Drawing the Artist: the Advantage of Artistic Ability for the Construction of Holistic Facial-Composite Images.

Building on Valentine's (1991) face space theory and evidence suggesting artists possess superior internal-feature encoding (e.g., Devue & Barsics, 2015; Kozbelt et al., 2010), this study investigated whether such an advantage would improve the construction of forensic facial composites. Artists and non-artists described a previously-seen unfamiliar face using a cognitive interview and then constructed a composite of it using one of the holistic facial-composite systems, EvoFIT. The effectiveness of the composites was assessed by asking participants who were familiar with the target identities to name the composites; we also asked further participants to rate the composites for likeness. Further, descriptive terms of the face provided by constructors during the cognitive interview were also analysed. Artist-generated composites were named significantly more often and rated significantly higher for likeness than non-artist composites, despite artists using significantly fewer descriptive terms, supporting a link between perceptual expertise and enhanced composite performance. Practical implications of the research are discussed.

Human face recognition is an exceptionally resilient cognitive function, underpinned by extensive behavioural and neurocognitive evidence demonstrating its robustness across a wide range of perceptual variations (Bruce & Young, 1986; Hancock, Bruce, & Burton, 2000). Despite substantial variability in viewing conditions, such as alterations in illumination (Moses et al., 1996), viewpoint (Bruce, 1982), facial expression (Bruce, 1982), and motion (Kemp et al., 1990), individuals routinely recognise faces with minimal conscious effort. Beyond establishing identity, faces also convey rich emotional and social signals (Leder & Bruce, 2000; White, 2001).

Theoretical frameworks such as Bruce and Young's (1986) parallel processing model and Valentine's (1991) multidimensional face space theory have sought to explain this capacity. Bruce and Young (1986) proposed that unfamiliar faces are encoded through view-specific pictorial codes, while familiar faces rely on abstract structural codes derived from accumulated exposure. Valentine's (1991) model offers a spatial analogy, positing that typical faces cluster centrally in a multidimensional space, with distinctive faces located toward the periphery, thus enhancing memorability.

However, empirical findings have nuanced these theories. Longmore et al. (2008) found limited generalisation across viewpoints for unfamiliar faces, implying discrete storage rather than abstraction. Functional neuroimaging further supports this distinction (see Natu & O'Toole, 2011). Recognition of familiar identities elicits increased activation in regions such as the fusiform face area (FFA) and occipital face area (OFA), consistent with specialised neural processing (Rossion et al., 2003; Young, 2018). These systems appear sensitive to familiarity, with viewpoint, lighting, expression, and context disproportionately disrupting recognition of unfamiliar compared to familiar faces (Bruce et al., 1987; Memon & Bruce, 1985; Russo et al., 1999).

Motion, while offering little benefit to unfamiliar face recognition (Bruce et al., 1999, 2001), may aid familiar identification under degraded conditions due to idiosyncratic motion cues (O'Toole et al., 2002). Similarly, distinctiveness plays a critical role, distinctive faces are recognised more efficiently than prototypical ones (Valentine & Bruce, 1986a; Wells, 1985), although Light et al. (1979) argued that attentional engagement, rather than fixed facial properties, may underlie this advantage. Caricature studies further show that exaggerated diagnostic features enhance recognition for both familiar and unfamiliar identities, whereas anti-caricatures impair recognition (e.g., Rhodes et al., 1987; Stevenage, 1995).

Importantly, familiarity influences the perceptual focus during encoding. Research shows that familiar face recognition favours internal features such as eyes, nose, and mouth, whereas unfamiliar recognition often relies on external features such as hairstyle and head shape (Ellis et al., 1979; O'Donnell & Bruce, 2001; Young et al., 1985). This internal-features advantage may emerge after relatively brief exposure and is particularly relevant in the context of forensic composite construction.

Holistic facial composite systems aim to replicate the way faces are naturally processed and recognised, prioritising internal features and recognition-based strategies over face recall (i.e., verbal description of faces). Typically, witnesses select whole faces with emphasised internal features, which are iteratively evolved to generate improved likenesses; external features are incorporated only at the final stage. This method reflects Davis et al.'s (1961) assertion that recognition places less cognitive demand than recall. EvoFIT, for instance, was designed to maximise identification accuracy through this approach, focusing on the refinement of internal features before finalising external elements. While structural and procedural differences exist across holistic composite systems, similar underlying principles, namely recognition-based generation and the prioritisation of internal facial features, characterise methods such as E-FITV and ID (e.g., Gibson et al., 2009; Tredoux et al., 2006). These commonalities render the theoretical rationale and findings of the present study broadly applicable, reinforcing its relevance across holistic approaches to facial composite construction.

Composites were constructed using EvoFIT, a holistic facial composite system that enables witnesses to select and evolve facial features based on recognition rather than verbal description. Its efficacy is supported by meta-analyses showing that it yields more than four times the naming accuracy of older, feature-based systems (Frowd et al., 2015).

Before constructing composites, participants completed a Holistic Cognitive Interview (H-CI), a structured recall technique designed to elicit detailed facial memories by encouraging witnesses to visualise and describe the target as a whole, rather than listing individual features. Widely used in forensic settings, the H-CI improves the quality of facial recall and has been shown to facilitate naming rates, especially when witnesses rate perceived personality traits such as intelligence, masculinity, and aggression (e.g., Fodarella et al., 2021; Frowd et al., 2008, 2012, 2015).

The H-CI promotes holistic encoding and reduces reliance on verbal descriptions, making holistic face construction with systems such as EvoFIT particularly effective for witnesses with communicative or cognitive challenges (Gawrylowicz et al., 2012). Importantly, the system's "holistic tools" appear to integrate facial features more effectively, enhancing recognition performance (Frowd, 2015) by changing the overall appearance of the face (e.g., by age, weight and health). A recent development of this interview involves a focus on the eye area. This region is important for recognition of an ensuing composite (Portch et al., 2025) when followed by a focus of attention on this area when evolving a likeness of the face (Fodarella et al., 2017).

Historically, forensic composites were rendered by artists using sketch techniques grounded in anatomical training and proportion estimation (Davies & Little, 1990; Frowd et al., 2005b; Laughery & Fowler, 1980). Modern research confirms that artists outperform novices on a range of perceptual tasks with trained artists able to demonstrate superior working memory (Perdreau & Cavanagh, 2015), broader attentional scanning and encoding of abstract features (Vogt & Magnussen, 2007), enhanced internal-features' focus (Kozbelt et al., 2010), and greater flexibility in perceptual processing (Chamberlain & Wagemans, 2015). While findings from Zhou et al. (2012) suggest cultural variation, the consensus across Western studies points to enhanced face-based cognition among artists (Devue & Barsics, 2015). Although drawing may not generalise to improved facial memory for novel identities, observational encoding during drawing appears to strengthen perceptual detail for studied faces (Cohen, 2005).

Light et al. (1979) extended Craik and Lockhart's (1972) levels of processing framework by examining how different encoding strategies influence memory performance, particularly in older adults. The original theory proposed that retention is determined not by rehearsal alone, but by the depth at which information is processed, ranging from shallow, perceptual analysis to deeper, semantic engagement. Light et al. demonstrated that meaning-based, elaborative encoding significantly enhances memory, even in incidental learning conditions. While older individuals showed similar benefits from deep processing, they were less likely to employ such strategies spontaneously. These findings underscore the principle that cognitive engagement during encoding, such as mentally drawing the face, plays a central role in retention.

Given these findings, the present study investigated whether trained artists produce more identifiable and accurate EvoFIT composites than non-artists. Based on prior evidence for internal-feature prioritisation and holistic perceptual strategies, it was hypothesised that artist-generated composites would outperform those created by non-artists in both spontaneous naming and likeness to the target.

