001 for an early review; Brown et al., 2014; Mickes, 2016).

The initial theory given by Schooler and Engstler-Schooler (1990) for the effect was that there were two competing representations: verbal and non-verbal. These two representations became conflated when required to identify the hard-to-describe stimulus; thus, participants chose incorrectly, showing impaired recognition performance. Schooler and Englster-Schooler explained that the verbal description interfered with the original visual memory, with participants only providing detailed descriptions of the easily identifiable parts of the face and not the configurable information, as it was too difficult to describe. It is suggested that this exact, hard-to-describe configurable facial information is important when distinguishing the correct face from those of the fillers or distractors in the line-up. The omission of these details deemed too complex to describe results in a "verbal encoding that is an inaccurate representation of the original visual stimulus" (Vangas et al., 2005, p 1128).

Indeed further studies have shown the same results for other hard-to-describe stimuli across a range of modalities, including taste and touch, and also a range of stimuli, such as wine (Melcher & Schooler, 1996) and colour (Schooler & Engstler-Schooler, 1990).
While the main focus of verbal overshadowing has concentrated mainly on face recognition, the effect has been noted in other areas of non-verbal cognition. The trend has also been noted when participants have attempted to verbalise other instances of visual stimuli such as colours (Forster), describing spatial settings (Forster, 2011), and non-visual stimuli, such as wine-tasting (Lewis, Seeley, & Miles, 2009), and interference has been seen with voice recognition and even decision making (Perfect, Hunt, & Harris, 2002).

Several theories for the verbal overshadowing effect have been suggested, and they fall into three categories; content or recoding interference (Brandimonte & Collina, 2008), criterion (Clare & Lewandosky, 2004) and processing shift (Hunt & Carroll, 2008; Schooler, 2002). The first account, content or recoding interference, posits that the verbal description alters the original visual memory, reworking it into a less favourable verbal format that subsequently interferes with accessibility to the original memory central to recognition memory. The RI was initially proposed by Engstler and Engstler-Schooler (1990) to explain the detrimental effect the description provided by participants had on subsequent face recognition. This finding has been replicated and expanded to the visual imagery domain by Brandimonte et al. (1997).

Secondly, Clare and Lewandowsky (2004) proposed a criterion shift theory of verbal overshadowing, whereby verbalising visual details produces a more conservative response (Chin & Schooler, 2008). In the author's study, it was found that recognition performance was impaired when participants were requested to provide a verbal description and then offered a not present option when viewing a subsequent target present line-up. The explanation is that verbal descriptions lead to participants adopting stricter recognition criteria (Brandimonte & Collina, 2008).

Finally, the processing shift theory posits that the production of a verbal description of a face shifts the processing style from a more global/holistic form of processing, necessary for face recognition, to a more feature-based or local style of processing (Schooler, 2002). The theory proposed is that verbalisation induces more featural-based processing, as it is easier to describe facial features in words, which is incongruent with the visual (Nakabayashi & Burton, 2008), global processing style necessary for facial recognition (Brown et al., 2014; Nakabayashi et al., 2012). According to Meissner et al. (2007), after having given a verbal description, participants are stuck in a verbal mode of processing, which is then carried over and interferes with the processes necessary for successful recognition. This transfer inappropriate processing shift theory developed out of Morris, Bransford and Franks (1977) transfer appropriate theory, which posited that memory performance for events was enhanced when the information was processed at the same level at both the encoding and retrieval stage.

The verbal overshadowing effect could therefore have implications for eyewitness identification accuracy. If, as previously mentioned, witnesses are required by police to provide verbal descriptions of a possible suspect, recognition of the possible perpetrator may well be hindered when presented with an identity parade and asked to identify the culprit. It may, therefore, be more beneficial for police to avoid eliciting detailed descriptions of possible suspects from suspects. However, specific investigative interviewing techniques are known to necessitate detailed descriptions of possible suspects, for example, the Cognitive Interview.

1.13 Breathe Relax Recognise: FM and Face Recognition

There have been multiple studies over the years testing the efficacy of different investigative tools on face recognition, including forensic hypnosis. Some studies have demonstrated facilitating effect of hypnosis on face recognition (Ready & Bothwell, 1997), while others have shown no facilitatory effect (Wagstaff, 1982). However, some researchers have noted the similarities between elements of forensic hypnosis and relaxation techniques such as meditation (Wagstaff et al., 2011). According to Wagstaff et al., they share a relaxed mode of thinking brought about by focussing attention on external stimuli, such as one's breath.

Wagstaf et al. (2004) put forward the idea that this particular focus on one's breath could prime a holistic or global processing style with a concomitant increase in right hemisphere processing. As mentioned in this section, face recognition utilises global processing, and the face recognition module resides in the right hemisphere. Therefore, Wagstaff et al. argued that FB could facilitate and improve face recognition. Indeed the suggestion was that it also aids concentration, which was supported by Van Leuwen et al. (2011).

Van Leuwen et al. (2011) conducted a study to test whether a focused meditation exercise increased concentration and primed a global processing orientation. In their study, they employed a Navon-style letter task (see section for more information) and asked participants to attend to the letters after engaging in a focussed meditation exercise. They found that those in the meditation groups tended quicker to attend to the global and local letters. The GPE was still in effect, as participants attended to the global letters quicker than they reacted to the local letters, thus suggesting that a focused meditation exercise aids concentration and primes a global precedence effect, which is necessary for both face and voice recognition.The findings that an FM/FB facilitates face recognition are supported by Martin et al. (2017) and Frowd et al. (2021). In both these previous papers, the researchers utilised the focussed meditation component of the LIP to construct a photofit of a face they had seen the previous day. They found that participants in the FM condition outperformed the control group when remembering the previously seen faces.

An interesting question would be, if FM facilitates face recognition by priming right hemisphere global processing, could the same be said for voice recognition, which is also thought to be processed globally in the right hemisphere? Indeed Blank et al. (2011) have suggested a direct connection between the face and voice recognising modules situated in the right hemisphere of the brain.

1.14 Research Aims

There is a large body of work that has shown there are multiple problems with eyewitness testimony and issues with identifications from a line-up. With eyewitness testimony, including identifying a suspect, being such a crucial part of an investigation, obtaining accurate accounts and identifications is paramount. As such there have been myriad interviewing techniques that have been proposed to deal with the issue, some, like the Reid Technique have proven to be ineffective, others, like forensic hypnosis have been shown to be slightly controversial and not as effective as first thought. However, the cognitive interview, with its components based on scientific research, has demonstrated its effectiveness in helping witnesses remember more without concomitant increases in false information. Ultimately, however, the technique has proven to be cumbersome, overly long, too complicated to teach and too complicated to implement, resulting in investigators not using it as suggested. The enhanced version added more components that were more witness focussed, for example establishing rapport, however the same issues persist, the complications of teaching and administering it properly. One of the other criticisms levied at the cognitive interview is its interference with face recognition, as the technique can include descriptions of possible perpetrators that leads to the verbal overshadowing effect.

Studies have shown that forensic hypnosis aids face recognition, but there is a body of work that disputes this. However, Wagstaff et al. developed a short interview technique that comprised elements of forensic hypnosis and components from the cognitive interview those being, focussed breathing, eye closure, report everything and context reinstatement. Wagstaff et al. found some success with focussed breathing appearing to facilitate better face recognition, the theory being, that focussing on one's breath primed a global processing orientation congruent with face recognition. Furthermore, the technique known as the Liverpool Interview Protocol, also showed beneficial effects on witness accounts, providing for more accurate information without a concommitant increase in false information. Additionally there was no increased confidence in incorrect identifications and information. The experiments presented in this thesis were designed to test the effectiveness of a focussed breathing exercise on face recognition and voice recognition and provide more insight to the theoretical underpinnings of said exercise.

1.14.1 Present research

Based on the literature described in this chapter, a number of research questions were formulated concerning the theoretical underpinnings of focussed breathing and its effects on face and voice recognition. Although not the main focus of the present research, further questions were formulated concerning the effects of focussed breathing on free and cued recall tasks and questions regarding the efficacy of eye closure on free and cued recall tasks. A further research question assessing the benefits of eye closure on voice recognition is also proposed. In addition based on the results of experiments two and three, a further research question was formulated to test the effectiveness of multiple administrations of the focussed exercise. With the cognitive interview and also the LIP demonstrating no increased confidence in incorrect responses to line ups and recall tasks, a further question regarding confidence was also proposed. Each separate question is addressed in the following sections accompanied by a brief rationale for the question.

1.14.1.1 Research questions

a. It has been suggested that focussed breathing primes a global processing orientation that is congruent with face and voice recognition. For this reason the research presented in this thesis will examine whether a focussed breathing instruction primes a global processing orientation.
b. Previous studies have shown beneficial effects of focussed breathing on face recognition; however none of the studies involved identification from a line-up. The present research examines the effects of focussed breathing on face recognition from two line-ups.
c. Like face recognition, it has been suggested that voice recognition also relies on global processing, in lieu of this the present research examines whether a focussed breathing exercise improves identification from a voice line-up.
d. In lieu of the results of studies 1 and 2 and contrary to previous research, there was no significant effect of focussed breathing on the free recall and cued recall tasks, therefore it was hypothesized that the focussed breathing exercise has a time limit to its efficacy. The present research examines whether multiple administrations of the focussed breathing exercise provides for more accurate information and identifications.
e. Research on the role of modality in eye closure has been mixed, with some studies showing beneficial effects for visual details only while other studies have shown beneficial effects for both visual and auditory information, as such the research presented in this thesis examines whether eye closure has a beneficial effect on voice identification, in addition to auditory and visual detail.
f. Certain interview techniques, such as forensic hypnosis, have been found to inflate confidence in incorrect responses. Therefore the present research will examine whether focussed breathing affects witness confidence.

1.14.2 Conclusion

In conclusion, we know that a focussed breathing exercises aids in face recognition and also in providing for more accurate information on free recall task, but we do not know what the theoretical underpinnings are. The present thesis was designed to shed more light on those theoretical underpinnings of focussed breathing and how it affects eyewitness testimony.

CHAPTER 2:

The Navon task: Focussed Meditation, local or global processing?

This chapter presents an experiment examining whether the FM instruction promotes global or local processing and aids concentration. The experiment investigates which processing orientation is primed when an FM instruction is administered and if concentration is improved.

2.1 Introduction

"Can we see the forest for the trees?" asked Navon (1977, p 353) in his seminal paper regarding how a visual scene is perceived. The paper sought to answer how a visual scene is first perceived. Is it the constituent parts of any scene perceived first and then built into a whole, or is it the opposite and the whole scene is perceived first and then broken down into its constituent parts? It is an interesting question that has stimulated debate since the paper was originally written (see Kimchi, 1992 for an early review).

Navon set out to discover if there was a global precedence effect (GPE) in that the global (the whole) elements are reacted to quicker than the local (constituent parts). Navon designed a task, which has been used numerous times in various research areas, whereby he presented participants with large letters representing the global, made up of smaller letters representing the local. The local letters could have been either the same as the larger letter or different letters altogether. (an example of which can be seen below in figure 1).

Navon did indeed find a GPE with participants reacting quicker to the global letters than the local ones. There has been some debate as to whether this effect was restricted to the compound stimulus used in the experiment, however, subsequent studies utilising the same methods have found similar results (Gerlach & Poirel, 2018, Morris et al., 2021, Ventura et al., 2021).

What could be interesting in the GPE research is whether it can be manipulated or indeed primed. Macrae and Lewis (2002) tested something similar. They utilised a Navon style letter task to examine whether attending to local or global letters interfered with face recognition. The study itself was tested within the transfer inappropriate processing paradigm (TIPP) of the VOE (see Schooler, 2002), in that verbalising hard to describe stimulus promoted local processing that later interfered with face recognition. The study confirmed the TIPP of VOE; however, it was not limited to just the verbalisation of the facial features, but effectively facial recognition was impaired when any type of local processing orientation was primed. The authors expanded the paradigm to wine tasting and even music.

These findings have, therefore, implications for face recognition and even voice recognition. If completing tasks that promote local processing styles interferes with subsequent recognition, then perhaps priming the global processing style could enhance it. Wagstaff and colleagues, along with Ready & Bothwell, have suggested numerous times that an FM instruction encourages a more holistic processing style by focussing on an out of body stimulus such as one's breathing, but as of yet, they had not tested for it specifically. However, Van Leeuwen et al. (2012) set out to test if a meditation exercise not only promoted global processing but also improved concentration. They utilised the Navon letter task with meditators as participants. Their results showed a GPE in the control group, however, the meditation groups showed faster reaction times for both the global and local targets, thus suggesting better concentration after meditation while still retaining, albeit, slightly reduced GPE.

The results from the Van Leeuwen and colleagues' study, which improved concentration, have been replicated a few times. Chen et al. (2020) found that a meditation exercise improved concentration in motor sequence learning and increased cognitive capabilities. Similar results have been found by Pozuelos et al. (2019), again by Chen et al. (2017, 2018), and by Norris et al. (2018), who all found faster reaction times after administering a focussed meditation exercise and more efficient allocation of cognitive resources and an increase in concentration.

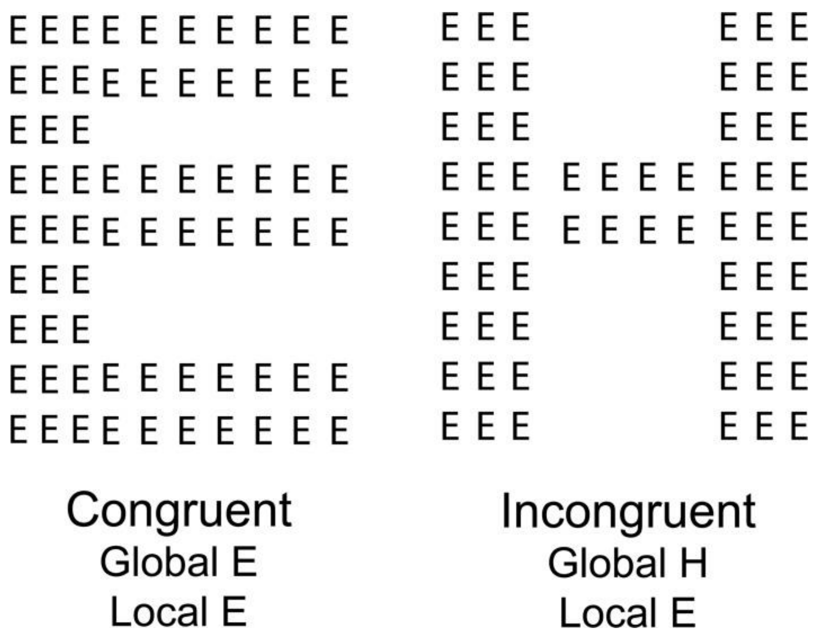


Fig 1. Example of a Navon letter task, both congruent and incongruent.

2.2 Experiment 1: The Navon Task

2.2.1 Introduction

Following on from the studies by Macrae and Lewis and Van Leeuwen et al., this study aimed to test the effectiveness of an FM exercise on global processing and concentration

2.2.2 Aims and hypothesis

The primary goal of this experiment was to test the effect of FM instruction on processing orientation. It was hypothesised that the FM instruction would promote a global processing orientation and could change a local processing orientation to a global processing style. In addition, it was hypothesised that the FM instruction would aid concentration and lead to quicker local and global responses.

2.2.2 Methodology

2.2.2.1 Participants

Twenty-one participants were recruited. Seven participants were undergraduates at the University of Liverpool competing for course credit, and the remaining participants were volunteers from various professions, ranging from healthcare workers and teachers and some working in the legal profession. No one was excluded from the analysis. The sample consisted of twelve females and nine males. None of the sample identified as any other gender outside of male or female. Age ranged from 18 to 74 = (M = 36.7, SD = 18.2). All participants were native English speakers with normal or “corrected to normal” eyesight. All experiments were approved by the Ethics Committee of the University of Liverpool and by the ethics committee in the Department of Psychology. All participants provided informed consent in line with the Committee guidelines.

2.2.2.2 Materials

A Navon task, taken from psytoolkit.com, was presented on an 18-inch laptop screen. An example of the larger letter made up of smaller letters can be seen in figure 1. The larger letter was three inches in height by 1.5 inches in width. The smaller letters were 40 by 40 millimetres. The letters appeared randomly each time. In all, there were 50 letters presented.

2.2.2.3 Pilot

Five pilot participants were administered the Navon Task and the FM. Based on their responses, no materials were adjusted.

2.2.2.4 Design

The experiment manipulated two independent variables. The first, orientation, was a within-subjects design with two levels, global and local. The second was FM, a within-subjects design with two levels again being global and local processing. Thus the experiment utilised a 2 (FM/No FM) x 2 (Local/global) within the participants' design. The dependent variables were the response times.

2.2.2.5 Procedure

All participants were tested individually in a small room. After providing informed consent, all participants took the initial Navon Task, and their response times were recorded. There was a fifteen-minute break; participants were permitted to leave the room and return. After the break, all participants were administered the FM instruction and were then required to retake the Navon Task. Reaction times were recorded. During the FM instruction, all participants were requested to close their eyes.

Participants were required to press the “b” key on the keyboard if they saw an H or an O, either small or large. If neither letter appeared, the participants were required to press the “n” key. After the second task, participants were debriefed and allowed to leave.

2.2.3 Results

This first experiment aimed to assess the role of an FM instruction on processing orientation and if the FM instruction provided for a more global or local processing style. A second aim was to assess if an FM instruction aided in concentration and provided quicker response times locally and globally. This section will firstly outline the results regarding response times, followed by an analysis of whether participants changed from a local to a global processing style or vice versa.

2.2.3.1 Response times

Mean response times and standard deviations as a function of FM or Control and processing orientation are shown in table 2.1 and figure 2.2. Exploratory analyses showed that all assumptions of parametric tests (normality, homogeneity of variance) were met.

Table 2.1 Mean Reaction Times in miliseconds

Condition	Reaction Times (ms)		
	Local	**Global**	**Total**
Control	844.71 (±177.9)	835.71 (±160.3)	840.21 (±169.1)
FM	735.32 (±137.3)	709.95 (±101.9)	722.64 (±119.6)

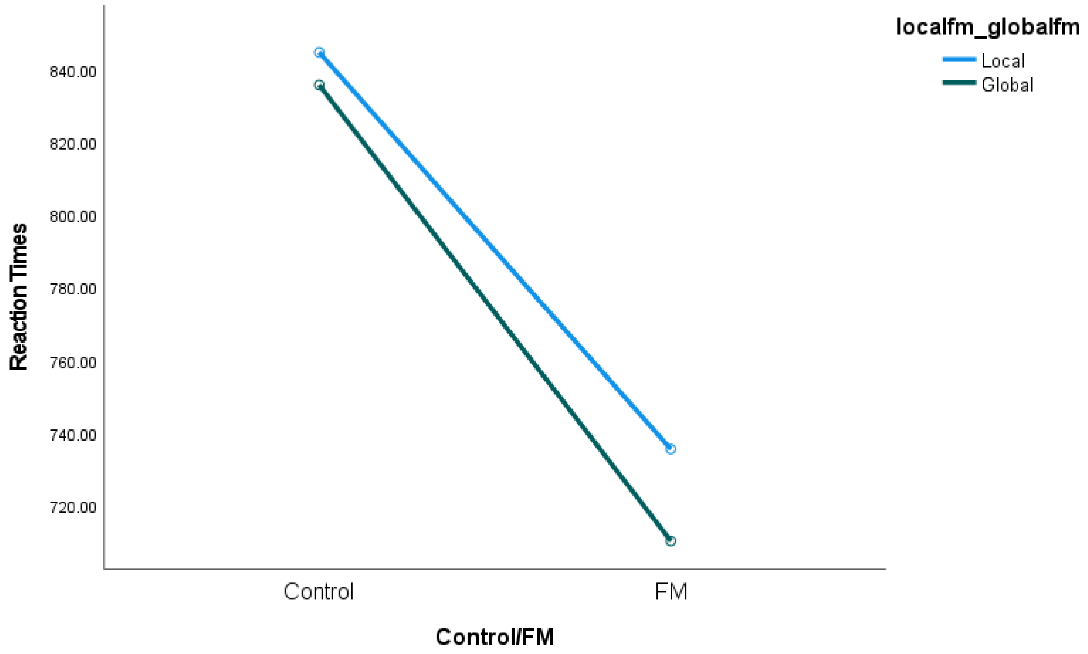


Figure 2.2 Experiment 1: Response times (ms). Mean response times as a function of processing orientation and FM/Control.

