

**Disguising external features affects  
identification accuracy in video  
identification lineups**

by

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## ABSTRACT

Hooded garments are a widespread fashion article and readily lend themselves as a disguise in terms of covering the hair and majority of the face. The presence of external features and maintaining the context in which a face was first seen have both been found to facilitate unfamiliar face recognition (Walker-Smith, 1978; Cutler, Penrod & Martens, 1987; Henderson, Bruce & Burton, 2001; O'Donnell & Bruce, 2001; Nachson & Shechory, 2002; Want, Pascalis, Coleman & Blades, 2004; Clutterbuck & Johnston, 2005). The following research investigated whether obscuring the hairstyle of a perpetrator of a crime affects subsequent identification when viewed in a video identification parade where hair is visible (i.e. context has been changed). Participants ( $N = 96$ ) viewed a crime scenario and video identity parade where external features were manipulated in terms of absence of a hood. Correct identifications were significantly higher for congruent film and parade conditions and lowest when a hood was worn during the crime but absent on the video identity parade. Also examined was the relationship between confidence and accuracy, considering inflated levels of confidence have been associated with low levels of identification (Cutler, Penrod & Dexter, 1990; Brewer & Burke, 2002; Memon, Hope & Bull, 2003). A significant association was also observed between confidence and accuracy levels with moderate levels of confidence being associated with moderate levels of accuracy. Results are interpreted in terms of the importance of external features in unfamiliar face recognition and preserving conditions between encoding and subsequent presentations of the face to permit optimum conditions for identification in video identity parades. Effects of briefing procedure and sex differences in identification are also discussed.

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## **1. Introduction**

### *1.1 Overview of Research*

Research has illustrated that unfamiliar face recognition is afforded an advantage from external features (Walker-Smith, 1978; O'Donnell & Bruce, 2001; Nachson & Shechory, 2002; Want Pascalis, Coleman & Blades, 2004). In relation to eyewitness identification, appreciating that numerous disguises may be adopted when crimes are committed, the aim of the current research was to explore the effects of presence or absence of a hood obscuring external features upon identification of perpetrators on a subsequent video identity parade. The current practices in eyewitness briefing and interviewing techniques were also investigated. A general overview of the theory behind and factors impacting upon face recognition will be provided before specifically addressing those affecting the identification of perpetrators. The following research was conducted in collaboration with Leicestershire police, employing the identical procedure used in video line up identifications at the Leicestershire Police Identification Unit and assisted by a grant from the Faculty of Health and Life Sciences.

## **2. Literature Review**

### *2.1 The Special Nature of Faces*

In contrast to other object categories, the special nature of faces has long been a subject of debate by researchers and one which has infiltrated many areas of face recognition research. Many studies have explored the effects of inverting faces and other objects in order to gain an insight into the perceptual processes involved. As a review of subsequent research will illustrate, there is evidence to suggest that inverted faces are perceived as qualitatively different to upright faces and inverted and upright objects and also that unfamiliar and familiar faces.

The concept of the uniqueness of faces compared to other objects was explored by Yin (1969). In a series of 3 experiments, Yin (1969) tested individuals' ability to recognise upright and inverted pictures of faces, cartoon stick men, cartoon aeroplanes,



houses and period costumes. Inverted faces were found to be significantly more difficult to recognise than any of the other inverted objects, although upright faces were significantly easier to recognise compared to other upright objects and thus implied that faces were a special type of object class. This view was challenged however. Gauthier and Tarr (1997) designed a specific set of stimuli (Greebles – computer-generated non-face stimuli comprising a central part and four protruding parts) to be learned. Both upright and inverted images were employed. After participants had undertaken an extensive period of training, the superiority effect that was present with faces and effects of configural changes were also observed for Greebles leading the authors to suggest that expertise may play a part in the recognition of categories other than faces. They acknowledged however that upright stimuli had been presented first which could have confounded results.

Rossion, Gauthier, Goffaux, Tarr and Crommelinck (2002) also employed faces and Greebles (upright and inverted) to further explore the effects of expertise in an event-related potentials (ERP) study. During the pre-training session, the N170 ERP was greater and more delayed for inverted faces in comparison to upright faces. For Greebles however, there were no significant differences between upright and inverted conditions for latency or amplitude. Post-training however, a rise in amplitude and delay in response time was observed for inverted compared to upright Greebles, although for inverted faces, latencies remained similar. The authors highlighted that although the inversion effect was maintained for faces pre and post-training, it became more pronounced for Greebles after training, implying that expertise could induce inversion effects in object categories other than faces, rather than assuming it could be a specific effect attributed solely to faces, thus refuting the speciality hypothesis.

Appreciating the potential specialness of faces, a number of models have been developed to account for the way faces are processed. In particular, they attempt to explain the processing of familiar and unfamiliar faces, the latter of which is of prime concern in relation to eyewitness identification.

## 2.2 Models of Face Recognition

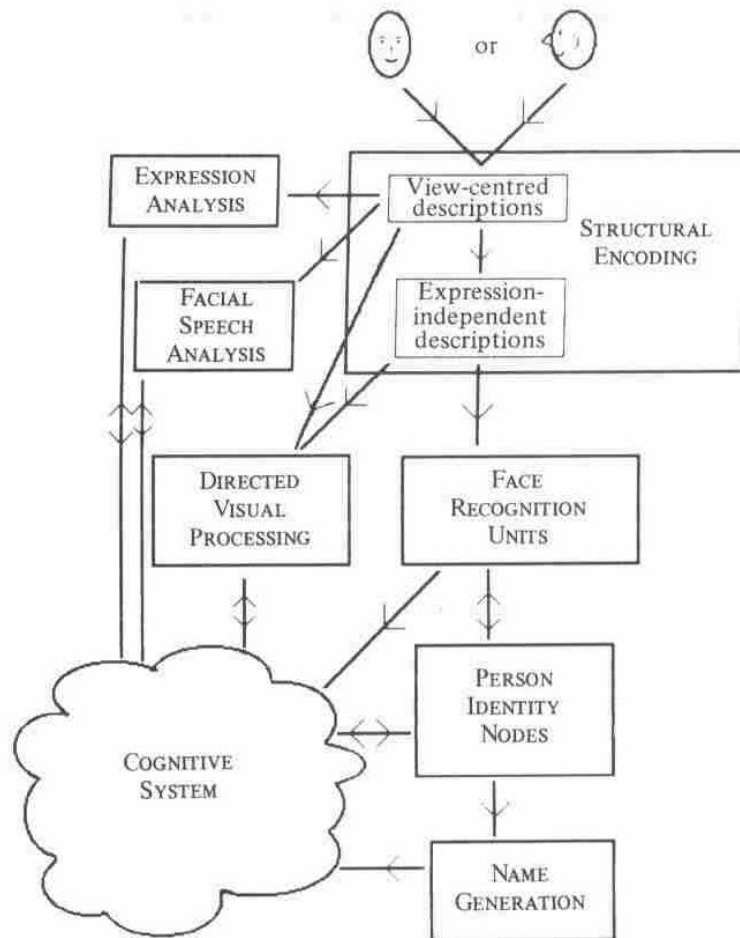
Many different models exist in order to account for the way faces are perceived and recognised including computational ones which apply the method of principal components analysis where facial averages are generated (i. e. Burton, Bruce & Hancock, 1999). However for the present research, consideration was predominantly afforded to the theoretical model of face recognition developed by Bruce and Young (1986) who identified different processing routes for familiar and unfamiliar faces.

### 2.2.1 A Functional Model for Face Recognition

Bruce and Young (1986) developed a functional model for face recognition incorporating evidence from studies of face processing disorders arising from varying types of brain injury, and studies of recognition errors made by individuals with intact face recognition ability both in daily life and under experimental conditions. The model comprises seven different types of information code provided by faces which the authors suggest are artefacts of the system of the functional components.

*Pictorial codes* include information combined after successive viewings of pictures or photographs of faces, incorporating a range of information such as lighting, expression and static pose which help to decipher yes/no decisions in recognition memory. *Structural codes* facilitate familiarity decisions and the process of distinction between faces. Such codes differ for unfamiliar and familiar faces, with codes for unfamiliar faces limited by information available at the original exposure. For familiar faces however, structural codes highlight the less variable face regions and recognition occurs when a correspondence is evident between a pre-existing structural code and an encoded representation of the face. *Visually derived semantic codes* provide information such as honesty, age and sex, which can be obtained for unfamiliar faces. Conversely, *identity-specific semantic codes* qualify familiarity status and provide information such as occupation for familiar faces. *Name codes* permit name generation and are distinguished from identity-specific semantic codes owing to the fact that a sense of familiarity may arise without necessarily being able to recall an individual's name. *Expression codes* provide emotional information gained from observing the postures of features and *facial speech codes* are obtained from lip and tongue movements. The model proposes a number of separate stores or components responsible for discrete

functional activities, with unilateral and bilateral links between each (see *Figure 1.8.1* below).



*Figure 2.2.1.* A functional model for face recognition (Bruce & Young, 1986).

Structural encoding provides featural and configural face information in terms of abstract and view-centred descriptions. The latter inform expression analysis and facial speech analysis, while abstract descriptions inform face recognition units (FRUs). FRUs possess stored structural codes for individual familiar faces. Signal strength depends upon the level of match between structural encoding input and stored description. Activation of a FRU results in the activation of the appropriate person identity node (PIN) holding identity-specific semantic codes. PINs may be accessed by an individual's voice, face or name, unlike FRUs which are only activated by faces. Names may be retrieved solely by PIN activation however a familiarity decision can be

ascertained without access to a name at the point in structural encoding where expression-independent descriptions inform the FRUs. The cognitive system retains episodic and associative peripheral information supplementary to that located in the PINs. The cognitive system has bidirectional links with PINs, directed visual processing, facial speech analysis and expression analysis components (the latter three assisting in the assessment and assimilation of information for unfamiliar faces).

### 2.3 Features and Configurations

Much research has been undertaken to explore the amount of weighting provided by specific features, their configurations and the whole form (holistic – including features and the spatial relations between them) to face recognition in order to establish the saliency of each. As will be discussed later, certain sets of features have been illustrated to facilitate recognition of different categories of faces, predominantly external features for unfamiliar faces and internal features for familiar faces.

The terms configuration and holistic have been used synonymously by researchers, however as Leder and Bruce (2000) highlighted, the term *configuration* has also been subject to a number of interpretations. Diamond and Carey (1986) described classes of objects which possessed variance in configuration and where the spatial relations differed between similar parts (e.g. landscapes) as having first-order relational properties. For classes of objects which shared a configuration however (including faces), the specific relations between the components that demarcated the shared configuration were ascribed the term second-order relational properties. They further asserted that the features enabling faces to be differentiated from each other resided on a continuum ranging from isolated (e.g. hair colour) to relational (e.g. distance between eyes), with the amount of dependency upon highly relational differentiating features discriminating between face representations and other object class representations. Conversely, Tanaka and Farah (1993) provided a definition of the holistic/featural divergence proposing that visual representations of objects were organised in a hierarchical manner and that the whole comprised specific parts. *Holistic* referred to recognition occurring as a result of the sum of the parts in their entirety as opposed to *featural* where recognition would be a product of the individual components. They

suggested that the two need not be mutually exclusive, but may be employed to varying degrees dependent upon the object in question. The authors explored this concept in a series of three experiments. In Experiment 1, participants ( $N = 21$ ) memorised a series of scrambled and intact Mac-a-Mug faces (computer generated with three different exemplars per feature) and were then required to complete a two-forced-choice recognition task for features (eyes, nose or mouth) presented within the context of a whole face (intact or scrambled) or in isolation. Results revealed that isolated parts taken from intact faces were identified correctly on 62% of trials compared to 73% when the same parts resided in the whole face. For isolated parts taken from scrambled faces however, correct identification was 71% compared to the same part in the whole scrambled face (64% correct), revealing an opposite effect to that yielded from intact faces. For facial features, correct eyes, nose, mouth judgements were 80%, 62% and 63% correct respectively. The authors postulated that results implied an advantage for holistic processing for intact faces over scrambled. In Experiment 2, scrambled faces were substituted for inverted faces. Findings revealed that recognition was significantly better for whole upright faces compared to whole inverted faces, although no significant difference was evidence for isolated parts in upright or inverted faces. No significant difference in accuracy was evident between inverted whole face (65%) and inverted isolated parts recognition (64%). For upright whole faces however, correct recognition was 74% in comparison to isolated part recognition (65%). Individual feature recognition repeated the same pattern as in Experiment 1; 76% correct for eyes, 64% for nose and 63% for mouth features. Tanaka and Farah asserted that compared to inverted faces, as with scrambled, a recognition advantage was evident from holistic processing for intact upright faces. Experiment 3 examined the impact of parts (windows & doors) and wholes for house recognition in order to determine whether the holistic advantage was evident for objects other than faces. Compared to features shown within isolation (65% correct) and within the whole face (77% correct), no advantage was observed for whole houses (79% correct) compared to isolated house parts (81% correct) leading the authors to highlight the importance of holistic representation in face processing and its contrasting nature in relation to object recognition. Considering the importance of the whole face in relation to isolated parts, it may be asserted that in terms of eyewitness

identification, any disruption in terms of covering part or the whole face with a disguise may lead to difficulties in identifying the perpetrator.

In a series of four experiments, Tanaka and Sengco (1997) further explored the concept of holistic processing by manipulating individual features and featural configurations. Featural configurations were interpreted in the capacity described by Diamond and Carey (1986) in terms of first and second-order relational properties. In Experiment 1, participants ( $N = 24$ ) were required to learn six Mac-a-Mug face and name pairs. Stimuli comprised eyes, noses and mouths in a generic face outline and had been generated so that two copies of foils and targets existed; with eyes far apart or close together. During testing, individuals responded to a yes/no alternative forced-choice decision task according to whether or not one of the features (eyes, nose or mouth) corresponded to the respective faces learned previously. Trials included isolated feature pairs, old configuration and new configuration pairs. Findings illustrated that features were recognised in old configurations significantly better (77% correct) than in new configurations (72% correct), with both of the former being significantly better recognised than features in isolation (65% correct). Further, spatially manipulating eyes was observed to significantly impair recognition of unchanged nose and mouth features leading the authors to suggest a configural and part information co-dependency. Experiment 2 investigated the effects of inversion. For the upright face condition, results replicated those of Experiment 1. However for inverted faces, no significant difference in correct recognition was observed between parts recognised in old or new configurations or in isolation, illustrating no effect of configural information and implying an absence of holistic processing (Tanaka & Sengco).

In order to investigate whether the inversion effect was a product of absence of configural processing *per se* or whether configural processing was different for distinct types of upright objects, houses in addition to faces were employed as stimuli in Experiment 3. Results revealed that on 78% of trials face parts were correctly identified, compared to 84% for house parts. For houses, no significant difference in recognition for parts was observed between old configurations (83%), new (84%) and isolated parts (83%). House part recognition remained unaffected by changes in spatial relationships

between parts. In case results were being confounded by the perceptual dissimilarity of house features, Experiment 4 incorporated stimuli which were more similar in appearance to ascertain whether holistic processing would be magnified. No significant difference in correct recognition was observed between house parts (79%) and face parts (76%). As in the previous experiments recognition hierarchy was maintained; correct recognition for face parts was 85% for old configurations, 74% for new and 69% for isolated parts and again, manipulating the distance between eyes significantly reduced nose and mouth recognition. No significant difference was evident however between old configurations (79% correct), new (79% correct) and isolated features (78% correct) for houses. Again, manipulating the distance between house parts procured no significant effects. Overall, results illustrated that configural changes impacted upon holistic feature recognition for upright faces, but not for houses or inverted faces. Tanaka and Sengco highlighted that manipulating the spatial position of a specific feature adversely affected recognition of features with unchanged spatial position and also emphasised that above chance recognition for isolated features signified independent encoding from featural configurations; culminating in the suggestion of interdependency between configural and featural processing for holistic face recognition.