The study employed the “gold standard” protocol (Frowd et al., 2005a) comprising three phases: (i) composite construction by artists and non-artists using unfamiliar static face stimuli (here, actors and actresses from the longstanding UK BBC TV soap *EastEnders*); (ii) naming of composites by participants who were familiar with these target identities; and (iii) independent likeness rating. Previous research has found no difference in recognition of composites created from static- or video-presented stimuli (Frowd et al., 2015), and intentional encoding reflects real-world witness behaviour (Fodarella et al., 2021).

To be of practical importance, the study was designed to be able to detect at least a medium effect size (i.e., with Cohen’s $d \geq 0.5$); this translates as an ability to detect an increase of around 15% naming (e.g., 10% vs. 25%) or more for artist-generated (cf. non artist-generated) composites (Frowd, 2021). As such, 10 targets were used, with composites constructed by equal numbers of artists and non-artists ($N = 2 \times 10$). Also, composite effectiveness was assessed by a familiar-identification group who named the composites ($N = 2 \times 10$), with a supplementary likeness rating task evaluated by a separate sample ($N = 60$). Based on prior research demonstrating that trained artists exhibit superior visual working memory (Gambarota & Sessa, 2019), broader attentional scanning and global-to-local flexibility (Chamberlain & Wagemans, 2015; Chamberlain et al., 2018), enhanced internal-feature focus (Ostrofsky et al., 2012), and greater perceptual adaptability and enhanced access to early visual representations (Perdreau & Cavanagh, 2014, 2015), it was predicted that artist-trained participants would produce facial composites with higher recognisability.

This study offers a novel contribution to forensic psychology by empirically linking holistic visual cognition, cultivated through artistic training, with improved facial composite recognisability. *EastEnders* characters were selected to ensure a diverse and ecologically valid stimulus set, spanning gender, age, and facial variation. Composite construction followed protocols established by Frowd and colleagues, widely regarded as the gold standard in facial composite research over the past two decades (Frowd et al., 2010), ensuring methodological rigour while introducing a previously unexplored variable: artistic perceptual expertise.

While previous research has focused on system development, verbal description, and general witness performance, this study uniquely integrates perceptual expertise, specifically holistic visual cognition cultivated through artistic training, as a predictor of composite success. By doing so, it shifts the focus from procedural optimisation to cognitive skill profiling, offering a new lens through which composite construction can be understood and improved. This represents a novel contribution to the facial composite literature and sets the stage for the empirical investigation that follows.

EXPERIMENT

The study followed a three-phase design to assess the impact of artistic training on facial composite recognisability. In Phase 1, artist and non-artist participants constructed facial composites using EvoFIT following a holistic cognitive interview (H-CI). In Phase 2, a separate group of *EastEnders* fans attempted to spontaneously name the resulting composites, providing accuracy and mistaken identity data. In Phase 3, a third group of participants rated the likeness of each composite using a 7-point Likert scale. This structure allowed for independent assessment of composite recognisability and visual accuracy across distinct participant groups. A visual overview of the procedure is provided in Figure 1.

Figure 1

Figure 1. *Overview of the three-phase study design. Phase 1 involved composite construction by trained artists and non-artists using EvoFIT following a holistic cognitive interview. Phase 2 assessed spontaneous naming accuracy by EastEnders fans. Phase 3 involved independent likeness ratings from a separate participant group using a 7-point Likert scale.*

PHASE 1: Composite Construction

- Participants: Trained artists and non-artists
- Procedure: Holistic Cognitive Interview (H-CI) + EvoFIT composite construction
- Output: 20 facial composites (10 artist, 10 non-artist)

↓

PHASE 2: Composite Naming

- Participants: *EastEnders* fans (naming group)
- Task: Spontaneous naming of each composite
- Measures: Correct naming, mistaken identity

↓

PHASE 3: Likeness Rating

- Participants: General public (rating group)
- Task: Rate visual likeness of each composite (1–7 Likert scale)
- Measure: Mean likeness score per composite

Stage 1. Composite Construction.

METHOD

Design

A between subject's design was used for composite construction. There was a single factor of Constructor Type (artist vs. non-artist). Each participant was individually exposed to a single image of an unfamiliar 'target' actor from the TV programme *EastEnders* for 30 seconds. Within a period of 20 – 28hrs later, the participant underwent a H-CI and then constructed a facial composite using the EvoFIT system.

Participants

Twenty participants (10 artists, 10 non-artists; 6 male, 14 female; *M* age = 24.5, *SD* = 8.2 years) were recruited through opportunity sampling, either voluntarily or in exchange for course credit. Artist participants had completed or were actively pursuing a Fine Art bachelor's degree and reported sustained engagement in visual arts. Non-artists were recruited from non-art disciplines and were checked that they had no formal art education or regular artistic practice, thereby minimising the inclusion of hobbyist artists. All participants reported no prior experience with facial composite construction and were recruited on the basis of being *unfamiliar* with the TV soap *EastEnders* and its cast.

Materials

Target faces were 10 characters from the BBC TV soap opera, *EastEnders*, sourced from the Internet. The target characters were Ian Beale, Jane Beale, Jack Branning, Laura Branning, Max Branning, Shirley Carter, Martin Fowler, Billy Mitchell, Jean Slater and Stacy Slater. The photographic images were of good quality and resolution, shown in a full-frontal aspect with minimum facial expression. All target faces were Caucasian and consisted of 5 males and 5 females with an approximate age range of 25 – 63 years. None of the male actors had facial hair beyond a slight stubble. The images were in colour and uniformly presented as 8 cm x 10 cm dimension images held on Microsoft Word documents. The experimenter was blind to the identities that were presented to participants. Composite images were constructed using EvoFIT v1.6 software.

Procedure

After informed consent, participant interactions were conducted individually with the procedure being participant-paced. Whilst each target image was randomly selected and shown to participants who were recruited on the basis of being unfamiliar with *EastEnders*, participants were also asked if they were familiar with the image presented. This step was to check that the presented face had not been seen elsewhere (e.g., on another TV programme). Whilst an alternate image would have been shown (also randomly selected) if the presented image was familiar, no participant reported familiarity with any image presented.

After a delay of nominally 24 hours, participants met with the experimenter online via Microsoft Teams. The delay between target exposure and face recall ranged from 20 to 28 hours, the exact time determined by the availability of experimenter and participant. This delay interval is a usual implementation in facial-composite research (e.g., Frowd, 2021), a relatively small difference in time that is unlikely to lead to detectable differences in composite effectiveness (e.g., Frowd et al., 2015). The experimenter conducted a Holistic Cognitive Interview (H-CI) with the participant, guiding them through a structured description of the target face and a series of characterisation tasks designed to elicit details of appearance, and impressions of personality and mood (for details, see Fodarella et al., 2015).

Utilising EvoFIT, and working with the experimenter, participants then constructed a facial composite of the target face they had seen the previous day. The experimenter was trained "in house" in how to use EvoFIT, and practiced until proficient prior to face construction. Thus, he operated the EvoFIT program, guiding each participant through the procedure of facial construction with the aim of creating the greatest possible resemblance to the target image. This process copies the normal life face construction, allowing face constructors to be unfamiliar with the method of construction while allowing focus on creation of the best likeness.

A detailed description of the EvoFIT procedure can be found in Fodarella et al. (2015). In brief, participants repeatedly selected the best matching example from an array of generated variations of whole faces (from a screen of 18 alternatives that changed by facial shape and then by facial texture, or greyscale colouring); to facilitate an identifiable likeness (Frowd, 2021), the internal features region of the face was presented (i.e., with external features masked) and witnesses were asked to focus on the eye area. After evolving a face in this way, the software then provided methods to enhance the likeness, first by altering the overall appearance of the face using "holistic tools" (software scales that changed the age, weight and other overall characteristics of the face) and then by improving the match of the individual facial features ("a shape tool"). After using these tools, external features (e.g., hair) were added to the face and then constructors given the opportunity to enhance the face further (using holistic and shape tools). The construction procedure was therefore participant led, and face creation varied between 45 minutes and 2 hours 35 minutes per person. Participants were thanked for their time and provided with a debriefing sheet.