A 2 (FM/Control) x 2 (processing: local/global) within –subjects ANOVA was conducted on mean reaction times.There was a significant difference between global and local reaction times in the control group F (1,20) = 44.26, p = < 0.001, np^2 =

0.69, thus suggesting a GPE. However there was no significant difference between local and global processing reaction times in the FM group, F (1, 20) = 0.81, p = .379, np^2 = 0.039. Surprisingly there was no statistically significant difference between control group and the FM group, F (1, 20) = 0.46, p = .505, np^2 = 0.23.

However, the results show that in both control and FM groups, mean reaction times were quicker for the global processing style than for the local. In addition, it can also be seen from the results that both local and global reaction times were quicker in the FM group, which warranted further investigation, as such two paired sample t-tests were performed to test the difference between the global processing group, the control group and DM group and the corresponding local reaction times.

Exploratory analyses showed that all assumptions of parametric tests (normality, homogeneity of variance) were met. The results showed a significant difference between local control and local FM, t(20) = 5.175, p = < .001, meaning reaction times in the FM group were quicker than in the control. For the global reaction times, there was a significant difference t(20) = 5.82, p = <.001, meaning global reaction times in the FM condition were quicker than the control group

Looking at the reaction times, it was interesting to see that 11 participants were quicker with regards to attending to the local letters than the global letters in the control group, meaning ten attended to the global letters quicker. However, given there were no statistically significant differences in the FM condition, after being administered the FM exercise 6 participants registered quicker response times to the local letters over the global ones, and 15 reacted to the global letters quicker. However with no statistical significance,

2.3 Discussion

The primary goal of the present study was to ascertain whether an FM instruction provides for a global processing orientation and secondary if concentration is improved with quicker response times across both the local and global orientations.

The goal was partially achieved, with significant effects of the FM on response times in both the local and global conditions, suggesting an FM aids in concentration.

There was a significant difference in response times between local and global processing styles, thus confirming a GPE concurring with the results of the original study by Navon (1977) that demonstrated significant differences between the two.

However, as seen from the results, after the administration of the FM instruction, there was no significant difference between local and global, although mean reaction times were quicker, which does not concur with Navon and means that one of the research aims of the study, the assertion that an FM instruction would promote a global processing style was not achieved. However, further investigation revealed that both global and local reaction times were significantly quicker, thus suggesting that a second aim of the research that FM aids in concentration was achieved. Obviously, from this particular experiment, it cannot be asserted that cognitive function improved.

Even though the results were not statistically significant, the results could potentially suggest that the FM instruction leads to a change in processing style. Initially, 11 participants showed a local processing orientation in the control condition of the study, leaving 10 participants that showed a global preference. This was not replicated after the FM instruction, with 15 participants showing a global preference, meaning only 6 showed a local preference.

2.3.1 Limitations

The Navon letter task relied on the participant pressing the B and the N. As the two keys were close together, there could be the possibility of unintentional errors

2.4 Conclusion

The present findings suggest that an FM could aid in concentration. The FM instruction reduced response times both globally and locally. Results did show a GPE, however as the results were not statistically significant, they did not show that

FB changed processing style This has implications for face and voice recognition, as both are thought to be processed globally in the right hemisphere of the brain (Tanakah & Farah, 1993). In addition, there could be implications for witness testimonies with improved concentration.

The next experiment specifically tests the effectiveness of the FM on face recognition and witness statements, including cued and free recall tests.

CHAPTER 3

Face Recognition

3.1 Introduction

Previous research by Wagstaff et al. (2004a) has demonstrated that short FM instruction benefits face recognition. It has been suggested that a relaxation type instruction encourages a more global or holistic mode of processing information (Wagstaff, 1998), which in turn is congruent with how faces are thought to be processed (Tanakah & Farah, 1993). Indeed research by Macrae and Lewis (2003) demonstrated that participating in a task that primed global/holistic processing facilitated subsequent face recognition in a line-up procedure.

One of the issues surrounding face recognition that could have a detrimental effect is the verbal overshadowing effect (VOE). The VOE, first proposed by Schooler and Engslter-Schooler (1990), demonstrated that verbally describing previously viewed faces later interfered with subsequent recognition. Schooler (2004) found that a verbal description shifts processing from a global to a more local mode of information processing, which is incongruent with facial recognition. Therefore if FM encourages a more holistic/global mode of information processing, as seen in study 1, it may be beneficial in overcoming the VOE.

Further to face recognition being processed globally in the right hemisphere of the brain, Wagstaff (1998) suggested that emotionally salient information is also processed in the right hemisphere of the brain and is governed by global processing and, therefore, could be susceptible to the VOE. Could an FM instruction overcome the VOE when describing the incident

Along with FM, the literature has also suggested that EC has a beneficial effect on witness memory (Nash et al., 2015, Perfect et al., 2008, Vredeveldt, Baddeley and Hitch, 2011, Wagstaff et al., 2004a, 2004b, 2007, 2008, 2009, 2011.). EC is a component that is shared by both meditation and hypnotic procedures (Wagstaff et al., 2011) and had been suggested as early as 1982 (Wagstaff) and later included as advice in early versions of the Cognitive Interview (CI) in order to aid the eyewitness' concentration, along with other guidance to help in reducing environmental distractions. Eye closure is thought to be a useful tool in facilitating more accurate recall as it is argued that it reduces distractions from the surrounding environment and facilitates auditory and visual imagery. Indeed, it has long been established that EC or averting one's gaze can aid in recalling information (Glenberg, Schroeder, & Robertson, 1998). In support, Wagstaff et al. (2003) showed that participants in an EC condition recalled significantly more auditory and visual details than in a control condition. However, Vredeveldt (2011, 2014, 2016) has suggested that EC only facilitates the recall of visual information, and works on a modal basis, so that in order to facilitate improved outcomes for auditory detail, ears would need to be closed or covered, in order to block out any sound.

EC and FM have also been shown to have a beneficial effect on the amount of information retrieved during a free recall instruction. A free recall instruction is a mechanism by which witnesses provide an account of a possible crime without interruption from the investigator or interviewer. The witness is encouraged to describe the crime in complete detail and is requested not to leave anything out, no matter how inconsequential that information may be. However, witnesses are told not to guess what happened. Previous studies (Perfect et al. 2008, Wagstaff et al. 2004, 2007, 2011) have shown the effectiveness of the FM instruction in conjunction with EC, with results from these studies showing significant effects of FM and EC on correct responses. Wagstaff (1998) has suggested that this type of emotionally salient information obtained from a free recall instruction is processed in the brain's right hemisphere and is governed by global processing, similar to face recognition. If this is the case, emotionally salient information may be vulnerable to the VOE.

Although Verdeveldt et al. (2015) found no significant effect of EC on line-up identification accuracy, there is limited research which examines the effects of EC on identification tasks. As such, this experiment first aimed to test the effectiveness of a short FM exercise and EC on face recognition. The second aim was to assess the effectiveness of FM and EC on free recall and cued recall responses. Thirdly, to consider the effectiveness of the FM instruction in overcoming the VOE by priming a global processing orientation congruent with face recognition

3.1.1 Aims and hypothesis

The primary aim of this experiment was to assess the effectiveness of FM instruction and EC on a facial recognition task. A secondary aim was to check the efficacy of an FM instruction in overcoming the VOE. A third aim was to check the effectiveness of an FM instruction and EC on free and cued recall tasks. Finally, confidence ratings were taken to assess whether FM inflated confidence in both correct and incorrect responses.

3.2 Method

3.2.1 Participants

Eighty participants were recruited to take part in the experiment. Forty-four were undergraduates completing the study for course credit as part of the University's experimental participation scheme (EPR). Thirty-six were members of the public recruited via opportunity sampling. The sample consisted of 20 males and 60 females; age range 18-70 (mean = 25.79, SD = ± 11.82). The study received approval from the University of Liverpool Ethics Committee (see Appendix X), and all participants provided informed consent in line with those guidelines.

3.2.2 Design

A 2 (Control / Focussed Meditation) x 2 (Eyes Open / Eyes Closed) x 2 (Description / No Description) between subjects design was used to examine the effects of FM, EC and verbal description on face recognition, free recall and cued recall tasks.

3.2.3 Stimuli/Apparatus

A short film depicting a crime was created and filmed by the researcher and two volunteers using Samsung SLR cameras. The scene lasted for two minutes and thirty seconds and depicted a distraction theft perpetrated by two males upon a female victim. A volunteer filmmaker recorded the clip from several angles and cut it together. The audio-visual clip was shown on a 60-inch TV screen, and the audio FM instruction was played on an Ipad 2. The FM instruction recording was provided and recorded by a supervisor and was modified from Wilcox (1982).

The line-ups were illustrated using PowerPoint on a 23-inch monitor connected to an HP Envy laptop. Each picture was 12 inches in height by 9 inches in width. There were a total of two separate line-ups, both male, to correspond with the perpetrators in the film. Each line-up consisted of nine static images, an actor from the film and eight foils. All line-ups were target present. All pictures were shown for 5 seconds before automatically moving on to the next. The foils were selected from the ColorFerret database acquired from the National Institute of Standards and Technology or other publicly available databases. Foils were selected that shared similar features to the actors and only headshots were provided. The researcher assessed each headshot to ensure each chosen photograph could be transferred to a bigger screen without distortion. Any other digital noise was removed to ensure all photographs conformed to the same size and standard.

The free recall instruction required the participant to verbally recall as much information as possible and, in accordance with the instruction, not leave anything out no matter how insignificant they thought it might be. The free recall interview was audio recorded on an HTC M8. The crime scene questionnaire consisted of 27 individual questions pertaining to the crime scene, including questions such as "what was the name of the street where the crime happened? (see appendix 3).

Correct, incorrect and non-identifications were written down for the face recognition task. Participants were asked to rate their confidence on a scale of 1 (not confident) to 9 (absolutely confident) in all their responses, including each of the 27 questions that made up the cued recall task. All responses to the free recall task were noted and written down. Correct, incorrect and do not know responses were noted and written down for the cued recall task.

Ten pilot participants observed the video before collecting data for the main study. They were required to identify the individuals from the clip and respond to the crime scene questionnaire. None of the pilot participants took part in the experiment. This enabled the researcher to assess the suitability of the line-ups. Two of the images needed changing; one was too similar to the actual perpetrator and was chosen by the pilot participants frequently, and the other was too different and not chosen at all as such changes were made to the line-up, Male A, with two static images being replaced by other images. No changes were made to the Male B line-up. Once the researcher was satisfied, the main data collection process began.

3.2.3 Procedure

A 2 (Control / Focussed Meditation) x 2 (Eyes Open / Eyes Closed) x 2 (Description / No Description) between subjects design was used to examine the effects of FM, EC and verbal description on face recognition, free recall and cued recall tasks.

Participants were assigned to one of the eight potential groups. All participants were tested individually in a laboratory space. Each participant read the participant information sheet and provided informed consent (in accordance with ethical approvals noted above). Once consent had been provided, participants observed the video and were asked to engage in a five-minute filler task involving general knowledge questions. Subsequently, participants in a description group were asked to provide a verbal description of one of the perpetrators' faces. They were asked to provide as much detail as possible as if they were describing a police sketch artist. Participants not assigned to a description group continued with the filler task for three more minutes. Following the description phase, participants in an FM group received the 1.5-minute FM breathing exercise derived from Wilcox (1982). All participants in FM groups were told to continue with the breathing exercise throughout the experiment. Participants in an EC group were requested to maintain EC throughout the whole experiment apart from when viewing the line-ups. Participants in the FM with eyes open group were requested to continue with the breathing exercise but keep their eyes open at all times. Participants in the control-only group continued with the filler task. Participants in the control plus EC groups were requested to maintain EC for the remainder of the study, apart from during line-up procedures, as previously described.

All participants viewed two line-ups. All line-ups were shown in the same order. Participants were shown the line-ups twice and were requested not to say anything until after the second line-up had been viewed. In line with police regulations regarding line-up procedures, participants were informed prior to viewing that the suspect may or may not be in the line-up. The researcher sat behind the participant during the line-ups to avoid indicating who the suspects may be. In between each set, participants in the FM condition were reminded to focus on their breathing before the second viewing. After having viewed the line-up, participants were asked if an individual from the clip was present in the line-up. If the response was yes, participants were asked to identify the suspect. If participants answered not present, they moved on to the next line-up. After each identification procedure had been completed, participants were requested to rate how confident they were in their response on the scale noted above.

Following on immediately from the line-ups, participants were then administered the free recall instruction. All participants were asked to recount as many details as possible, no matter how inconsequential they felt they were, and not to leave anything out. Participants in the FM condition were again reminded to focus on their breathing. Participants in the EC groups were requested to shut their eyes and not open them again until instructed at the end of the experiment. All free recall interviews were, by consent, recorded.

Finally, participants were asked to complete the crime scene questionnaire, which consisted of 27 questions. Again participants in the FM conditions were reminded to focus on their breathing. Participants in the EC group were reminded not to open their eyes and vice versa. All questions were "closed", requiring specific answers. For example, "what was the street's name where the crime happened?"; "who does the man ask the woman to call?"; "what was the phone number?" Participants were asked not to guess, and a "do not know" response was allowed. Each correct, incorrect, and do not know the response was noted and written down on the crime scene questionnaire sheet (see appendix 3). After each question, participants were asked to rate their confidence in the response, even if they provided a "do not know" response.

In order to ensure compliance with the FM and EC instructions and act as a manipulation test, the researcher sat opposite the participants, so it was possible to see their actions. The researcher reminded the participants throughout to maintain EC if they were in the EC condition. Participants in an eyes-open condition were reminded to keep their eyes open throughout the experiment. For participants in the FM condition, the researcher reminded them to focus on their breathing. The specific breathing exercise rhythms were visible and were therefore checked by the researcher.

At the end of the experiment, participants were thanked for taking part and debriefed. Finally, participants were provided with the results of their line-up responses.

3.3 Results

The primary aim of this experiment was to assess the effectiveness of FM instruction and EC on a facial recognition task. A secondary aim was to check the efficacy of an FM instruction in overcoming the VOE. A third aim was to check the effectiveness of an FM instruction and EC on free and cued recall tasks. Finally, confidence ratings were taken to assess whether FM inflated confidence in both correct and incorrect responses.

3.3.1 Face Recognition

As previously mentioned, Tanakah and Farah (1988) suggested that faces are processed holistically, as the whole is seen first and then broken down into its constituent parts. This was demonstrated further by MaCrae and Lewis (2003), who utilised a Navon task to prime a processing orientation. In that particular study, participants were either asked to attend to the global letters or the large letters made up of smaller letters. The study showed that those who attended the global letters were primed to a global processing orientation and performed significantly better than those attending the smaller local letters. These findings were backed up by the results of study 1 of this thesis, which showed FM primed global processing. In addition to the above, Schooler has suggested that describing a suspected perpetrator prior to a line-up identification task interferes with subsequent recognition due to that verbal description priming a local processing orientation.

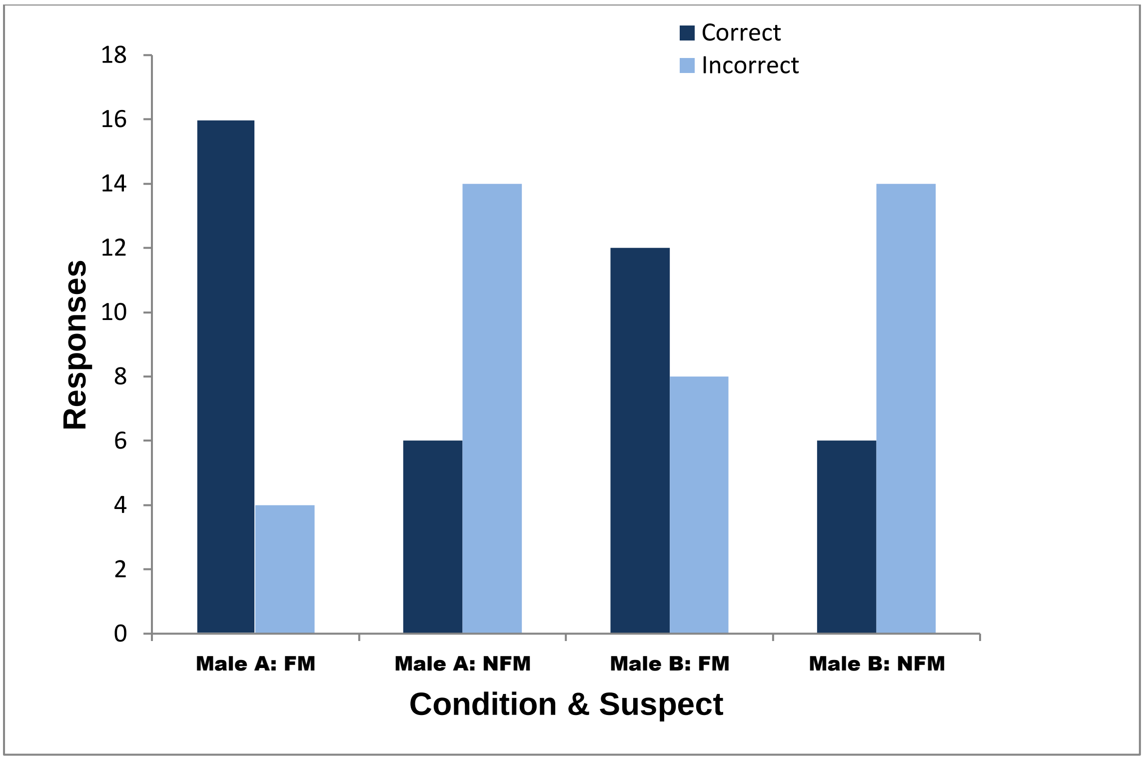
3.3.1.1 FM: Identification Accuracy

In order to investigate whether an FM exercise could influence the outcomes of a line-up by providing for more correct and fewer incorrect identifications, a 2 (Interview: FM/Control x 2 (Response: Correct/Incorrect) Chi Square analysis was conducted on the total number of responses. The level of significance was set at 5%*. Male A and Male B were each analysed individually due to Male A being on screen for 25 seconds and Male B being on screen for 9 seconds.

Sixteen participants (80%) in the FM group correctly identified Male A as the suspect as opposed to 6 participants (30%) in the Control condition. For Male A, a significant effect of FM was found (X^2 {1, N=40}=10.1, $p = <.001$, $V = 0.5$). 12 participants (60%) correctly identified Male B as the suspect in the FM condition as opposed to 6 (30%) participants in the control condition, however the result was non-significant ($p = 0.15$, $V = 0.31$).

Figure 4.1: Total number of correct and incorrect responses as a function of FM (FM/Control) for Male A and Male B.