Leder and Bruce (2000) further explicated the definition of configural. They redefined Diamond and Carey's (1986) explanation of configural (exact spatial relationship between features) as *relational* information and further, differentiated between relational information and local features, i.e. basic elements such as individual features. In a series of five experiments they explored the effects of inversion upon local and relational information. In Experiment 1, participants ( $N = 16$ ) learned two sets of six upright face-name pairs composed of Mac-a-Mug features. In one set relational information was standard and local information differed in terms of feature colours. In the second set relational information was manipulated. At test faces were shown in both upright and inverted orientations and individuals were required to name each face. Significantly more correct identifications were made for upright faces in the relational condition compared to inverted faces however no significant difference was observed between inverted and upright face conditions for local features, leading the authors to

suggest than the manipulation of solely relational information was responsible for the inversion effect. In order to explore whether invariability of relational information was responsible for the absence of effect, this was factored into Experiment 2; where stimuli (varying in skin colour) consisted of relational and local information (combined) or purely local information. As before, no significant difference in correct identification was evident between upright and inverted faces for local information, although significantly more correct identifications were made for upright compared to inverted faces in the local and relational (combined) condition. No significant difference was observed between means of upright local and upright local and relational (combined) conditions. A significant effect was observed however for the inverted combined condition, but not for the inverted local condition leading the authors to emphasise the importance of relational information in procuring an inversion effect and consequently differentiating between same classes of objects. In Experiment 3, the effects of change in luminance level (brightness of features) as opposed to skin colour for local information were investigated. Findings illustrated a significant effect of inversion in the relational condition, but no significant effect of inversion in the local condition. For upright and inverted conditions respectively, correct recognition employing relational information was 74% and 57%. For local information, correct recognition was 74% in the upright condition and 72% in the inverted condition. From Experiments 1, 2, and 3, Leder and Bruce concluded that cues afforded by relational information from upright faces were disrupted during inversion. They suggested that as the specific stimuli employed as local information were not subject to inversion effects, evidence of the influence of holistic processing was doubtful for those specific features (brightness & colour).

In Experiment 4, relational information was subject to further investigation, to explore the level of involvement in the recognition process. Additionally, the importance of the facial context was examined. Stimuli to be learned differed in terms of a single relational feature. During testing, participants viewed one of four conditions; same context, where one feature was included in critical relational information (CtxPart); isolated parts in addition to a highly redundant context (CtxRel); isolated parts including specific relational information (IsoRel); or a full face condition. Results



revealed that a recognition advantage was present for upright faces in all four conditions. An inversion effect was also observed for each condition. Compared to other conditions, performance was lowest in same context (CtxPart). Recognition was better for full faces compared to CxtRel faces, but no difference was evident between CtxRel and IsoRel, leading the authors to highlight the importance of relational information in memory representation. The fact that an advantage was not revealed for face processing in the CtxRel condition and also that in the CtxPart condition, context failed to act as a substitute for essential relational information led the authors to suggest that weighting was evident for the relational view of the configural hypothesis as opposed to the holistic view. Experiment 5 further explored the relationship between features and spatial relations. Stimuli differed with respect to shape of feature, with one local feature unique to each face. Further, a face could be differentiated by a distinct relational feature however the local elements comprising the relational information were common to another face. A significant effect of inversion was observed for full face and relation conditions although not for the local condition. Performance in the full face condition was significantly better compared to local and relational conditions independently. Overall findings illustrated that the relational information was retrievable when faces also differed in respect to local information. Acknowledging the results from Experiments 1-5 cumulatively, the inversion effect occurred for relational information but not for local information, regardless of whether the local information possessed brightness, colour or form values, leading Leder and Bruce (2000) to conclude that for upright faces, both configural (relational) and local information may independently contribute to processing, with a primary reliance upon relational processing.

In summary, the views differ regarding what constitutes a definition of configural and also the amount of weighting the whole face and configurations of features provide to enable effective face recognition. For Tanaka and Farah (1993), holistic referred to the face being perceived in its entirety, excluding the impact of relational properties between features and a recognition advantage was found for holistic processing. Diamond and Carey (1986) however asserted that configurations comprise first-order relational properties (relationships between features) and second-

order relational properties (distances between features). In essence, they highlighted the importance of a shared configuration and the ability to differentiate between same-class objects employing second order relational information. Tanaka and Sengco (1997) assumed the properties ascribed by Diamond and Carey (1986) and from their studies, suggested an interdependence was evident between featural and configural information. Leder and Bruce (2000) redefined configural information as relational information, and suggested from a series of experiments that relational and local information combine to facilitate the processing of faces with weighting given to relational information, rather than accepting the concept of holistic processing where the face is considered as a whole unit. Although the above studies predominantly employed Mac-A-Mug faces (Tanaka & Farah, 1993, Tanaka & Sengco, 1997 and Leder & Bruce, 2000), which it may be argued could compromise the ecological validity of findings, relational information appears to play a major part in the recognition process. This becomes an important point for consideration when the external feature of hair is taken into account.

#### *2.4 Familiar and Unfamiliar Faces – The Internal and External Divide*

Research has illustrated that familiar and unfamiliar faces may be processed differently, with different features or groups of features affording specific recognition advantages. More specifically, there is evidence to suggest that external features facilitate the recognition of unfamiliar faces and internal features assist in the recognition of familiar faces. It may be asserted that in the event of a crime being committed where a disguise is adopted and hair is covered, the task of then identifying an already unfamiliar face becomes even more difficult, in addition to the other numerous surrounding factors which may add to the stress of the incident, to be discussed later.

Walker-Smith (1978) investigated the effects of exposure and delay upon unfamiliar face recognition. Stimuli consisted of 51 black-and-white Photo-fit images designed to include pairs where only one feature (eyebrows & eyes, noses, mouths, chins or forehead & hair) was different. Participants ( $N = 8$ ) were allocated to one of four conditions; Condition 1 (control) the target was initially displayed for 2s followed

by a mask of 1s then the test face for 1s; Condition 2 (long delay) target 2s, mask 20s, test face 1s; Condition 3 (long delay and short exposure) target 2s, mask 20s, test face 65ms and Condition 4 (short exposure) target face 2s, mask 1s, target face 65ms, and were required to make same/different decisions. Results were analysed in terms of reaction times, confidence ratings and error rates. Data revealed that hair, and to a lesser degree eyes, were processed faster, more confidently and accurately compared to noses, mouths and chins. After the 20s delay, eyes and mouths yielded higher error rates, but at the shorter delay performance was found to be significantly better. The author highlighted that hair followed by eyes yielded the best performance for each dependent measure, implying superiority of the top half of the face in recognition. Further, that immediate testing resulted in better performance for eyes and mouths implicated their role in expression conveyance (Walker-Smith, 1978). Although the sample size comprised only 8 participants, the fact that unfamiliar faces were employed suggests that hair played an important part in recognition for this category.

Ellis, Shepherd and Davies (1979) examined the impact of external and internal features upon unfamiliar and familiar face recognition. In Experiment 1, stimuli comprised 30 greyscale photographs of famous individuals (deceased and living) from the categories; actors, sports persons, royals and politicians. There were three derivations per face; whole, no external features and no internal features. Participants ( $N = 69$ ) viewed one condition only. Photographs were presented for 9 seconds and individuals were required to respond by documenting the name of the famous individual. Individuals identified approximately 30% of faces from outer features, 50% from inner features and 80% where the whole face was present, with a significant difference only found between outer versus inner conditions. In Experiment 2, unfamiliar face stimuli were employed. Individuals ( $N = 54$ ) initially viewed 15 faces before being presented with them again interspersed with distractors. An unrelated filler task was completed between encoding and test conditions. No significant difference in recognition rates or confidence was observed between external and internal features. In the final experiment, the procedure followed that of Experiment 2 except famous face stimuli were employed. Recognition was significantly greater for inner-part faces compared to outer-parts. Overall, famous face recognition was observed to yield an

advantage from internal features. The authors highlighted the importance of not generalising about the prominence of certain features, appreciating the potential differences in their contribution to unfamiliar and familiar face recognition.

Nachson and Shechory (2002) explored the impact of inversion upon unfamiliar internal and external face recognition. Participants ( $N = 24$ ) took part in pair-matching (PM) and multiple-choice matching (MC) tasks. Stimuli consisted of four full target faces and 96 test faces comprising; full faces, internal features (eyes, nose, mouth) and external features (face outline, hair, ears). For pair-matching, each test face was paired with itself and three test faces. There were 96 test-pairs in total. Individuals were required to give yes/no responses to indicate whether target and test faces matched. For multiple-choice matching, stimuli comprised four target faces, each with four test faces. When a target face was displayed, test faces were shown simultaneously, with one being identical to the target. Performance was found to be significantly more accurate on MC compared to PM. Further, recognition was significantly more accurate for upright faces compared to inverted for PM and MC. For internal features, recognition was least accurate and for full faces most accurate in both tasks. Reaction times were observed to be longest for inverted features and shortest for full faces in both tasks. Overall, slowest recognition was for internal features and quickest for full faces. Compared to internal features, external features elicited greater accuracy scores and faster recognition times. It may be suggested that this was consistent with unfamiliar faces being employed as stimuli.

From a developmental perspective, Want, Pascalis, Coleman and Blades (2004) investigated 5, 7, 9 year-old and adult participants' ability to recognise familiar and unfamiliar faces from internal features, external features and whole face stimuli. Participants viewed thirty 3-second moving videos showing a mixture of 15 unfamiliar females and males moving from a 90-degree turn to facing front whilst speaking their name, although the purpose of this was to induce facial movement therefore sound was removed. Videos were presented individually and after 1500ms pairs of photographs (still shots of the individual alongside a similar-matched individual) featuring full faces, ovals of eyes, nose and mouth (internal stimuli) or hair, chin and ears (external stimuli)

were displayed. Individuals were required to state which face they had seen previously. For all ages, full faces were recognised more accurately than inner and outer features alone. Five and 7-year olds were more accurate with outer compared to inner features, although no significant difference was evident between 9 year olds and adults. Again, for all ages, fastest recognition was for whole unfamiliar faces, but outer features alone were detected faster than inner features alone. The authors suggested this may be due to the fact that there is a greater variation between individuals' outer features, rendering this an advantage when a face is only viewed briefly and the opportunity to focus on the configuration of features is not present. This again highlights an outer feature advantage in unfamiliar face recognition.

Young (1984) examined the effects of internal and external features of famous faces in relation to hemisphere superiority. Participants ( $N = 24$ ) were allocated to one of four conditions; external features upright, internal features upright, whole face upright or whole face inverted. Individuals then viewed 20 black and white photographs of famous British males (each photograph had been manipulated to create internal features only and external features only counterparts). Images were presented bilaterally to the left visual field (LVF) and right visual field (RVF) for 150ms (a different face in each field). Participants were then required to identify the two faces from a 4 x 5 matrix after each presentation. There were 40 trials per condition. A main effect of stimulus type was revealed, with a recognition advantage for internal compared to external features and whole face compared to internal and external features. A main effect of visual hemifield was also observed indicating a LVF advantage. When whole and inverted faces were compared, the LVF advantage was observed for upright faces, but no hemifield advantage for inverted faces. The author highlighted the superiority of the right hemisphere in face processing *per se*, considering the absence of such an effect for inverted faces but advantage for upright, external and internal conditions. The point that the whole face presided over both internal and external features even for familiar faces implies that absenting or disguising external features may further impair recognition for unfamiliar faces.

Campbell, Coleman, Walker, Benson, Wallace, Michelotti and Baron-Cohen (1999) examined face recognition for familiar and unfamiliar faces in relation to internal and external features. In the first of five experiments, individuals ( $N = 40$ ) viewed 20 faces with either outer or inner features blurred and were required to name each famous face. Significantly more famous faces were recognized from their internal compared to external features.

Clutterbuck and Johnston (2005) investigated face familiarity and the impact of internal and external features. In the first of two experiments, stimulus pairs of frontal and three-quarter views were created for both celebrities and unfamiliar faces. Each frontal face had corresponding internal and external feature images (same) to be used for one of the pair and internal and external features extracted from another face (different). Participants ( $N = 60$ ) viewed frontal faces only during the learning phase. Each face was presented for either 10 times for 2s or five times for 4s with a space of 1500ms between each face. Individuals were requested to rate the distinctiveness of each face. During test, participants viewed 96 pairs of faces (permutations of famous, unfamiliar, 2s and 4s) and were required to make same/different decisions. Results revealed quicker reaction times for familiar faces paired with internal features compared to novel faces, irrespective of same/different decisions. Further, familiar faces presented 10 times for 2s were matched faster compared to novel faces. For internal features, errors were less for familiar compared to novel faces for both same and different tasks. For external features, significantly less errors were made for novel compared to familiar faces. In Experiment 2, new sets of stimuli were generated to produce sets of very famous faces and unfamiliar faces. The learning phase was the same as that in Experiment 1 except faces were viewed 10 times for 2s; the five times 4s condition was omitted. Findings illustrated that matching famous faces paired with internal features was faster than novel faces and learned faces seen 10 times/2s. Participants were also quicker at matching familiar (10 times/2s) learned faces compared to novel ones with internal features. Error rates in both experiments were found to be higher for external feature 'same' decisions compared to 'different' decisions for familiar faces.

Bentin, Allison, Puce, Perez and McCarthy (1996) conducted a series of five experiments investigating face perception and subsequent event related potentials (ERPs). In Experiment 4, participants were required to mentally count the amount of butterflies presented from a selection of stimuli also including unfamiliar full faces and individual noses, eyes and mouths. Each stimulus was exposed for 250ms followed by an interval of 1500ms before the next one appeared on-screen. Results revealed peak latencies of N170 for the full face at 173ms, eyes 186ms, noses 210ms and lips 215ms. Eyes were observed to elicit a significantly larger N170 at T6 compared to faces, lips or noses. In Experiment 5, stimuli remained the same as those used in Experiment 4 except that the full face was manipulated so that the outer remained the same but the inner features were distorted in order to explore whether or not a normal face presentation was sufficient to elicit N170. Compared to distorted faces, eyes elicited slightly larger and later N170s although the difference was not found to be significant. Bentin et al. suggested that the N170 may be responsive to individual features, and in particular eyes, rather than faces *per se*. The results may be interpreted as interesting in light of other studies where internal features have elicited an advantage in familiar face recognition, as the stimuli displayed by Bentin et al. were of unfamiliar faces. An interesting concept would have also been to explore the peak latency of hair had it been displayed in isolation in order to explore the possibility of hair displaying shorter peak latency than perhaps noses and mouths, appreciating the possible external / unfamiliar face advantage.

Stephan and Caine (2007) examined featural information and viewpoint transformation in unfamiliar face recognition. Participants ( $N = 62$ ) were divided into two learning-conditions;  $\frac{3}{4}$ -left and  $\frac{3}{4}$ -right. Stimuli consisted of four male and four female faces target faces in  $\frac{3}{4}$ -view. Test faces comprised five orientations; right profile, left profile,  $\frac{3}{4}$ - right,  $\frac{3}{4}$ - left and frontal and were digitally enhanced (all with hair and ears removed) to produce seven conditions per face; whole face – eyes, nose, mouth; eyes and nose; eyes and mouth; nose and mouth; eyes only; nose only and mouth only. Participants viewed eight faces successively for 4s each in the  $\frac{3}{4}$  view (left or right, dependent upon which learning condition they had been allocated to). This was followed by a two-alternative forced-choice (2AFC) recognition task where target and

test faces (comprising different orientation and feature manipulations) were presented simultaneously and a same/different decision was required. No significant effect of learning direction ( $\frac{3}{4}$ -left or  $\frac{3}{4}$ -right) or test direction (right versus left) was observed. There was no significant difference in performance for whole faces viewed in frontal at test, but a significant decrease in performance when viewed in profile. For each view, whole face recognition was better than part faces. When eyes and an extra feature were available, recognition accuracy was only slightly better for the whole face but significantly greater compared to all single-feature faces. Further, compared to nose only and mouth only faces, fewer errors were made to faces with noses and mouths combined. The greatest impairment of recognition was for faces where eyes were unavailable in comparison to eyes available faces. Considering all part faces, recognition accuracy was similar for  $\frac{3}{4}$  and frontal views, however a change at test to profile from a  $\frac{3}{4}$  view significantly decreased recognition to eyes-available faces. The only condition where recognition significantly improved in profile was mouth only. When mean reaction times were analysed, peaks were observed in the eyes-mouth and nose-mouth conditions. Overall, the feature informing recognition the most was the eyes, with the nose-only being less informative and the mouth being least informative in  $\frac{3}{4}$  and frontal views. Considering faces were unfamiliar and external features were unavailable, eyes appeared to play a salient part in the recognition process.

To summarise, the above studies, which have employed a range of methodologies, have provided an insight into the part played by different features in the recognition process, namely the recognition advantage afforded from internal features for familiar face recognition (Ellis, Shepherd & Davies, 1979; Young, 1984; Campbell, Coleman, Walker, Benson, Wallace, Michelotti & Baron-Cohen, 1999; Clutterbuck & Johnston, 2005) and external features for unfamiliar face recognition (Walker-Smith, 1978; Nachson & Shechory, 2002; Want, Pascalis, Coleman & Blades 2003). When external features are unavailable for unfamiliar faces however, eyes have been found to feature predominantly in the recognition process as illustrated by Stephen and Caine (2007) and in the perception process (Bentin, Allison, Puce, Perez & McCarthy, 1996).