Stage 2. Composite Naming.

METHOD

Design

A separate group of participants comprised of fans of *EastEnders*, recruited via social media as composite 'namers'. Each participant was given a selection of 10 composites, one composite per each of the 10 characters, with 5 composites selected from both of the groups used within Stage 1. Therefore, the design was within subjects for the independent variable Constructor Type (artist vs. non-artist); the dependent variable was composite naming. A participant viewed 10 composites of 10 different characters, a random five were artist created, whilst the other five were non-artist created; a second set was created with the remaining composites, and these two sets were selected randomly for presentation to participants with equal sampling. Each composite was given equal exposure across the 20 participants.

We did not present additional, "foil" composites. While it seems sensible to include identities with which participants were unfamiliar (i.e., composites of genuinely unfamiliar identities), research suggests that the presence of foil composites, while not influencing correct naming, tend to undesirably inflate prevalence of mistaken names (for discussion, see Frowd et al., 2015).

Participants

Participants for the naming task comprised of an opportunity sample of 20 (13 Females, 7 Male, *M* = 32.0, *SD* = 6.4) volunteer, self-proclaimed fans of *EastEnders*, who were recruited online via the *EastEnders* fan group on the Facebook social media site in the *a priori* understanding that they were familiar with *EastEnders* characters. It is important that participants were familiar with the cast in order to be able to recognise an individual in the same way as a member of a community would be able to recognise and identify an individual represented by a composite in a real-life situation. The *a priori* inclusion criterion was deemed satisfied when participants accurately identified at least 80% of the target faces presented in the photographic lineup, indicating an acceptable level of familiarity with the characters. All participants achieved above this level of familiarity, and so no further participants were recruited.

Materials

Participants received briefing sheets before completing a within-participants naming task using a randomised set of 10 facial composites, one per target character, standardised to 8 cm × 10 cm and presented via Microsoft Word. Participants were assigned to view one of two composite sets (Set 1 or Set 2), each containing ten faces, five generated by trained artists and five by non-artists, selected through balanced random sampling. Each set included one composite per character. Sets were evenly distributed across participants (10 per set), and the viewing order of composites was individually randomised[1]. Following the naming task, participants were presented with standardised colour photographs of all 10 original targets to assess prior familiarity.

Figure 2

Example composites constructed in the experiment of 'EastEnders' character Max Branning by artist (left) and non-artist (right).

Note. Each of these composites was constructed with a holistic cognitive interview by a different participant who saw a picture of *EastEnders* character Max Branning (actor Jake

[1] The assigned set (Set 1 or Set 2) was accounted for as a between-subjects factor in the subsequent analysis to control for potential order or content effects.

Wood). For reasons of copyright, a picture of the actor used cannot be reproduced here; however, an example of his appearance can be easily located on the Internet.

Procedure

After providing consent to proceed, participants were individually informed that they would view and attempt to spontaneously name 10 facial composites depicting different *EastEnders* characters, and after seeing all the composites photographs of the characters would be shown for them to also attempt to identify. Participants were shown the 10 composite images individually with no time constraints. When all 10 composites had been shown and participants had attempted to spontaneously name them aloud, the target photographs were presented individually for the participants to name aloud, again with no time constraints. Participants unable to name more than 80% of the target photographs were replaced by another participant, with their responses excluded from the analysis to ensure character familiarity. Participants received a different random order of presentation of composites and target photographs. The naming procedure was completed in about 10 minutes per person including debriefing as to the aims of the experiment.

Stage 3. Composite Likeness Rating.

METHOD

Design

Likeness ratings for the resulting composite images created in Stage 1 to the original target images were sought. This was to determine whether there was a difference between composite images constructed by artists and those constructed by non-artists in terms of likeness to the original target image. A within participants design was utilised for the independent variable Constructor Type (artist or non-artist); the dependent variable was likeness rating (scored on a Likert scale 1-7).

Participants

An opportunity sample of 60 volunteers (49 Female, 9 Male, 2 Gender Fluid, *M* = 42.0, *SD* = 8.5 years) were recruited online through social media (Facebook). It was not noted if the volunteer participants were or were not familiar with the soap *EastEnders* and no mention of the soap was stated in the recruiting advert.

Materials

Each of the 20 composites were presented in the format specified in Stage 2, with each composite presented next to its corresponding target photograph from Stage 1 (both in the format of 8 cm x 10 cm) in a Microsoft Forms document with a Likert scale bar of 1 – 7. The order of presentation of the composites was randomised with no two composites of the same target photograph presented sequentially.

Procedure

Volunteers responded to an online advertisement inviting them to participate in a facial recognition study. Following informed consent, each participant was tested individually and completed the task at their own convenience. They viewed a series of image pairs each comprising a facial composite and its corresponding target photograph, with a different order of presentation for each person, and rated overall likeness using a 7-point scale (1 = not at all similar, 7 = identical). The rating procedure was completed in about 10 minutes per person including debriefing as to the aims of the experiment.

RESULTS

All target photographs were correctly named by all participants in the naming phase, confirming that each composite had the potential to be recognised. Composite responses were scored in two ways: ‘correctness’ (1 = correct identity, 0 = otherwise) and ‘mistaken identity’ (1 = incorrect but named identity, 0 = otherwise). Higher correct scores indicate greater resemblance to the intended target, while fewer mistaken names suggest stronger idiosyncratic accuracy.

Table 1 summarises both response types. Artist-generated composites were named correctly more often (*MD* = 19%) and received fewer mistaken identities (*MD* = 25%) than those produced by non-artists. Notably, half of the artist composites showed ≥30% improvement in correct naming, and four showed ≥30% reductions in mistaken naming compared to their non-artist counterparts.

Table 1. Participant Responses to Composites by Type of Response

Response	Constructor	
	Non-Artist	Artist
Correct	32	51
Mistaken	50	25
Accuracy	39.0 (32 / 82)	67.1 (51 / 76)

Note. Values for Correct and Mistaken naming are the total number of responses that were correct and mistaken, respectively. For Accuracy, values are correct-naming scores calculated by dividing responses shown in parentheses and expressed as a percentage; parenthesised values are summed correct responses (numerator) of total responses (correct and mistaken, denominator).

Inferential Analysis: Generalized Linear Mixed Effects Models (GLMM)

To assess composite accuracy robustly, a combined binary measure was derived: correct responses were scored as 1, mistaken responses as 0, and non-responses were excluded (*N* = 42). This measure appropriately reflects the proportion of accurate naming among all named responses.

Table 2. Table of Fixed Effects for the final GLMM model

Fixed Effects	*F*	*DF1*	*DF2*	*p*
Corrected Model	2.81	3	157	.042
Constructor	4.27	1	157	.041
Sex of Target	3.94	1	157	.049
Rated Likeness	4.08	1	157	.045

Note. The following coding scheme was used: Type of Constructor was 0 for non-artist and 1 for artist; Target, 0 or 1, as specified in the text for Accuracy; 1-20 for face constructors; 1-20 for composite namers; 1-10 for items (target identities); 0 for female targets and 1 for male targets; and 1 for presentation Block set 1 and 2 for presentation Set 2. See Table 3, *Note*, for further details of this model.

GLMM was used to analyse the impact of artistic training and perceived likeness on naming accuracy, accounting for random effects. Variables were coded as shown in Table 2 Note. Fixed effects included:

- Type of Constructor (artist vs. non-artist)
- Mean rated likeness (centred at $M = 3.39$)
- Sex of target identity
- Block order of presentation

Random intercepts and slopes were specified for items (target identities), based on model fit and variance estimates ($\sigma^2 > 0.01$). Random effects from participants who named composites were excluded from the analysis as their responses were sufficiently consistent that random intercepts could not be calculated ($\sigma^2 < 0.01$).