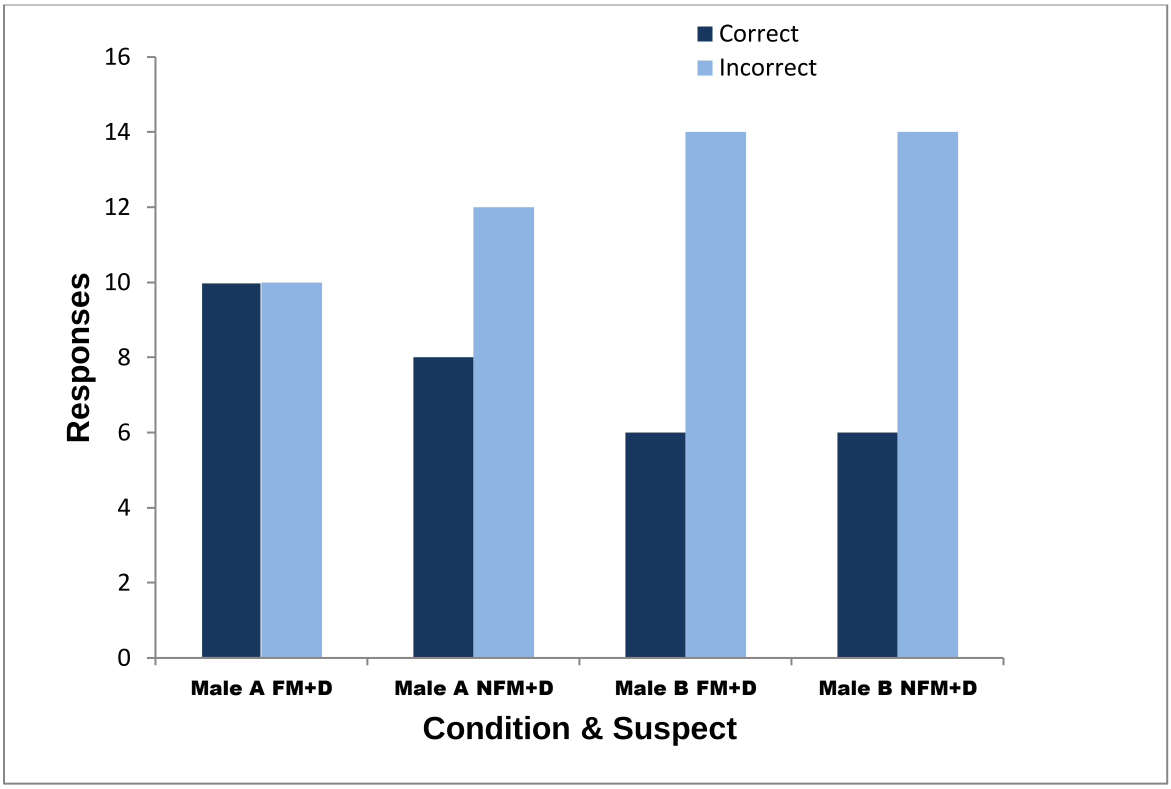
(*from this point forward the reader can assume levels of significance were set at 5%)



3.3.1.2 FM and Description (D): Identification Accuracy:

A 2 (Interview: FM+D/ C + D) x 2 (Response: Correct/Incorrect) Chi Square was conducted on the total number of responses. 50% of participants in the FM + D groups correctly identified Male A as opposed to 40% in the Control + D group. There was no significant effect of FM ($p = 0.38$) or association ($V = 0.1$). For Male B across both groups, 30% of participants correctly identified the suspect. There was no significant effect of FM ($p = 0.63$) and no association ($V = <0.001$). The total number of correct and incorrect responses for participants in the FM/D and Control/D conditions can be seen in Figure 4.2 below.

Figure 4.2: Total number of correct and incorrect responses as a function of FM/Control and D for Male A and Male B.

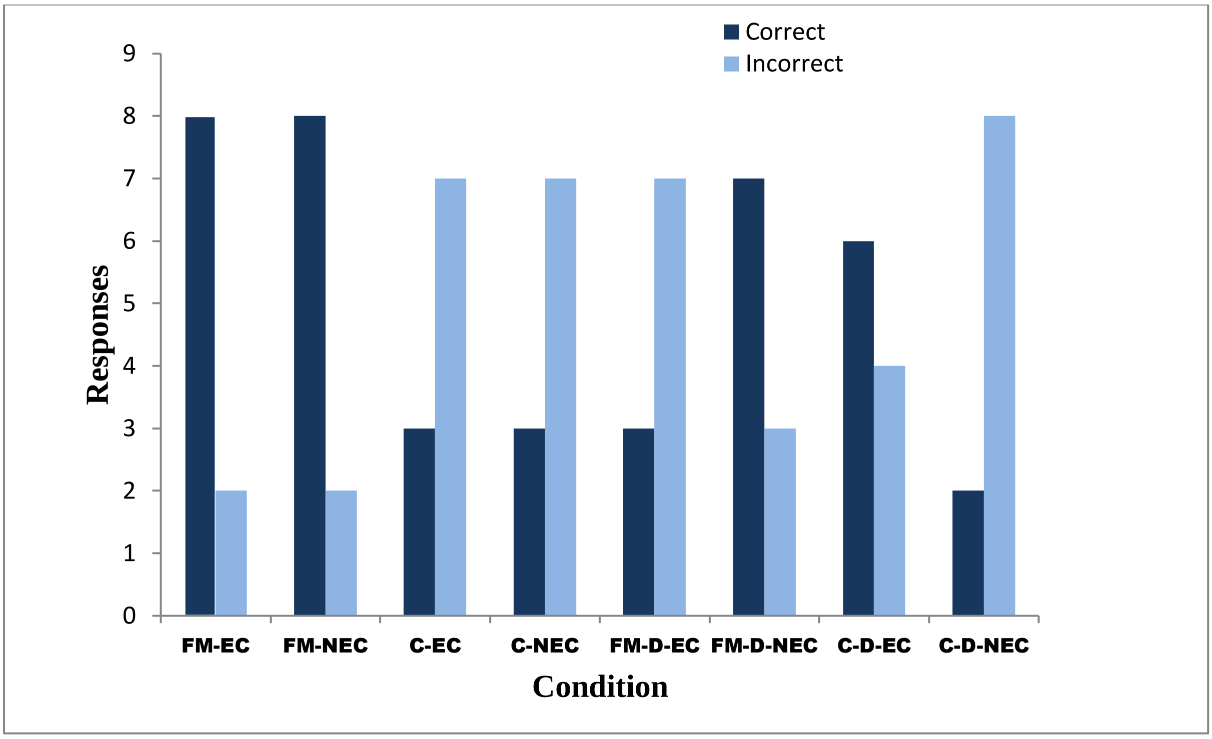


3.3.2 Line-up Identification and EC

3.3.2.1 Male A

The total number of correct and incorrect responses in a line-up as a function of FM/C, D and EC for Male A is shown below.

Figure 4.3: Total number of correct and incorrect responses as a function of FM (FM/C) and description (D) and eye closure (EC/NEC) for Male A.

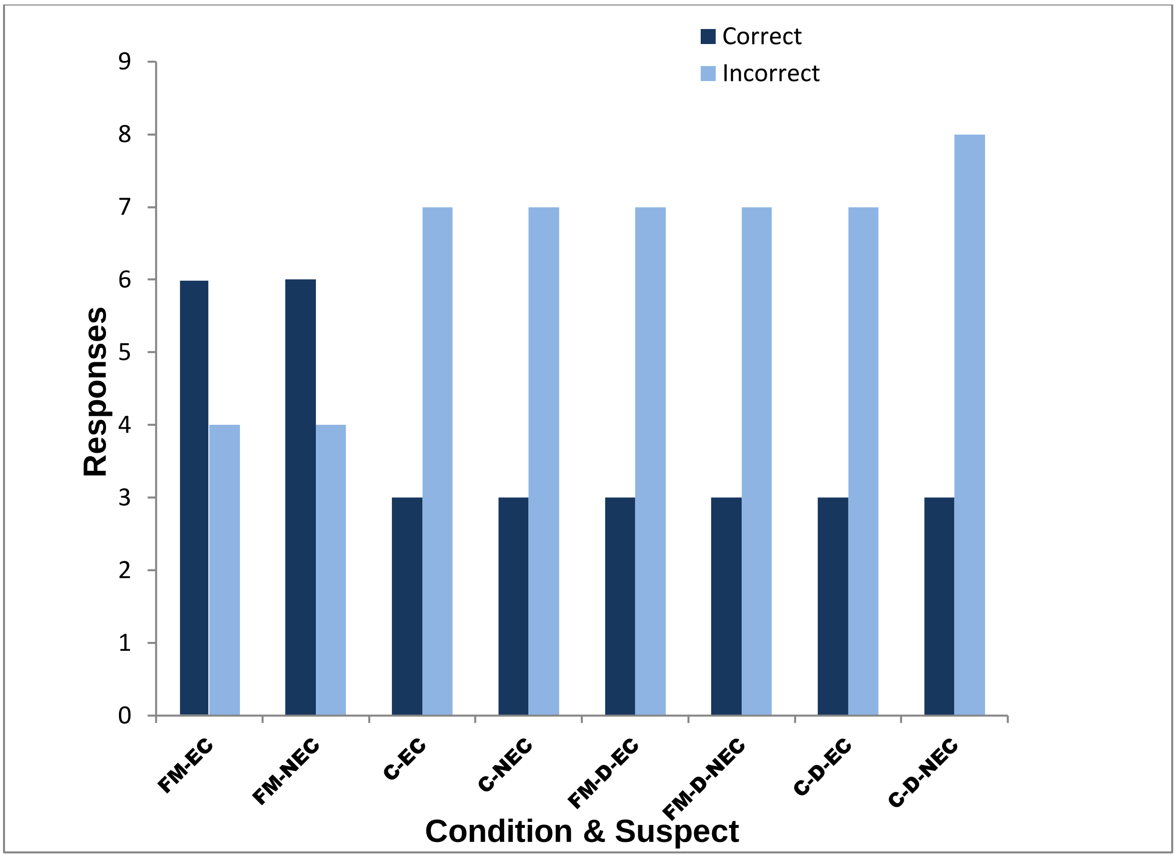


There was no significant effect of EC on responding. With the data collapsed across eyes closed or eyes open, both for correct and incorrect responses, the accuracy rate was 50% across the groups (p = 0.59, v = < 0.001), thus indicating there is no effect of EC on face recognition.

3.3.3.2: Male B

The total number of correct and incorrect responses as a function of FM/C, D and EC for Male B is shown below.

Figure 4.4: Total number of correct and incorrect responses as a function of FM (FM/C) and description (D) and eye closure (EC/NEC) for Male B



As Male A, for Male B there was no significant effect of eye closure (p = 0.63). With the data collapsed, 37.5% of participants in both the eyes closed group and the eyes open group correctly identified the suspect.

3.3.3 FM and Description: Confidence

3.3.3.1 Male A

After initial exploratory analysis, all parametric assumptions were met (homogeneity, distribution and independence*). Two x 2 (FM/C) x 2 (D/No D), analysis of variance (ANOVA) were conducted on mean confidence scores for correct and incorrect responses. The descriptive statistics are shown in table 3.1 below.

Table 3.1:

Mean Confidence and Standard Deviations for Correct and Incorrect Responses as a Function of FM and Description: Male A

Condition	Description		No Description	
	Correct	Incorrect	Correct	Incorrect
Control	5.63 (±1.85)	5.17 (±2.37)	6.01 (±1.79)	4.29 (±1.59)
Focussed Meditation (FM)	6.11 (±1.97)	5.20 (±1.48)	5.56 (±1.93)	5.25 (±2.22)
Total	11.74	10.37	11.57	9.54

Analysis showed no main effects for FM (*F* (3, 36) = 3.75, *n* = 40, *p* = 0.3) or Description (*F* (3, 36) = 2.9, *p* = 0.37) on confidence in incorrect responses and no interaction between the two conditions. There were no significant differences in confidence for correct or incorrect responses *F* (1, 72) = 11.95, *p* = 0.073.

Thus in accordance with previous research FM was shown not to inflate confidence in correct or incorrect responses.

3.3.3.2: Male B

A 2 (FM/C) x 2 (Description/No Description), analysis of variance (ANOVA) was conducted on mean confidence scores for correct and incorrect responses. The results are shown in table 3.2 below.

*From this point forward the reader can assume all assumptions were met

Table 3.2:

Mean Confidence Scores and Standard Deviations for Correct and Incorrect Responses as a Function of FM and Description: Male B

Condition	**Description**		**No Description**	
	Correct	Incorrect	Correct	Incorrect
Control	4.83 (±0.98)	4.27 (±2.07)	5.67 (±2.34)	4.07 (±1.90)
Focussed Meditation	5.00 (±1.10)	3.93 (±2.13)	4.75 (±2.14)	4.86 (±1.96)
Total	9.83	8.20	10.42	8.93

As per the results for Male A, overall results showed no significant main effect of FM on confidence levels for Male B, (F (1, 72) = 3.85, p = 0.054). There was neither a significant main effect of FM on confidence (F (1, 72) = 0.005, p = 0.95) nor a significant main effect of description (F (1, 72) = 0.54, p = 0.47). There were no significant interactions. The results align with the results for Male A thus suggesting that FM (and D) do not inflate confidence in correct or incorrect responses.

Further analysis conducted on the incorrect responses only (N =50, there were a higher number of incorrect responses for Male B, see figure 2), showed no significant differences and no significant main effects of FM (F (1, 46) = 0.64, p = 0.43) and no significant main effects of description (F (1, 46) = 0.45, p = 0.51) and no interactions. Again this is in line with the results for Male A and also concurs with previous research demonstrating that FM does not inflate confidence in incorrect responses.

3.3.4. Free recall

This section of the study aimed to test the effectiveness of an FM plus EC instruction in providing for more correct items reported and fewer incorrect items. Confidence levels were not recorded for the free recall part as the information provided by participants contained both accurate and inaccurate details, which were not possible to separate out without interrupting the witness/participant.

The mean total number of correct and incorrect items reported by participants across groups is displayed below in table 3.3.

Table 3.3:

Mean and Standard Error for Free Recall Correct and Incorrect Responses. The Table Shows the Mean Number of Correct and Incorrect Responses as a Function of FM, Eye Closure and Description

Condition	**Response**	
	Correct	Incorrect
Control	23.3 (1.41)	2.03 (0.42)
Focussed Meditation	25.18 (1.27)	1.25 (0.18)
Eyes Closed	27.3 (1.25)	0.88 (0.14)
Eyes Open	21.18 (1.26)	2.40 (0.46)
Description	25.05 (1.33)	1.50 (0.32)
No Description	23.43 (1.35)	1.78 (0.34)

Note: Standard errors in parentheses

A 2 (FM/C) x 2 (EC/NEC) x 2 (Description/No Description), analysis of variance (ANOVA) was conducted on mean free recall correct responses. The results are shown in table 3.4 below.

Table 3.4:

Mean and Standard Deviations for Free Recall Correct Responses. The Table Below Shows the Mean and Standard Deviations for Free Recall Correct Responses as a Function of FM, Eye Closure and Description.

Condition	Eyes Open	Eyes Closed	Eyes Open + Description	Eyes Closed + Description
Control	19.81 (± 7.77)	27.51 (± 9.44)	18.11 (± 6.51)	27.81 (± 8.03)
Focussed Meditation	22.32 (± 9.63)	24.13 (± 6.26)	24.54 (± 7.31)	29.82 (± 7.63)
Total	21.06	25.82	21.27	28.92

Analysis showed there was a significant main effect of Eye Closure F (1, 72) = 12.01, p = 0.001, n^2 = 0.15, with participants in the EC conditions providing more correct items than participants who kept their eyes open. However surprisingly there was no significant main effect of FM, F (1, 72) = 1.12, p = 0.292. There was also no significant main effect of Description, F (1, 72) = 0.85, p = 0.36. Contrary to previous studies there was no interaction between FM and EC, F (1, 72), p = 0.15 and also no interaction between FM, EC and Description, F (1, 72) = 0.45, p = 0.83.

Next, the number of incorrect items reported was analysed. A 2 (FM/C) x 2 (EC/NEC) x 2 (Description/No Description), analysis of variance (ANOVA) was conducted on mean free recall incorrect responses. The results are shown in table 3.5 below.

Table 3.5:

Mean and Standard Deviations for Free Recall Incorrect Responses. The Table Below Shows the Mean and Standard Deviations for Free Recall Incorrect Responses as a Function of FM, Eye Closure and Description

Condition	Eyes Open	Eyes Closed	Eyes Open + Description	Eyes Closed + Description
Control	3 (± 3.81)	1.3 (± 0.95)	3 (± 3.13)	0.8 (± 0.92)
Focussed Meditation	1.6 (± 1.17)	1.2 (± 0.79)	2 (± 1.25)	0.2 (± 0.42)
Total	4.6	2.5	5	1

Analysis showed there was a significant main effect of EC, F (1, 72) = 12.62, p = 0.001, n^2 = 0.15. Participants in the EC conditions reported fewer incorrect items than their counterparts who kept their eyes open. There was no significant main effect of FM, although there was a trend in the predicted direction, F (1, 72) = 3.26, p = 0.075. There was no significant main effect of description F (1, 72) = 0.41, p = 0.524. Contrary to previous studies, there was neither interaction between FM and EC nor interaction between EC, FM and Description.

3.3.5. Cued Recall

Table 3.6:

Mean and Standard Error cued recall. The Table Below Shows the Mean Number of Correct and Incorrect Responses as a Function of FM, Eye Closure and Description.

Condition	Response	
	Correct	Incorrect
Control	15.85 (0.69)	4.33 (0.47)

Focussed Meditation	17.08 (0.46)	3.9 (0.33)
Eyes Closed	18.45 (0.46)	2.88 (0.30)
Eyes Open	14.48 (0.54)	5.35 (0.40)
Description	17.28 (0.67)	3.55 (0.36)
No Description	15.65 (0.48)	4.68 (0.43)

Note: Standard errors in parentheses

3.3.5.1 Cued Recall Correct

A 2 (FM/C) x 2 (EC/NEC) x 2 (Description/No Description), analysis of variance (ANOVA) was conducted on mean cued recall correct responses. The results are shown in table 3.7 below.

Table 3.7:

Mean and Standard Deviations for Cued Recall Correct. The Table Below Shows the Mean and Standard Deviations for Cued Recall Correct responses as a Function of FM, Eye Closure and Description

Condition	Eyes Open	Eyes Closed	Eyes Open + Description	Eyes Closed + Description
Control	13.3 (±2)	17.4 (±3.34)	13.3 (±5.08)	19.4 (±3.06)
Focussed Meditation	14.8 (±2.74)	17.1 (±1.97)	16.5 (±2.22)	19.9 (±2.38)
Total	28.1	34.5	29.8	39.3

Analysis showed there was a significant main effect of eye closure F (1, 72) = 34.96, p = <.001, n^2= 0.33. FM approached, but failed to reach significance F = (1, 72) = 3.32, p = 0.073. There was a significant main effect of description F = (1, 72), p = 0.018, n^2= 0.075. There were no significant interactions, however FM/EC was a trend in the predicted direction p = 0.09.

3.3.5.2 Cued recall errors

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) analysis of variance (ANOVA), was conducted on the total number of incorrect responses. The results are shown in table 3.8 below.

Table 3.8*:*

Mean and Standard Deviations for Cued Recall Incorrect. The Table Below Shows the Mean and Standard Deviations for Cued Recall Incorrect Responses as a Function of FM, Eye Closure and Description

Condition	Eyes Open	Eyes Closed	Eyes Open + Description	Eyes Closed + Description
Control	6.71 (±3.53)	3.31 (±2.21)	5.33 (±2.26)	2.02 (±1.05)
Focussed Meditation	5.02 (±2.06)	3.73 (±1.7)	4.41 (±1.78)	2.51 (±2.27)
Total	11.73	7.04	9.74	4.53

Analysis showed a significant main effect of Eyes, F (1, 72) = 25.1, p = <0.01, n^2= 0.26, and a significant main effect of description, F (1, 72) = 5.19. p = 0.03. However the FM condition was not significant (p = 0.39). There were no significant interactions between conditions, however FM/EC almost reached significance and was a trend in the predicted direction (p = 0.08)

3.3.5.3. Confidence: Cued Recall

Table 3.9:

Mean and Standard Errors for Confidence Ratings. The Table Below Shows the Mean Confidence Ratings for Overall Cued Recall Correct and Incorrect Responses as a Function of FM, Eye Closure and Description.