### *2.5 When does recognition ability develop?*

Investigations have been conducted exploring the age at which recognition ability becomes established and the cues facilitating the process. Maurer, Le Grand and Mondloch (2002) suggested there were three separate types of configural face processing: first-order relations sensitivity where the stimulus is distinguished as a face, holistic processing where facial features are interconnected and second-order relations sensitivity where feature spacing differentiates individuals. In infancy however, it was asserted that featural processing was evident in addition to the three configural types, with the latter maturing at different stages. The composite and part-whole recognition effects were apparent by 6 years (adult level), however second-order relational processing was found to be markedly worse compared to adults.

Crookes and McKone (2009) evaluated evidence regarding the qualitative development of face perception in a literature review and by undertaking 3 quantitatively comparable studies. In Experiment 1 (explicit memory test), participants (age range 5 – 38 yrs) completed a 2-Alternative-Forced-Choice recognition test comprising faces with internal facial features only and dogs. No difference in development rate was observed after 5-6 years, leading the authors to claim a lack of support for face-specific hypothesis. In Experiment 2 (explicit memory test) inverted dogs and faces were employed. Participants ranged from 7 – 30 years. No difference in holistic processing was observed between ages, again casting doubt on the face-specific hypothesis but evidence of early qualitative maturity. Finally, Experiment 3A (explicit memory test) and Experiment 3B (implicit memory test) had identical learning phases but different test phases in order to test for own-age bias. The procedure for Experiment 3A followed that of Experiment 1. Explicit memory was observed to improve with age from children 5-6 years to adulthood. Also observed was an own-age bias for children. Results from Experiment 3B revealed priming present in young children but no increase with age, leading the authors to imply a shared ability between children and adults to describe, store and create a new face.

Evidence of recognition ability has been revealed from birth however. Turati, Macchi, Cassia, Simeon and Leo (2006) examined face recognition in newborns in a series of three experiments. In Experiment 1, three groups of 1 – 3 day-old infants were

tested on their recognition of familiarised faces where a.) The whole face was present (infants were habituated to a whole face and then during test, were required to choose between that or a similar looking full face), b.) Internal features were present (during habituation and test) or c.) Only external features were present (during habituation and test). No difference between conditions was observed, although for outer features, fixation times were significantly lower suggesting an external advantage. In Experiment 2, ninety-seven newborns (2 groups) were either a.) Habituated to a full face and then at test, were required to choose between that or a similar looking face, both with no hair, or b.) Habituated to a face with no hair and at test, were required to choose between the same and a similar face, both with hair. In both conditions, internal features failed to facilitate recognition, which the authors suggested was due to the need to identify the perceptual similarity from two very different stimuli, i.e. one with and one without internal features. Experiment 3 followed the format of Experiment 1 albeit all faces were rotated 180 degrees. In the no external features condition, newborns failed to recognise the face that had been familiarised, which the authors suggested was evidence of configural processing in Experiment 1 for the inner features condition, although the point that newborns were able to recognise an inverted full face implied the main cues resided within the external features. Turati et al. summarised that overall, results from Experiment 1 illustrated that outer or inner features singularly could provide viable recognition cues. An outer-features advantage was evident in Experiment 2 in addition to demonstrating sensitivity to the relations between outer and inner features. In Experiment 3, sensitivity to the spatial relations between inner features was observed. Considering that sensitivity to relations between inner and outer features was observed to be present at such an early age, in addition to acknowledging the importance of relational information for face recognition in adulthood (Tanaka & Sengco, 1997; Leder & Bruce, 2000), it may be suggested that any disruption to this configuration is going to have a deleterious effect upon recognition.

The central themes running through studies investigating face recognition question predominantly the specialness of faces, the contribution of featural configurations, individual features and the whole face and at what age such abilities are apparent. From the evidence discussed so far, it may be proposed that elements

including internal and external features, configurations of features and the spatial relations between them interact to varying degrees to enable the end product of recognition. When considering recognition in relation to the identification of perpetrators of a crime however, further variables specific to the criminal incident also require consideration. As will be addressed subsequently, these were categorised by Wells (1974) as system and estimator variables.

### *2.6 Face recognition from an applied perspective*

It may be asserted that in daily life, individuals attend to faces during social interaction, however unless actively committed to memory for a specific reason, the vast amount of other faces encountered in passing may often go unnoticed. For example, upon visiting a pub or restaurant, attention is more likely to be focused on the faces of companions within the party, leaving the faces of passing clientele regardless of the close proximity, to remain uncommitted to memory unless a specific incident occurs. Even then, it may be difficult to identify the individual in question again. Hodges and Ward (1989) when discussing famous faces emphasised the problem of establishing when a face becomes registered as famous. It may be asserted that the same can be applied to unfamiliar faces. In usual circumstances, this may not be perceived as a problem. However, in relation to areas such as eyewitness identification, the ability to identify a previously unknown perpetrator without error where a positive identification may contribute to a subsequent conviction, important consideration is required.

On witnessing a crime, individuals may only see the perpetrator for a matter of seconds. Depending upon the nature of the incident, numerous factors may affect consolidation of the memory; including whether or not a weapon was involved (Hope & Wright, 2007; Loftus, Loftus & Messo, 1987; Steblay, 1992), whether or not the perpetrator had attempted to cover or disguise their face (Cutler, Penrod & Martens, 1987); the amount of time the perpetrator was viewed (Reynolds & Pezdeck, 1992); levels of illumination (Yarmey, 1986); witness arousal levels (Deffenbacher, Bornstein, Penrod & McGorty, 2004; Valentine & Mesout, 2009). A number of variables may also affect the recall of such information; such as the amount of time elapsed between viewing a crime and the subsequent identification of the suspect (Odinot & Wolters,

2006); amount of collaboration and discussion with other witnesses (Gabbert, Memon & Allan, 2003; Garry, French, Kinzett & Mori, 2008); method of recall employed by interviewers, i.e. cognitive reinstatement (Geiselman, Fisher, MacKinnon & Holland, 1985; Geiselman & Fisher, 1992), questioning styles (Loftus & Palmer, 1974); sex (Lewin & Herlitz, 2002; McBain, Norton & Chen, 2009) and ethnicity (Meissner & Brigham, 2001; Wright, Boyd & Tredoux, 2003) of witness and perpetrator; method of identifying procedure employed, i.e. type of identity parade (Sporer, 1993; Steblay, Dysart, Fulero & Lindsay, 2001). Wells (1974) classified variables into; system variables (i.e. line up structure, line up instructions, question structure) which can be manipulated by research and estimator variables (i.e. witness/perpetrator characteristics, characteristics of the criminal event) which cannot be controlled in actual events. In addition to these variables, police legislation and protocols enforced may also impact upon the effectiveness and accuracy of the identification process. These were addressed in relation to the current research, which investigated how external features are represented in terms of eyewitness memory, with the aim of informing police procedure in order to enhance the identification process.

## *2.7 Estimator variables*

### *2.7.1 Internal and external features*

Although the internal and external features were discussed earlier in relation to their advantage for familiar and unfamiliar faces respectively, they will now be addressed in relation to eyewitness identification. Research has illustrated that the manipulation of external features can adversely affect recognition rates. If a disguise is adopted by a perpetrator who is already unfamiliar to witnesses, deleterious effects can be encountered with respect to accurate identification. In terms of identifying a perpetrator once a crime has been committed, it may be asserted that it is paramount, where possible, to preserve the context of the unfamiliar face to allow witnesses optimum chances of accurate identification. Henderson, Bruce and Burton (2001) found that upon viewing a video still of a robber alongside a photographic line-up in which the robber was present, participants' matching performance was significantly worse in the disguise condition where a hat was worn by the robber (43%) compared to when the robber's hair was visible (83%). In two experiments by O'Donnell and Bruce (2001)

designed to isolate the facial information (eyes, hair, mouth & chin) utilised in the learning of new faces; two groups of participants were each trained on different sets of faces by using dynamic video presentation. Individuals were then presented with both familiar (trained) and unfamiliar faces in a same-different decision task, where 'different' trials included manipulations of internal and external features, and the task was to decide whether the two faces were identical or had a difference in one or more features. Results illustrated that hair change was most easily detected in unfamiliar faces and detection of eye changes were significantly enhanced for familiar faces.

In two studies examining recognition in target present line-ups, correct identification rates were found to be significantly lower for sequential (where images are viewed one at a time) and simultaneous line-ups (where the images are viewed together) for both adults (Pozzulo & Marciniak, 2006) and children (Pozzulo & Balfour, 2006) when target hairstyle was changed, suggesting this is an important feature in the recognition process for unfamiliar faces.

Shapiro and Penrod (1986) conducted a meta-analysis of facial identification studies and from their findings, proposed that witness performance could decline owing to a mismatch in cues between the initial encoding of an image and change in presentation at the subsequent time of recognition. It may be asserted therefore, that presenting an image of the perpetrator which optimally matches their appearance to the time the offence was committed, is paramount. However, owing to current practices involved in organising line-ups, this may not always be possible. Depending upon the timescale involved between apprehension and image capture, it may be the case that the perpetrator has sufficient time to change hairstyle and clothing, potentially interfering with a witness' memory trace. This has important implications for the way images are captured and subsequently presented for identification procedures.

### *2.7.2 Context and appearance change*

Rainis (2001) explored the effects of semantic contexts upon face recognition. Stimuli consisted of faces depicting neutral expressions displayed on backgrounds evoking negative (e.g. concentration camp); positive (e.g. paradise island) and neutral emotions (e.g. call box). Participants sequentially viewed 12 faces in random order (four

each of negative, positive & neutral). After six days, individuals returned, were allocated to one of four conditions and were requested to identify the faces they had previously seen from a series of 24 (12 old, 12 novel). From the 12 targets, three were presented without context (no context), three in a new context, i.e. from concentration camp to road accident (changed context), three in the same context, i.e. same call box (same context) and three in a similar type of context, i.e. two different concentration camps (semantic context). For accuracy data, correct identifications were found to be significantly higher in semantic contexts compared to same contexts, with correct identifications being significantly higher for same contexts compared to changed and no contexts. Compared with positive and neutral contexts, significantly less correct identifications were made from negative contexts. Individuals in the semantic context condition displayed greater recognition accuracy compared to those in the same context for negative context stimuli. Fewer false alarms were also generated by semantic context participants compared to no or changed contexts. When viewing a negative context, there was a significantly greater reduction in false positives for participants in the semantic context compared with those in the changed context condition. Considering discrimination data, ability to discriminate targets was greater for participants in the semantic context compared to all other conditions. Additionally when negative emotions were induced, individuals found it significantly harder to discriminate targets from distractors compared to stimuli inducing neutral or positive emotions. Semantic context, compared to same and changed context conditions enabled significantly higher discrimination between targets and distractors. To summarise, preserving semantic context facilitated greater recognition accuracy and a reduction in false alarms and false positive identifications. Rainis suggested that for a neutral encoding context, stricter analysis of feelings of familiarity may occur with the faces in a semantic context; and further that the semantic context may offset the influence of negative emotions upon face recognition by concentrating individuals' attention on the episodic memory semantic retrieval cues. It can be argued that results highlight the need for generating a semantic context similar to that which was initially present at encoding, i.e. the presence of a hood on an identity parade if one was present when the crime was committed, in order to help improve accuracy rates.

Cutler, Penrod and Martens (1987) investigated the effects of disguise and context reinstatement on eyewitness accuracy. In total, 10 variables were manipulated; two types of context reinstatement (context reinstatement interview, cognitive interview with contextual cues); disguise (hat, no hat); weapon visibility (handgun visible, hidden throughout); retention interval (2 days, 2 weeks); exposure to mug shots (mug shots viewed, no mug shots viewed); line up instructions (option given to reject line up, no rejection option given); line-up type (target-present, target-absent); line up size (6-person line up, 12-person line up) and line up composition (high-similarity line ups, low similarity line ups). Participants viewed one of four films depicting a liquor store robbery from permutations of weapon present/absent and disguise (hat) present/absent. Individuals then completed a prejudgment questionnaire and a questionnaire relating to the perpetrator and robbery. Individuals in the mug-shot condition were requested to view the 41 photographs and either indicate the target or state that the target was not present. Participants in the context reinstatement condition were instructed to think back through the incident, beginning to end, from different perspectives and orders and to recall their emotions. Participants were divided again into weak line up context conditions (viewing front and full profile head and shoulder slides only) and strong line up context conditions (viewing videos of each line up member coming in and out of a room, in addition to front, full profile and three-quarter head and shoulder slides). Individuals either viewed six or 12 colour photograph line ups, with permutations of target absent/present, disguise or no disguise as discussed above. All participants completed an interrogation questionnaire relating to the robbery, but only half the sample re-read the questionnaire pre-line up. Results illustrated that overall a positive identification was made by 81% of individuals. For those viewing target present line ups, 64% correctly identified the target, and for target-absent line ups, 71% incorrectly identified a foil. Significant main effects were observed for disguise and line up type, with fewer correct judgments in disguise compared to no disguise conditions and target-absent compared to target-present conditions. For individuals viewing highly similar line ups, a significant improvement in performance was observed if context cues had been provided. Context cues also improved performance after a two-week interval period compared to two-days. The context reinstatement interview significantly enhanced identification performance for participants in the disguise condition.

Confidence questionnaires were completed by participants pre and post-line up. A weak correlation was observed between prejudgement confidence and identification accuracy. Compared to confidence in ability to identify the perpetrator, confidence in line up decision was a greater indicator of identification performance. Disguise was observed to be a significant predictor of prejudgement confidence, implying that this factor could adversely impact upon the recognition process.

Davies and Flin (1984) conducted 3 experiments employing overhead stockings as a disguise. In Experiment 1 ( $N = 232$ ), instructions were provided to assist with encoding the face however both patterned and plain stockings were observed to adversely affect identification accuracy. In Experiment 2 ( $N = 48$ ) where either high frequency information and complexion cues were removed or facial features were distorted, the latter resulted in the most disruption to recognition. Finally in Experiment 3 ( $N = 64$ ), where participants viewed masked faces during encoding, recognition rates were observed to be significantly higher at test when faces were also masked, compared to unmasked ones.

It may not always be evident that a perpetrator has changed appearance between committing a crime and then taking part in a line up. Charman and Wells (2007) investigated the effects of including a pre-line up appearance-change instruction. Participants ( $N = 289$ ) viewed a five-minute mock crime video involving four perpetrators, each in view for 120 seconds of which 15-20 seconds were close-up shots. Individuals then viewed four line ups, one for each of the perpetrators, (1 male absent, 1 female absent, 1 male present and 1 female present). Half of the participants were also informed that perpetrators may have changed their appearance. This instruction was reinforced before each line up. Line ups comprised six colour photographs presented simultaneously. Target photographs were obtained from student identification cards, taken at the beginning of their first year. Appearance-change in the subsequent line up photographs varied as time had elapsed between identification card photographs and line up photographs. For target-present line ups, no significant effect was observed in mean identification score for target appearance instruction. For the proportion of total identification attempts for target-present line ups, appearance-change instruction



significantly reduced the proportion of target identifications. When examined individually, the appearance-change instruction significantly reduced the proportion of target-present identifications for Target 2. Mean filler identification scores significantly increased as a result of appearance-change instruction in target-present line ups, although not for Target 1. For target-absent line-ups, appearance-change instruction significantly increased mean false alarm rates, except for Target 1. Average confidence scores were significantly lower and average response latencies significantly higher for participants in the appearance-change instruction condition. Overall, no significant increase in target identification or decrease filler identifications or false alarms was observed, suggesting a large negative effect of appearance-change instruction. As current legislation stands in the United Kingdom, participants are not informed the suspect could have changed their appearance since they were last seen. Although this instruction resulted in an increase in filler identifications and decrease in target identifications (Charman & Wells, 2007), further research is also in evidence where change in appearance without appearance-change instruction has resulted in both positive and negative effects.