Initial models tested included all interactions. The analysis revealed that the three-way interaction (constructor × sex × block) and all three two-way interactions exceeded the usual criterion threshold of $\alpha = .10$, and were removed. In the following model, Block order was also excluded ($p = .206$), resulting in the final model (see Table 2).

The final GLMM revealed that:

- Artist-generated composites had significantly higher odds of accurate naming than non-artist composites [*Exp(B)* = large effect; see Table 3].
- Higher rated likeness predicted greater naming accuracy.
- The odds of accurate naming were higher for male (cf. female) targets.

Estimated marginal means (Table 3) on the transformed scale revealed a mean of 0.89 (*SE* = 0.62) for artist composites and −0.80 (*SE* = 0.58) for non-artist composites, reinforcing the recognisability advantage of artist-generated images.

Table 3. Summary of final GLMM Model for Accurate Naming of Composites from Face Constructors by Type of Constructor (With and Without Artistic Ability).

Fixed Effects	*B*	*SE(B)*	*t(157)*	*p*	*Exp(B)*	*95% CI(-)*	*95% CI(+)*
Constructor Artist > Non Artist	1.69	0.82	2.07	.041	5.39	1.08	27.03
Sex of Target Male > Female	1.84	0.93	1.99	.049	3.68	1.01	39.45
Rated Likeness	1.24	0.61	2.02	.045	3.44	1.03	11.51

Note. Comparisons are presented with reference to the lowest category (underlined); positive values of *B* indicate higher accurate naming with respect to the reference. The conducted GLMM [IBM SPSS (Version 29)] used the GENLINMIXED procedure. The model was specified with the lowest category of the categorical predictor (underlined) as reference, and the target (DV) and predictors were sorted in a descending order. Values of 95% Confidence Intervals (CI) relate to *Exp(B)*. For the final model, the Intercept was *B* = -5.91 (*SE* = 2.39). The classification was 78.9% correct overall, and Information criteria were based on −2 log likelihood (*AICC* = 766.41, *BIC* = 772.45). Coefficients of Determination were Marginal (.23) and Conditional (.52), and ICC were Adjusted (.37) and Conditional (.29). Random effects were random intercepts (σ^2 = 0.30, *SE* = 1.25) and random slopes (σ^2 = 2.09, *SE* = 1.55) for items. For the model's EMMEANS using the transformed scale—including the continuous, centred predictor likeness (*M* = 3.39)—the Mean was 0.89 (*SE* = 0.62) for artists and -0.80 (*SE* = 0.58) for non-artists. For appropriate interpretation of the *Exp(B) measure of* effect size, values of approximately 1.5 can be considered as a 'small' effect, 2.5 as 'medium' and 4.5 as 'large' (Sporer & Martschuk, 2014).

Analysis of Verbal Descriptions from Participant-Witnesses

A unit-of-information analysis was conducted on the verbal descriptions provided by both groups of participant-witnesses during the Holistic Cognitive Interview (H-CI) in Stage 1. Each description sheet was duplicated and independently scored by two raters who worked independently of each other, with discrepancies resolved through discussion. Units were defined as distinct pieces of facial information; for example, “short, blonde hair” was scored as two units (for length and colour).

Table 4 presents the total number of units recalled by each group. Non-artists recalled significantly more facial details than artists (124 vs. 80 units), $\chi^2(1, N = 204) = 9.49$, $p = .002$.

Table 4.

Total units of information recalled by Artists and Non-Artists.

	Artist	Non-Artist	Total
Units of Information	80	124	204

This finding suggests that non-artists may rely more heavily on verbal encoding strategies during recall, whereas artists may engage more visually or holistically, consistent with prior research on perceptual expertise.

DISCUSSION

The current study explored whether artists possess measurable advantages in face recall and composite construction, with implications for improving real-world forensic outcomes. By introducing artistic perceptual expertise into a gold-standard composite protocol, this study offers a novel empirical contribution to forensic psychology, highlighting the role of holistic visual cognition in enhancing composite recognisability. Using a typical holistic system, EvoFIT, both artists and non-artists constructed composites of unfamiliar targets. Quality of facial encoding was evaluated through spontaneous naming and likeness ratings of the resulting composites. As is normal practice, prior to face construction, participants also completed a holistic cognitive interview (H-CI), during which the given verbal descriptors were recorded. As hypothesised, relative to non-artists, artist-generated composites that were significantly more likely to be identified and were rated as more visually accurate, despite providing fewer descriptive units, information that is no doubt valuable to guide police investigation. These findings lend robust support to theories connecting artistic training with enhanced perceptual encoding and specialised face-based cognition, underscoring its potential value in forensic contexts. Such advantages hold practical significance for law enforcement professionals seeking to utilise composite procedures and improve identification outcomes.

Kozbelt (2001) and Devue and Barsics (2015) have shown that artists outperform novices in tasks involving visual memory and discrimination, abilities that appear to have contributed to the superior performance of artist composites in this study. Although Vogt and Magnussen (2007) proposed that artists scan images more broadly and encode abstract features, this was not directly tested here; nonetheless, the higher likeness scores suggest artists retained more diagnostic visual information. The focus on internal facial features, observed in prior studies (Bruce et al., 1999; Ellis et al., 1979; Kozbet et al., 2010) may account for enhanced recognisability, while the ability to flexibly shift between local and global perceptual strategies (Chamberlain & Wagemans, 2015) likely underpins both improved naming and likeness outcomes.

These findings do not appear to align neatly with Valentine and Bruce's (1986a) assertion that distinctiveness enhances recognition, as high recognisability in the current study did not seem to consistently correspond with presumed distinctiveness. For example, artist-generated composites of distinctive targets Max Branning and Jean Slater were correctly named by all participants (100% recognition), with Billy Mitchell and Shirley Carter reaching 90% and 80%, respectively. In contrast, their non-artist counterparts, based on the same targets, received naming rates of 30% at best, under matched presentation conditions. While facial distinctiveness was not formally assessed, it is likely that male targets appeared more distinctive in appearance to participants, which may then have contributed to higher recognition rates (Frowd et al., 2005b).

As an alternative, the findings align more closely with Light et al.'s (1979) depth of processing theory. Several artists reported mentally "drawing" the face during exposure, suggesting that internal visual rehearsal facilitated encoding. Perdreau and

Cavanagh (2015) demonstrated that artists have superior visual memory when drawing, and Devue and Barsics (2015) identified greater face recognition accuracy among artists across objective measures. Supporting this, Miall et al. (2009, in Devue & Barsics) observed activation of both the FFA and OFA during imagined drawing tasks, suggesting that the act of mentally rehearsing a drawing may stimulate face-sensitive regions of the brain. These outcomes collectively support the idea that artists may rely on visual-spatial strategies rather than verbal recall.

This interpretation is further reinforced by the inverse relationship observed between verbal description quantity and composite performance. Wells (1985) found a positive correlation between verbal detail and recognition, but the current findings contradict that claim. Artists used fewer descriptive units in their H-CIs, yet their composites achieved higher recognition and likeness scores. One especially telling example was the Jean Slater composite: while the non-artist provided 18 verbal descriptors and achieved only 20% recognition with a likeness rating of 2.8, the artist used just 10 descriptors and achieved 100% recognition with a likeness rating of 5.4. This indicates that detailed verbal articulation may not reflect the depth or quality of visual encoding; it may also be the case that artists create a more compact encoding, a suggestion that would be worthy of further investigation. The finding that artist participants produced more recognisable composites despite providing fewer verbal descriptors does support the view that verbal articulation is not a reliable proxy for visual memory (e.g., Goldstein et al., 1979; Pigott & Brigham, 1985). This suggestion aligns with recent work by Fazlic and Deljkic (2025), who found that accuracy in verbal facial descriptions does not predict successful identification in police lineups. Together, these findings suggest that composite construction may benefit more from visual cognition than from verbal fluency.

