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RESEARCH ARTICLE

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Mindfulness in face recognition: Embedding mindfulness instructions in the face-composite construction process

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Summary

Meditative mindfulness practices, promoting sustained attention and reducing mind-wandering, have been associated with improvements in cognitive abilities and memory. The present study explored whether a non-meditative practice could be successfully applied in a forensic application; specifically, whether mindfulness instructions can be embedded in the face-composite construction process to facilitate identification. Twenty participants, who were not football fans, were asked to memorise an unfamiliar footballer's face and return 24 hr later to construct a face using the self-administered EvoFIT facial composite system. In the experimental condition, mindfulness instructions were embedded in the EvoFIT system, encouraging witnesses to focus on the target face and the process; in the control condition, participants constructed the face using the standard EvoFIT system. Naming of the composites was attempted by 24 football fans, who each viewed 10 composites, five from each condition, and then the target footballer images to ensure they were familiar with the identities. Results showed significantly higher levels of correct naming for composites constructed using EvoFIT with mindfulness instructions compared to using the standard EvoFIT. These findings indicate the potential for non-meditative mindfulness instructions to assist face-composite construction, improving correct naming of ensuing composites.

KEYWORDS

EvoFIT, face recognition, face-composite construction, mindfulness

1 | INTRODUCTION

An eyewitness of a crime may be asked by police to assist in creating an impression of the face of a perpetrator, an image commonly known as a facial composite (Davies & Valentine, 2007). A facial composite is typically constructed with the help of a trained forensic practitioner (Frowd, 2015) and/or computerised systems such as EvoFIT (Frowd et al., 2004), EFIT-V/6 (e.g., Davis et al., 2016) and ID (Tredoux et al., 2006). As opposed to feature-based systems (e.g., E-FIT and PRO-fit), where the process entails combining face features (i.e., eyes,

nose, mouth, etc.), EvoFIT, EFIT-V/6 and ID follow a holistic approach that encourages processing the face as a whole that is more effective in face-composite construction (e.g., Wells & Hasel, 2007). While these holistic systems have all been evaluated in the literature (e.g., Davis et al., 2016; Frowd et al., 2019; Tredoux et al., 2006), EvoFIT is notably accompanied by research exploring additional methods, such as mindfulness meditation (Martin et al., 2017), to assist with composite construction and, in effect, composite identification. The present research focused on enhancing the EvoFIT process further by embedding non-meditative mindfulness instructions

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throughout the face-composite process, to assist with face construction.

EvoFIT has been successfully integrated into forensic processes, leading to the successful conviction of offenders (e.g., Frowd, Hancock, et al., 2011; Frowd, Pitchford, et al., 2011; Frowd et al., 2019). The 'gold-standard' procedure involves a witness participant viewing a photograph (or video) of an unfamiliar person, and, usually from 24 to 48 hr later, working to create a composite of the face the witness remembers. The face construction process begins with witnesses repeatedly selecting faces from arrays of faces, which are combined to 'evolve' a face. Then, software tools are used to manipulate the face holistically (e.g., weight or age) and alter the size and position of facial features. The task concludes by adding external features (e.g., hair). The final composite is shown to the public (or other participants who know the person depicted), to attempt recognition (Fodarella et al., 2015).

Research has investigated methods to enhance the EvoFIT composite process, focusing on improving recollection of the target face. The Cognitive Interview (CI), employed at the beginning of an EvoFIT session, invites the witness to recall as much detail about the crime scene and the offender as possible (Fisher & Geiselman, 1992, 2010) by visualising the target face and freely recalling as many details of him or her as possible (Fodarella et al., 2015; Frowd, 2011). The Holistic Interview (HI), employed after the CI, asks the witness to make judgements about the target based on specific personality traits (e.g., intelligence, aggressiveness; Frowd et al., 2008). Combined with EvoFIT, both interviewing procedures (together known as H-CI) are valuable for identifying suspects (e.g., Frowd et al., 2012). Recently, Martin et al. (2017) incorporated a brief focused breathing exercise before applying CI and H-CI techniques. Focused breathing inductions guide participants to direct their attention and awareness to present moment sensations, focusing on the experience of breathing. When their awareness moves away from the breath, participants are guided back to the sensations of breathing (e.g., Arch & Craske, 2006). Focused breathing practices have been related to a reduction in stress (e.g., Chiesa & Serretti, 2009), a side-effect of experiencing a criminal event (e.g., Morgan et al., 2004), and constructing a facial composite (Hancock et al., 2011). Martin et al. showed correct naming of facial composites created after the focused breathing exercise was significantly higher than of facial composites created using the standard procedure conducted without focused breathing.