Condition	**Response**	
	Correct	Incorrect
Control	6.68 (0.18)	4.92 (0.29)
Focussed Meditation	7.01 (0.16)	5.18 (0.33)
Eyes Closed	6.87 (0.18)	4.36 (0.33)
Eyes Open	7.06 (0.16)	5.74 (0.24)
Description	6.83 (0.21)	4.62 (0.35)
No Description	7.09 (0.13)	5.48 (0.26)

Note: Standard errors in parentheses

3.3.5.4. Cued Recall: Confidence correct responses

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) analysis of variance (ANOVA), was conducted on confidence scores for correct responses. Results are shown in table 3.10 below.

Table 3.10:

Mean and Standard Deviation for Confidence Scores for Cued Recall Correct Responses as a Function of FM, E C and D.

Condition	Eyes Open	Eyes Closed	Eyes Open + Description	Eyes Closed + Description
Control	7.1 (±0.91)	6.81 (±0.95)	7.22 (±1.27)	6.49 (±1.49)
Focussed Meditation	7.32 (0.64)	7.13 (±0.83)	6.61 (±1.21)	6.93 (±1.28)
Total	7.21	6.97	6.92	6.71

Analysis showed there were no significant effects of FM (F = 1, 72, p = 0.18), eyes (F = 1, 72, p = 0.65) or description (F = 1, 72, p = 0.3). There were no significant interactions. Thus, as per previous research, there is no increased confidence in correct answers.

3.3.5.5. Cued Recall; Incorrect Confidence:

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) analysis of variance (ANOVA), was conducted on confidence scores for incorrect responses. The results are shown in table 3.11 below.

Table 3.11:

Mean and Standard Deviation for Confidence Scores for Cued Recall Correct Responses as a Function of FM, Eye Closure and Description.

Condition	Eyes Open	Eyes Closed	Eyes Open + Description	Eyes Closed + Description
Control	5.35 (±1.85)	4.56 (±1.25)	5.89 (±1.32)	3.88 (±2.29)
Focussed Meditation	6.74 (±0.97)	5.29 (±1.65)	4.99 (±1.46)	3.71 (±2.87)
Total	6.05	4.93	5.44	3.8

Analysis showed no significant effect of FM ($p = 0.52$), showing that the FM instruction did not inflate confidence in incorrect responses. However, there were significant differences in the eyes open/closed condition, $F(7,72) = 11.79$, $p = 0.001$, with participants in the eyes open group showing inflated confidence in incorrect responses. There was also a significant difference in the description condition, $F(7,72) = 15.02$, $p = 0.04$, with participants in the no description condition showing inflated confidence in incorrect responses.

3.3.6. Auditory cued recall

With there being several competing theories as to how EC works, one being the Cognitive Load Theory (Glenberg,1982) which stipulates that the closing of the eyes reduces environmental distractions and frees up cognitive resources that can be applied to other areas of cognition and the other Modality Specific Theory (Perect et al., 2008; Vredeveldt, 2011; Vredeveldt et al., 2011) which suggests that EC only affects visual recall of memories, it was decided to extrapolate the auditory answers and analyse them separately.

Table 3.12:

Mean and Standard Errors for Auditory Cued Recall Responses. The Table Below Shows the Mean Scores for Overall Auditory Cued Recall Correct and Incorrect Responses as a Function of FM, Eye Closure and Description

	Response	
Condition	Correct	Incorrect
Control	3.2 (0.24)	1.18 (0.16)
Focussed Meditation	3.65 (019)	0.93 (0.16)
Eyes Closed	3.98 (0.19)	0.88 (0.17)
Eyes Open	2.88 (0.22)	1.23 (0.15)
Description	3.75 (0.2)	0.8 (0.12)
No Description	3.1 (0.23)	1.3 (0.19)

Note: Standard errors in parentheses

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) ANOVA was conducted on auditory correct responses.

Table 3.13:

Mean and Standard Deviations for Auditory Recall Correct Responses. The Table Below Shows the Mean Scores for Overall Auditory Cued Recall Correct and Incorrect Responses as a Function of FM, Eye Closure and Description

Condition	Eyes Open	Eyes Closed	Eyes Open + Description	Eyes Closed + Description
Control	2.44 (±1.27)	3.51 (±1.58)	2.72 (±1.83)	4.24 (±0.79)
Focussed Meditation	3.01 (±1.56)	3.53 (±1.27)	3.41 (±0.52)	4.71 (± 0.48)
Total	2.73	3.52	3.07	4.98

Analysis showed there was a significant main effect of EC on correct responses F (7, 72) = 15.34, p = <.001, n^2= 0.18. Description was also seen to have a significant effect F (7, 72) = 5.37, p = 0.024. There was no significant effect of FM (p = 0.11) and no significant interactions.

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) ANOVA was conducted on Auditory Incorrect responses.

Table 3.14:

Mean and Standard Deviations for Auditory Recall Incorrect Responses. The Table Below Shows The Mean Scores for Auditory Cued Recall Incorrect Responses as a Function of FM, Eye Closure and Description.

Condition	Eyes Open	Eyes Closed	Eyes Open + Description	Eyes Closed + Description
Control	1.61 (±0.97)	1.22 (±1.4)	1.21 (±0.92)	0.73 (±0.68)
Focussed Meditation	1.23 (±1.23)	1.21 (±1.23)	0.91 (±0.57)	0.42 (±0.7)
Total	1.42	1.22	1.06	0.58

Analysis showed there was a significant effect of description, F (1, 72) = 4.99, p = 0.03. There was no significant effect of eyes, F (1,72) = 2.43, p = 0.12, or FM, F(1,72) = 1.25, p = 0.27. There were no significant interactions.

4.3.6.1 Confidence

Table 3.15:

Mean and Standard Errors for Overall Auditory Cued Recall Confidence. The Table Below Shows the Mean Scores for Overall Auditory Cued Recall Confidence in Correct and Incorrect Responses as a Function of FM, Eye Closure and Description

Condition	**Response**	
	Correct	**Incorrect**
Control	6.65 (0.33)	3.82 (0.49)
Focussed Meditation	6.81 (0.3)	3.63 (0.54)
Eyes Closed	6.82 (0.23)	2.37 (0.44)
Eyes Open	6.64 (0.38)	5.08 (0.5)
Description	6.58 (0.33)	3.43 (0.52)
No Description	6.88 (0.29)	4.02 (0.51)

Note: Standard errors in parentheses

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) ANOVA was conducted on auditory correct confidence ratings.

Table 3.16:

Mean Confidence Ratings and Standard Deviations for Auditory Correct Responses. The Table Below Shows the Mean Confidence Ratings for Auditory Correct Responses as a Function of FM, Eye Closure and Description

	Eyes Open	**Eyes Closed**	**Eyes Open + Description**	**Eyes Closed + Description**
Control	7.13 (±1.57)	6.72 (±1.7)	6.01 (±3.28)	6.78 (±1.45)
Focussed Meditation	6.91 (±2.8)	6.82 (±1.1)	6.53 (±1.78)	7.02 (±1.72)
Total	7.02	6.78	6.27	6.95

The analysis showed there were no significant differences between eyes open and eyes closed ($p = 0.69$), FM ($p = 0.72$) or description ($p = 0.51$). There were no significant interactions. Thus in line with previous results, there is no increased confidence in correct responses.

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (D/No D) ANOVA was conducted on auditory incorrect confidence ratings.

Table 3.17:

Mean Confidence Ratings and Standard Deviations for Auditory Incorrect Responses. The Table Below Shows the Mean Confidence Ratings for Auditory Incorrect Responses as a Function of FM, Eye Closure and Description

Condition	Eyes Open	Eyes Closed	Eyes Open + Description	Eyes Closed + Description
Control	5.15 (±2.73)	2.75 (±2.97)	4.92 (±3.4)	2.45 (±2.77)
Focussed Meditation	5.25 (±3.7)	2.94 (±2.96)	5 (±3.2)	1.35 (±2.43)
Total	5.25	2.85	4.96	1.85

Analysis showed there were no significant differences between FM (F = 1. 72. p = 0.07), or description (F = 1, 72, p = 0.76), which is in line with previous results. However there were significant differences in the eye closure condition, F (1, 72) = 15.82, p = <.01. Participants with eyes open showed increased confidence in incorrect responses.

Eye closure was seen to have a significant beneficial effect on correct responses (F = 1, 72, p = 0.001), however there was no significant effect on incorrect responses (F = 1, 72, p = 0.12). In line with other results in this experiment, there was no significant effect of FM, although, generally, participants across the FM groups have offered more correct responses and fewer incorrect answers. Again there was a significant effect of description across correct and incorrect responses (p = 0.02 and p = 0.03, respectively), with participants across description groups giving more correct answers and fewer incorrect responses. There were no significant differences in confidence ratings in line with other results, demonstrating further that FM does not inflate confidence in incorrect answers.

3.4 Discussion

The primary aim of the first part of study 2 was to test the effectiveness of FM and EC on face recognition. It was also an aim to test the effectiveness of FM in combatting the VOE. Confidence in both correct and incorrect responses was also analysed. Firstly for both male A and Male B, there was a significant and beneficial effect of the FM on face recognition, thus suggesting that the short FM exercise indeed increases accuracy. This is in line with the results of study 1, the Navon Task, which suggested that FM can prime a global processing orientation, which is needed for correct processing (own race) faces. This also concurs with previous research from Wagstaff et al., who also found a beneficial effect of FM on face recognition.

However, there were no significant effects of EC on the recognition task. There is not a large volume of studies testing the efficacy of EC on line-ups; however, these results do follow the research from Vredeveldt (2015), who found similar results, in as much as EC does not affect face recognition, thus suggesting the mechanisms governing EC are different to those governing face recognition, which is discussed further below. There are obvious limitations with studies examining EC on face recognition tasks, such as needing to keep the eyes open to view the line-up

One of the main issues surrounding FM, along with investigative interview techniques, such as forensic hypnosis that utilises similar mechanisms, is whether confidence is inflated in both correct identifications and especially incorrect identifications. A common theme in the forensic hypnosis literature is the inflation of confidence in incorrect responses (Wagstaff et al., 2011). However, the results here show no inflated confidence in correct or incorrect responses. This does correspond to previous studies by Wagstaff et al., who also found no increased confidence in either response.

The previous studies conducted by Wagstaff et al. have shown a significant effect of FM on free recall coupled with an additive effect of EC, suggesting that both components work in unison to provide better recall. Unfortunately, the present results do not agree with the previous studies, with no significant effect of FM or interaction between FM and EC. However, there was a significant effect of EC only, on both correct and incorrect responses, with participants in the EC condition providing more correct items and fewer incorrect items. This does concur with previous studies conducted by Wagstaff et al. (2004, 2007, 2011), Perfect et al. (2008) and Vredevelt et al. (2011).

As with the free recall, the results from the cued recall questionnaire have shown beneficial effects of EC on correct responses, with participants in the EC groups providing significantly more correct responses to the cued recall questions. Moreover, these results did not come at the expense of incorrect responses, with participants providing fewer incorrect details nor inflated confidence levels in incorrect responses.

Although participants across the FM groups provided a greater amount of correct and fewer incorrect responses, neither reached significance. The FM instruction did not lead to inflated confidence in incorrect responses. There was a significant effect of the description on both correct and incorrect responses, with participants offering a greater number of correct responses and fewer incorrect responses as a result of giving a description.

The findings suggest that the EC instruction is beneficial to auditory cued recall, following the Cognitive Load theory of EC, in so much that EC frees up cognitive resources that can be concentrated elsewhere. This is in line with previous sections and studies in so much as EC provided for more correct responses. However, the findings conflict with those of Vredeveldt et al., who found that EC only affected visual memories per the Modality Specific Theory.

3.5 Conclusion

The present findings suggest that a short FM exercise could be an effective tool in an investigator's toolbox. FM certainly increased the number of correct responses in a line-up in the free recall test and the cued recall questionnaire compared to a control group for both Male A and Male B. There were more correct identifications for Male A over Male B, which could be down to the amount of screen time apportioned to each. In addition, EC did not affect line-up identification.

The results in the free recall section do not concur with previous results demonstrated by Wagstaff et al., with there being no effect of FM on its own and also no interaction between FM and EC. Previous studies have demonstrated an additive effect of FM and EC on results from a free recall instruction. However, the effects of EC were significant, in line with previous studies by Wagstaff et al., thus suggesting EC could be a valuable addition to the investigator's toolbox.

EC significantly increased the number of correct and decreased the amount of incorrect responses to a cued recall task. Again, as per previous studies and sections, neither FM nor EC provided for inflated confidence in both correct and incorrect responses

3.6 Limitations

As with studies conducted in laboratories, there are limitations to the results. For example, said results may not always be transferable to the real world (Wagstaff et al., 2003). This is particularly applicable to simulated crime scenes, as some of the variables that may influence witness responses cannot be replicated and therefore accounted for, such as environmental conditions. This leads to the possibility that knowing the crime was staged could affect witness performance (Murray & Wells, 1982). Another limitation is the crime clip itself. Every care was taken to make the scene as authentic as possible; ambient and environmental noise remained in the film, and the clip was filmed and edited sequentially, making the film easier to follow than it would be in a real-life situation.

Sample size could also be a limitation, as participants per group was small, this was especially evident in the conditions where FM and EC were used in tandem, reducing the groups further, there was also a lack of male participants. Caution also needs to be advised with regards to the confidence scores (discussed in more detail in the discussion section). Confidence scores were measured on a Likert scale, which is ordinal data, and therefore ranked, using the mean could lead to false conclusions being drawn about the data.

3.7 Chapter Summary

1. FM was shown to have a beneficial effect on face recognition from a line-up
2. FM was not shown to overcome the VOE
3. EC had no significant effect on face recognition

4. There were no additive effects of FM and EC on a free recall task or the cued recall, however, there was a benefit of EC on its own.

5. FM did not inflate confidence in correct and incorrect responses to the line-up.

6. There was a significant effect of EC on cued recall responses, but no effect of FM

7. There was a significant effect of EC on auditory responses, thus suggesting a Cognitive Load Theory of EC

Chapter 4

Voice Recognition

4.1 Study 3: Voice Recognition

4.1.1 Introduction

Eyewitness testimony has many studies, papers and books dedicated to it. Conversely, earwitness testimony, and therefore by extension, voice recognition, has been criminally neglected. Although as far back as the 1970s, researchers noticed the similarity between voice and face recognition (Mann, Diamond & Carey, 1979), with both being hard to describe stimuli. Indeed research has shown that the similarities go even further, with voices, like faces being processed in the right hemisphere (Blank et al., 2011; Gonzalez et al.,2010; Rosa et al., 2011). Studies from brain-damaged patients have shown that the focal lesions on the right hemisphere have impaired recognition. In a study by Grenier et al. (1975), it was found that participants with right hemisphere damage were impaired when asked to recognise and encode unfamiliar voices. Similar results were demonstrated by Kreiman and Van Lancker (1988) The right hemisphere theory of voice processing is also supported by Molfese, Freeman and Palermo (1975), Blank et al.(2011) and Rosa et al. (2011).

If, as suggested, the voice recognition module is indeed in the right hemisphere, it could also be suggested that the processing of voices is done globally, similar to face recognition. Therefore, could voice recognition, like face recognition, be susceptible to the VOE? Vanags et al. (2005) set out to research this very question. In a series of experiments, participants listened to some voices and were requested to describe the voice they heard. Then they were required to identify the voice from a line-up. In experiment 2, it was discovered that there was a significant effect of the description on voice recognition that showed a strong verbal overshadowing effect.

The previous chapter provided some valuable insights into the role FM can play in identifying potential suspects from a line-up, as well as the beneficial effects of EC on free and cued recall. Another interesting finding from the previous study was the effect of EC on auditory detail, with results showing an enhanced effect of EC, which is consistent with the Cognitive Load theory. The results showed an increase in correct responses to auditory questions compared to the control group. As such, the results pose further questions that need answering. If EC enhances correct responses to auditory details, could EC possibly help with voice recognition? As noted in the introduction, crime has changed, and with just exiting lockdowns, crime statistics show an increase in over-the-telephone crime, particularly scams that hope to relieve people of their life savings. Thus it becomes imperative to identify the voice on the other end of the phone.

It has been suggested that, like faces, voices are processed globally in the right hemisphere of the brain, and as was noted in experiments 1 and 2, FM enhanced concentration and showed a global processing bias. It, therefore, makes sense, bearing in mind previous results, to test the effectiveness of FM and EC on voice recognition.

4.1.2 Aims and Hypothesis

The primary goal of this study was to test the effectiveness of FM and EC on voice recognition. A secondary aim was to check the efficacy of an FM instruction in overcoming the VOE. A third aim was to check the effectiveness of an FM instruction and EC on free and cued recall tasks. Finally, confidence ratings were taken to assess whether FM inflated confidence in both correct and incorrect responses. it was hypothesized that FM would increase accurate identifications, it was also hypothesized that EC would provide for more accurate identifications than a control group and the combination FM and EC would also provide for more correct identifications than a control group.

4.2 Method

4.2.1 Participants

Eighty participants were recruited to participate in the experiment, all of whom were undergraduates competing for course credit as part of the University’s experimental participation scheme (EPR). The sample consisted of (10) males and (70) females, with ages ranging from 18 to 29 years old (mean = 19.04, SD = ± 1.65). The University of Liverpool Ethics Committee approved all experiments in this thesis, and all participants provided informed consent per Committee guidelines.

4.2.2 Stimuli/apparatus

The crime film was filmed by the researcher and two volunteers using a Samsung SLR camera. The scene lasted for two minutes and thirty seconds and depicted a distraction theft perpetrated by two males upon a female. The film was filmed from several angles and cut together by a volunteer filmmaker. The film was shown on an 80-inch screen. The FM instruction was played over the room speakers. The instruction was an audio recording provided by Professor G Wagstaff, modified from Wilcox.

The voice line-up was presented sequentially over the room speakers. Each member of the line-up relayed the same sentence twice. The sentence was a piece of dialogue spoken by the female victim shown in the crime film. The line that was spoken was, “What is your number; I will give her a ring. What is her name, by the way?”

As per study 2, the free recall instruction required the participant to relay as much information as possible and not leave anything out, no matter how insignificant they thought it might be. The crime scene questionnaire consisted of 27 questions (same csq used in study 2, see appendix 1)

4.2.3 Pilot

Eleven pilot participants watched the video and attempted to identify the individual's voice from the video. Twenty-five different foil voices for the line-up were recorded, six were chosen for the line up. The line-up was changed several times to reflect the results from the pilot test to ensure the line-up was diagnostically viable, with 3 voices having to be changed. Two of the voices were too similar to the target voice and had to be changed out, as it proved to be too difficult to differentiate between them, one of the voices was changed because the accent was too dissimilar. None of the pilot participants took part in the main experiment

4.2.4 Design/Procedure

A 2 (focussed meditation – control) x 2 (eyes open – eyes closed) x 2 (description – no description) between subjects design was used to examine the effects of FM, eye closure and verbal description on voice recognition, free recall and cued recall task.

This particular experiment was conducted in groups of between 2 and 5 participants. The room was strategically arranged so no participant could see the other participants' written results.

Participants were assigned to one of eight groups: meditation, eye closure and description (n = 10); meditation, eye closure, no description (n = 10); meditation, eyes open, description (n = 10); meditation only (n= 10); control, eye closure and description (n = 10); control, eye closure, no description (n = 10); control, eyes open, description (n = 10); control only (n= 10).

Prior to the voice line-up, participants were told that the voice from the film was present in the line-up. Therefore only correct and incorrect identifications were recorded for the voice recognition task. Participants were requested to rate their confidence on a scale of 1 (not confident) to 9 (absolutely confident) in their given responses.