Importantly, this study adhered to the “gold standard” protocol (Frowd et al., 2005a), enhancing its ecological validity for investigative contexts. Nevertheless, there were limitations, particularly surrounding target image consistency. Some target characters (e.g., Ian Beale) have undergone visual changes over time, which may have introduced variability in likeness ratings. While this was not formally tested, it is acknowledged as a potential limitation in stimulus consistency (although the same image was used in both conditions of the experiment, limiting systematic differences). Future studies should consider constraining targets to a specific time window or clearly indicating the target period to mitigate this issue. It is also worth mentioning that, while the project involved the artistic ability of *face constructors*, the artistic ability of practitioners is also relevant. It has been known for a long time that practitioner skill in this area is important for the ensuing composite (e.g., Davies, 1983; Gibling & Bennett, 1994). Indeed, artistic training for police practitioners remains important (Frowd, 2021)—although holistic face construction systems typically provide enhancement techniques (esp. "holistic tools") that serve to lessen the artistic demands of practitioners.

Likeness ratings also proved to be useful to some extent, being positively related to accuracy, but we note that their reliability includes an element of subjectivity. Some composites received a wide range of likeness ratings, suggesting variability in subjective perception. While not formally analysed, this variability highlights the limitations of likeness ratings as a sole measure to assess composite effectiveness. Notably, several highly named composites received modest likeness ratings (for instance, Shirley Carter's artist composite was correctly named by 80% of viewers despite a likeness rating of just 3.5) highlighting the functional primacy of spontaneous identification over subjective similarity.

Looking forward, this study advocates reduced dependence on verbal recall in composite construction protocols. Fodarella et al. (2021) argued that facial descriptions are inherently difficult and prone to inaccuracy, a view supported by the present findings. Given that holistic systems like EvoFIT do not rely on verbal detail, it may be more effective to minimise verbal demands within the H-CI. Future adaptations of the H-CI could explore silent reflection or non-verbal rating methods to reduce cognitive load and potential social desirability bias, particularly for vulnerable witnesses (Gawrylowicz et al., 2012).

Future research could also explore whether mechanisms such as abstract feature encoding or scan-path variation (Vogt & Magnussen, 2007) can be integrated into holistic systems via tools like eye-tracking or think-aloud protocols. Chamberlain and

Wagemans' (2015) theory of perceptual flexibility also warrants further investigation, potentially offering system designers insights into how to support both global and local processing styles during construction. By understanding and replicating the strengths that artists bring to facial encoding, future developments could make facial composite systems more effective and accessible for all users.

It is important to note that, in the present study, the composite constructor and witness were the same individual. Thus, the observed benefits of artist-generated composites reflect the perceptual encoding and recall abilities of artist-witnesses, rather than the facilitation of composites by trained artists. While this limits direct applicability to typical investigative scenarios—where the witness is rarely an artist—it nonetheless highlights the potential value of perceptual expertise. These findings may inform future training protocols or system refinements that aim to replicate the encoding strategies employed by artists, even among non-artist witnesses.

In summary, the present study provides compelling evidence that artist-created facial composites offer significant advantages in recognisability and visual accuracy compared to those created by non-artists, when produced under identical conditions and even with fewer verbal descriptors. These outcomes challenge traditional assumptions about the role of facial distinctiveness and verbal elaboration, and instead support a depth of processing interpretation, wherein visual-spatial encoding strategies, such as mental imagery and holistic feature integration, appear to enhance composite quality. By validating the benefits of artist-led construction within a rigorous and ecologically sound framework, the study highlights the value of perceptual expertise in forensic identification. The results suggest that composites constructed by individuals with strong artistic ability are, on average, more readily identified than those produced by non-artists, an observation that warrants greater consideration during police investigations. This evidence highlights the potential value of artistic skill in suspect identification and may merit greater weighting in decision-making processes related to composite use and prioritisation. Furthermore, mechanisms that artists instinctively employ, such as enhanced visual encoding and structural awareness, could inform future refinements to holistic systems, helping optimise protocols for a broader range of witnesses and operational settings. These findings also hold practical utility for law enforcement, underscoring that visual perceptual skill, rather than the volume of verbal descriptors, may be a stronger predictor of composite recognisability. Accordingly, practitioners should avoid assuming that limited verbal detail reflects poor facial recall. Instead, it would be best for practitioners to acknowledge that witnesses capable of compact yet accurate visual encoding may produce highly effective composites, even when their verbal recall is minimal. These insights support a more nuanced, evidence-informed approach to witness assessment, composite scheduling, and practitioner training within investigative environments.

Industry Implications

- Artistic training, particularly holistic visual cognition, enhances the recognisability of facial composites, suggesting that visual cognition is a valuable asset in composite construction.
- The ability to verbally describe a face does not reliably predict composite success, aligning with police line-up research and reinforcing the primacy of perceptual over verbal recall.
- Current research developments, such as the integration of artistic blur techniques, aim to reduce cognitive load and improve EvoFIT's effectiveness across all user backgrounds.
- This study is the first of its kind to empirically link artistic holistic cognition with composite accuracy, offering a novel direction for forensic psychology and software refinement.

References

Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language, 68*(3), 255–278. https://doi.org/10.1016/j.jml.2012.11.001

Benson, P. J., & Perrett, D. I. (1994). Visual processing of facial distinctiveness. *Perception, 23*(1), 75–93. https://doi.org/10.1068/p230075

Bindemann, M., Brown, C., Koyas, T., & Russa, A. (2012). Individual differences in face identification postdict eyewitness accuracy. *Journal of Applied Research in Memory and Cognition, 1*(2), 96–103. https://doi.org/10.1016/j.jarmac.2012.02.001

Bruce, V. (1982). Changing faces: Visual and non-visual coding processes in face recognition. *British Journal of Psychology, 73*(1), 105–116. https://doi.org/10.1111/j.2044-8295.1982.tb01795.x

Bruce, V., Doyle, T., Dench, N., & Burton, M. (1991). Remembering facial configurations. *Cognition, 38*(2), 109–144. https://doi.org/10.1016/0010-0277(91)90049-A

Bruce, V., Henderson, Z., Greenwood, K., Hancock, P. J. B., Burton, A. M., & Miller, P. (1999). Verification of face identities from images captured on video. *Journal of Experimental Psychology: Applied, 5*(4), 339–360. https://doi.org/10.1037/1076-898X.5.4.339

Bruce, V., Henderson, Z., Newman, C., & Burton, A. M. (2001). Matching identities of familiar and unfamiliar faces caught on CCTV images. *Journal of Experimental Psychology: Applied, 7*(3), 207–218. https://doi.org/10.1037/1076-898X.7.3.207

Bruce, V., Valentine, T., & Baddeley, A. (1987). The basis of the 3/4 view advantage in face recognition. *Applied Cognitive Psychology, 1*(2), 109–120. https://doi.org/10.1002/acp.2350010204

Bruce, V., & Young, A. (1986). Understanding face recognition. *British Journal of Psychology, 77*(3), 305–327. https://doi.org/10.1111/j.2044-8295.1986.tb02199.x

Campbell, R. (1999). When does the inner-face advantage in familiar face recognition arise and why? *Visual Cognition, 6*(2), 197–215. https://doi.org/10.1080/713756807

Chamberlain, R., McManus, I. C., Brunswick, N., Rankin, Q., Riley, H., & Kanai, R. (2018). Global saccadic eye movements characterise artists' visual attention while drawing. *Journal of Vision, 18*(10), 1–15. https://doi.org/10.1167/18.10.1

Chamberlain, R., & Wagemans, J. (2015). Visual arts training is linked to flexible attention to local and global levels of visual stimuli. *Acta Psychologica, 161*, 185–197. https://doi.org/10.1016/j.actpsy.2015.08.012