### *2.7.3 Clothing*

In research by Lindsay, Wallbridge and Drennan (1987) adult participants viewed photographic line ups which contained either the target or similar-looking suspect where; all suspects were dressed alike, all suspects wore different attire, or where the suspect only was dressed similarly to when the time the crime was committed (biased condition). Findings revealed that from the clothing-biased condition, the innocent suspect was most likely to be identified. Additionally, when showed photographs of clothing, participants who selected suspect clothing were significantly more accurate in identifying the suspect than participants who failed to select the clothing worn during the crime, implying that contextual factors may influence the recognition process. Seitz (2003) examined the effects of clothing and posture change upon recognition in children 4, 6, 8 and 10 years and adults. Both variables, when combined, affected performance in all age groups; when separated however, clothing only (a change from a white shirt to a black pullover) adversely affected recognition in all age groups.

In an archival study by Fahsing, Ask and Granhag (2004), case files from bank and post office robberies in Oslo between January 1999 and December 2001 were examined and the accuracy of 250 offender descriptions by witnesses were gauged against authentic video documentation of the witnessed crimes. Results revealed that after gender and height; clothing (upper body) and clothing (head) were the most frequently reported attributes (mentioned by 90.8% and 89.6% of witnesses respectively) from a list of 26. The following attributes; (percentage of witnesses reporting in brackets) hair (17.6%), face shape (10%), eye colour (4.4%), facial hair (2.4%), mouth shape (2%) and eyebrows (2%) all featured in the lower half of the list.

Taken together, the above studies suggest that clothing and appearance change, that is, disguising specific features can impact significantly upon both recognition and identification processes.

#### *2.7.4 Weapon focus*

Presence of a weapon during the witnessing of crimes had been illustrated to adversely affect the later identification of perpetrators. Loftus, Loftus and Messo (1987) found that 35% of participants correctly identified the perpetrator after viewing a series of slides conveying a crime scenario where there was no weapon compared to 15% of individuals where a weapon was present. Only target present line ups were employed. Hope and Wright (2007) found that presence of a weapon reduced the accuracy of details recalled by participants and also significantly reduced individuals' confidence levels. Individuals in the weapon-present condition provided significantly more object descriptors in comparison to participants in the control group, but less target descriptors. Further, a meta-analytic review by Stebalay (1992) revealed significantly higher feature-accuracy scores (including facial features & clothing) for participants in weapon-absent conditions and also greater identification accuracy. It may be asserted that presence of a weapon may prohibit individuals' cognitive capacity in terms of which details are permitted access to memory. In addition an unanticipated crime scenario, presence of a weapon may add a considerable amount of stress to the situation.

### *2.7.5 Levels of stress*

Deffenbacher, Bornstein, Penrod and McGorty (2004) conducted a meta-analytic review of 32 studies investigating the impact of high stress upon eyewitness memory. For face identification, eyewitness accuracy was found to be negatively impacted by increased stress levels and an increase in the amount of false alarms was observed for target-present line ups. For eyewitness accuracy for details of the crime, heightened stress levels were also observed to have a detrimental effect. When type of recall was considered, interrogative recall was more negatively impacted by heightened stress compared to narrative and free recall. Finally, a statistically significant effect was found for studies employing a staged crime and those where a staged crime was not included in relation to the detrimental of heightened stress upon recall. The effect size for staged crime studies was greater than double compared to studies employing non-crime scenarios. Valentine and Mesout (2009) explored eyewitnesses' ability to identify a target encountered in the London Dungeon previously viewed under conditions of high state anxiety. Results revealed that fifty-eight per cent of state anxiety score variance was accounted for by change in heart rate. Females exhibited significantly higher state anxiety compared to males. Significantly more correct descriptors were recalled by participants who reported lower state anxiety, with the inverse being true. Individuals who reported high state anxiety were less likely to correctly identify the target. Further, more correct identifications were made by males compared to females. Evidence from both studies highlights the negative impact that stress may have upon memory and subsequent identification of perpetrators.

### *2.7.6 Illumination*

In addition to changes in attires and background, time of day a crime is witnessed had also been observed to affect identification rates. Yarmey (1987) investigated the impact of illumination (daylight, start of twilight, end of twilight or night) upon target identification. After viewing a series of slides portraying an implied rape, free recall of target characteristics was significantly better for daylight and beginning of twilight compared to end of twilight and night vision conditions. The end of twilight condition yielded low proportions of correct rejections in target absent line ups and low proportions of correct identification in target-present line ups.

Consequently, visibility in terms of atmospheric conditions, in addition to any disguise which may be adopted may also impact upon the recognition process.

### *2.7.7 Confidence*

Research has illustrated low correlations between the confidence and accuracy of witnesses. Sporer, Penrod, Read and Cutler (1995) conducted a meta-analysis of 30 studies, each containing target-absent and target-present line ups. From 4036 participants, 2467 had selected someone from a line up. A weak confidence-accuracy correlation was observed overall. When choice was included as a moderator variable however (other moderators included sex of participant, total number in the sample per study, video or live event and proportion of individuals choosing from an array; for correct choosers (positively identifying a perpetrator), the confidence-accuracy level was higher compared to non-choosers. Correct non-choosers were only moderately more confident in comparison to incorrect non-choosers however. In all studies, incorrect choosers had a lower mean confidence level compared to correct choosers. Considering the many moderating variables on the confidence-accuracy relationship overall however (e.g. poor viewing conditions, post-identification interference), the authors advocated that jurors be informed that confidence is not the only indicator of accuracy.

Studies have also illustrated that inflated levels of confidence conveyed by witnesses can result in misperceptions of accuracy by both jurors and mock jurors. Cutler, Penrod and Dexter, (1990) examined jurors' sensitivity to evidence provided by eyewitnesses. One-hundred-and-twenty-nine experienced and eligible jurors were required to view a video of a trial of a liquor store robbery, in which a number of witnesses gave evidence. Subsequently, they then completed a questionnaire where they were required to provide a 'guilty' or 'not guilty' decision and provide estimates of confidence. Results were then pooled with data from undergraduates ( $N = 321$ ) who had participated in an earlier study. Witnesses varied in the amount and type of information they provided. There were no main effects of disguise of robber, presence of weapon, violence, witness retention interval, mug shot search, line up instructions, size of line up, similarity of line up members or voice samples on jurors' judgements. Further, there were no significant differences in judgements between undergraduate jurors and

experienced and eligible ones. Both undergraduates and eligible jurors were influenced by witness confidence leading Cutler et al. to advocate the presence of expert psychological testimony in order to enhance juror sensitivity.

Brewer and Burke (2002) also explored the effects of witness confidence upon the judgement of mock jurors. Participants ( $N = 130$ ) were allocated to one of four conditions;  $2 \times 2$  (witness confidence – confident or low confidence) and  $2 \times 2$  (testimonial consistency – consistent or inconsistent) and then listened to an audio-tape of a trial of an armed bank robbery. Afterwards, individuals completed a questionnaire including; documentation of how confident they perceived the witness to be (on a scale of 1 – 7) and probability that the defendant committed the crime (employing a 10% scale marker where 0% = not sure & 100% = 100% sure). Compared to unconfident witnesses, confident witnesses were rated as significantly more confident. Confident witnesses led participants to make significantly higher crime probability commission ratings, compared to unconfident witnesses and probability ratings were also significantly higher for witnesses conveying consistent information. Significantly more guilty verdicts were given when witnesses appeared confident, regardless of inconsistent or consistent testimonies.

Evidence from Sporer, Penrod, Read and Cutler (1995), Cutler, Penrod and Dexter (1990) and Brewer and Burke (2002) illustrated how increased levels of confidence can adversely affect eligible jurors' and mock jurors' perceptions and are not synonymous with accuracy. Considering the potential for wrong convictions, it may be asserted that members of the criminal justice system and individuals undertaking jury service would benefit from knowledge of such information in order that the evidence may be assessed in an equitable and unbiased manner.

#### *2.7.8 Exposure duration*

Memon, Hope and Bull (2003) examined the impact of exposure duration of perpetrator upon confidence and accuracy in two groups of participants; young (17-25yrs) and older (59-81yrs). Individuals viewed a mock bank robbery scenario where the perpetrator's face (full & profile) was visible for either for 12 seconds or 45. Participants then viewed either a target-absent or target-present  $3 \times 2$  greyscale

photographic line up before completing a questionnaire, part of which required a confidence judgement on a scale of 1-7. Individuals were observed to be significantly more accurate in the long compared to the short exposure condition. Accuracy rates were also significantly higher in target-present compared to target-absent conditions. No significant effects of age were apparent. For target-present line ups, significantly more correct identifications were evident for long exposure conditions and false identifications in short exposure conditions, with the number of hits outweighing incorrect identifications for long exposure. For target-absent line ups, false identifications were significantly higher in short compared to long exposure conditions. When confidence was analysed, participants in the target present condition were significantly more confident after long compared to the short exposure duration, and confidence was also higher for correct identifications compared to both foil identifications and incorrect rejections. In the short exposure condition, inaccurate witnesses displayed lower levels of confidence however in the long exposure condition there was no difference in confidence ratings between accurate and inaccurate witnesses. In the target-absent condition, no significant effects of exposure, accuracy or confidence ratings were observed. So, although longer exposure increased accuracy rates in target-present and target-absent line ups, it also increased confidence levels of both inaccurate and accurate witness in target-present line ups, which the authors suggested should be highlighted to police and jurors.

Reynolds and Pezdek (1992) investigated the effects of duration of exposure to target upon recognition employing Identi-kit constructions. Participants ( $N = 99$ ) were allocated to either 3-second or 20-second exposure conditions. Each individual viewed 20 presentation faces followed 2-minutes later by a further 40 faces (20 presentation faces and 20 faces that differed by one feature; eyes, nose, mouth, hair or chin), and had to respond either 'same' or 'different' by key press. For upper-face features (hair and eyes), false alarms were significantly lower compared to lower-face features at the 20 second exposure condition. No significant interaction was observed for exposure duration by feature interaction. Hair was the only feature to differ significantly between 3 and 20-second exposure conditions, with a higher mean false alarm rate for the shorter exposure condition and vice versa. Participants observed nose, mouth and chin changes

equally well for both exposure conditions. An advantage for upper and lower feature-recognition was observed for the 20-second exposure duration condition. Memory for upper facial features compared to lower facial features was better in both 3 and 20 second conditions. It may be noted however that viewing *Identi-Kit* constructions is markedly different from viewing an actual crime scenario with innumerable other variables present affecting the view obtained of the perpetrator.

#### 2.7.9 *Sex*

Research also indicates that the sex of an individual can affect the recognition process. Lewin and Herlitz (2002) examined recognition ability in both males and females for male and female faces where individuals viewed full faces or those with external features (hair & ears) removed for either 1 or 3 seconds. Findings illustrated that female faces were observed to be significantly easier to recognize compared to males. Females performed at a significantly higher level compared to men. Higher performances were exhibited in full face and slow presentation conditions. For the recognition of male faces, similar levels of performance were observed for men and women. Females were observed to display an own-sex recognition advantage. McBain, Norton and Chen (2009) explored face discrimination and recognition ability and found that women displayed higher accuracy levels for upright and inverted faces compared to men and performed significantly better in face discrimination tasks. Wright and Sladden (2003) found an own-sex recognition advantage for both sexes afforded by hair.

Rehman and Herlitz (2006) also found an own-sex bias for females for recognition of different race faces. Participants (219 Swedish individuals) viewed pictures of either Swedish or Bangladeshi faces (children & adults). Results revealed that females recognised significantly more faces than males, with an own-sex bias evident and also outperformed males with male face recognition. Swedish faces and female faces were found to be easier to remember than Bangladeshi and male faces respectively. A significant interaction between ethnicity and sex of stimuli revealed Swedish female faces were the easiest to remember indicating an own-race bias. No age-bias was evident. The authors suggested that women's interest in social aspects in general and with their own sex may have been contributed to results.

Areh (2011) examined sex differences between eyewitnesses. Participants ( $N = 280$ ) viewed a two-minute film of a violent robbery and were then required to complete a feature checklist testing 77 visual and audio details of the crime and then complete a number of Likert scales relating to quality of memories for the event and actors and memory certainty. Compared to males, females recalled significantly more correct details and fewer incorrect details. Male confidence for perceived self-accuracy for memory of event and place of incident was greater than that of females. A small advantage for males was observed for accuracy of incident descriptors however females outperformed men in accuracy for descriptions of actors and place of incident. Overall, males were found to be more confident but less accurate compared to females.

To summarise, Lewin and Herlitz (2002) and Rehnman and Herlitz (2006) found an own-sex recognition advantage for females. McBain, Norton and Chen (2009) discovered that women outperformed men in face detection and discrimination tasks implying that men had higher perceptual thresholds. However, no conclusions could be drawn about own-sex bias as only male images were employed as stimuli. Areh (2011) found females to be more accurate than males for place and actor descriptors. Wright and Sladden (2003) found an own-sex bias for both sexes compounded by hair.

#### *2.7.10 Race*

From investigations involving individuals from different ethnic origins, it has become apparent that there is evidence of an own-race bias (ORB) effect, where individuals are more adept at recognising their own race compared to other-race faces. Subsequently research has illustrated that race of witness and perpetrator can interact and affect the recognition process. A meta-analysis by Meissner and Brigham (2001) found an increase in false alarms was evident for other-race faces and but an identification advantage for own-race faces after reviewing 39 studies. Additionally, own-race bias was observed to be more prevalent in White compared to Black participants. However, further studies revealed that this effect could be ameliorated with increased inter-racial contact (Wright, Boyd & Tredoux, 2003; Tanaka, Kiefer & Bukach, 2004).



Smith, Lindsay, Pryke and Dysart (2001) explored the effects of three eyewitness accuracy postdictors; judgement strategy (relative versus absolute), decision time and confidence upon eyewitness accuracy for own and other-race faces for White and Asian individuals. In sum, 40% of individuals who made correct identifications (choosers) and 60% who did not identify anyone (non-choosers) were correct in their choice. For individuals who made correct own-race identifications, decision time, judgement strategy and confidence were useful accuracy postdictors. For non-choosers however, the converse was true. Considering the results, Smith et al. concluded that although the aforementioned postdictors may be valuable for own-race identification reliability, they may be inappropriate for other-race faces and further that confidence measures employed by courts and police may not reflect witness confidence at the time of the identification.

In two experiments, Bradfield and McQuiston (2004) examined assessments of confidence inflation of witnesses by White and Hispanic participants. In Experiment 1, participants ( $N = 90$ ) were asked to read one of three fictitious trial scenarios. In the control condition, the eyewitness stated she was positive that her identification of the perpetrator was accurate during identification and at the trial. In the second condition (inflation), the witness was unsure during identification but positive at the trial. In the final condition (inflation & challenge), the witness was challenged regarding inflated confidence. After reading their respective scenarios, individuals completed questionnaires relating to witness confidence and identification. Results revealed that compared to the control condition, the inflation and inflation + challenge conditions significantly favoured the defence. The defendant was considered significantly guiltier by individuals in the inflation compared to the inflation + challenge condition. Experiment 2 examined the effects of in-group bias and evidence evaluation. Three-hundred-and-sixty Hispanic individuals read scenarios identical to those in Experiment 1, except half featured White perpetrators and half featured Hispanic perpetrators. Findings illustrated that individuals who read a scenario featuring an Hispanic witness rated eyewitness accuracy higher compared to individuals who read scenarios featuring White eyewitnesses, providing partial support for in-group bias. No interactions were evident between confidence inflation and race, unlike Experiment 1. The authors

accounted for this by suggesting that different racial backgrounds were responsible (83% in Experiment 1 were White) making direct comparisons difficult. In summary, evidence of inflated witness confidence levels and in-group bias were observed to affect participants' perceptions to some degree.

So, in addition to confidence alone, race and sex of participant of witness and perpetrator may also affect individuals' perceptions (Smith, Lindsay, Pryke & Dysart, 2001; Lewin & Herlitz, 2002; Wright & Sladden, 2003; Bradfield & McQuiston, 2004; McBain, Norton & Chen, 2009; Areh, 2011), reiterating the need to exercise caution when interpreting witness testimonies. Any one or a combination of these physical characteristics or traits may affect the identification in addition to factors such as illumination, duration of exposure, disguise, presence or absence of a weapon for example. Although these variables are unalterable, system variables can be controlled for.