Correct and incorrect responses were recorded for the free recall, and correct, incorrect, and do not know responses were recorded for the cued recall task. Using the aforementioned scale, the confidence ratings were also taken after each of the 27 questions on the cued recall task.

After reading the participant information sheet and providing consent, participants watched the video and were engaged in a five-minute filler task involving general knowledge questions. Subsequently, participants in the description groups were asked to provide a verbal of the female victim’s voice. They were asked to provide as many details as possible as if they were describing a police officer.

Participants not in the description groups carried on with the filler task for three more minutes. Following the description phase, participants in the FM with eyes closed groups were administered the 1.5-minute focussed breathing meditation exercise. They were told to continue with the breathing exercise throughout the rest of the experiment. Participants in this group experiment were requested to write down their answers on the sheets provided, however, they were told to keep their eyes closed throughout the rest of the study, apart from the instances of reading and answering questions. For example, a participant would have been instructed to read a question from the CSQ and then close their eyes until they were ready to answer it. For the free recall, participants were asked to read the instructions, close their eyes and only open them when they had something to write. The researcher monitored all participants to ensure that they were closing their eyes.

Participants in the FM groups without eye closure were requested to continue breathing throughout, with the caveat of keeping their eyes open at all times. Participants in the control group continued with the filler task and were either given instructions to keep their eyes open or closed for the remainder of the study, apart from when reading instructions and writing down answers.

All participants listened to the line-up. The line-up was presented in the same order to all participants. Participants in the FM condition were reminded to focus on their breathing. After listening to the line-up, participants were asked to mark down what they thought the voice was on the voice recognition sheet. After each identification, participants were requested to rate how confident they were in their response on the aforementioned scale of 1-9.

Following on immediately from the line-ups, participants were then given a free recall instruction, whereby they were asked to recount as many details as possible, no matter how inconsequential, and not to leave anything out. Participants in the FM condition were again reminded to focus on their breathing. Participants in the eye closure groups were requested to shut their eyes and only open them to write

Finally, participants were administered the crime scene questionnaire. Once again, participants in the FM conditions were reminded to focus on their breathing. Participants in the eye closure group were reminded to read the question and close their eyes before responding. All questions were “closed”, requiring a specific answer; for example “, what was the name of the street where the crime happened”; “Who does the man ask the woman to call”; “what was the phone number”. Participants were asked not to guess. A “do not know” response was allowed. After each question, participants were asked to rate their confidence in the response, even if they provided a “do not know” response.

At the end of the experiment, participants were thanked for taking part and debriefed. Finally, participants were asked how they thought they did and were then provided with the results of their line-up responses.

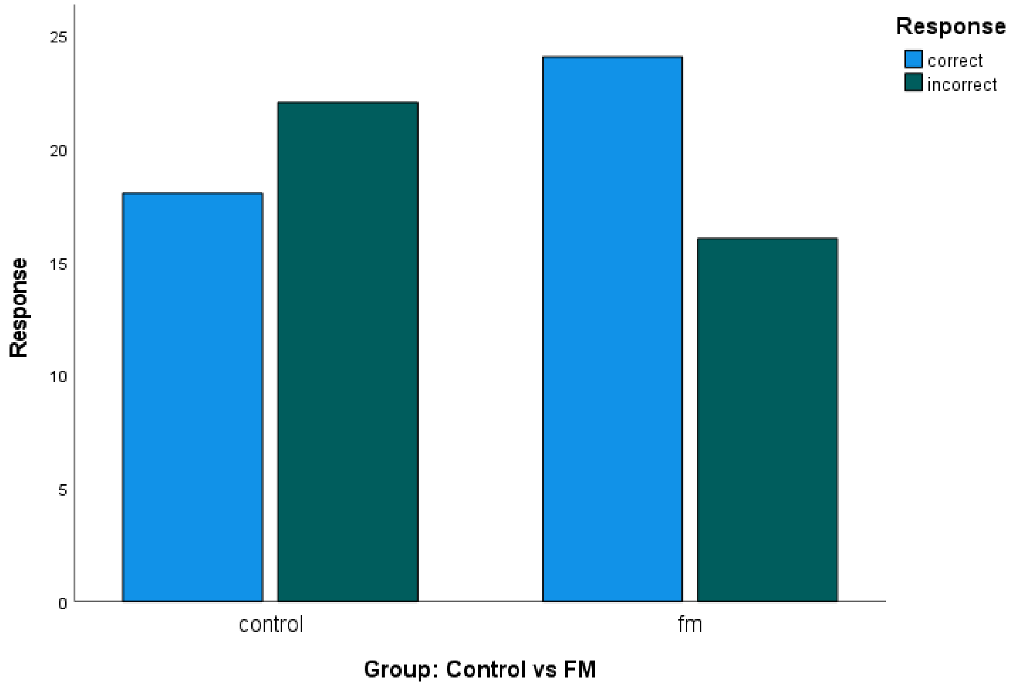
4.3 Results

The results are split into several sections. Firstly the voice recognition data is analysed in five separate tests. Secondly, the free recall data is analysed, and finally, the responses to the cued recall questionnaire are analysed. Confidence scores were recorded and analysed for the voice recognition line-up and cued recall responses.

4.3.1 Focussed Meditation vs Control

First, up for analysis is the FM vs Control data from the voice recognition line-up

Figure 4.1: Total number of correct and incorrect responses as a function of FM (FM/Control) for Male A and Male B.

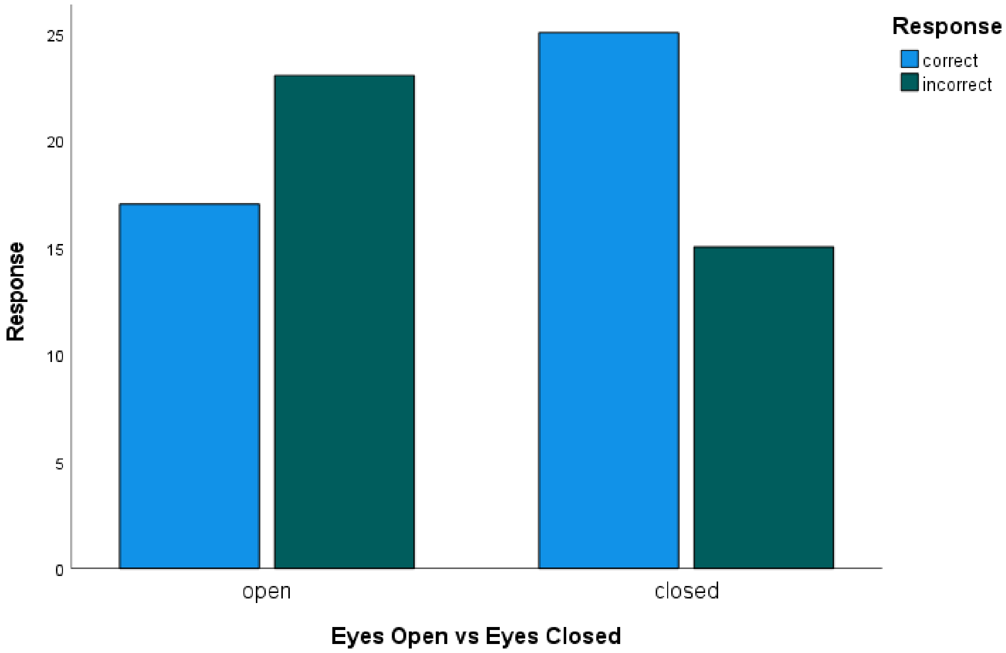


A 2 x 2 Chi Square test of independence was conducted to assess if there was a relationship between interview type (FM/C) and response (correct/incorrect). The level of significance was set at 5%*. There was no statistical significant relationship between the two variables X^2 (1, N=80) = 1.805, p= .179.

4.3.2 Eye Closure:

Next up for analysis is eye closure and its effect on voice recognition. As previously mentioned research has shown beneficial effects of eye closure on auditory domain information (see study 2).

Figure 4.2: Total number of correct and incorrect responses as a function of EC/EO for Male A and Male B.



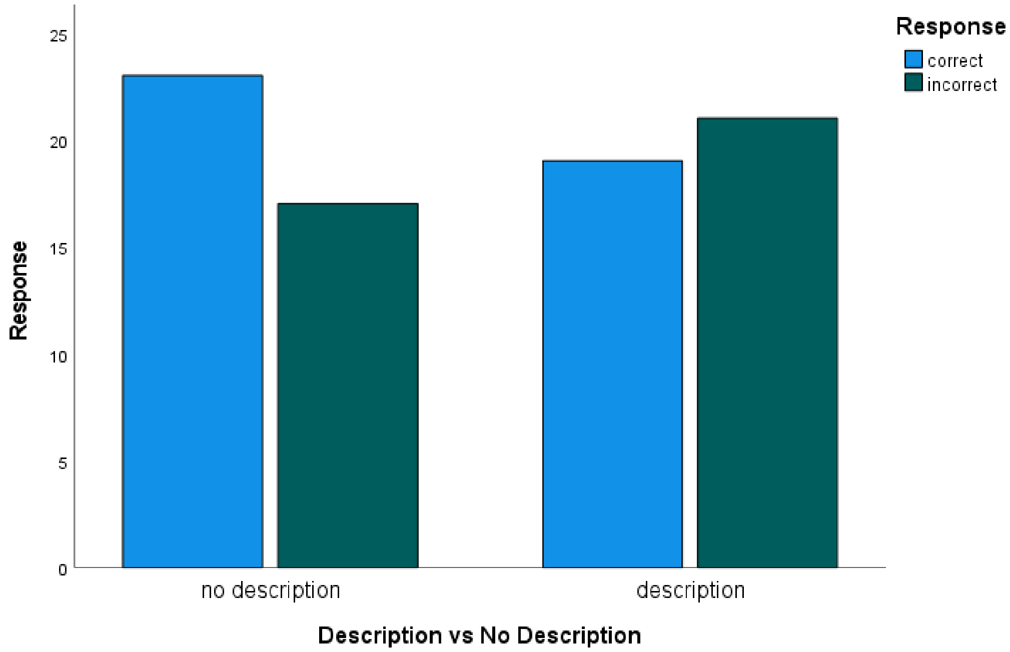
A 2 x 2 Chi Square of independence test was performed to test the relationship between EC and response (correct/incorrect). Once again there was no statistical significant relationship between the variables X^2 (1, N=80) = 3.208, p = .076.

(* from this point the reader can assume levels of significance was set at 5%)

4.3.3 Description

Next up for analysis is the effect of a description on voice recognition. There had been the suggestion that if voices are processed similar to faces, providing a description could inhibit and result in fewer correct identifications, however, Vangas et al. (2005) did not find a verbal overshadowing effect in their first experiment.

Figure 4.3: Total number of correct and incorrect responses as a function of Description/No Description for Male A and Male B.

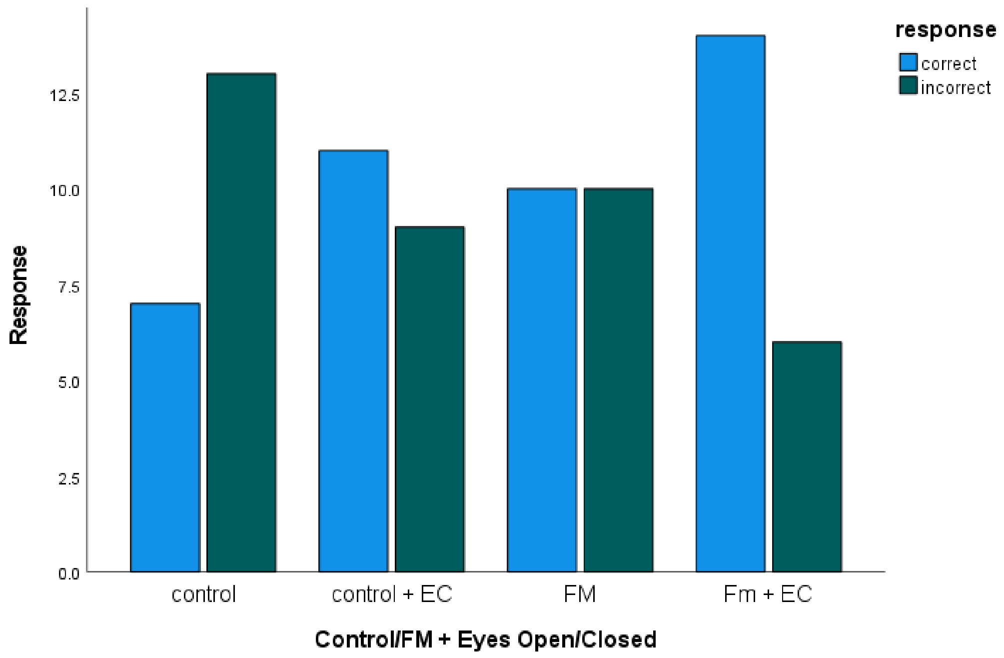


A 2 x 2 Chi Square test of independence was performed to examine if there was a relationship between giving a description of a voice and subsequent incorrect identification of said voice from a line-up. There was no statistical significant relationship between description and response, X^2 (1, N=80) = 0.37, p = .502. Thus implying there was no significant verbal overshadowing effect..

4.3.4 Focussed Meditation vs Eye Closure:

Wagstaff and colleagues have oft found an additive beneficial effect of FM and EC on free recall, with more information being provided by participants in that dual group. From study 2 of this thesis, one can see a beneficial effect of EC on auditory information; as such could the same combination have similar effects on voice recognition?

Figure 4.4: Total number of correct and incorrect responses as a function of FM (FM/Control) and EC/EO for Male A and Male B.

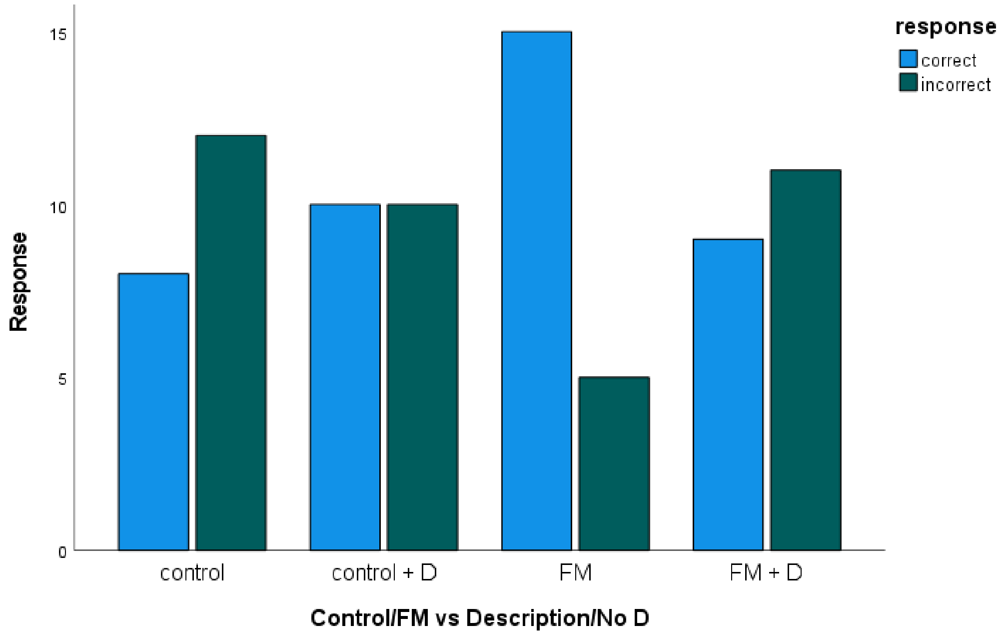


A 2 x 2 x 2 (FM/Control, EC/EO, Correct/Incorrect response) was performed to test if there was a relationship between FM and EC that could influence the response provided by a participant. There was no statistical significance, X^2 (1, 3, N=80) = 5.01, p = .171.

4.3.5 Focussed Meditation vs Description

Next up for analysis is to test for a relationship between FM and Description. If voices are processed globally and the VOE is a thought to be due to inappropriate processing, that is the processing styles are not congruent after having provided a description, then perhaps FM, which promotes global processing, cold overcome the VOE

Figure 4.5: Total number of correct and incorrect responses as a function of FM (FM/Control) and Description/No Description for Male A and Male B.



A 2 x 2 x 2 (FM/Control, Description/No D, Correct/Incorrect Response) Chi Square was performed to test if there was an association between the variables. There was no statistical significance X^2 (1, 3, N=80) = 5.82, p = .121.

4.3.6 Confidence:

Table 4.1

Mean + Standard Error for Confidence in Correct and Incorrect Responses as a Function of FM or Control.

A 2

Condition	Response		
	Correct	Incorrect	Total
Control	4.62 (±0.42)	5.18 (± 0.38)	4.90 (±0.41)
Focussed Meditation	5.83 (±0.36)	4.94 (±0.44)	5.39 (±0.34)

(FM/Control) x 2 (Correct/Incorrect) analysis of variance (ANOVA) was conducted on confidence scores for both correct and incorrect responses to the voice line-up. After exploratory analysis, showed all assumptions were all met (independence, homogeneity and distribution*). There were no significant effects of either FM or Control on confidence scores, $F (1, 1) = 1.502$, $p = .224$. There was no significance of response, either incorrect or correct on confidence scores, $F (1, 76) = 0.667$, $p = .685$. There was also no significant effect FM/Control and response, $F (1, 76) = 3.38$, $p = .07$. In line with study 2, FM did not lead to increased confidence in both correct and incorrect responses.

4.3.7 Free Recall

Table: 4.2

Mean + Standard Error for Free Recall Correct and Incorrect Responses. The Table Shows the Mean Number of Correct and Incorrect Responses as a Function of Focussed Meditation or Control, Eyes Open/Eyes Closed and Description/No Description.

Condition	Response	
	Correct	Incorrect
Control	24.05 (± 1.41)	3.03 (± 0.27)
Focussed Meditation	31.08 (± 1.09)	1.85 (± 0.27)
Eyes Closed	29.01 (± 1.09)	2.28 (± 0.27)
Eyes Open	26.13 (± 1.09)	2.61 (± 0.27)
Description	28.03 (± 1.09)	2.41 (± 0.27)
No Description	27.11 (± 1.09)	2.48 (± 0.27)

(* from this point of the study, readers can assume all assumptions were met unless stated otherwise)

Table: 4.3

Mean + Standard Deviations for Free Recall Correct Responses. The Table Below Shows The Mean + Standard Deviations for Free Recall Correct Responses as a Result of Focussed Meditation + Eyes Open/Eyes Closed, Focussed Meditation + Description/No Description and Control + Eyes Open/Eyes Closed and Control + Description/No Description.

Condition	Eyes Open	Eyes Closed	Eyes Open + D	Eyes Closed + D	Total
Control	4.1 (± 2.77)	1.8 (± 1.87)	3.0 (± 1.25)	3.2 (± 1.75)	3.01 (± 1.91)
Focussed Meditation	1.8 (± 1.32)	2.2 (± 1.03)	1.5 (± 1.18)	1.9 (± 1.91)	1.85 (± 1.36

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) analysis of variance (ANOVA) was conducted on the total number of correct items reported. Levene's test for homogeneity indicated an equal variance across groups (p = 0.51). There was a significant main effect across all FM conditions, with participants across all groups providing more correct responses F (1, 72) = 20.68, p = < .001, n^2 = 0.23, than across the control groups. There was no significant main effect of eye closure, F (1, 72) = 3.46, p = 0.06, although it did approach significance. There was also no main effect of Description, F (1, 72) = 0.36, p = 0.55, n^2= 0.36. Again, as per the results of the first experiment, and contrary to previous studies, there was no significant interaction between FM and EC (p = 0.26). However there was a significant interaction between FM and Description, F (1, 72) = 7.48, p = 0.008, n^2= 0.09, meaning participants in the FM/description group provided more correct responses than the control group. There was also a significant interaction between EC and Description F (1, 72) = 4.24, p = 0.04, n^2= 0.055. There was no significant interaction between FM, EC and Description, (p = 0.41).