Cohen, D. J. (2005). Look little, look often: The influence of gaze frequency on drawing accuracy. *Perception & Psychophysics, 67*(6), 997–1009. https://doi.org/10.3758/BF03193626

Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior, 11*(6), 671–684. https://doi.org/10.1016/S0022-5371(72)80001-X

Dalton, P. (1993). The role of stimulus familiarity in context-dependent recognition. *Memory & Cognition, 21*(2), 223–234. https://doi.org/10.3758/BF03202735

Davis, J. P., Lander, K., Evans, R., & Jansari, A. (2016). Investigating predictors of superior face recognition ability in police super-recognisers. *Applied Cognitive Psychology, 30*(6), 827–840. https://doi.org/10.1002/acp.3260

Davis, R., Sutherland, N. S., & Judd, B. R. (1961). Information content in recognition and recall. *Journal of Experimental Psychology, 61*(5), 422–429. https://doi.org/10.1037/h0044848

Davies, G. M. (1983). Forensic face recall: The role of visual and verbal information. In S.M.A. Lloyd-Bostock and B.R. Clifford (Eds.). *Evaluating witness evidence* (pp. 103-123). Chichester: Wiley.

Davies, G. M., & Little, M. (1990). Drawing on memory: Exploring the expertise of a police artist. *Medicine, Science and the Law, 30*(4), 345–354. https://doi.org/10.1177/106002809003000412

Davies, G. M., & Milne, A. (1982). Recognising faces in and out of context. *Current Psychological Research, 2*(3), 235–246. https://doi.org/10.1007/BF02684516

DeGutis, J., Wilmer, J., Mercado, R. J., & Cohan, S. (2013). Using regression to measure holistic face processing reveals a strong link with face recognition ability. *Cognition, 126*(1), 87–100. https://doi.org/10.1016/j.cognition.2012.09.004

De Haan, E. H. F., & Hay, D. C. (1986). The matching of famous and unknown faces, given either the internal or the external features: A study on patients with unilateral brain lesions. In H. D. Ellis, M. A. Jeeves, F. Newcombe, & A. Young (Eds.), *Aspects of face processing* (pp. 129–145). Springer. https://doi.org/10.1007/978-94-009-4420-6_32

Devue, C., & Barsics, C. (2016). Outlining face processing skills of portrait artists: Perceptual experience with faces predicts performance. *Vision Research, 127*, 92–103. https://doi.org/10.1016/j.visres.2016.07.007

Diamond, R., & Carey, S. (1986). Why faces are and are not special: An effect of expertise. *Journal of Experimental Psychology: General, 115*(2), 107–117. https://doi.org/10.1037/0096-3445.115.2.107

Duchaine, B., Germine, L., & Nakayama, K. (2007). Family resemblance: Ten family members with prosopagnosia and within-class agnosia. *Cognitive Neuropsychology, 24*(4), 419–430. https://doi.org/10.1080/02643290701380491

Duchaine, B., & Nakayama, K. (2006). Developmental prosopagnosia: A window to content-specific face processing. *Current Opinion in Neurobiology, 16*(2), 166–173. https://doi.org/10.1016/j.conb.2006.03.003

Eger, E., Schweinberger, S. R., Dolan, R. J., & Henson, R. N. (2005). Familiarity enhances invariance of face representations in human ventral visual cortex: fMRI evidence. *NeuroImage, 26*(3), 1128–1139. https://doi.org/10.1016/j.neuroimage.2005.03.010

Ellis, H. D., Shepherd, J. W., & Davies, G. M. (1979). Identification of familiar and unfamiliar faces from internal and external features: Some implications for theories of face recognition. *Perception, 8*(4), 431–439. https://doi.org/10.1068/p080431

Ellis, H. D., Shepherd, J. W., & Davies, G. M. (1980). The deterioration of verbal descriptions of faces over different delay intervals. *Journal of Police Science and Administration, 8*(1), 101–116.

Fazlic, A., & Deljkic, I. (2025). The face recall and face recognition: Description accuracy does not indicate eyewitness identification accuracy. NBP. *Nauka, bezbednost, policija, 30*, 96.

Fodarella, C., Frowd, C. D., Warwick, K., Hepton, G., Stone, K., Date, L., & Heard, P. (2017). Adjusting the focus of attention: helping witnesses to evolve a more identifiable composite. *Forensic Research & Criminology International*, 5(1), DOI: 10.15406/frcij.2017.05.00143.

Fodarella, C., Kuivaniemi-Smith, H., Gawrylowicz, J., & Frowd, C. D. (2015). Forensic procedures for facial-composite construction. *The Journal of Forensic Practice, 17*(4), 259–270. https://doi.org/10.1108/JFP-10-2014-0033

Fodarella, C., Marsh, J. E., Chu, S., Athwal-Kooner, P., Jones, H. S., Skelton, F. C., Wood, E., Jackson, E., & Frowd, C. D. (2021). The importance of detailed context reinstatement for the production of identifiable composite faces from memory. *Visual Cognition, 29*(3), 180–200. https://doi.org/10.1080/13506285.2021.1890292

Frowd, C. D. (2011). Eyewitnesses and the use and application of cognitive theory. In G. Davey (Ed.), *Introduction to applied psychology* (pp. 267–289). BPS Wiley-Blackwell.

Frowd, C. D. (2015). Facial composites and techniques to improve image recognisability. In T. Valentine & J. Davis (Eds.), *Forensic facial identification: Theory and practice of identification from eyewitnesses, composites and CCTV* (pp. 43–70). Wiley-Blackwell.

Frowd, C. D., Bruce, V., Smith, A., & Hancock, P. J. B. (2008). Improving the quality of facial composites using a holistic cognitive interview. *Journal of Experimental Psychology: Applied, 14*(3), 276–287. https://doi.org/10.1037/1076-898X.14.3.276

Frowd, C. D., Carson, D., Ness, H., McQuiston, D., Richardson, J., Baldwin, H., & Hancock, P. J. B. (2005a). Contemporary composite techniques: The impact of a forensically-relevant target delay. *Legal and Criminological Psychology, 10*(1), 63–81. https://doi.org/10.1348/135532504X15358

Frowd, C. D., Carson, D., Ness, H., Richardson, J., Morrison, L., McLanaghan, S., & Hancock, P. J. B. (2005b). A forensically valid comparison of facial composite systems. *Psychology, Crime & Law, 11*(1), 33–52. https://doi.org/10.1080/10683160310001634313

Frowd, C. D., Erickson, W. B., Lampinen, J. M., Skelton, F. C., McIntyre, A. H., & Hancock, P. J. B. (2015). A decade of evolving composites: Regression and meta-analysis. *Journal of Forensic Practice, 17*(4), 319–334. https://doi.org/10.1108/JFP-10-2014-0037

Frowd, C. D., Skelton, F. C., Atherton, C., Pitchford, M., Hepton, G., Holden, L., McIntyre, A., & Hancock, P. J. B. (2012). Recovering faces from memory: The distracting influence of external facial features. *Journal of Experimental Psychology: Applied, 18*(4), 224–238. https://doi.org/10.1037/a0027393

Ganel, T., & Goshen-Gottstein, Y. (2004). Effects of familiarity on the perceptual integrality of the identity and expression of faces: The parallel-route hypothesis revisited. *Journal of Experimental Psychology: Human Perception and Performance, 30*(3), 583–597. https://doi.org/10.1037/0096-1523.30.3.583

Gambarota, F., & Sessa, P. (2019). Visual working memory for faces and facial expressions as a useful tool for understanding social and affective cognition. *Frontiers in Psychology, 10*, 2392. https://doi.org/10.3389/fpsyg.2019.02392

Gauthier, I., Skudlarski, P., Gore, J. C., & Anderson, A. W. (2000). Expertise for cars and birds recruits brain areas involved in face recognition. *Nature Neuroscience, 3*(2), 191–197. https://doi.org/10.1038/72140

Gawrylowicz, J., Gabbert, F., Carson, D., Lindsay, W. R., & Hancock, P. J. B. (2012). Holistic versus featural facial composite systems for people with mild intellectual disabilities. *Applied Cognitive Psychology, 26*(5), 716–720. https://doi.org/10.1002/acp.2850

Geiselman, R. E., Fisher, R. P., MacKinnon, D. P., & Holland, H. L. (1985). Eyewitness memory enhancement in the police interview: Cognitive retrieval mnemonics versus hypnosis. *Journal of Applied Psychology, 70*(2), 401–412. https://doi.org/10.1037/0021-9010.70.2.401

Gibling, F., & Bennett, P. (1994). Artistic enhancement in the production of photofit likeness: an examination of its effectiveness in leading to suspect identification. *Psychology, Crime & Law*, 1, 93-100.