## *2.8 System variables*

### *2.8.1 Discussion*

Gabbert, Memon and Allen (2003) explored witness conformity and memory. Sixty younger adults (18-30yrs) and 60 older adults (60-80yrs) viewed one of two films (1 minute, 30seconds duration). The films differed in that they were filmed from different angles with the aim of procuring different perspectives from witnesses. The scenario depicted a girl returning a book to an unoccupied library and in one of the films, participants are able to observe some money being taken. After viewing the respective films, individuals were provided with questionnaires and were allocated to either a co-witness condition where they discussed answers to the questions or an individual recall condition. Participants then completed filler tasks (45 minutes duration) before completing a final questionnaire comprising free recall and structured questions. Both age groups (co-witness condition) included information into their recall test they could have only obtained through discussion with co-witnesses. For individuals who had not seen money stolen, 60% believed the girl was guilty after discussion with individuals who had observed the crime. No significant relationship was

observed between co-witness susceptibility and angle of film viewed. Younger adults were observed to recall significantly more details than older adults, but no significant main effect was found for age or condition for the amount of incorrect items reported. Further there was no difference in susceptibility to memory conformity between age groups. Overall, 71% of individuals in the co-witness condition reported items at test acquired as a result of discussion.

Garry, French, Kinzett and Mori (2008) investigated the effects of discussion on eyewitness memory. Forty participants viewed one from two versions of the same film; identical except for eight items which had been digitally altered. The film depicted an electrician taking items from an unoccupied house. After a 15-minute filler task, individuals then viewed 12 sequentially presented questions which they were requested to discuss and answer with fellow participants. After a second filler task (5minutes) participants completed a two-alternative forced-choice recognition task comprising 20 questions. From a possible 160 occasions, individuals were subject to post-event leading information 81 times. Participants performed equally well in remembering details for whichever version of the film they viewed. Individuals were significantly more likely to report correct answers for non-discussed critical details compared to when misleading information had been discussed. When individuals agreed to misinformation during discussion, they used it at test 85% of the time. Further, when participants concurred with misinformation they answered first 10% of the time, but second 90% of the time.

### 2.8.2 *Delay*

In addition to discussion, the amount of time elapsed between the observed crime and subsequent recall may also impact upon the accuracy of detail obtained from witnesses. This was explored by Odinot and Wolters (2006). Participants ( $N = 67$ ) were allocated to one of three conditions. Individuals viewed a 21-minute film depicting two non-criminal storylines. Condition 1 participants attended recall sessions 1, 3 and 5 weeks after viewing the film; Condition 2 participants returned after 3 and 5 weeks and participants in Condition 3 returned after 5 weeks. At each recall session individuals were provided with the same questionnaire comprising 23 open-ended questions all relating to the previously viewed film. A significant difference was observed between 1 and 5-week retention intervals, with a reduced number of questions answered as the

retention interval increased. Further, there was a significant difference in the amount of units of information recalled by individuals between 1 and 5 and 3 and 5-week intervals. The amount of correctly recalled units significantly decreased also between 1 and 5 and 3 and 5-week intervals. For subsequent recall sessions in Conditions 1 and 2, the mean proportion of correctly recalled units of information was almost identical. Repeated recall did not affect mean confidence levels. Confidence was observed to be a predictor of accuracy; with lower levels of confidence indicating an increase in the proportions of incorrect units recalled. Overall, increased intervals before the first recall session resulted in less units of correct information being provided, lower confidence ratings and an increase in the amount of 'do not know' answers. However, none of these measures were affected by repeated questioning.

### *2.8.3 Questioning and interviewing styles*

As discussed so far, the amount of variables that can affect identification are numerous. However, the way information is obtained from witnesses may also have an effect upon accuracy. Research by Loftus and Palmer (1974) illustrated that providing participants with leading questions affected their memory of events. In the first of two experiments, participants ( $N = 45$ ) watched films depicting car accidents whilst cars were travelling at different speeds. Individuals then completed questionnaires comprising a free recall section and a series of questions (one of which differed in the verb used to describe the collision, i.e. bumped, collided, smashed). Mean speed estimates increased as the perceived severity of the crash increased. In Experiment 2, participants ( $N = 150$ ) viewed a 1-minute film of a multiple accident and then completed a series of questions; one of which differed in the verbs 'crashed' or 'smashed' in relation to the speed the cars were going when they collided. Upon returning after 1 week, individuals were asked further questions, including whether they had seen any broken glass. The verb smashed resulted in significantly more yes responses in relation to the glass question compared to the verb hit and higher speed estimates, even though no broken glass featured in the film.

Considering the influence that styles of questioning and interviewing may have upon the quality of information retrieved, it may be argued that it is essential to adopt the most effective and efficient method, especially in light of other system and estimator

variables which can affect the process. Geiselman et al. (1984) developed the cognitive interview which involved context reinstatement, reporting all details that could be remembered, recalling events in different orders and changing perspectives. The effectiveness of it was explored by Geiselman, Fisher, MacKinnon and Holland (1985) who compared it with standard interviews involving open-ended reports then specific questions and hypnosis interviews comprising open-ended reports, hypnosis, then open-ended and specific questions. Compared to standard interviews, cognitive and hypnosis conditions elicited a significantly higher number of correct items. No main effect was observed for incorrect or confabulated items. Superiority of the cognitive and hypnosis conditions for number of correct items recalled was evident for bank robbery and liquor store hold-up scenarios where several actions were occurring at once, compared to warehouse search and family dispute scenarios. The authors suggested that the density of events to-be-remembered were enhanced by the memory-search procedures provided by the cognitive and hypnotic techniques. It may be argued therefore that employing a technique which procures greater amounts of correct information without increasing incorrect or confabulated material renders a great advantage in forensic fields. The cognitive interview was later adapted by Fisher and Geiselman (1992) becoming the enhanced cognitive interview, where a rapport between interviewer and witness is fostered and the witness is encouraged to have control in the interaction in order to reduce anxiety and therefore facilitate memory for events.

Finger and Pezdek (1999) investigated the effects of the cognitive interview on face identification accuracy and verbal overshadowing (an effect where verbal description of a face later reduces identification accuracy). In the first of three experiments, participants ( $N = 75$ ) viewed a slide of a White male target whilst making characteristic judgments. After a 10-minute filler task, individuals were subject to either a cognitive reinstatement interview or standard interview. After a further filler task, participants viewed six sequentially presented slides twice (5 foils, 1 target). Significantly more correct, incorrect and subjective details (perceived personality or occupation) were recalled for the cognitive interview compared to the standard interview. However, face identification accuracy was significantly less (47% correct) for the cognitive interview in comparison to the standard interview (73% correct). No

significant difference in false identifications or non-identifications (misses) was evident between conditions. For incorrect identifications, significantly more correct and incorrect details were recalled, compared to correct identifications, illustrating a verbal overshadowing effect. In Experiment 2 ( $N = 69$ ), the procedure was identical albeit participants received a 1-hour break after the interview was over. Significantly more correct, incorrect and subjective details were recalled in the cognitive interview compared with the standard interview. The 1-hour delay was observed to reduce the difference in accuracy between conditions, with identification accuracy rates of 69% and 85% being achieved for standard and cognitive conditions respectively. Although more incorrect details were obtained in the cognitive interview as in Experiment 1, no significant difference in identification accuracy rates or identification errors were observed between conditions. Further, no significant difference was observed between inaccurate and accurate identifications for amount of correct or incorrect details recalled, suggesting an elimination of the verbal overshadowing effect. Experiment 3, participants ( $N = 87$ ) were allocated to either a verbal description condition, verbal description with delay (24 minutes) or no description group. Rather than sequential presentation, faces were presented simultaneously. Compared to the no description condition, identification accuracy was significantly reduced in the verbal description no delay condition. No significant difference in accuracy was observed between no description and verbal description with delay conditions. There was no significant difference between conditions for errors in identification. In the verbal description no delay condition, more correct details were recorded by individuals who made an incorrect identification compared to those who made a correct identification. For inaccurate and correct identification, no significant difference in the number of incorrect details recalled was evident. Overall, results suggested that the 24-minute delay eradicated the verbal overshadowing effect.

Memon, Meissner and Fraser (2010) conducted a meta-analysis reviewing the effectiveness of the original cognitive interview, enhanced and modified versions (appropriate for children) over 25 years. Mean weighted effect sizes were obtained for correct, incorrect and incorrect recall from 59 independent effect sizes published in 46 studies. Findings revealed that in comparison to the control interview, the cognitive

interview yielded a significant and large increase in the amount of correct details recalled, a significant, but small effect for the amount of incorrect details recalled and no significant effect for confabulated details. Of the 19 studies that documented mean accuracy rates, no significant difference between control and cognitive interview conditions were apparent. For type of event, there were no differences for confabulated and incorrect details, but a significant difference was observed for correct details. Smaller effect sizes were evident for the amount of correct details for accident and crime scenarios compared to neutral scenarios however an advantage for the cognitive interview remained evident over all scenarios. When delay increased, effect sizes decreased for correct information, but increased in line with duration of delay for confabulated information. No significant effects were observed for retention interval upon incorrect information, leading the authors to conclude an overall advantage of the cognitive interview for procuring correct information up to the longest delay period analysed. Compared to the cognitive interview, significantly larger effect sizes were observed for the modified version for incorrect details, i.e. more incorrect details were generated by the modified cognitive interview however no significant differences were observed for confabulated or correct details. Further, no significant differences were evident between the cognitive interview and the enhanced cognitive interview for correct, incorrect or confabulated details. In summary, compared to the control condition, the cognitive interview was observed to be the most effective in terms of obtaining correct details for adults, with the benefits comparatively outweighing the small significant increase in incorrect details produced; appreciating that the modified version generated a greater number of incorrect details compared to the cognitive condition.

#### *2.8.4 Simultaneous vs. Sequential line ups*

Debate has arisen over past decades regarding the most appropriate type of line up to employ in order to facilitate optimum target identification rates whilst keeping incorrect identifications and false imprisonments to a minimum. Whether displayed as mug shots, live or video presentation, line ups take the format of either a sequential display where images are viewed individually, or simultaneously where all images are seen together. A number of events can take place when a witness views a line up. In a line up where a target is present, a correct identification (hit) can be made; there may be

no identification made in which case the line up is rejected (miss) or an incorrect identification may be made where an innocent person is selected. In a line up where a target is absent, either no identification is made and the line up is correctly rejected or an incorrect selection is made (false alarm).

Lindsay and Wells (1985) suggested that different types of judgment may be applied in target identification, for simultaneous and sequential line ups. In simultaneous line ups where images may be compared the risk exists of selecting the closest match to the target from the available choices even when the target is absent, resulting in an incorrect identification. Wells (1984) described this as relative judgment. With sequential line ups however, witnesses have to rely upon the closest match to memory from initial encoding as comparison between line up members is not possible, in which case absolute judgement is applied. When comparing simultaneous and sequential line ups, Lindsay and Wells found that sequential line up presentation resulted in a reduction in false alarm rates compared to simultaneous line ups, while there was no significant difference between line ups for correct identification.

Sporer (1993) investigated eyewitness accuracy for simultaneous and sequential line ups in relation to confidence, accuracy and decision times. Participants ( $N = 72$ ) viewed a 5 and-a-half minute colour film of a robbery taking place from a concession stand in a park. Individuals returned later and viewed one of four line ups; target-present/ simultaneous, target-absent/simultaneous, target-present/sequential, target-absent/sequential. Line ups comprised six pairs of full-front and 90° right profile colour-photographs. For simultaneous line ups, pairs were presented in a 2 x 3 format. Confidence scores were obtained before and during the line up and decision times were recorded. No significant difference was observed for correct decisions between simultaneous and sequential line up conditions. When target-absent and target-present line ups were analysed separately, there was only a marginal difference in correct identifications between simultaneous (44.4%) and sequential (38.9%) for target-present line ups, but a significant difference in target-absent line ups with a higher number of correct rejections for sequential line ups (61.1%) compared to simultaneous line ups (27.8%). Further, individuals who made an accurate identification were significantly



faster than those who selected a foil. Individuals who made a correct rejection for target-absent line ups took slightly longer compared to those who made incorrect rejections for target-present line ups.

## *2.9 Legislation*

Any combination of the system or estimator variables discussed may impact upon the identification process, however procedures enforced by legislation also require consideration. When the Police and Criminal Evidence Act 1984 (Codes of Practice) (Temporary Modifications to Code D) Order 2002 (Home Office, 2002) came into force on 1<sup>st</sup> April, 2002, equal weighting was given to video identification and identity parade procedures, allowing the identifying officer to select the one deemed most appropriate. Previously, identity parades had been the preferred process. In 2005 however, video identification procedures became mandatory, albeit if a known suspect was unavailable or a physical feature on the suspect was unable to be concealed or replicated (Home Office, 2005). VIPER – the Video Identification Parade Electronic Recording system was developed by the West Yorkshire police in the 1990's and has been utilised since 1996 (Burton, 2003). Subsequently, as this method has been utilised throughout police forces nationally, favourable reports have transpired conveying the advantages provided by video identification. Such advantages include; increased portability and convenience – images can be viewed in witness' homes or hospital for example, if necessary; a reduction in witness anxiety as they do not have to view the suspects in person; cost cutting – a pre-existing database reduces the need to pay volunteers; and, if an image can be obtained whilst a suspect is detained in custody, the confound of appearance change can be prevented (Pike, Brace, & Kynan, 2002). In accordance with Pace Code D (Home Office, 2008), parades are constructed by an identification officer not involved with the case. The code stipulates that there should be between at least eight other individuals in addition to the suspect, of similar appearance and age. Any outstanding features, i.e. hairstyle or colour, scars or tattoos should be concealed, but may be viewed upon request from the witness. The image of each individual is moving and lasts for fifteen seconds where the featured individual is initially facing forwards, turns to the left, faces forwards, turns to the right and finally faces forwards again. The identification officer is responsible for ensuring that witnesses do not communicate before viewing the images. Before viewing a parade, witnesses are informed the

perpetrator may or may not be present and should state if they are unable to make a positive identification. Witnesses are required to view the parade a minimum of twice, but may also view the images an unlimited amount of times, either moving or frozen. Once indicating that no further viewing is required, participants are asked if the person they saw on the particular occasion is present and if so, indicate the parade number. The moving image is viewed once more in order to allow confirmation of recognition. When the procedure is complete, witness are asked if they have seen any media broadcasts of descriptions relating to the crime, which is subsequently recorded.

Regardless of the aforementioned advantages of a video identification parade, all line-up members including targets, may present in an attire of their own choosing. This is despite the fact that research has illustrated that change of attire can impede the recognition of targets at a later date (Shapiro & Penrod, 1986; Cutler, Penrod & Martens, 1987; Lindsay, Wallbridge & Drennan, 1987; Seitz, 2003; Fahsing, Ask & Granhag, 2004; Stuart & Lindsay, 2004). Further, change in hairstyle has been observed to have an effect on subsequent identification (Henderson, Bruce & Burton, 2001; O'Donnell & Bruce, 2001; Pozzulo & Warren, 2003; Want, Pascalis, Coleman & Blades, 2004; Pozzulo & Balfour, 2006; Pozzulo & Marciniak, 2006). A consequence of such changes may be the misidentification of innocent individuals. A point to note with respect to Pace Code D however is that if a perpetrator drastically changes their appearance, they are informed that evidence of this may be given in the event of a trial (Home Office, 2011). Acknowledging the advantage provided by external features for unfamiliar face recognition (Walker-Smith, 1978; Cutler, Penrod & Martens, 1987; Henderson, Bruce & Burton, 2001; O'Donnell & Bruce, 2001; Nachson & Shechory, 2002; Want, Pascalis, Coleman & Blades, 2004; Clutterbuck & Johnston, 2005), hair may be considered an important factor in the identification process for identity parades.

It may be suggested that all of the factors discussed comprising the system and estimator variables could potentially affect individuals' memory of the crime scenario to some extent and the subsequent identification of a perpetrator, some of which can be controlled for and others which cannot. Regardless of how long a perpetrator has been viewed, whether or not a weapon was, how stressful the event is perceived by a witness

or whether or not a disguise was adopted for example may all affect the memory trace. Further, individuals may also differ in the way they encode events. Tulving and Thomson (1973) described the encoding specificity principle – the way material is encoded determines what is stored, and subsequently the stored material is then responsible for determining the necessary retrieval cues to access it. Considering this in relation to the evidence discussed it may be purported that upon viewing a line-up, it is of paramount importance that the current image of each individual presented, achieves an optimum match to the initial time the perpetrator was viewed and the image encoded. In doing so, this may stimulate the natural chronological order of memories and facilitate the identification process.

As legislation currently stands, when perpetrators have their image captured for a video identity parade, unless apprehended immediately, their attire may be different from the time the crime was committed. Appreciating the potentially adverse effects of attire/appearance change in relation to current legislation, the purpose of the present research was to examine the effects of specific attire (absence or presence of hoods) upon recognition. Such garments are widely available and may be easily adopted as a disguise for the purpose of committing a crime. Additionally, they are more common than head attire such as balaclavas and therefore add a degree of ecological validity to the study. In 2005, Bluewater shopping centre in Kent banned the garments in order to discourage antisocial behaviour (Hinsliff, Weitz & Bright, 2005). As far as the researcher was aware sparse literature was in evidence which explored identification rates of perpetrators wearing hooded garments. Considering the evidence discussed however, the presence of a hood may serve to affect the way the face is perceived, thus having a cumulative effect on witness confidence and accuracy rates.