Next the number of incorrect items reported was analysed. The mean total number of incorrect items reported is displayed in the table below.

Table: 4.4

Mean + Standard Deviation for Free Recall Errors. The Table Below Shows the Mean + Standard Deviations for Free Recall Errors as a Result of Focussed Meditation + Eyes Open/Eyes Closed, Focussed Meditation + Description/No Description and Control + Eyes Open/Eyes Closed and Control + Description/No Description.

Condition	Eyes Open	Eyes Closed	Eyes Open + D	Eyes Closed + D	Total
Control	26.1 (± 7.34)	25.3 (± 6.62)	20.9 (± 4.07)	23.9 (± 7.33)	24.05 (±6.34)
Focussed Meditation	28.4 (± 7.49)	28.6 (± 8.49)	29.1 (± 5.55)	38.2 (± 7.42)	31.08 (±7.24)

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) analysis of variance (ANOVA) was conducted on the total number of incorrect items reported. Levene's test for homogeneity indicated an equal variance across groups (p = 0.27). There was a significant main effect of FM, F (1, 72) = 9.35, p = 0.003, n^2= 0.12. There was no significant main effect of EC, F (1, 72) = 0.72, p = 0.71 n^2= 0.01 and there was also no significant main effect of Description, F (1, 72) = 0.04, p = 0.84. Again contrary to previous research, there was no significant interaction between FM/EC (p = 0.06), however it was a trend in the predicted direction. There was also no significant interaction between FM/Description (p = 0.56), EC/Description (p = 0.11) and also FM/EC/Description (p = 0.11).

Contrary to study 2, study 3 has shown a significant effect of FM across all conditions, with participants in any of the FM groups reporting more correct items and fewer incorrect items than the control group, which is in line with previous research. EC in study 1 was significant. However, in study 2, there was no significant effect of EC, there was no significant effect for incorrect responses (p = 0.71). Description had no significant effect on correct or incorrect responses. Also, in line with study 1, there were no significant interactions between FM and EC for correct responses. There were significant interactions between FM/Description and EC/Description, meaning participants in those particular groups provided more correct responses than the control group, though, for incorrect responses, there were no significant interactions.

4.3.8 Cued Recall

The cued recall questionnaire consisted of 27 questions; therefore the maximum amount of points available was 27.

Table : 4.5

Mean + Standard Error Cued Recall. The Table Below Shows the Mean Number of Correct and Incorrect Responses as a Function of Focussed Meditation or Control, Eyes Open/Eyes Closed and Description/No Description.

Condition	Response	
	Correct	Incorrect
Control	13.73 (± 0.42)	6.83 (± 0.41)
Focussed Meditation	14.5 (± 0.42)	5.95 (± 0.41)
Eyes Closed	14.43 (± 0.42)	6.43 (± 0.41)
Eyes Open	13.8 (± 0.42)	6.35 (± 0.41)
Description	13.85 (± 0.42)	6.23 (± 0.41)
No Description	14.38 (± 0.42)	4.68 (± 0.41)

Note: Standard errors in parentheses

4.3.8.1 Cued Recall Correct Responses:

Table: 4.6

Mean + Standard Deviations for Cued Recall Correct. The Table Below Shows the Mean + Standard Deviations for Cued Recall Correct Responses as a Result of Focussed Meditation + Eyes Open/Eyes Closed, Focussed Meditation + Description/No Description and Control + Eyes Open/Eyes Closed and Control + Description/No Description.

Condition	Eyes Open	Eyes Closed	Eyes Open + D	Eyes Closed + D	Total
Control	13.6 (±2.99)	14.3 (±2.71)	14.1 (±2.77)	12.9 (±1.73)	13.7 (±2.55)
Focussed Meditation	14.7 (±2.98)	14.9 (±2.77)	12.8 (±3.01)	12.8 (±3.01)	13.8 (±2.94)

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) analysis of variance (ANOVA) was conducted on the total number of correct responses reported. Levene's test for homogeneity indicated an equal variance across groups ($p = 0.6$). Contrary to study 1, there were no significant main effects of FM, EC or Description, ($p = 0.2$, 0.3 and 0.38 respectively). There were also no significant interactions between FM/EC, FM/Description, EC/Description.

4.3.8.2 Cued recall errors

Table: 4.7

Mean + Standard Deviations for Cued Recall Incorrect. The Table Below Shows the Mean + Standard Deviations for Cued Recall Incorrect Responses as a Result of Focussed Meditation + Eyes Open/Eyes Closed, Focussed Meditation + Description/No Description and Control + Eyes Open/Eyes Closed and Control + Description/No Description.

Condition	Eyes Open	Eyes Closed	Eyes Open + D	Eyes Closed + D	Total
Control	7.3 (±3.53)	6.1 (±2.69)	6.4 (±3.11)	7.5 (±2.79)	6.83 (±3.03)
Focussed Meditation	6.1 (±2.03)	6.7 (±1.57)	5.6 (±2.01)	5.4 (±2.17)	5.95 (±1.94)

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) analysis of variance (ANOVA) was conducted on the total number of incorrect responses reported. Levene's test for homogeneity indicated an equal variance across groups ($p = 0.42$). There were no significant main effects of FM, EC, or Description ($p = 0.14$, 0.9 and 0.58 respectively). Again contrary to previous studies there were no significant interactions between FM/EC, FM/Description, EC/Description and FM/EC/Description ($p = 0.83$, $p = 0.33$, $p = 0.52$ and $p = 0.19$, respectively).

4.3.9 Confidence

Table : 4.8

Mean Scores + Standard Errors for Confidence Ratings. The Table Below Shows the Mean Confidence Ratings for Overall Cued Recall Correct and Incorrect Responses as a Function of Focussed Meditation or Control, Eyes Closed/Eyes Open and Description/No Description.

Condition	Response	
	Correct	Incorrect
Control	6.68 (±0.16)	4.92 (±0.29)
Focussed Meditation	6.91 (±0.16)	5.18 (±0.33)
Eyes Closed	6.96 (±0.16)	4.36 (±0.33)
Eyes Open	6.63 (±0.16)	5.74 (±0.24)
Description	6.63 (±0.16)	4.62 (±0.35)
No Description	6.96 (±0.16)	5.48 (±0.26)

Note: Standard errors in parentheses

Table : 4.9

Mean + Standard Deviation for Confidence Scores for Cued Recall Correct Responses. The Table Below Shows the Mean Confidence Ratings for Cued Recall Correct Responses as a Result of Focussed Meditation + Eyes Open/Eyes Closed, Focussed Meditation + Description/No Description and Control + Eyes Open/Eyes Closed and Control + Description/No Description.

Condition	Eyes Open	Eyes Closed	Eyes Open + D	Eyes Closed + D	Total
Control	6.8 (±0.94)	7.0 (±0.95)	6.45 (±1.01)	6.46 (±0.93)	6.68 (±0.96)
Focussed Meditation	6.64 (±0.64)	7.36 (±1.03)	6.62 (±1.25)	7.0 (±0.93)	6.91 (±0.96)

Results:

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) analysis of variance (ANOVA) was conducted on confidence scores for correct responses. Levene's test for homogeneity indicated an equal variance across groups ($p = 0.89$). There was no significant main effect of FM, EC or Description on confidence scores and there were no significant differences for FM/EC, FM/Description, EC/Description or FM/EC/Description meaning there was no increased confidence in correct responses, which is in line with previous studies.

Table: 4.10

Mean + Standard Deviation Confidence Scores for Cued Recall Errors. The Table Below Shows the Mean Confidence Ratings for Cued Recall Incorrect Responses as a Result of Focussed Meditation + Eyes Open/Eyes Closed, Focussed Meditation + Description/No Description and Control + Eyes Open/Eyes Closed and Control + Description/No Description.

Condition	Eyes Open	Eyes Closed	Eyes Open + D	Eyes Closed + D	Total
Control	5.96 (±1.25)	6.28 (±1.7)	5.58 (±1.41)	5.15 (±1.23)	5.74 (±1.41)
Focussed Meditation	6.12 (±1.16)	6.63 (±0.97)	6.20 (±1.25)	6.08 (±1.12	6.26 (±1.13)

Results:

A 2 (FM/NFM) x 2 (Eyes Open/Eyes Closed) x 2 (Description/No Description) analysis of variance (ANOVA) was conducted on confidence scores for incorrect responses. Levene's test for homogeneity indicated an equal variance across groups ($p = 0.78$). There were no significant effects of EC ($p = 0.81$), or Description ($p = 0.09$), or FM. There were no significant interactions between FM/EC, FM/Description, EC/Description or FM/EC/Description. In agreement with study 2 and previous research, there was no inflation of confidence in incorrect responses to the cued recall questionnaire.

4.4 Discussion

Following on from study 2, face recognition, it was expected that the FM instruction would significantly affect voice recognition after all previous research has suggested that, like faces, voices are processed globally. However there was no statistical significance of FM, even though FM provided more correct identifications. Indeed there was no statistical significance across almost all conditions in the voice recognition part of the study, even though FM did provide for more correct identifications.

Even when coupled with EC, FM had no significant effect, which is contrary to the results of study 1. Based on the results from the first study regarding auditory detail, there was expected to be a significant effect. However, the first study did contradict previous research by Wagstaff and colleagues in that there was no additive benefit of FM and EC for voice recognition. Following FM and EC having no effects, the following analysis looked at whether the voice identification was susceptible to the VOE and if FM could overcome the effect.

Again, like EC and FM, there was no significant effect of the description on voice recognition, which is incongruent with the results discovered by Vangas et al. (2005). There were signs that the description interfered with recognition, with participants in that group providing fewer correct identifications. FM had no benefit in overcoming the VOE. Participants in the FM and Description condition, actually provided fewer correct identifications than all other groups, thus meaning the FM instruction did not manage to overcome the VOE; perhaps the effect was too strong. Ultimately, however, the study did not meet its primary aims of improving recognition accuracy and overturning the V OE, which is a shame.

Moving on to the free recall part of the study, there would have been the expectation that EC would have an additive effect on FM and provide more correct answers. However, once again, this was not the case. The FM did improve recall with more correct responses recorded, which turned out to be statistically significant, which is different to the previous study in this thesis, where FM was not significant, however, the result here concurs with the research of Wagstaff and colleagues, however, this did not extend to incorrect responses, where there was no significant effect.

There was also no significant effect at all of FM across all conditions and responses in the cued recall task. FM was not significant, EC was not significant, and neither was description. This was not unexpected; the same effect occurred in the previous study, with FM having no significant effect on cued recall responses. What is an interesting question at this point is why FM did not affect the cued recall task?

What is needed to be considered here is perhaps time constraints. If, in both studies, participants have taken two line-ups, a free recall task in experiment 1 and a voice line-up and a free recall task in this experiment, which amounts to approximately 20 minutes, is it possible that the beneficial effects of the FM instruction have diminished are no longer effective?. This is something that will be addressed in the following chapter and study.

There was no statistically significant evidence of the VOE on voice recognition, although when provided a description, participants provided fewer correct responses than they did with face recognition. The FM instruction was also shown to be non-significant in overcoming the VOE, which agrees with the results of study 1.

Looking at the incorrect responses provided by participants, it can be seen in this study, like study 1, that confidence was not inflated in those responses, with no significant differences between correct and incorrect responses. The same was seen across the cued recall task, too, with no inflation in confidence in incorrect responses and no significant differences in confidence between correct and incorrect responses. This does agree with studies by Wagstaff and colleagues and shows that the problems of inflated confidence in responses associated with hypnosis do not apply to FM.

4.5 Conclusion

While the study did not achieve what was expected, in that there was no statistically significant effect of FM nor EC on voice recognition, the results can be considered somewhat encouraging and worthy of further research as more correct identifications were made in those conditions. Once again, there were no additive beneficial effects of FM and EC when used in conjunction together. One crucial result to note is that, again, FM had no significant effect on cued recall, which is the same result from study 1 and is worthy of further research. This is addressed in the subsequent study.

4.6 Limitations

This study was done in groups, unlike the previous study. In the previous study, all participants sat in the exact same place and distance from the screen, as this was done in groups of 3 to 5 participants the conditions for each individual were not uniform. Participants were required to write their answers to the free recall and cued recall tasks. Those in the EC groups were asked to close their eyes between answering questions on the cued recall task. When performing the free recall, participants were requested to shut their eyes for a period of time and then reopen them to write down their responses. They were requested to do this several times during the free recall, and after every question on the CSQ which could have interfered with their concentration and nullified the effects of the FM instruction.

As with study 2, this present study was conducted under laboratory conditions and as such this could affect the results. For example, said results may not always be transferable to the real world (Wagstaff et al., 2003). This is particularly applicable to simulated crime scenes, as some of the variables that may influence witness responses cannot be replicated and therefore accounted for, such as environmental conditions. This leads to the possibility that knowing the crime was staged could affect witness performance (Murray & Wells, 1982). Another limitation is the crime clip itself. Every care was taken to make the scene as authentic as possible; ambient and environmental noise remained in the film, and the clip was filmed and edited sequentially, making the film easier to follow than it would be in a real-life situation.

Sample size could also be a limitation, as participants per group was small, this was especially evident in the conditions where FM and EC were used in tandem, reducing the groups further, there was also a lack of male participants. Caution also needs to be advised with regards to the confidence scores (discussed in more detail in the discussion section). Confidence scores were measured on a Likert scale, which is ordinal data, and therefore ranked, using the mean could lead to false conclusions being drawn about the data.

4.7 Chapter Summary

1 FM had no significant effect on voice recognition.

2 EC had no significant effect on voice recognition.

3 There was no significant evidence of the VOE on voice recognition.

4 There was a significant effect on free recall correct responses.

5 There was no significant effect of FM or EC at all on the cued recall task.

6 Confidence was not inflated in either correct or incorrect responses.

Chapter 5

Single vs Multiple Administration

5.1 Introduction

The previous two studies in this thesis have presented some interesting yet mixed results. Both those studies aimed to identify if an FM instruction had a beneficial effect on face and voice recognition. The studies also tested whether an FM instruction would prove beneficial in a free recall task and a cued recall task. As mentioned numerous times in this thesis, previous work by Wagstaff and colleagues on the FM instruction has shown beneficial effects on all but one voice of those tasks. However, it must be noted that their study on face recognition was not conducted using a crime scene film and subsequent line-up procedure. Wagstaff et al. did find a significant beneficial effect of FM on face recognition. In their numerous studies, Wagstaff et al. also found beneficial effects of FM on free recall tasks, with participants providing more accurate and correct information after having the instruction administered.

Study 2 in this thesis, the face recognition task, did find a beneficial effect of FM on face recognition, thus concurs with Wagstaff et al. even though the studies were quite different in their design. Conversely, study 2 did not show beneficial effects of FM on free recall and cued recall tasks, which is an interesting result that required further research, especially as those results were repeated in study 3, with no beneficial effects on free or cued recall tasks.

Study 3 also aimed to discover if there were beneficial effects on voice recognition, which had not been investigated at this point. Unfortunately, while participants in the FM condition did provide more correct identifications, the results did not reach significance. This could have been due to several reasons. In study 2, participants took part individually, and all participants sat in the same place and distance from the screens. In study 3, participants attended in groups of 3 to 5, so not everyone was subjected to the same conditions, which could have impacted the results. As such, it would make sense to conduct a further study whereby participants attended individually, and conditions were exactly the same for all.

Even so, considering the limitations of study 2, results still showed no beneficial effect of FM on the fee and cued recall tasks, and the question then arises, that in the two previous studies, FM has failed to reach significance, why that would be. To answer that question, one must look at the sequence of studies 2 and 3 compared to the studies conducted by Wagstaff and colleagues. The studies presented in this thesis all followed a specific sequence, film, filler task, recognition task, free recall task and finally cued recall task, this taking anywhere between 35 and 45 minutes, depending on the amount of information provided by the participant. In most of Wagstaff and colleagues' studies, each task was presented separately so that participants would be administered the FM exercise and then take part in a free recall task; thus, the time difference between tasks was much shorter. This suggests that the FM instruction has a limited "shelf life" in that the beneficial effects may subside after a certain amount of time has passed, which looks likely to be around the ten to the fifteen-minute mark.

As such, it makes sense to test this possibility by introducing a multiple administration condition to the above two studies to see if time is a factor. This study is presented below.

5.2 Method

5.2.1 Participants

Sixty participants were recruited to participate in the experiment, all of whom were undergraduates completing course credit as part of the University's experimental participation scheme (EPR). The sample consisted of 6 males and 54 females; age range 18-35 (mean = 19.08, SD = ± 2.52). The study received approval from the University of Liverpool Ethics Committee, and all participants provided informed consent in line with those guidelines.

5.2.2 Stimuli/Apparatus

The researcher and two volunteers created a real-life crime stimulus using a Samsung SLR camera. The scene lasted for two minutes and thirty seconds and depicted a distraction theft perpetrated by two males upon a female. A volunteer filmmaker recorded the clip from several angles and cut it together. The clip was shown on an 80-inch screen, and the FM instruction was played over the room speakers. The instruction was an audio recording provided by a supervisor and modified from Wilcoxon (1982).

The face recognition line-ups were illustrated using PowerPoint on a 23-inch monitor connected to an HP Envy laptop. Each picture was seven inches in height by 4 inches in width. There were a total of two separate facial recognition line-ups, both male, to correspond with the perpetrators in the film. Each line-up consisted of nine static images, an actor from the film and eight foils. All line-ups were target present. All pictures were shown for 5 seconds before automatically moving on to the next.

The foils were selected from the ColorFerret database acquired from the National Institute of Standards and Technology or other (publicly available databases). Foils were selected that shared similar features to the actors and only headshots were provided. The researcher assessed each photograph, and any digital noise was removed.

The voice line-up was presented sequentially over the room speakers. Each member of the line-up relayed the same sentence twice. The sentence was a piece of dialogue spoken by the female victim shown in the crime film. The line that was spoken was, "What is your number; I will give her a ring. What is her name, by the way?"

The free recall instruction required the participant to recall as much information as possible and, in accordance with the instruction, not leave anything out, no matter how insignificant they thought it might be. The free recall interview was recorded on an HTC M8. The crime scene questionnaire consisted of 27 questions.

Correct, incorrect and non-identifications were recorded for the face and voice recognition tasks. Participants were asked to rate their confidence on a scale of 1 (not confident) to 9 (absolutely confident) in all their responses, including the 27 questions that made up the cued recall task. Correct, incorrect and do not know responses were also recorded for the free recall and cued recall tasks.

For this particular study, no pilot was needed as previous studies had used the same materials.

5.2.3 Design and Procedure

A 3 (Control / FMS/FMM) x 2 (Eyes Open / Eyes Closed) between subjects design was used to examine the effects of a single administration of FM, a multiple administration of FM and EC on face recognition, voice recognition free recall and cued recall tasks.

Participants were assigned to one of the six potential groups. All participants were tested individually in a laboratory space. Each participant read the participant information sheet and provided informed consent (under ethical approvals noted above). Once consented, participants observed the video and were asked to engage in a five-minute filler task involving general knowledge questions.

Participants in the single administration group were given the FM exercise and told to continue to focus on their breathing for the face and voice line-ups. They were not reminded to focus on their breathing after the voice line-up but did engage in an equivalent filler task for the 1.5 minutes the FM instruction took. Participants in the multiple administration condition were administered the FM exercise prior to each separate task. Participants in the control condition were not administered the FM instruction but engaged in a 1.5-minute filler task prior to each separate task of the study. Participants in the EC groups were asked to keep their eyes closed at all times except for the facial recognition task. Participants not in the EC group were monitored to ensure they did not close their eyes during the tasks.