Focused breathing is an example of traditional mindfulness meditation training. Mindfulness meditation involves intentionally observing the breath (or any other attentional focal point), without reacting to feelings and thoughts that may arise, by accepting things as they are (Kabat-Zinn, 1990). Mindfulness training involves the recurrent practice of self-regulating attention, leading to measurable increases in attentional skills in non-meditating participants (e.g., Campillo et al., 2018; Chambers, Lo, & Allen, 2008; Semple, 2010; Tang et al., 2007). Meditative practices often require weeks of training (e.g., Geiger et al., 2016; Hilton et al., 2017), but research has also developed brief exercises, which can be effective in enhancing state levels of mindfulness (e.g., Carmody & Baer, 2009).

Mindfulness meditation has been associated with improvements in cognitive abilities (Chiesa et al., 2011) and memory (Levi &

Rosenstreich, 2019), all mainly due to fostering of sustained attention and reduction in mind-wandering (e.g., Mrazek et al., 2012; Tang et al., 2007). Specific to brief meditative practices, mindfulness training has been linked to improved long delay free recall (but not long delay cued recall), better object recognition memory, and recognition memory in a word task (Brown et al., 2016; Rosenstreich & Ruderman, 2016), and better source monitoring of misinformation (Alberts et al., 2017) and memory recall (Hammond et al., 2006) in the eyewitness process. Moreover, a single mindfulness meditative session has been shown to improve short-term memory for faces (Youngs et al., 2020), recall of novel words (Alberts & Thewissen, 2011; Bonamo et al., 2015), attention to and memory of visual and auditory stimuli (Campillo et al., 2018) and fewer false memories in word tasks (Calvillo et al., 2018; Lloyd et al., 2016; but see Rosenstreich, 2016). Nevertheless, participants may cease meditation practice, or even refuse to engage with it, due to preconceptions around meditation or because of potential conflicts with their cultural and religious background (e.g., Mantzios & Wilson, 2013; Wellings, 2015).

Non-meditative practices have been developed to induce a state of mindfulness, without the commitment or engagement required in meditation, and are typically embedded within the cognitive or behavioural aspect of interest. For example, as an alternative practice to meditation, mindfulness instructions have been employed in the process of washing hands and dishes (Gilmartin, 2016; Hanley et al., 2015) and in the process of adding colour on lined art (i.e., colouring; Mantzios & Giannou, 2018a), both to successfully enhance mindfulness and reduce anxiety. In targeting specific behaviours, mindfulness instructions during the process of trying on a bathing suit have been found to effectively induce both a state of mindfulness that abated the influence of body satisfaction on negative effect and smoking urges (Adams et al., 2013; Bowen & Marlatt, 2009) and have been incorporated in food diaries to promote more mindful eating habits, again increasing mindfulness and reducing anxiety (Hussein et al., 2017; Mantzios & Wilson, 2014, 2015). Hence, recent research has collectively explored the potential of alternative practices that may appeal to a wider part of the population, and successfully identified ways of inducing mindfulness through non-meditative practices, necessary in assisting specific processes, which in the present research could be utilised to create a facial composite.

Recently, a standalone (i.e., self-service) version of the original EvoFIT facial composite system was developed, to be easily deployed to witnesses on a computer within a few hours of witnessing. The importance of this approach is threefold: first, as the process lasts about an hour, composite construction with this version of EvoFIT is time efficient. As facial composites are more effective when face construction occurs within hours rather than days (Frowd et al., 2005), the 'self-administered' system may help to improve composites and, thus, offender identification. Second, efficiency also applies to reduced demands for police resources, removing the need for comprehensive training of police officers and forensic practitioners. A self-administered procedure could be useful in cases of less serious crimes, easing the strain on police resources. Third, visiting a police station can conceivably elevate stress levels (Risan et al., 2016),

adversely affecting witness performance (Kieckhafer et al., 2014). As the standalone EvoFIT does not require a trained forensic practitioner, who would apply CI and H-CI processes (or a practitioner who would apply a mindfulness exercise), further research appears necessary to explore practices that could potentially enhance the outcomes of the self-administered construction process.