In terms of specific predictions, Henderson, Bruce and Burton (2001) found that identification rates dropped from 83% to 43% when a hat was worn on a photograph identity parade when the target, a video still image was placed alongside the photographs. Further, Davies and Flin (1984) found that maintaining presentation between encoding and later viewing facilitated recognition. It was predicted therefore that for correct identification, a significant association would be observed between film

type (hood, no hood) and parade type(hood, no hood). In addition to attire, the effects of the cognitive interview were also explored, as contrasting evidence exists in relation to its effectiveness in recognition accuracy rates (Geiselman, Fisher, MacKinnon & Holland, 1985; Finger & Pezdek, 1999; Memon, Meissner & Fraser, 2010). It was hypothesized that there would be a significant difference between briefing groups (DVD, verbal and cognitive reinstatement) for identification (correct, incorrect & none attempted). It was also hypothesized that there would be a significant difference between sex and correct/incorrect identification. Wright and Sladden (2003) found an own-sex bias for females and males enhanced by the presence of hair. Lewin and Herlitz (2002) found that females performed as well as males in male face recognition, with an own-sex bias observed for females. Additionally, Rehnman and Herlitz (2006) found a female own-sex bias, with females exhibiting better male face recognition than males. Finally, the impact of confidence was investigated. Research has illustrated a weak correlation between confidence and accuracy, albeit moderated by correct choice (Sporer, Penrod, Read & Cutler, 1995) and that inflated witness confidence can adversely jurors' perceptions (Cutler, Penrod & Dexter, 1990; Brewer & Burke, 2002; Memon, Hope & Bull, 2003). It was predicted therefore that there would be a significant association between confidence and identification (correct & incorrect). The following research was conducted in collaboration with Leicestershire police, employing the identical procedure used in video line up identifications at the Leicestershire Police Identification Unit in assistance with a grant from the Faculty of Health and Life Sciences.

### **3. Method**

#### *3.1 Parade generation*

On gaining ethical approval from the Faculty Research Ethics Committee, course leaders from the faculties of Humanities and Health and Life Sciences within De Montfort University were contacted by email in order to gain consent to approach their respective student cohorts. Once permission was obtained, talks were given to first, second and third-year drama undergraduates, third-year human psychology undergraduates and trainee police officers; informing them of the identity research and asking for volunteers to take part in a video mock identity parade and/or the filming of

mock crime scenarios. These cohorts were chosen specifically considering the subsequent recruitment of participants for the study; drama students are located both in a different faculty and building, the third-year human psychology students would complete their course before the testing of any participants commenced, and the trainee police officers would not be recruited as participants. The aim was to minimise the chances of participants coming into contact with anyone featuring in the identity parades. Volunteers were allocated time slots for participation. It was made explicit to male individuals who volunteered to take part in the mock crime scenario that they would also be required to have their image captured for a video line-up as they would be adopting the role of perpetrator. Volunteers were issued with consent forms for the line-up (see Appendix A1) and signed consent was obtained before filming commenced.

Image captures took place either at the Leicestershire Police Identification Unit or in a recording studio in the Art and Design faculty within the University. The equipment employed was identical at each location and image captures were all performed by the Inspector of the Leicestershire Police Identification Unit. For image capture a green background identical to the one used by Leicestershire police was set up in a recording studio in the Art and Design faculty within the University. A stool was placed in front of the screen on which the volunteers sat whilst having their images captured. Two continuous lights were placed in-situ to achieve the correct level of lighting and prevent facial shadows.

A video camera was used to film the 15 second moving image captures. Each participant was instructed to sit on the stool facing forwards. An instruction CD (15s duration) was played on a CD player requesting participants to first face forwards, second turn their head to the left, third turn their head to the right and finally to face forwards again. Participants were instructed beforehand to fixate on a mid-point between floor and ceiling on the respective walls as they turned their heads from left to right to ensure that a 90° head turn each side was achieved from the frontal position. Four images of each male volunteer were captured in total; wearing their normal attire, a black wool hat, a black hooded top (hood down) and a black hooded top (hood up).

For female volunteers the wool hat image capture was omitted due to its incongruence with usual female attire.

Forty-four volunteers had their images captured (21 male and 23 female) resulting in a total of 153 15s video captures. For the purposes of the actual study, only male captures were used. Eight parades were compiled by officers at the Leicestershire Police Identification Unit employing the Promat system (Promat, 2010) which is currently used throughout Leicestershire. Adhering to this system, presentation of the parade is sequential where each line up member is displayed individually. This is in contrast to simultaneous parades where all line up members are viewed at the same time. Parades 1, 2, 3, and 4 consisted of nine members wearing black hooded tops – hood down. Parades 5, 6, 7 and 8 consisted of nine members wearing the same tops – hood up. Parades 1 and 5, 2 and 6, 3 and 7, and 4 and 8 were identical except for the absence or presence of hood. Each line-up featured the same 8 fillers and perpetrator, but their order varied between each of the respective pairs. For pair 1 and 5, the perpetrator was in position 7 and for pairs, 2 and 6, 3 and 7, and 4 and 8, the perpetrator featured in positions 5, 4 and 3 respectively (see Appendix A2 for line-up image stills). The position of perpetrators varies in actual video identity parades compiled by police officers; albeit all witnesses viewing the same parade view the suspect in the same position. The position of the perpetrator in the current research was varied in order to allow the exploration of any potential suspect position bias in relation to identification.

### *3.2 Mock crime scenarios*

Two sets of mock crime scenarios were filmed in a local park location; short (duration 18s) and long (29s), with the suspect's face visible for 15s and 25s respectively. In one series, the suspect was wearing a black hooded top (hood up) and in the second, the hood was down. The suspect was filmed sitting on a bench, texting on a mobile phone. At the other end of the bench, a girl was sitting reading a magazine. Her lap top bag was between them. After 12s had elapsed in the short film and 23s had elapsed in the long film, the suspect looked to his right and then his left before snatching the bag and running off. The presence of a weapon was deliberately avoided in light of research implying the effects of weapon focus, where more attention is afforded to the weapon rather than the perpetrator (Stebly, 1992; Hope & Wright,

2007; Loftus, Loftus & Messo, 2007). Further, a violent scenario was avoided as increased stress levels have been illustrated to have a detrimental effect upon identification accuracy by increasing the amount of false alarms in target-present line ups (Deffenbacher, Bornstein, Penrod & McGorty, 2004) and reducing the amount of descriptors recalled (Valentine & Mesout, 2009). The aim was to create a scenario where witnesses would focus more intently on the perpetrator by attempting to control for these variables.

Versions of short and long films (hood up, hood down) were piloted on 20 participants (staff and students) within the university. Floor effects were evident from participants who had viewed the short versions. No correct suspect identifications were made from the video identity parade by participants who had viewed any of the permutations of short film (hood up, hood down) and parade (hood up, hood down). Research by Reynolds and Pezdek (1992) exploring duration of target exposure had revealed an advantage for feature recognition (hair, eyes, nose, mouth and chin) for a 20 second exposure duration compared to the 3-second exposure duration. Further, eyes and hair procured a recognition advantage in the 20 second duration condition. Considering this and results from the pilot study, only the long versions of the films (hood up, hood down) were selected for use in the main study.

### *3.3 Participants*

An opportunity sample of 33 males (mean age 40.24 years, *SD* 12.83, age range 18 – 62 years) and 63 females (mean age 36.14 years, *SD* 11.92, age range 19 – 61 years) were recruited. Participants comprised staff and undergraduate students (with the exception of those from cohorts where individuals had taken part in the image captures) within the faculty of Health and Life Sciences, and open day visitors to the University. The sample comprised 80 Caucasian participants, 6 Indian, 4 Black, 2 Chinese, 2 mixed race, 1 White non-British and 1 Other (Arabian). English was the first language of all participants. All participants had normal or corrected to normal vision. Individuals did not know any of the actors in the videos.

### 3.4 Design

A 2 x 2 x 5 between-participants design was employed. Three independent variables were manipulated; film (hood up, hood down); parade (hood up, hood down); and clarity of briefing (DVD, verbal & cognitive reinstatement), resulting in 20 subsets. For purposes of continuity, the same police Inspector that featured on the briefing DVD also performed some of the verbal briefings and cognitive reinstatement briefings. Participants were randomly allocated to one of four conditions; hood down film and parade, hood down film/hood up parade, hood up film and parade or hood up film/hood down parade.

The dependent variables were identification, confidence and clarity of briefing. Identification was measured as correct, incorrect or no identification. Confidence was scored on a scale of 1 to 10, with high scores indicating high levels of confidence. Clarity of briefing was also scored on a scale of 1 to 10, with high scores indicating high levels of clarity. The perpetrator featured in every parade.

### 3.5 Materials

An Optoma 25 projector was used to display the two films. Corresponding sound was played via a separate audio speaker. The parades were displayed on a RM monitor, employing Promat software (Promat, 2010) as used by Leicestershire police. In addition to an information and consent form and a form requesting demographic details, participants completed a series of forms and questionnaires designed specifically for the research as follows:- *Suspect Appearance Questionnaire* – A filler task comprising questions relating to the crime scenario they had just witnessed on video. *Briefing Procedure Questionnaire* - Comprised questions relating to the clarity of the briefing instructions. *Suspect Identification Questionnaire* – relating to at what stage individuals were able to identify the perpetrator and also including a confidence scale where 1 = not at all confident and 10 = very confident. Participants were also provided with a set of questions relating to features but these will not be reported. All participants were provided with a debrief sheet upon completion of the experiment documenting the purpose of the study. (See Appendix A 3 – A10 for complete set of forms).



### *3.6 Procedure*

Participants were shown into a waiting room where they were asked to read an information sheet providing details of the study, and if satisfied sign a consent form (see Appendix A3). Individuals were also asked to provide their demographic details (see Appendix A4). Once forms had been completed, participants were then escorted into the viewing room and were informed that they were about to view a short film which would be under one minute in duration. Participants viewed the film either alone or in twos or threes, depending on how many researchers were present to show the subsequent video identity parades. Participants viewed the parade alone, in the presence of the researcher in accordance with Leicestershire police procedures. Witnesses do not view parades in the presence of other witnesses as any potential discussion or conference could be viewed as contaminating evidence (Home Office, 2011).

The colour film was viewed in a dark room and projected onto a wall 1.58m by 1.17m. Sound was played through a separate speaker. The image was subtended 24.6 by 32.1 degrees. The aim was to project life-size images accompanied by sound in order to enhance presence and atmosphere, as far as simulating a crime scenario is possible. Participants were arbitrarily allocated to view either the hood up or the hood down condition. Once the film had been viewed, participants were then escorted back into the waiting room and were requested to fill in an eight-question questionnaire about the appearance of the suspect (see Appendix A5). This was designed to ascertain which aspects of suspect appearance participants felt most prominent; and also to act as a filler task before embarking upon the identification parade stage of the study. On average, individuals took approximately 10 minutes to complete the questionnaire. In accordance with police procedure, participants were not allowed to discuss events.

Upon completing the Suspect Identification questionnaire, participants were escorted to individual parade viewing rooms and were subject to one of five parade briefing conditions: 1.) Instructions were conveyed via a DVD which involved a 1 minute film regarding the video identity parade process, given by a uniformed police Inspector (see Appendix A6 for briefing script), 2.) Instructions were conveyed verbally by the researcher or 3.) By the police Inspector from an adapted form, used and adapted by Leicestershire police for the purposes of this research (see Appendix A7), 4.)

Participants first underwent an adapted shortened version of the Cognitive Reinstatement (CR) procedure by the same uniformed Inspector who featured in the DVD or 5.) A female researcher trained in the cognitive interviewing process, where they were encouraged to recall events from different perspectives and in different orders before then receiving the verbal briefing as detailed on the adapted Leicestershire police form (Appendix A7).

Before a parade was shown, each individual was informed that the perpetrator may or may not be present. Participants viewed either a parade where all parade members were wearing hoods (hood up) or one where no hoods were worn (hood down). For both parades, the suspect featured in one of four positions; 3, 4, 5 or 7 out of a possible 9. The same filler faces were used for each parade, positioned pseudo-randomly in relation to the suspect; resulting in four different parades per condition (hood up, hood down), each comprised of the same faces. The entire parade format was identical to that used by Leicestershire police. The parade was displayed on a LCD 22' monitor subtended 16.26 by 26.18 degrees, employing Promat software (Promat, 2010). Each of the nine parade members were featured individually in a 15 second moving video clip; first looking straight on, turning their head to the left, then the right and ending up facing the front again. Each member was shown against a uniform green background and the whole parade was displayed sequentially. Participants were informed they would see the parade twice. They were then asked if they would like to see the whole parade or any of the suspects again. Any further requests for viewings were honoured until each participant could state whether they thought the suspect was absent or present; and if present, state the number accompanying the clip. Individuals were permitted to see clips as many times as required until they felt able to make a decision to reject the line up or make an identification. If a number was stated, that clip was played once again in order to confirm the participant's selection. In accordance with police procedure participants were not given any feedback in relation to their decision. Once the parade viewing was over, individuals were escorted back to the holding room and asked to complete two further questionnaires; one on the clarity of the briefing procedure (see Appendix A8), the other on the identification of the suspect; including confidence (see Appendix A9). Once completed, participants were provided

with a debrief sheet (see Appendix A10) and any further questions they had were addressed verbally.

## **4. Results**

### *4.1 Suspect Position*

A 4 x 3 Chi-square test for independence was carried out to explore the relationship between suspect position in the parade and identification (correct, incorrect, no ID). No significant association was observed  $\chi^2 (6, N = 96) = 9.97, p = .126$ , Cramer's  $V = .23$  suggesting that the suspect's position in 3, 4, 5 or 7 from a parade of nine did not affect participants' identification decision.

### *4.2 Context*

Frequencies were calculated for the amount of correct, incorrect and non-identifications per condition (no hood film/no hood parade, hood film/hood parade, no hood film/hood parade, hood film/no hood parade). From the sample, there were 30 correct identifications, 16 incorrect identifications and 50 participants were unable to make a positive identification (see Table 4.2.1.) Further, see Table 4.2.2. for context broken down into 'same' and 'different' for correct, incorrect and no identifications attempted.

Table 4.2.1 *Frequency of Responses for Correct, Incorrect and No Identifications per Condition (No Hood Film/No Hood Parade, Hood Film/Hood Parade, No Hood Film/Hood Parade, Hood Film/No Hood Parade)*

Identification	Parade			
	Hood Film/Hood Parade	No Hood Film/No Hood Parade	Hood Film/No Hood Parade	No Hood Film/Hood Parade
<b>Correct</b> ( <i>n</i> = 30)	10	11	2	7
<b>Incorrect</b> ( <i>n</i> = 16)	4	4	5	3
<b>None attempted</b> ( <i>n</i> = 50)	10	9	17	14
<b>Total</b> ( <i>N</i> = 96)	24	24	24	24

Table 4.2.2 *Frequency of Responses for Correct, Incorrect and No Identifications per Condition divided into Same and Different Contexts*

Identification	Context	
	Same	Different
<b>Correct</b> ( <i>n</i> = 30)	21	9
<b>Incorrect</b> ( <i>n</i> = 16)	8	8
<b>None attempted</b> ( <i>n</i> = 50)	19	31
<b>Total</b> ( <i>N</i> = 96)	48	48

Correct, Incorrect and No identifications were examined separately to explore the main effects of each. In relation to identification, witnesses are required to be absolutely certain that the individual they have selected from the identity parade was the person they had seen committing the crime. This information can then be used as evidence in court, so it is important to differentiate between the three.

#### *4.2.1 Correct identification*

A 2 x 2 Chi-square test for independence (with Yates Continuity Correction) was carried out to explore the relationship between context (hood film/hood parade, hood film/normal parade, normal film/normal parade, normal film/hood parade) and correct identification. A significant association was observed  $\chi^2 (1, n = 30) = 4.12, p = .042$ ,  $\phi = .44$  indicating that individuals were more likely to make correct identifications when film and parade contexts were identical.