All participants viewed the two face line-ups. All line-ups were shown in the same order. Participants were shown the line-ups twice and were requested not to say anything until after the second line-up had been viewed. In line with police regulations regarding line-up procedures, participants were informed prior to viewing that the suspect may or may not be in the line-up. The researcher sat behind the participant during the line-ups to avoid indicating who the suspects may be. In between each set, participants in the FM condition were reminded to focus on their breathing before the second viewing. After having viewed the line-up, participants were asked if an individual from the clip was present in the line-up. If the response was yes, participants were asked to identify the suspect. If participants answered not present, they moved on to the next line-up. After each identification procedure had been completed, participants were requested to rate how confident they were in their response on the scale noted above.

Subsequent to the face recognition line-ups, participants were presented with a voice recognition line-up. The line-up consisted of 5 voices; the actual voice to be identified and four foils. The voices were presented in sequential order. Those participants in the FM multiple conditions were administered the instruction prior to hearing the voices.

Following on immediately from the line-ups, participants were given free recall instructions. All participants were asked to recount as many details as possible, no matter how inconsequential they felt they were, and not to leave anything out. Participants in the FMM condition were once again administered the FM instruction. Participants in the eye closure groups were requested to shut their eyes and not open them again until instructed at the end of the experiment.

Finally, participants were asked to complete the crime scene questionnaire (see appendix 1). Again participants in the FM multiple conditions were administered the FM instruction prior to engaging in the cued recall task. Participants in the eye closure group were reminded not to open their eyes and vice versa. All questions were "closed", requiring specific answers. For example, "what was the name of the street where the crime happened?"; "who does the man ask the woman to call?"; "what was the phone number?" Participants were asked not to guess, and a "do not know" response was allowed. After each question, participants were asked to rate their confidence in the response, even if they provided a "do not know" response.

At the end of the experiment, participants were thanked for taking part and debriefed. Finally, participants were provided with the results of their line-up responses.

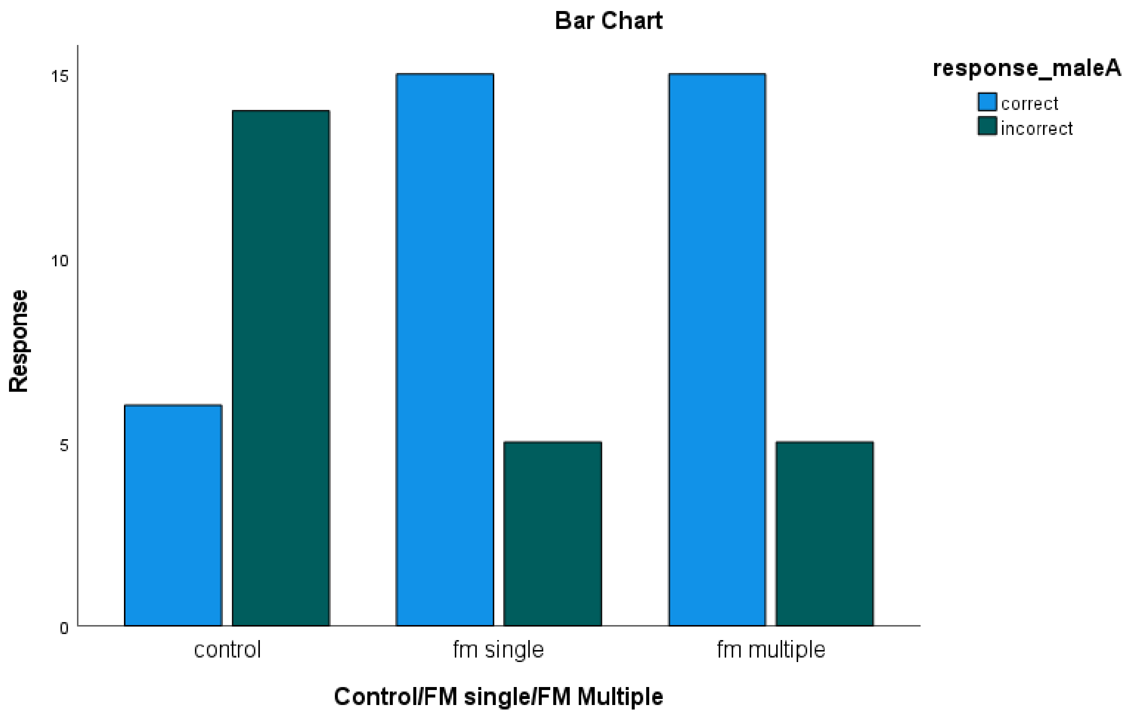
5.3 Results:

The results of experiment 3 are detailed below. The results have been separated into four different sections; 1) face recognition task, 2) Voice recognition task, 3) recall task and 4) cued recall task. All sections include a confidence rating for correct and incorrect responses.

5.3.1 Face Recognition:

5.3.1.1 Male A

Figure 5.1: Total number of correct and incorrect responses as a function of FM (Control/FM Single/FM Multiple) for Male A



A 3 (C/FMS/FMM) x 2 (Response Correct/Incorrect) was performed to test if there was an association between the variables. The level of significance was set at 5% The result was statistically significant X^2 (2, N=60) = 11.25, p =.004. The effect size for this finding Cramer's V was moderate at 0.433. From this we can ascertain there that both FMS and FMM resulted in more correct responses than a control group.

5.3.1.2 Confidence Correct/Incorrect Responses:

A 3 (C/FMS/FMM) x 2 (EC/NEC) analysis of variance (ANOVA) was conducted on mean confidence scores for correct and incorrect responses. The descriptive statisitics are shown in table 5.1 below.

Table 5.1: *Mean Confidence and Standard Deviations for Correct and Incorrect Responses as a Function of Interview: Male A*

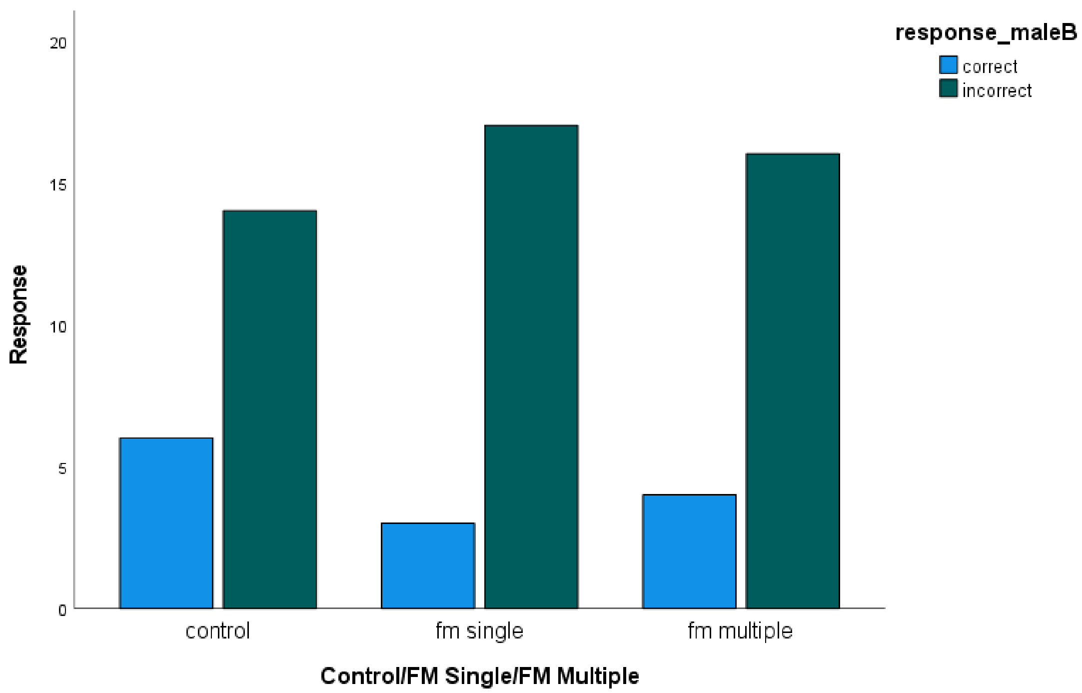
Condition	**Response**		
	Correct	Incorrect	Total
Control	5.33 (±1.75)	4.50 (±1..40)	4.75 (±1.52)
Focussed Meditation Single	5.73 (±1.62)	5.40 (±1.52)	5.65 (±1.57)
Focussed Meditation Multiple	3.93 (±1.67)	4.61 (±1.14)	4.11 (±1.55)

A 3 (Control/FMS/FMM) x 2 (Correct/Incorrect) ANOVA was conducted to test whether confidence was inflated in correct and incorrect responses. All assumptions were met (homogeneity, independence, variance*). There was no significant differences in confidence in correct or incorrect responses, $F(5, 1) = 2.48$, $p = .083$. Thus again suggesting that an FM instruction does not result in increased confidence in incorrect responses, which are in line with previous studies in this thesis and also studies conducted by Wagstaff and colleagues.

(* from this point readers can assume all assumptions were met unless otherwise stated)

5.3.1.3 Male B

Figure 5.2: Total number of correct and incorrect responses as a function of FM (Control/FM Single/FM Multiple) for Male B



A 3 (C/FMS/FMM) x 2 (Response Correct/Incorrect) was performed to test if there was an association between the variables. The result was not statistically significant X^2 (2, N=60) = 1.375, p =.503. From this we can ascertain there that the FM instruction did not improve accuracy rates. This finding is in line with the previous study's finding pertaining to Male B.

5.3.1.4 Confidence Correct/Incorrect Responses

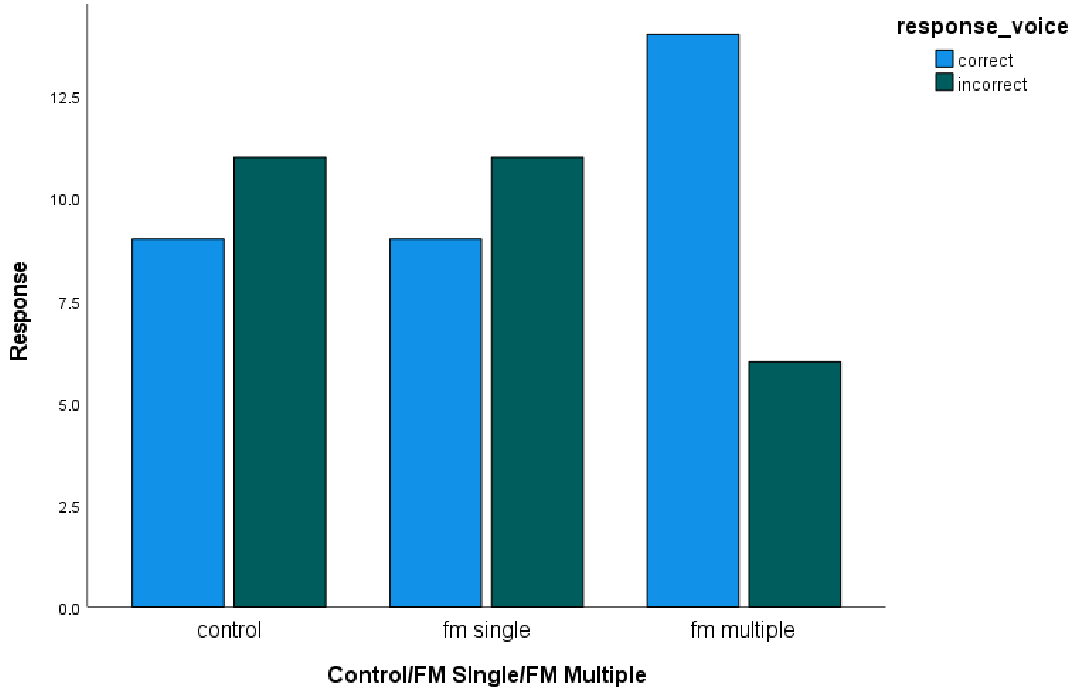
Table 5.2: *Mean Confidence and Standard Deviations for Correct and Incorrect Responses as a Function of Interview: Male B*

Condition	Response		
	Correct	Incorrect	Total
Control	4.01 (±0.89)	3.79 (±1..43)	3.85 (±1.26)
Focussed Meditation Single	3.67 (±2.52)	4.41 (±1.91)	4.31 (±1.94)
Focussed Meditation Multiple	4.01 (±1.15)	4.69 (±1.99)	4.55 (±1.85)

A 3 (Control/FMS/FMM) x 2 (Correct/Incorrect) ANOVA was conducted to test whether confidence was inflated in correct and incorrect responses. There was no significant differences in confidence in correct or incorrect responses, $F(5, 1) = 0.535$, $p = .783$. Thus again suggesting that an FM instruction does not result in increased confidence in incorrect responses, which are in line with previous studies in this thesis and also studies conducted by Wagstaff and colleagues.

5.3.2 Voice Recognition:

Figure 5.2: Total number of correct and incorrect responses as a function of FM (Control/FM Single/FM Multiple) for Voice Recognition



A 3 (C/FMS/FMM) x 2 (Response Correct/Incorrect) Chi Square was performed to test if there was an association between the variables. The result was not statistically significant X^2 (2, N=60) = 3.348, p =.187. From this we can ascertain there that the FM instruction did not improve accuracy rates in the voice recognition line up, concurring with the results of study 3.

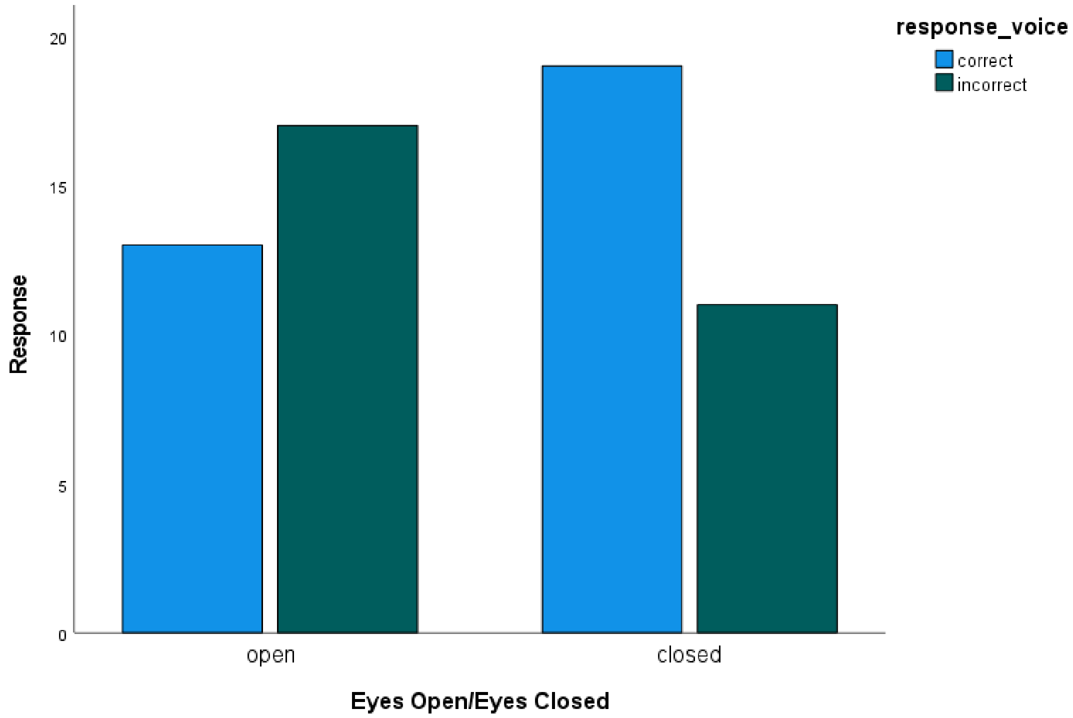
5.3.2.1 Confidence Correct/Incorrect responses

Condition	Response		
	Correct	Incorrect	Total
Control	4.78 (±1.39)	4.09 (±1..51)	4.40 (±1.46)
Focussed Meditation Single	4.78 (±2.16)	5.00 (±1.61)	4.91 (±1.84)
Focussed Meditation Multiple	3.86 (±2.07)	3.34 (±1.63)	3.71 (±1.93)

A 3 (Control/FMS/FMM) x 2 (Correct/Incorrect) ANOVA was conducted to test whether confidence was inflated in correct and incorrect responses. There was no significant differences in confidence in correct or incorrect responses, $F(5, 1) = 0.265$, $p = .768$. Thus again suggesting that an FM instruction does not result in increased confidence in incorrect responses, which are in line with previous studies in this thesis and also studies conducted by Wagstaff and colleagues.

5.3.2.2 Eye Closure

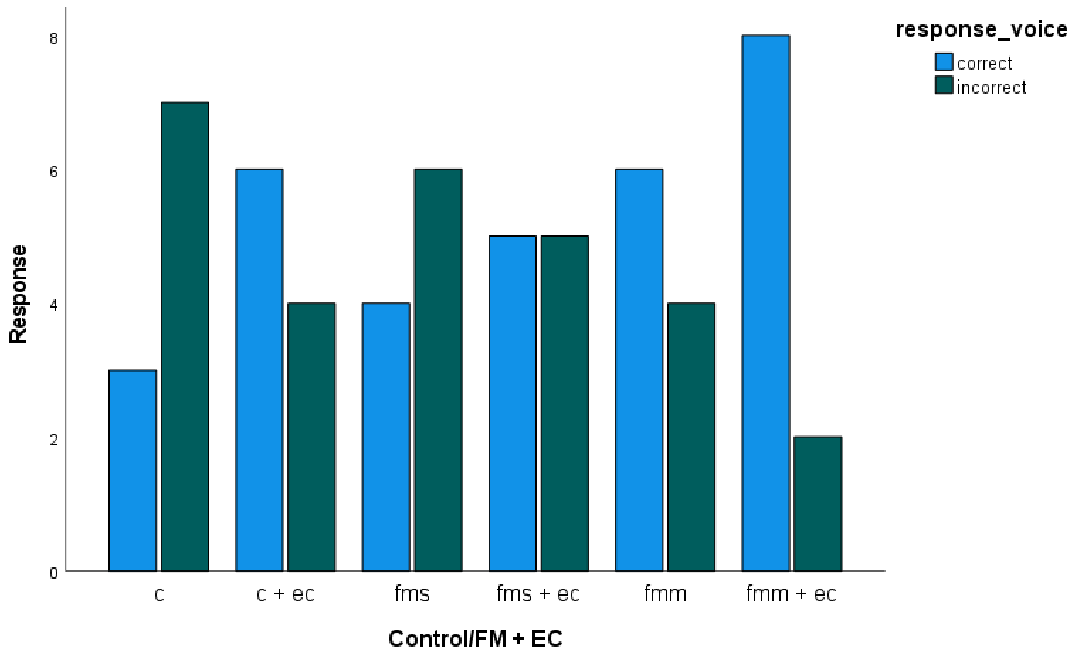
Figure 5.4: Total number of correct and incorrect responses as a function of Eyes Open/Eyes Closed for Voice Recognition



A 2 (Eyes closed/Eyes Open) x 2 (Correct/Incorrect) Chi Square was conducted to check if there was an association between EC and responses. X^2 (1, N=60) = 2.411, p =.098 meaning there was no significant effect of EC on voice recognition. This is in line with the results of the previous study

5.3.2.3 FM/Eye Closure

Figure 5.5: Total number of correct and incorrect responses as a function of FM (Control/FM Single/FM Multiple) and Eyes Open/Eyes Closed



A 3 (Control/FMS/FMM) x 2 (Eyes open/Eyes closed) x 2 (correct/Incorrect) Chi Square was conducted to see if FM and EC had a beneficial effect on voice recognition. There was no significant effect of FM and EC, X^2 (2, N=60) = 6.11, p =.298.

5.3.3 Free recall

Table 5.4 The mean total number of correct items reported by participants across groups is displayed below in table 5.4.