Gibson, S. J., Solomon, C. J., Maylin, M. I. S., & Clark, C. (2009). New methodology in facial composite construction: From theory to practice. *International Journal of Electronic Security and Digital Forensics, 2*, 156–168. https://doi.org/10.1504/IJESDF.2009.024900

Goldstein, A. G., Johnon, K. S., & Chance, J .E. (1979). Does fluency of face description imply superiour face recognition? *Bulletin of the Psychonomic Society*, 13, 15-18.

Hancock, P. J. B., Bruce, V., & Burton, A. M. (2000). Recognition of unfamiliar faces. *Trends in Cognitive Sciences, 4*(9), 330–337. https://doi.org/10.1016/S1364-6613(00)01519-9

Hasel, L. E., & Wells, G. L. (2007). Catching the bad guy: Morphing composite faces helps. *Law and Human Behavior, 31*(2), 193–207. https://doi.org/10.1007/s10979-006-9007-2

Haxby, J. V., Hoffman, E. A., & Gobbini, M. I. (2000). The distributed human neural system for face perception. *Trends in Cognitive Sciences, 4*(6), 223–233. https://doi.org/10.1016/S1364-6613(00)01482-0

Hill, H., & Bruce, V. (1996). Effects of lighting on the perception of facial surfaces. *Journal of Experimental Psychology: Human Perception and Performance, 22*(4), 986–1004. https://doi.org/10.1037/0096-1523.22.4.986

Hill, H., Schyns, P. G., & Akamatsu, S. (1997). Information and viewpoint dependence in face recognition. *Cognition, 62*(2), 201–222. https://doi.org/10.1016/S0010-0277(96)00785-8

Hosie, J. A., & Milne, A. B. (1996). The effect of experimental design on memory for typical and distinctive faces. *Memory, 4*(2), 175–197. https://doi.org/10.1080/096582196389031

Jansari, A., Miller, S., Pearce, L., Cobb, S., Sagiv, N., Williams, A. L., ... Hanley, J. R. (2015). The man who mistook his neuropsychologist for a popstar: When configural processing fails in acquired prosopagnosia. *Frontiers in Human Neuroscience, 9*, Article 390. https://doi.org/10.3389/fnhum.2015.00390

Johnston, A., Hill, H., & Carman, N. (1992). Recognising faces: Effects of lighting direction, inversion, and brightness reversal. *Perception, 21*(3), 365–375. https://doi.org/10.1068/p210365

Johnston, R. A., & Edmonds, A. J. (2009). Familiar and unfamiliar face recognition: A review. *Memory, 17*(5), 577–596. https://doi.org/10.1080/09658210902976969

Kaufmann, J. M., & Schweinberger, S. R. (2004). Expression influences the recognition of familiar faces. *Perception, 33*(4), 399–408. https://doi.org/10.1068/p5083

Kemp, R., McManus, C., & Pigott, T. (1990). Sensitivity to the displacement of facial features in negative and inverted images. *Perception, 19*(4), 531–543. https://doi.org/10.1068/p190531

Kozbelt, A. (2001). Artists as experts in visual cognition. *Visual Cognition, 8*(6), 705–723. https://doi.org/10.1080/13506280042000090

Kozbelt, A., Seidel, A., ElBassiouny, A., Mark, Y., & Owen, D. R. (2010). Visual selection contributes to artists' advantages in realistic drawing. *Psychology of Aesthetics, Creativity, and the Arts, 4*(2), 93–102. https://doi.org/10.1037/a0017657

Lander, K., & Bruce, V. (2003). The role of motion in learning new faces. *Visual Cognition, 10*(8), 897–912. https://doi.org/10.1080/13506280344000149

Lander, K., & Poyarekar, S. (2015). Famous face recognition, face matching and extraversion. *Quarterly Journal of Experimental Psychology, 68*(9), 1769–1776. https://doi.org/10.1080/17470218.2014.988737

Laughery, K. R., Duval, C., & Wogalter, M. S. (1986). Dynamics of facial recall. In H. D. Ellis, M. A. Jeeves, F. Newcombe, & A. Young (Eds.), *Aspects of face processing* (pp. 373–387). Martinus Nijhoff.

Laughery, K. R., Fessler, P. K., Lenorovitz, D. R., & Yoblick, D. A. (1974). Time delay and similarity effects in facial recognition. *Journal of Applied Psychology, 59*(4), 490–496. https://doi.org/10.1037/h0037193

Laughery, K. R., & Fowler, R. H. (1980). Sketch artist and Identi-Kit procedures for recalling faces. *Journal of Applied Psychology, 65*(3), 307–316. https://doi.org/10.1037/0021-9010.65.3.307

Leder, H., & Bruce, V. (2000). When inverted faces are recognised: The role of configural information in face recognition. *Quarterly Journal of Experimental Psychology, 53*(2), 513–536. https://doi.org/10.1080/713755889

Li, J., Tian, M., Fang, H., Xu, M., & Liu, J. (2010). Extraversion predicts individual differences in face recognition. *Communicative and Integrative Biology, 3*(4), 295–298. https://doi.org/10.4161/cib.3.4.12093

Light, L. L., Kayra-Stuart, F., & Hollander, S. (1979). Recognition memory for typical and unusual faces. *Journal of Experimental Psychology: Human Learning and Memory, 5*(3), 212–228. https://doi.org/10.1037/0278-7393.5.3.212

Longmore, C. A., Liu, C. H., & Young, A. W. (2008). Learning faces from photographs. *Journal of Experimental Psychology: Human Perception and Performance, 34*(1), 77–100. https://doi.org/10.1037/0096-1523.34.1.77

McIntyre, A., & Hancock, P. J. B. (2012). Interviewing techniques for Darwinian facial composite systems. *Applied Cognitive Psychology, 26*(2), 576–584. https://doi.org/10.1002/acp.2824

Megreya, A. M., & Burton, A. M. (2006). Unfamiliar faces are not faces: Evidence from a matching task. *Memory & Cognition, 34*(4), 865–876. https://doi.org/10.3758/BF03193433

Meissner, C. A., & Brigham, J. C. (2001). Thirty years of investigating the own-race bias in memory for faces: A meta-analytic review. *Psychology, Public Policy, and Law, 7*(1), 3–35. https://doi.org/10.1037/1076-8971.7.1.3

Memon, A., & Bruce, V. (1985). Context effects in episodic studies of verbal and facial memory: A review. *Current Psychological Research & Reviews, 4*(4), 349–369. https://doi.org/10.1007/BF02686589

Moses, Y., Ullman, S., & Edelman, S. (1996). Generalization to novel images in upright and inverted faces. *Perception, 25*(4), 443–462. https://doi.org/10.1068/p250443

Natu, V., & O'Toole, A. J. (2011). The neural processing of familiar and unfamiliar faces: A review and synopsis. *British Journal of Psychology, 102*(4), 726–747. https://doi.org/10.1111/j.2044-8295.2011.02053.x