#### *4.2.2 Incorrect identification*

A 2 x 2 Chi-square test for independence was carried out to explore the relationship between context (hood film/hood parade, hood film/normal parade, normal film/normal parade, normal film/hood parade) and incorrect identification. Three cells (75%) had expected frequencies  $< 5$  therefore Fisher's Exact Probability Test was interpreted. No significant association was observed  $p = 1.0$  (2-sided) suggesting that incorrect identifications were not affected by context.

#### *4.2.3 No identification*

A 2 x 2 Chi-square test for independence (with Yates Continuity Correction) was carried out to explore the relationship between context (hood film/hood parade, hood film/normal parade, normal film/normal parade, normal film/hood parade) and no identification. No significant association was observed  $\chi^2 (1, n = 50) = 1.95, p < .155$  (2-sided),  $\phi = -.24$  implying that inability to make an identification was not affected by context.

### *4.3 Briefing*

#### *4.3.1 Briefing and Identification*

Owing to insufficient participant numbers to achieve an appropriate level of statistical power, briefing groups were collapsed from five groups (DVD, verbal – researcher, verbal police Inspector, cognitive reinstatement researcher, cognitive reinstatement – police Inspector) to three (DVD, verbal & cognitive reinstatement). A Chi-square test for independence was undertaken to explore type of briefing (DVD, verbal and verbal + cognitive reinstatement) upon identification (Correct, Incorrect and No). Results revealed no significant association between briefing condition and identification;  $\chi^2(4, N = 96) = 1.36, p = .852$ , Cramer's  $V = .08$ , suggesting that type of briefing had no impact on whether or not participants made an identification or levels of correctness.

#### *4.3.2 Clarity of briefing*

A one-way between groups analysis of variance was undertaken to explore the impact of type of briefing (DVD, verbal or verbal + cognitive reinstatement) upon clarity as scored as a percentage between 1 –100. There was no statistically significant difference at the  $p < .05$  level in clarity scores for the three groups:  $F(2, 93) = .08, p = .927$ , implying that type of briefing had no effect upon perceived clarity of instructions.

### *4.4 Confidence*

#### *4.4.1 Condition and Briefing*

A two-way analysis of variance was undertaken to investigate the impact of condition (hood film/hood parade, hood film/no hood parade, no hood film and no hood parade and no hood film/hood parade) and type of briefing (DVD, verbal or cognitive reinstatement) upon participant confidence levels as scored as a percentage between 1 – 100 (confidence scores were provided by participants who made correct and incorrect identifications only). Both the main effect of condition,  $F(3, 34) = 1.24, p = .31$  and briefing type  $(2, 34) = .06, p = .943$  failed to reach statistical significance. The interaction between condition and briefing type was not statistically significant:  $F(6, 34) = .47, p = .829$ , indicating that neither condition nor type of briefing employed had an effect upon participant confidence levels.

#### *4.4.2 Confidence and Identification (Correct & Incorrect)*

For participants who made an identification ( $n = 46$ ), the relationship between confidence and correct and incorrect identification was explored employing a point-biserial correlation. Levels of confidence were significantly related to correct and incorrect identification,  $r^{pb} = .31$ ,  $p = .039$ , with moderate levels of confidence being associated with moderate levels of correct identification.

#### *4.5 Sex*

##### *4.5.1 Confidence and Sex*

Of participants who made correct and incorrect identifications, the relationship between confidence and sex was explored employing a point-biserial correlation. Levels of confidence were not significantly related to sex;  $r^{pb} = -.12$ ,  $p = .437$ , suggesting that both males and females possessed similar levels of confidence.

##### *4.5.2 Sex and Identification*

A 2 x 3 Chi-square test for independence was carried out to explore the relationship between sex of participant and identification (correct, incorrect and no). No significant association was observed,  $\chi^2 (2, N = 96) = .928$ ,  $p = .63$ , Cramer's V = .10, indicating that sex of witness had no effect upon any of the three identification categories.

## **5. Discussion**

In relation to examining the impact of external features upon recognition when perpetrators of a crime were wearing a hooded garment, four main hypotheses were proposed. First, the prediction that for correct identification, a significant association would be observed between film type (hood, no hood) and parade type (hood, no hood) was supported. Second, the hypothesis that there would be a significant difference between briefing groups (DVD, verbal and cognitive reinstatement) for identification (correct, incorrect & none attempted) was not supported. Third, the prediction that there would be a significant association between confidence and identification (correct & incorrect) was supported. Finally, the prediction that there would be a significant difference between sex and correct/incorrect identification was not supported.

### *5.1 Context*

The current research was undertaken in collaboration with Leicestershire police in view of informing police procedure with respect to video identity parades. The aim therefore was to formulate a forensic situation where each stage simulated events as they would unfold in a real life scenario, beginning where a crime is witnessed through to the stage of the identity parade. The compilation and undertaking of the video identity parade followed the identical procedure to that employed by the Leicestershire Police Identification Unit. Participants were subject to one of four possible context conditions; hooded film / hooded parade, no hood film / no hood parade, hooded film / no hood parade or no hood film / hooded parade. Regardless of which line up was employed (hood or no hood), the suspect could appear in one of four positions; 3, 4, 5 or 7. Analysis confirmed that suspect position was not biasing identification. No significant effects were observed for incorrect identification and context and no identification and context. When context and correct identification were analysed however, correct identifications were significantly higher in congruent context conditions compared to incongruent context conditions. The lowest number of correct identifications were made by participants in the hood film / no hood parade condition ( $n = 2$ ). Considering that the hood film / no hood parade context is the one which is closest to a real-life scenario and the fact that only two participants (8.3%) out of a possible 24 in this condition were able to make a positive identification has implications for the way line ups are presented. Further, for participants in the no identification condition, the hood film / no hood parade context yielded the highest number of non-attempts at identification with 17 / 24 (70.8%). Although this latter condition was not significant, a pattern appeared evident where congruent contexts yielded the highest levels of correct identifications and incongruent contexts were responsible for the highest number of non-identifications.

As discussed previously, research has illustrated that for unfamiliar faces hair has afforded a recognition advantage (O'Donnell & Bruce, 2001; Want, Pascalis, Coleman & Blades, 2004) and further that in the event of hairstyle change, correct identification rates of perpetrators was shown to decrease (Pozzulo & Balfour, 2006; Pozzulo & Marciniak, 2006). As with the present research, both of the latter two studies employed only target-present line ups and although the present study employed



sequential line ups, this effect was observed for simultaneous and sequential line ups (Pozzulo & Balfour; Pozzulo & Marciniak). Although hairstyle change did not take place in the present study, hair was completely covered in half of the films and half of the parades. Rainis (2001) found that correct identifications were significantly higher for similar background contexts compared to changed context and no context conditions. Whilst it may be improbable that the background context where a crime is committed and identity parade backgrounds would correspond in real life scenarios; it may be possible to manipulate clothing, where presence of hood may be considered as the context immediately surrounding the face. Further, Davies and Flin (1984) found that when conditions between encoding and subsequent viewing matched (a mask present at both), resulted in significantly higher recognition rates compared to incongruent conditions. Acknowledging the encoding specificity principle described by Tulving and Thomson (1973), it may be asserted that preserving the context of the face between initial viewing and the video identity parade (hood in both or no hood in both) acted as the retrieval cue permitting access to the memory of the face.

Considering the evidence that viewing a perpetrator in an identity parade with the same facial context as viewed in a crime scenario film significantly enhanced identification, this has important connotations and highlights external features as an important frame of reference. As current police legislation stands, any distinguishing features (e.g. scars or tattoos) possessed by line up members are disguised in order to maintain equity (PACE Code D, Home Office, 2008). Further, lineup members are required to be of similar appearance with regards age and hair colour/style. As previously discussed, varying amounts of time may elapse between a perpetrator committing a crime and having their image captured. Such time periods allow for changes in hairstyle and facial hair. Additionally, lineup members (both perpetrators and fillers) may present in different attires. As illustrated by Lindsay, Wallbridge and Drennan (1987), Seitz (2003) and Freire, Lee, Williamson, Stuart and Lindsay (2004), clothing bias can adversely affect the identification process. The perpetrator and line up members in the current experiment had no distinguishing features, however absence or presence of hooded attire continued to affect the recognition process. With respect to police procedure, a more equitable process would be to have all line up members in the

same attire. It may not be possible or practical to ensure that when images are captured individuals are uniformly dressed. However, with technology available to digitally enhance images to obscure distinguishing features, consideration may also be given to digitally enhancing attire to ensure that all line up members are either dressed uniformly and/or in similar clothing to that of the perpetrator when the crime was committed. Further thought may also be given to providing witnesses with a hooded line up in addition to the standard non-hooded line up, if the perpetrator was wearing a hooded garment at the time the offence was committed. However, further investigation may be required in this area, especially considering the type of head attire available, for example, baseball caps, balaclavas, hijabs, turbans and yashmaks to name but some. In a recent study, Mansour, Beaudry, Bertrand, Kalmet, Melsom, and Lindsay (2012) investigated the effects of disguising eyes and hair where perpetrators either wore a woollen hat and sunglasses or stocking over their head. In target-present line ups, the hat caused the most disruption to recognition leading the authors to suggest that hair acts as a confirming cue when there is a match to memory. Presence of a hat also significantly reduced confidence levels compared to when no hat was worn. Although no disguises were present when participants viewed the identity parade, it may be argued that results still highlight the detrimental effects of covering hair.

### *5.2 The importance of external features in unfamiliar face recognition*

The current findings support the advantage of external features for unfamiliar face recognition as found by Walker-Smith (1978); Cutler, Penrod and Martens (1987); Henderson, Bruce and Burton (2001); O'Donnell and Bruce (2001); Nachson and Shechory (2002); Want, Pascalis, Coleman and Blades (2004) and Clutterbuck and Johnston (2005). Evidence has revealed a divergence between the perceived importance of the whole face, configurations of features, the spatial relations between them and individual features in recognition (Tanaka & Farah, 1993; Tanaka & Sengco, 1997; Leder & Bruce, 2000), however from the current findings, it may be asserted that external features featured prominently in the recognition process, as when concealed during a crime, recognition rates fell significantly. Considering correct identifications for the hood film / hood parade and no hood film / no hood parade were 10 / 24 and 11 / 24 respectively, it may also suggested that support is provided for holistic processing

(Tanaka & Farah, 1993) and further for the importance of the spatial relations between features (Leder & Bruce, 2000), in terms of spatial relations between internal features and hair in the current research. Recognition rates were high when the whole face was present in film and parade conditions even though the face was unfamiliar. Diamond and Carey (1986) implied an interdependence between featural and configural information. It may be intimated however that for unfamiliar faces external features are more prominent, as illustrated by the significant decrease in recognition; when hair was disguised during the crime but present on the identity parade, the internal features, although seen once before, were not sufficient to render a recognition advantage.

### *5.3 Briefing*

Briefing type and clarity scores (measured as a percentage) were analysed. There were no significant differences observed between the DVD, cognitive reinstatement and verbal instructions provided and individuals' perceptions of clarity. When the effects of type of briefing (DVD, verbal & cognitive reinstatement) and identification (correct, incorrect & no) were examined, again no significant relationship was found and the hypothesis that there would be a significant difference between briefing groups for identification was not supported. Therefore, type of briefing was not observed to be affecting participants' judgement. This is in contrast to findings by Cutler, Penrod and Martens (1987) who found that the context reinstatement interview significantly enhanced identification performance for participants viewing a perpetrator wearing a disguise (hat). However the type employed by Cutler et al. was more extensive. The cognitive interview has been illustrated to facilitate memory (Geiselman, Fisher, MacKinnon & Holland, 1985) by encouraging witnesses to recall events in different orders and different perspectives. Finger and Pezdek (1999) however found that this effect diminished owing to a verbal over-shadowing effect (where verbally describing a face subsequently lowers identification accuracy). This effect was observed after a description of the perpetrator was required after 10 minutes but not after 24 minutes or 1 hour, suggesting the effect was eradicated after a longer time period. Memon, Meissner and Fraser (2010) also found an overall advantage for the cognitive interview in eliciting correct information after extended delay periods. Individuals in the present study were required to provide a written description straight away after viewing the

crime scenario as opposed to verbalizing what they had seen. This took approximately 10 minutes. After this, they immediately participated in DVD, verbal and cognitive reinstatement conditions. Again, in the cognitive reinstatement condition, participants were encouraged to think about what they had seen as opposed to verbalization. It may be emphasized that the cognitive reinstatement provided in the pre-parade briefing was a condensed version compared to the type employed after witness have viewed a crime and was related to the briefing only thus making comparisons to the full cognitive reinstatement interviewing technique difficult. In light of the results found by Finger and Pezdek however, if participants had been encouraged to verbally describe the perpetrator, an alternative set of results may have been yielded in relation to identification.

Findings may also be interpreted in terms of economy and efficiency. In the current political climate of uncertain economic activity and limited resources, it is paramount that public services maximise resource efficiency and minimise expenditure. Evidence from the current experiment has revealed that the presence of an actual police Inspector during briefing yielded no difference in obtaining correct identifications, compared to a DVD briefing by an Inspector or a cognitive reinstatement briefing before a video identity parade viewing was undertaken. This suggests that the gravitas of an Inspector is not always necessary as the briefing can be conveyed effectively by other media, i.e. DVD and further that this enables their resources to be utilised in other areas. As an officer is always present during identity parades, each parade viewing is video recorded and any comments made by the witness are documented by the officer, the witness has every opportunity to clarify uncertainties.

#### *5.4 Confidence*

Only participants making an identification (either correct or incorrect) were requested to document their levels of confidence (scored as a percentage between 1 & 10) where 1 = not at all confident and 10 = completely confident). A medium correlation was observed between confidence and correct and incorrect identification, with moderate levels of confidence being associated with moderate levels of correct identification, thus supporting the hypothesis that there would be a significant

association between confidence and identification. Findings by Sporer, Penrod, Read and Cutler (1995) revealed a weak correlation between confidence and accuracy of witnesses from a meta-analysis of 30 studies. However, when the moderator of choice was included, the level of confidence-accuracy was observed to be higher for those who had correctly selected the perpetrator from an array than those who had not made a selection. Further, compared to individuals who had made a correct selection, a lower mean confidence level was observed for those making an incorrect selection. It may be suggested that maintaining the appearance of the perpetrator between crime scenario and identity parade assisted individuals in making a correct selection thus consolidating witness confidence levels. As discussed earlier, even if a disguise has been adopted during a crime, in accordance with current legislation the perpetrator is subsequently viewed in an identity parade with no disguise. The incongruence between encoding and later viewing conditions could result a decrease in confidence levels with respect to making a positive identification.

Type of lineup may also affect levels of confidence. Memon, Hope and Bull (2003) found that for individuals who had observed a perpetrator for 45 seconds, there was no difference in confidence levels between accurate and inaccurate participants in the target-present line up condition. For those who had viewed the perpetrator for 12 seconds, inaccurate witnesses were less confident. In the current scenario where only target present conditions were employed, the perpetrator was only in view for 25 seconds, followed by a sequential line up. The line up in the study by Memon et al. was a photographic 3 x 2 sheet of black and white images displayed simultaneously. It may be asserted that the presence of a simultaneous as opposed to sequential line up may have resulted in a relative judgement decision-making strategy as implied by Wells (1984) to be employed consequently affecting confidence scores. The simultaneous presentation of the identity parade in the present study permitted absolute judgements to be made.

When the effects of condition (hood film/hood parade, hood film/no hood parade, no hood film and no hood parade and no hood film/hood parade) and briefing type (DVD, verbal or cognitive reinstatement) were investigated, neither was observed

to significantly affect confidence levels. Again, this may be viewed as advantageous with regards economic efficiency, in terms of employment of the DVD briefing, enabling staff to be deployed for other duties.

Findings by Brewer and Burke (2002) revealed jurors were observed to be influenced by high levels of confidence conveyed by both accurate and inaccurate witnesses. Cutler, Penrod and Dexter (1990) also observed that disproportionate weighting was given to witness evidence. Although moderate levels of confidence were related to correct identification in the current study it is asserted that caution should still be exercised when considering witness evidence, given the numerous variables that can affect the encoding, retention and recall of information.