Condition	Response		
	Eyes Open	Eyes Closed	Total
Control	26.9 (±5.70)	29.1 (±5.15)	28.0 (±5.37)
Focussed Meditation Single	31.6 (±6.31)	30.0 (±4.37)	30.8 (±5.34)
Focussed Meditation Multiple	40.4 (±10.57)	48.8 (± 6.19)	44.6 (±9.47)

A 3 (C/FMS/FFM) x 2 (Eyes Open/Eyes Closed) analysis of variance (ANOVA) was conducted on the total number of correct items reported. Levene's test for homogeneity indicated an equal variance across groups (p = 0.81). There was a significant main effect across all FM conditions, with participants across all groups providing more correct responses F (2, 54) = 35.33, *p* = < .001, n^2 = 0.567, than across the control groups. There was no significant main effect of eye closure, F (2, 54) = 3.02, p = 0.053, although it did approach significance. Again, as per the results of the first experiment, and contrary to previous studies, there was no significant interaction between FM and EC F(2, 54) = 2.85, *p* = .067, n^2 = 0.095

5.3.4 Cued Recall

The cued recall questionnaire consisted of 27 questions; therefore the maximum amount of points available was 27.

Condition	Correct			Incorrect		
	Eyes Open	Eyes Closed	Total	Eyes Open	Eyes Closed	Total
Control	13.0 (±1.24)	13.5 (±2.91)	13.25(±2.19)	4.8 (±1.93)	3.2 (±1.87)	4.0 (±2.02)
Focussed Meditation Single	14.0 (±2.9)	14.9(±2.28)	14.45(±2.60)	3.0 (±1.69)	4.0 (±1.94)	3.5 (±1.84)
Focussed Meditation Multiple	17.9(±2.51)	18.5(±2.27)	18.2 (±2.97)	2.7 (±1.49)	2.1 (±1.11)	2.4 (±1.31)

A 3 (C/FMS/FFM) x 2 (Eyes Open/Eyes Closed) analysis of variance (ANOVA) was conducted on the total number of correct items reported in the CSQ. There was a significant main effect across both FM conditions, with participants providing more correct responses F (2, 54) = 22.58, *p* = < .001, n^2 = 0.456, than across the control groups. There was no significant main effect of eye closure, F (2, 54) = 1.13, p = 0.293. Again, as per the results of the first experiment, and contrary to previous studies, there was no significant interaction between FM and EC F(1, 54) = 0.67, *p* = .420, n^2 = 0.011.

5.3.4.3 Crime Scene Questionnaire Confidence:

Table 5.6

Condition	Correct			Incorrect		
	Eyes Open	Eyes Closed	Total	Eyes Open	Eyes Closed	Total
Control	6.61 (±0.71)	6.65(±1.38)	6.64(±1.07)	5.91(±0.94)	6.53(±1.81)	6.22(±1.44)
Focussed Meditation Single	6.65(±1.38)	7.47(±0.57)	7.06(±1.12)	5.18(±2.15)	5.65(±1.44)	5.42(±1.80)
Focussed Meditation Multiple	7.09(±1.21)	7.29(±0.87)	7.19(±1.04)	5.47(±1.14)	5.81(±2.00)	5.64(±1.59)

A 3 (Control/FMS/FMM) x 2 (Eyes Open/Eyes Closed) ANOVA was conducted to test whether confidence was inflated in correct responses. There was no significant differences in confidence in correct responses, $F(5, 1) = 1.71$, $p = .236$. Thus again suggesting that an FM instruction does not result in increased confidence in correct responses.

A 3 (Control/FMS/FMM) x 2 (Eyes Open/Eyes Closed) ANOVA was conducted to test whether confidence was inflated in incorrect responses. There was no significant differences in confidence in incorrect responses, $F(5, 1) = 1.71$, $p = .266$. Thus again suggesting that an FM instruction does not result in increased confidence in incorrect responses.

5.4 Discussion

This chapter aimed to address the issues discovered in studies 2 and 3, in that by the time participants had reached the last tasks in those studies, the FM instruction was not proving beneficial as it had done in the face recognition tasks and previous studies by Wagstaff and colleagues. As previously mentioned, Wagstaff et al. found that the FM instruction was beneficial in free recall and cued recall tasks. However, that was not replicated in the first two studies here. The question is, why did that happen, and what could be done to address this issue.

One of the issues that could be identified was the time it took to perform all the tasks in these studies presented here compared to the tasks performed in Wagstaff's studies. In the studies in this thesis, time was a factor in that there were multiple tasks in this study that took between 35 and 45 minutes to complete in full compared to the single task studies of Wagstaff. As such, it was determined that time could indeed be the factor, and therefore the effects of the FM instruction could subside after a certain period of time. While the exact amount of time was not identified, approximate suggestions indicate the effect being in use for 15 minutes.

This present study addressed the issue by introducing the FM instruction at each stage of the study, so it was repeated before the face recognition task, before the voice recognition task, and before the free and cued recall. The results showed that, in contrast to studies 2 and 3, participants provided far more information on both the free and cued recall tasks, thus demonstrating that there is a time limit to the beneficial effects of FM, and multiple administrations could also be beneficial.

Chapter 6

Summary and general discussion

The final chapter of the thesis discusses the theoretical and practical implications of the research findings. First, an overview of the research aims will be presented and their main findings. Towards the end, the limitations of the research will be discussed, along with recommendations for future research.

6.1 Research Aims and Main Findings

This thesis aimed to investigate the benefits of a focused meditation instruction on witness testimony. The first aim was to explore the theoretical underpinnings of FM and whether an FM instruction primed a global processing style. The second aim was to explore if the FM could prime a global processing style congruent with face recognition and improve accuracy rates from a line-up. A third aim was to explore the effectiveness of FM on a free and cued recall task. The fourth aim was to check the effectiveness of FM on voice recognition. The final and an a posteriori aim that arose from the findings of studies 2 and 3 was to explore the duration of the effects of FM and whether multiple applications of FM resulted in improved outcomes and more accurate information than a single application.

A summary of the findings:

1. AN FM instruction improved reaction times on a Navon task in both local and global processing, suggesting an improvement in concentration (study 1)

2. FM did not change the local processing style to global (study 1)

3. FM improved accuracy rates on a face recognition line-up (study 2)

4. The FM did not negate the verbal overshadowing effect on a face recognition task (study 2)

5. FM did not increase the amount of information on a free recall task (Study 2 and 3)

6. FM did not increase the amount of correct responses on a cued recall task (studies 2 and 3)

7. FM did provide for more correct identifications on a voice recognition task but was not statistically significant (study 3 and 4)

8. Multiple administrations of FM were shown to be beneficial on a free and cued recall test.

6.2 Theoretical Implications

Across several separate studies (2, 3 & 4), the FM instruction improved accuracy rates on face and voice recognition tasks. Studies 2 and 4 showed significantly improved accuracy rates on the face recognition tasks. Studies 3 and 4 showed greater amounts of correct identifications of a voice recognition line-up task. However, the results were not statistically significant. The final study showed the benefits absent from the previous two studies of FM on free cued recall correct responses. In summation, the FM instruction seems robust across multiple tasks.

6.3 Global/Local Processing

Ready & Bothwell (1997) and Wagstaff et al. (2004, 2011) have suggested that focussed meditation encourages a more holistic/global processing style. Study 1 utilised the seminal stimulus from Navon (1977). The Navon Task is large letters made up of smaller letters. The task required participants to either attend to the larger or smaller letters. From this experiment, Navon determined that there was a global precedent effect, in that the global features are perceived first and then broken down to their constituent parts. As such, the Navon task was determined to be a robust test that could be used to explore if FM primed a global processing style. The control condition did show a global precedent effect, and while the FM condition did not show significant effects of FM, reaction times were quicker for both local and global letters. In addition, 50% more participants in the FM group showed a global preference over local.

The finding that there is a global precedence effect has implications for face and voice recognition (see studies 2, 3 and 4) and, although not considered in this thesis, emotionally salient information, as Wagstaff (2009) has suggested, is also processed globally.

6.4 Face Recognition

Wagstaff et al. (2004, 2011) suggested that FM led to a more holistic/global processing style by focussing one's breath on a stimulus outside of one's body. In one particular study, an FM instruction was found to increase accuracy rates on a face recognition task, whereby participants were shown photographs of individuals and were later requested to pick out those faces from a selection of photos. Tanakah and Farah (1993) have shown that faces are processed globally, so if the FM instruction successfully improved accuracy rates, it could be hypothesised that FM promotes a processing style, namely global, that is congruent with face recognition. This particular finding was replicated by Martin et al. (2017), who found improved accuracy rates on a line-up.

Across two studies (2 and 4), it was shown the FM instruction enhanced face recognition from a line-up. Studies 2 and 4 utilised a simulated crime scene, followed by two line-ups. The two line-ups consisted of nine static images viewed by the witness twice, which is the standard procedure in the UK (Seale-Carlisle & MIckes, 2016), the first time this particular type of study had been done with FM. Results were statistically significant, thus suggesting that FM did improve face recognition and, also suggest that FM primes a more global style of processing that is congruent with face recognition, which is in line with the results from previous research by Wagstaff et al.

The practical implications of these findings suggest that police could use the brief 1.5-minute focussed meditation exercise prior to administering a line-up, especially as it has been shown to enhance face recognition from a line-up.

6.5 Voice Recognition

Blank et al. (2011) suggested that there are correlations between face and voice recognition modules in the brain's right hemisphere, and they work similarly. If this is the case and voices are processed globally like faces, then it is possible that priming a global processing orientation could improve the recognition of voices. Vangas et al. (2005) showed in experiment 2 that voices were susceptible to the verbal overshadowing effect and maintained that the verbal overshadowing resulted from inappropriate processing styles. As such, there is the possibility that administering an FM instruction prior to a voice recognition line-up could improve accuracy rates.

Studies 3 and 4 explored the FM's effect on voice recognition. More correct responses were provided in the FM condition across the two studies, suggesting it could be beneficial; however, the differences were not statistically significant. There were different circumstances to the voice recognition tasks than the face recognition tasks that could account for the non-significance, such as the fact that study 3 was done in groups. Further research is warranted into the effects of focussed meditation on voice recognition, and the implications for this are similar to those of the face recognition tasks, in that a brief instruction could lead to more accurate identifications by priming a global processing style that is congruent with voice recognition.

6.6 Single vs Multiple Administration

Throughout their output on the benefits of focussed meditation, Wagstaff and colleagues have demonstrated that the FM instruction leads to better outcomes on free recall tasks, with more information that is also more accurate. In studies 2 and 3 of this thesis, this was found not to be the case, with FM not showing improved outcomes on free recall. The question that this posed was, why was this happening?

The sequence of events was the difference between the studies by Wagstaff et al. and the 2 and 3 of this thesis. The time to reach the free and cued recall tasks in studies 2 and 3 was about 20 minutes. After that, it appeared that the beneficial effects of the FM, as seen in face and voice recognition tasks, had subsided or vanished completely. It was therefore decided to test this notion by increasing the frequency of the administration of the focussed mediation exercise. It is as if the focussed meditation has a time limit and needs to be refreshed. The FM instruction was therefore administered prior to each individual task to strengthen the effects. The results did show that after multiple administrations, the beneficial effects on free recall, as evidenced by Wagstaff et al., were also present in study 4, suggesting that the FM does indeed have a time limit on it. The practical implications for this are numerous. Witnesses can be required to remember large amounts of information and can spend several hours relaying that information to investigators. Having a refresh of a short focussed meditation exercise could improve outcomes and more reliable witness testimonies

6.7 Confidence

A confidence–accuracy paradigm was outside the scope of this thesis, however, it was important to check that the FM instruction did not inflate confidence in correct or incorrect responses, as had been seen with forensic hypnosis. As was seen in previous studies by Wagstaff and colleagues, in focussed meditation, confidence was not inflated by participants in either correct or incorrect responses to the voice line-up, the facial line-up, and both free and cued recall. Thus possibly consigning forensic hypnosis to the past, as inflated confidence in hypnosis had been a relevant problem. However, in the present studies in this thesis, confidence was also not inflated in incorrect responses on both voice and face recognition and not for responses to the free recall and the cued recall tasks which is in line with the research conducted by Wagstaff et al.

6.8 Limitations and Future Research

Although the research presented here in this thesis made some important contributions to the literature, several limitations were also connected with the research. Some of the limitations have been discussed already elsewhere in this thesis, and some are expanded upon here.

6.9 Limitations of using the mean with Likert scales

While the mean is one the most commonly used measures of central tendency, there are disadvantages to using it, especially with ordinal data (Liddel & Kruschke, 2018). The mean represents that average value of the collected data, however, this can be affected by outliers, that is a small or large number can have a serious effect on the average, giving a distorted view of the data due to the extreme values, meaning the mean could be larger or smaller, compared to the true central value (Abramson, 1990). The mean can also not be calculated if a single data point is missing. Furthermore it is possible that two data sets may have the exact same mean even though there are different implications, which makes it difficult to draw conclusions from the data by simply looking at the mean as it doesn't provide a complete picture of the distribution (Jamieson, 2004). Liddel and Kruschke (2018) state that even though ordinal data is analysed, it is often analysed as if it were metric, which can lead to errors. Ordinal data is used often in psychological research as well as a multitude of other disciplines, and often it is used with Likert scales (Carifio & Perla, 2007). Likert scales as mentioned above, are often treated as metric data, but in actuality, contain no metric data, the numerals represent order and not equal intervals between levels (Jamieson, 2004; Norman, 2010). The debate has been a long one (Knapp,1990), but assuming an interval scale for ordinal data, such as a Likert scale is important as the descriptive statistics differ for those two scales. The wrong statistical test could be used, meaning the researcher may arrive at the wrong conclusions about their work. The statistical texts do advise that the median should be used for ordinal data as the mechanisms for calculating the mean are not appropriate for ordinal data. However Norman (2010) suggests that it isn't that straightforward. Indeed Norman suggests that parametric testing can be used with Likert scales, as long as the sample size is small.

6.10 Filler Tasks

In the current research, participants were required to engage in filler tasks, sometimes prior to the whole study beginning and others during the study. For example, in study 4, participants not in one of the focussed meditation conditions were required to answer general knowledge questions instead of being administered the instruction. What is needed to be taken into consideration here is that the general knowledge questions may have disrupted the participant's concentration which could have affected how they responded to the free and cued recall tasks. Granted, the filler task remained the same throughout all the studies employed, but this must be considered.

6.11 Sample Size

Another limitation of the studies in this thesis was sample size and the lack of male participants, which couldn't be avoided. One of the studies had eight different groups, which meant there were groups with only ten participants.

6.12 Ecological Validity

One of the main problems with experimental research on eyewitness testimony is the lack of ecological validity. The events that participants are exposed to in this thesis, for example, a staged crime scene, are very different from the experience of witnessing a crime in real life. Experiments that rely on videotaped staged crimes tend to lead to more accurate reporting than in a real-life situation (Murray & Wells, 1982). As such, the results may be slightly exaggerated and overestimate the resulting performance from a participant. Indeed Ihlebæk et al. (2003) found that recall of videotaped and staged events tended to be filled with more accurate detail than the recall of a live event, as such experiments utilising staged videotaped crimes may lead to an over estimation of the performance of witnesses in a live event. What is needed in experimental research is to replicate the same arousal that a real-life eyewitness would feel. As Wagstaff et al. (2003) ask, are laboratory findings applicable to the real world?

6.13 Future Research

Expanding the studies into field research would, of course, be optimal to see if the multiple administration of the focussed meditation exercise has the same results when in actual use. While laboratory experiments provide opportunities to test the effects of focussed meditation in a controlled environment, this does not mean it necessarily transfers to the field, where circumstances are not so much under control. For example, watching a crime scene film on a screen does not pose the same problems as walking through a city centre and witnessing a crime. All conditions can be controlled in the laboratory, which is not equivalent to happening in real life. Noise and environmental distractions are controlled, which would not happen in the open and affect the witness. Other estimator variables, such as weapons and stress, can affect a witness' recollection of events that are difficult to recreate in the controlled environment of a university lecture theatre. Laboratory experiments cannot simulate the real levels of arousal felt by eyewitnesses of violent crime. Future research should also include larger sample sizes. One of the limitations of the NAVON task was the proximity of the keys, B and N, which could have led to inadvertent error, future studies should use different keys to avoid this issue

6.14 Conclusion

The studies presented in his thesis show that a focused meditation instruction can substantially increase the amount of information provided by witnesses and provide more accurate identifications from a line-up. The first study showed that FM concentration increases and perhaps elicit a change to a global processing style that is congruent with face recognition, although voice recognition performance was not enhanced by the FM instruction. The issues that arose from studies 2 and 3, namely, FM having no beneficial effects on free and cued recall as per previous studies, were addressed in study 4. It was discovered that FM has a time limit to its usefulness that appeared to be around the 15-minute mark. Multiple administrations of the FM addressed the issue prior to each task; this resulted in an increase in correct information being provided in the free and cued recalls. While eye closure showed some benefits, across studies, particularly in study 2, regarding auditory details, however, the effect was not transferred to voice recognition, and there were no additive benefits of FM and eye closure used together.

The results do have implications for eyewitness research and investigative interviewing. With other interview techniques, such as the cognitive interview proving to be cumbersome and hard to deliver and difficult to train investigators, a shorter technique that encompasses a 1.5-minute focussed meditation exercise may be beneficial. The criticisms levied at the PEACE model of interviewing are similar to those levied at the cognitive interview, as in the process is overly long and officers have difficulty adhering to it fully, meaning it is not implemented properly; it is also difficult to teach and can result in expensive training. Therefore implementing a shorter more practical interview technique, that is easier to teach, easier to administer and is cost effective, could be a way of improving the outcomes, especially if adheres to the principles of the PEACE model. It is easier to teach prospective interviewers and is not too onerous for the witness. It could certainly serve as a simpler alternative to what is already in use.

To conclude, while not all the results of this thesis concurred with previous research, some of the current findings do suggest that a focused meditation exercise can improve witness testimony and identifications from a line-up, especially if the FM exercise is administered multiple times.

APPENDIX

Crime Scene Questionnaire

Below are a series of questions pertaining to the crime scene you have just witnessed.

Please answer the questions to the best of your ability.

For each question, please mark down how confident you are in your answers on a scale of 1-9, with 1 being no confidence whatsoever to 9, being absolutely certain.

For example:

1 - No confidence whatsoever

3 - Somewhat unconfident

5 - Neither confident nor unconfident

7 - Quite Confident

9 – Certain

Question 1. What was the name of the street?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 2. Did you see the no entry sign at the beginning of the street?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 3. What was the number on the door on the corner of the street?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 4. What other buildings are in the street where the crime happens?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 5. What other modes of transport passed by the end of the road where the incident took place?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 6. There was a van parked in the street, what colour was it?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 7. Someone runs across the street, was it male or female?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 8. Did you see the two women pushing a pram?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 9. A man suddenly goes to the ground, describe what he was wearing?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 10. The sick man walks past a car, what colour was it?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 11. A woman walks up to the man, what was she wearing?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 12. What was she carrying?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 13. Did you see what the sick man was carrying ?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 14. What is the man's name?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 15. What does the woman ask the man?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 16. What was the colour of the bag?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 17. What does the sick man say is wrong with him?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 18. What does the woman offer to do?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 19. What does the woman take out of her bag?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 20. What colour is the door behind where the incident occurred?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 21. Was the man wearing a cap holding a case?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 22. The building where the incident occurs is next to what appears to be a residence, what colour was the house?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 23. Who does the sick man ask the woman to call?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 24. Did you see a green door with the number 175c on it?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 25. What is the name the sick man gives?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 26. What colour was the door behind where the incident occurred?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

Question 27. What is the shop seen in the clip?

(No confidence whatsoever Absolutely certain)

1 2 3 4 5 6 7 8 9

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