O'Donnell, C., & Bruce, V. (2001). Familiarisation with faces selectively enhances sensitivity to changes made to the eyes. *Perception, 30*(6), 755–764. https://doi.org/10.1068/p3027

Ostrofsky, J., Kozbelt, A., & Seidel, A. (2012). Perceptual constancies and visual selection as predictors of realistic drawing skill. *Psychology of Aesthetics, Creativity, and the Arts, 6*(2), 124–136. https://doi.org/10.1037/a0026246

O'Toole, A. J., Roark, D. A., & Abdi, H. (2002). Recognizing moving faces: A psychological and neural synthesis. *Trends in Cognitive Sciences, 6*(6), 261–266. https://doi.org/10.1016/S1364-6613(02)01908-3

Perdreau, F., & Cavanagh, P. (2014). Artists have enhanced access to early visual representations. *Psychological Science, 25*(1), 4–13. https://doi.org/10.1177/0956797613509967

Perdreau, F., & Cavanagh, P. (2015). Drawing experts have better visual memory while drawing. *Journal of Vision, 15*(5), Article 5. https://doi.org/10.1167/15.5.5

Pigott, M., & Brigham, J. C. (1985). Relationship between accuracy of prior description and facial recognition, *Journal of Applied Psychology*, 70, 547-555.

Rhodes, G., Brennan, S., & Carey, S. (1987). Identification and ratings of caricatures: Implications for mental representations of faces. *Cognitive Psychology, 19*(4), 473–497. https://doi.org/10.1016/0010-0285(87)90016-8

Rhodes, G., Byatt, G., Tremewan, T., & Kennedy, A. (1997). Facial distinctiveness and the power of caricatures. *Perception, 26*(2), 207–223. https://doi.org/10.1068/p260207

Portch, E., Brown, C., Fodarella, C., Jackson, E., Hancock, P. J. B., Tredoux, C. G., Lewis, M. B., Liu, C. H., Marsh, J. E., Erickson, W. B., Mitchell, N. P., Fasching, C., Tran, L., Wood, E., Damin, E. A., Robertshaw, L., Lampinen, J. M., Date, L., Joyce, S., ... Frowd, C. D. (2025). The impact of forensic delay: facilitating facial composite construction using an early-recall retrieval technique. *Ergonomics*, 1. https://doi.org/10.1080/00140139.2025.2519876

Rossion, B., Schiltz, C., Robaye, L., Pirenne, D., & Crommelinck, M. (2001). How does the brain discriminate familiar and unfamiliar faces?: A PET study of categorical perception. *Journal of Cognitive Neuroscience, 13*(7), 1019–1034. https://doi.org/10.1162/089892901753165917

Rossion, B., Schiltz, C., & Crommelinck, M. (2003). The functionally defined right occipital and fusiform "face areas" discriminate novel from visually familiar faces. *NeuroImage, 19*(3), 877–883. https://doi.org/10.1016/S1053-8119(03)00105-8

Russo, R., Ward, G., Geurts, H., & Scheres, A. (1999). When unfamiliarity matters: Changing environmental context between study and test affects recognition memory for unfamiliar stimuli. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 25*(2), 488–499. https://doi.org/10.1037/0278-7393.25.2.488

Schooler, J. W., & Engstler-Schooler, T. Y. (1990). Verbal overshadowing of visual memories: Some things are better left unsaid. *Cognitive Psychology, 22*(1), 36–71. https://doi.org/10.1016/0010-0285(90)90003-M

Shakeshaft, N. G., & Plomin, R. (2015). Genetic specificity of face recognition. *Proceedings of the National Academy of Sciences of the United States of America, 112*(41), 12887–12892. https://doi.org/10.1073/pnas.1421881112

Shapiro, P. N., & Penrod, S. (1986). Meta-analysis of facial identification studies. *Psychological Bulletin, 100*(2), 139–156. https://doi.org/10.1037/0033-2909.100.2.139

Shepherd, J. W. (1983). Identification after long delays. In S. M. A. Lloyd-Bostock & B. R. Clifford (Eds.), *Evaluating witness evidence* (pp. 173–187). Wiley.

Sporer, S. L., & Martschuk, N. (2014). The reliability of eyewitness identifications by the elderly: An evidence-based review. In M. P. Toglia, D. F. Ross, J. Pozzulo, & E. Pica (Eds.), *The elderly eyewitness in court* (pp. 3–37). Psychology Press.

Stevenage, S. V. (1995). Can caricatures really produce distinctiveness effects? *British Journal of Psychology, 86*(1), 127–146. https://doi.org/10.1111/j.2044-8295.1995.tb02550.x

Taylor, K. (2001). *Forensic art and illustration*. CRC Press. https://doi.org/10.1201/9781420036954

Tredoux, C. G., Nunez, D. T., Oxtoby, O., & Prag, B. (2006). An evaluation of ID: An eigenface based construction system. *South African Computer Journal, 37*, 1–9. https://doi.org/10.18489/sacj.v37i0.214

Troje, N. F., & Kersten, D. (1999). Viewpoint-dependent recognition of familiar faces. *Perception, 28*(4), 483–487. https://doi.org/10.1068/p2901

Valentine, T. (1991). A unified account of distinctiveness, inversion and race in face recognition. *Quarterly Journal of Experimental Psychology, 43*(2), 161–204. https://doi.org/10.1080/14640749108400966

Valentine, T., & Bruce, V. (1986a). The effects of distinctiveness in recognizing and classifying faces. *Perception, 15*(5), 525–535. https://doi.org/10.1068/p150525

Valentine, T., & Bruce, V. (1986b). Recognizing familiar faces: The role of distinctiveness and familiarity. *Canadian Journal of Psychology, 40*(3), 300–305. https://doi.org/10.1037/h0080101

Vogt, S., & Magnussen, S. (2007). Expertise in pictorial perception: Eye-movement patterns and visual memory in artists and laymen. *Perception, 36*(1), 91–100. https://doi.org/10.1068/p5262

Wells, G. L. (1985). Verbal descriptions of faces from memory: Are they diagnostic of identification accuracy? *Journal of Applied Psychology, 70*(4), 619–625. https://doi.org/10.1037/0021-9010.70.4.619

Wells, G. L., & Hryciw, B. (1984). Memory for faces: Encoding and retrieval operations. *Memory & Cognition, 12*(4), 338–344. https://doi.org/10.3758/BF03198293

Wells, G. L., Memon, A., & Penrod, S. D. (2007). Eyewitness evidence: Improving its probative value. *Psychological Science in the Public Interest, 7*(2), 45–75. https://doi.org/10.1111/j.1529-1006.2006.00027.x

White, M. (2001). Effect of photographic negation on matching the expressions and identities of faces. *Perception, 30*(8), 969–981. https://doi.org/10.1068/p3225

Wilmer, J. B., Germine, L., Chabris, C. F., Chatterjee, G., Williams, M., Loken, E., ... Duchaine, B. (2010). Human face recognition ability is specific and highly heritable. *Proceedings of the National Academy of Sciences of the United States of America, 107*(11), 5238–5241. https://doi.org/10.1073/pnas.0913053107

Young, A. W. (2018). Faces, people and the brain: The 45th Sir Frederic Bartlett Lecture. *Quarterly Journal of Experimental Psychology, 71*(3), 569–594. https://doi.org/10.1177/1747021817740275

Young, A. W., Hay, D. C., McWeeny, K. H., Flude, B. M., & Ellis, A. W. (1985). Matching familiar and unfamiliar faces on internal and external features. *Perception, 14*(6), 737–746. https://doi.org/10.1068/p140737

Zhou, G., Cheng, Z., Zhang, X., & Wong, A. C.-N. (2012). Smaller holistic processing of faces associated with face drawing experience. *Psychonomic Bulletin & Review, 19*(2), 157–162. https://doi.org/10.3758/s13423-011-0203-6