#### *5.5 Sex*

No significant association was observed between sex of participant and identification (correct, incorrect or none attempted) and therefore the hypothesis was not supported. McBain, Norton and Chen (2009) found that women outperformed men in face discrimination and recognition tasks. However, in their study stimuli consisted of both line drawings and morphed faces, which may be considered widely contrasting to the stimuli in the current experiment. Both Lewin and Herlitz (2002) and Rehnman and Herlitz (2006) found an own-sex bias for females and the latter also found that females performed better than males for male face recognition. Wright and Sladden (2003) found hair procured an own-sex recognition advantage for both females and females. Although their participants had not viewed a crime scenario, the recognition task did involve viewing a sequential presentation of photographs. It may be suggested therefore that presence of a hood in three of the four possible conditions (hood film / hood parade, no hood film / no hood parade, hood film / no hood parade and no hood film / hood parade) affected encoding and subsequent recognition, resulting in a diminished effect of the own-sex advantage for males afforded by hair (Wright & Sladden) and reduced the performance of females (Rehnman & Herlitz). As the present investigation only comprised male perpetrators, future research might also look to include female perpetrators.

There were no significant differences in levels of confidence between males and females which is in contrast to findings by Areh (2011) where men were observed to be more confident but less accurate than women. It may be noted however that in Areh's study, participants were required to respond to a 77 item checklist, including items relating to descriptors of individuals, place and objects related to the incident which may have provided prompts that assisted in recall and consequently compounded confidence levels, whereas the current study relied predominantly upon free recall for questionnaires. Further, individuals in Areh's study were not required to view an identification parade, thus making comparisons difficult.

#### *5.6 Interpretations in Relation to the Functional Model for Face Recognition (Bruce & Young, 1986)*

Findings were interpreted in terms of Bruce and Young's (1986) model which differentiates between familiar and unfamiliar face recognition. Considering video parade identification, the unfamiliar face of the suspect was perceived to be processed by way of the structural encoding and directed visual processing route to seek out the information in the face. As the suspect had only been viewed once for 25 seconds, the strength of resemblance between input from structural encoding and the stored structural code contained in the face recognition unit may not have been sufficient enough to facilitate recognition even though the face had been seen 15 minutes earlier owing to the change in presentation of the face due to incongruent film and parade conditions. When conditions did correspond, even though the face could still be interpreted as unfamiliar, the strength of resemblance appeared sufficient enough to permit correct identification. As no semantic information was known about the individual, recognition could not have been confirmed by the person identification nodes (PINs).

## **6. Conclusions**

### *6.1 Limitations*

The current study employed only hooded attire and therefore hair was the only feature disguised. Considering the different types of attires that may be adopted as a

disguise, some may leave different features exposed. It may be possible to explore the effects of identification where eyes are the only visible feature, or where the head is covered with a different article. Research by Stephan and Caine (2007) illustrated eyes featured highly in terms of identification importance when hair was unavailable. Therefore different disguises and exposed features may reveal different results.

Further, in the present study, the majority of participants were White (80/96) in addition to the perpetrator and fillers on the identity parade. With a mixed demographic, a different set of results may have been procured. The introduction of a perpetrator from a different ethnic origin in addition to increasing the mixed ethnic demographic of participants would permit further investigations. This would enable the effects of own race bias (Meissner & Brigham, 2001; Wright, Boyd & Tredoux, 2003; Tanaka, Kiefer & Bukach, 2004) and the ameliorating effects (Wright, Boyd & Tredoux; Tanaka, Kiefer & Bukach) to be investigated, especially in communities comprising a highly mixed racial demographic.

In addition to expanding the racial demographic, it would also be interesting to explore the effects of disguise with female perpetrators. No own-sex bias was observed in contrast to findings by Wright and Sladden (2003) where hair acted as a marker. As the current study only employed male faces, the inclusion of female faces would permit comparisons.

Finally, no significant effects were observed for type of briefing. Categories were collapsed owing to insufficient participant numbers per cell into DVD, verbal and cognitive reinstatement conditions. A further breakdown into cognitive reinstatement researcher or police Inspector and verbal researcher or police Inspector would be interesting to explore in order to consolidate the present findings.

## *6.2 Overall aims and recommendations*

The overall aim of the current research was to investigate the impact that external features have upon face recognition in individuals in an applied context in relation to video identity parades with a view to informing police. Significantly more correct identifications were made when individuals observed congruent (hood film



followed by a hood parade or no hood film followed by a no hood parade) compared to incongruent (no hood film followed by a hood parade or a hood film followed by a no hood parade) conditions. The lowest number of correct identifications ( $n = 2$ ) and the highest number of non-identifications ( $n = 17$ ) were evident in the hood film/no hood parade condition, compared to all other conditions, which is the condition most representative of a real-life scenario. In order to increase the number of correct identifications, it is proposed that if a crime is witnessed where a perpetrator is wearing a hood, availability should be made to view an additional hooded line up to facilitate retrieval of the memory trace established at the time of the initial encoding of the incident, in accordance with Tulving and Thompson's (1973) encoding specificity principle. Current police procedure dictates that all line up members should be of similar appearance and age to the suspect and that any distinguishing features are disguised (they may be revealed however upon request of the witness). Further, regardless of whether a disguise was adopted at the time of the crime, hair is always visible on the parade. Considering that digital enhancement may be applied to disguise identifying features, the same process could be applied in order to create a hooded line up. This would reduce the need for extra image captures necessitating the actual presence of the suspect whilst keeping time and cost expenditure to a minimum. It is evident from the system and estimator variables discussed, that numerous factors can interact and influence memory of events and the subsequent identification of perpetrators. It may not be possible to control estimator variables, but for system variables such as the way parades are presented, there may be scope for adaptation.

Hair was the only feature manipulated which suggests this feature may assist in the recognition of unfamiliar faces. Therefore, considering results further, the importance of maintaining the presentation of the face between encoding and subsequent viewing of a face appears paramount for unfamiliar faces. It may be asserted that even subtle differences may alter the way a face is perceived and recognized. It may further be emphasized that not all individuals may share the same level of adeptness with respect to recognition ability, therefore optimum conditions should be provided in order to facilitate the process. In essence, if a perpetrator is viewed initially wearing a

disguise such as a hood, presenting a hooded parade in addition to the normal parade is advised in order to achieve increased levels of correct identification.

With respect to type of briefing, no significant association was observed with identification (correct, incorrect or none attempted). This may be viewed in a positive light suggesting that presence of a police Inspector is not necessary in order to convey parade protocol information, thus the DVD featuring the Inspector can be employed saving both time and resources. As an officer is present during every parade, any questions a witness may have can be addressed.

When confidence levels and identification were analysed, confidence was moderately correlated with correct identification for a target present line up after the perpetrator had been viewed for 25 seconds. A clear view of the perpetrator was obtained in a non-violent crime scenario. However, in a real-life situation, the length and clarity of view may not be as pronounced. Other studies have illustrated that despite witness fallibility, jurors' perceptions may be adversely influenced by witness confidence levels (Brewer & Burke, 2002; Memon, Hope & Bull, 2003) therefore it is recommended that caution continues to be applied in relation to witness confidence and accuracy considering the amount and combination of variables that can affect the recognition process.

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## **APPENDICES**

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**APPENDIX A1**

**Filming Consent Form**

Thank you for volunteering to take part in the filming of a crime scenario. The film will be used for research purposes only. The research is being done in collaboration with Leicestershire police. The aims of the research are to investigate eyewitness memory and identification. If you sign this consent form, your part in the film will only be used as part of our research.

If you are happy to participate in our research, then please sign below:

**Signature -----**

**Date -----**

**Name (BLOCK CAPITALS) -----**

If on reflection, if you decide that you do not want us to use the film you are in, please notify us by (Date). If you have any further questions, please don't hesitate to contact us.

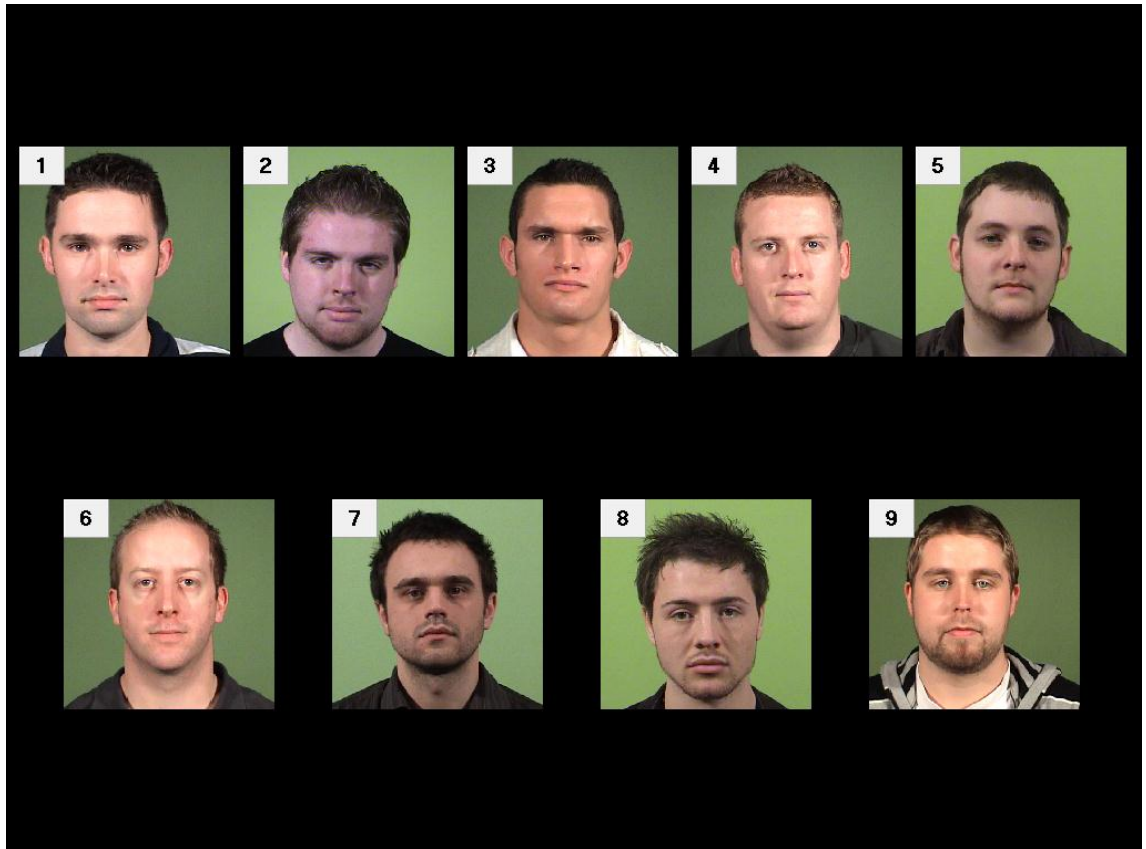
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**Thank you very much for your time.**

**APPENDIX A2**

**Parade Image Capture Stills**



**APPENDIX A3**

**Information and Consent Form**

This is a study investigating eyewitness memory. You will be shown a short video of a crime which is not violent and later you will be asked some questions. The experiment will last approximately forty minutes.

If at any point during the experiment you decide that you do not want to take part, please say so. Even after data has been collected, if you do not wish your data to be included please tell researchers by (Date) (contact details will be provided); otherwise it will be assumed that you are happy for your data to be included for analysis. In order to maintain anonymity, all data collected during this study will be number coded, stored electronically and password protected.

At the end of the experiment the aims of the study will be explained and you will have the opportunity to ask any questions you may have.

Please could you sign and print your name below to confirm that you have read and understood the above information and are willing to participate in the experiment.

Signature .....

Date .....

Print .....

**APPENDIX A4**

**Demographic Details**

Please could you provide the following information:

Age:

Sex: M / F      Please circle

Ethnic origin:      Please tick one of the following:

White British	
White non-British	
Afro-Caribbean	
Indian	
Pakistani	
Bangladeshi	
Chinese	
Somali	
Other (Please state)	

**APPENDIX A5**

**Suspect Appearance Questionnaire**

Participant number:

1.) What happened in the video you just saw?

2.) Was the thief in the video someone you know or think you have seen before?

YES  NO  DON'T KNOW

3.) What do you remember about the appearance of the thief?



4.) Was there anything particularly about their appearance that stood out?

5.) What do you remember about the clothes the thief was wearing?

6.) Was there anything about the clothing that particularly stood out?

7.) What do you remember about the thief's face?

8.) Which facial feature(s) do you think stood out the most?

## **APPENDIX A6**

### **DVD Briefing: Leicestershire Police**

Welcome to the Identification Unit and thank you for your help with this case.

Today, you will be asked to watch a video identification parade of at least 9 people.

One of these is a suspect, but this may or may not be the person you saw.

Please watch the video at least twice, and if you want, you can see the whole video or any part of it as many times as you like before you make an identification. You may even ask to see a particular frame frozen to study it further.

When you are ready, you will be asked if you can identify the person you saw.

If you can't make a positive identification, say so, but if you are confident the person you saw is shown, then make that identification.

The identification procedure will be video recorded and there may be another person present as the legal observer.

When the identification procedure is finished, you'll go to another room where we'll take a short statement about whether or not you've identified anybody.

Please don't discuss the case with any other witnesses while you are here. And thank you again for your help.

Verbal briefing Instructions

ID Research project

Date

Witness  
Name:

Age

---

*The compilation selected randomly*

Compilation 1  Compilation 2  Compilation 3  Compilation 4

---

Witness enters the viewing area  :  hrs.  
at

---

You have been asked here today to see help us in our research:

**You are about to view a video parade of at least 9 persons. The person you saw previously may or may not be on the video parade.**

**Please view the video parade at least twice before you make your final decision. There is no limit on how many times you can view the whole parade or any part of it, you may even ask to see an image frozen, which you can study further.**

**Once you have viewed the parade twice, I shall ask you whether the person you saw on the film shown earlier is shown on the parade. If you cannot make a positive identification you should say so, but if you can, please give me the number that appeared on the screen when their image was shown.**

**Do you understand?**

Yes  No

***Show the Video Parade***

---

*Describe what the witness does and says during the showing.*

---

---

---

---

**“Do you wish to view all or part of the film again?”**

Indicate numbers requested:	Action taken in response:

**Additional Comments**

---

---

---

---

---

**Is the person from that incident on the parade today?**

Yes  No

Other Reply):

---

---

---

---

**Which number?**

**“In order to confirm your identification, is this the person you were referring to when you made the positive identification?”**

Yes  No

---

---

**Suspect position:**

**APPENDIX A8**

**Briefing Questionnaire**

Participant number:

- 1.) On a scale of 1 to 10, could you please state how clear you felt the police briefing instructions were.

Please mark on the line how clear you felt the instructions were; where 1 = not at all clear and 10 = very clear.

**NOT AT ALL  
CLEAR**

**VERY  
CLEAR**

1

10

---

- 2.) Was there anything in the briefing that you did not understand? If so, please give details.

- 3.) Is there anything else you would like to see included in the briefing to make the instructions clearer? If so, please give details.

**APPENDIX A9**

**Identification Questionnaire**

1.) Did you pick someone out of the parade?

YES            NO            Please circle

If yes, please give the number of the individual you identified

If NO, go to question 4.

2.) If you did identify someone, how confident are you that this is the person you saw stealing the bag?

Please mark on the line your level of confidence; where 1 = not at all confident and 10 = completely confident.

**NOT AT ALL  
CONFIDENT**

**COMPLETELY  
CONFIDENT**

1

10

---

3.) If you were you able to identify the thief, was it:  
(Please circle)

- a.) As soon as you saw his face.
- b.) Only after the first viewing of the first viewing of the whole parade.
- c.) After the second viewing of the parade.
- d.) After viewing the parade twice and some of the images more than twice.
- e.) Any other reasons (please give reasons below)

**Now please go to question 5.**

4.) If you didn't identify anyone, was it because:  
(Please circle)

- a.) You did not think that the thief was on the identity parade.
- b.) Although you think the thief was on the identity parade, you are not sure enough to make an identification.
- c.) You cannot remember the face of the thief.
- d.) You could not decide between two or more of the faces.
- e.) Any other reasons (please give below).

5.) We are interested in which features you found most important in making an identification. Please could put a mark on the line for each of the following features in relation to how important you think each feature was; where 1 = not important at all and 10 = highly important.

Eyes	1	_____	10
Nose	1	_____	10
Mouth	1	_____	10
Face shape	1	_____	10
Hair	1	_____	10
Facial hair	1	_____	10
Hair line	1	_____	10
Other (please state)	1	_____	10



**Debrief Sheet**

Thank you very much for taking part in this research. The aims of this experiment were first; to examine the accuracy of identification using new video parade techniques; and second; to analyse the effects of the information before making an identification. Because this is a large scale study undertaken in collaboration with Leicestershire police, we would appreciate it if you did not discuss events with anyone in order that the results of the research are not contaminated.

Thank you again for you time and valuable contribution to the research. Please find below details where researchers can be contacted if you have any further questions or queries.

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**Thank you for your time**