The self-administered EvoFIT system incorporates user prompts throughout the initial process of selecting faces from face arrays to encourage witnesses to visualise the face, instigating recall of the target face. Martin et al. (2017) suggested face construction benefited from mindfulness meditation; importantly, enhancing these already existing prompts through mindfulness instructions could result in gaining the cognitive benefits of mindfulness without the need for a practitioner to lead a meditative session prior to composite construction. Mindfulness instructions can benefit face-composite construction in two ways. First, mindfulness prompts, which encourage witnesses to close their eyes when visualising the face, introduce eye-closure (i.e., an instruction to close the eyes or an automatic impulse to close the eyes) to improve memory for events (e.g., Perfect et al., 2008; Vredeveltdt et al., 2010; Vredeveltdt & Penrod, 2013). As part of meditative practices, eye-closure has been observed to facilitate free recall of an event without an increase in errors (e.g., Wagstaff et al., 2004, 2011) and researchers put forward the idea that its importance lies in reducing general cognitive load (e.g., eliminating any monitoring of the environment; Perfect et al., 2008; Sprawson et al., 2020), resisting distractions (e.g., Perfect et al., 2011) and facilitating visualisation (Vredeveltdt et al., 2011).¹

Second, a task-congruent practice has the potential to cultivate mindfulness without the need to engage in meditation. For example, Mantzios and Wilson (2014) used diaries to successfully prime participants to develop more mindful eating habits, and Hanley et al. (2015) adapted dishwashing instructions to reproduce a mindfulness practice. One element that amplified the outcomes for participants in these studies was how these mindfulness practices were task-congruent, targeting specific activities and behavioural outcomes by aligning the intervention to the task, rather than using a generic contemplative intervention, separate from a task. As opposed to a mindfulness meditative practice before the task, task-congruent mindfulness instructions recurrently prompt the mindful cycle of acknowledging a distraction as a distraction and bringing awareness back to the present experience (e.g., Kabat-Zinn, 2003). Such a mindfulness-inducing cycle has the potential to be more beneficial in providing the necessary skills to focus attention to the composite construction process (e.g., Campillo et al., 2018; Mrazek et al., 2012), by resisting distractions (e.g., Diaz, 2013) and encouraging recall of the target face (e.g., Alberts & Thewissen, 2011; Hammond et al., 2006), during the process when these qualities are relevant (e.g., Adams et al., 2013).

In the present experiment, participants, who were not football fans, were asked to memorise a famous footballer's face, an identity who was unfamiliar to them, and return 24 hr later to construct a face using the self-administered EvoFIT facial composite system. In the experimental condition, mindfulness instructions were embedded in the EvoFIT system, encouraging witnesses to focus on the target face and the process; in the control condition, participants constructed the

face using the normal EvoFIT procedure. The resulting face composites were presented to football fans, who attempted to name the footballers depicted in the composites. These football fans were further asked to name the famous footballer face images (i.e., the actual face images that the composite construction participants were asked to memorise), to ensure that they were familiar with these identities. We expected that embedding mindfulness instructions in the EvoFIT process would promote more identifiable composites.

2 | METHOD

2.1 | Participants

2.1.1 | Face construction

Twenty (19 females) students aged 18–20 ($M = 18.8$, $SD = 0.70$) years participated, in exchange for course credit. All participants claimed not to be familiar with footballers. Ten participants (all female) aged from 18 to 20 years ($M = 18.9$, $SD = 0.74$) were allocated to the experimental condition (i.e., mindfulness instructions) and 10 participants (9 female) aged 18–20 ($M = 18.8$, $SD = 0.75$) were allocated to the standard condition.

2.1.2 | Composite naming

To ensure naming participants were familiar with the target footballers, the naming sample consisted of participants who correctly identified at least eight footballers from the target images (presented to naming participants after composite naming). Starting with an opportunity sample of 52 volunteer football fans, aged 20–48 years (40 males; $M = 29.58$, $SD = 7.56$), the final sample consisted of 24 male participants, aged 20–47 years ($M = 30.67$, $SD = 6.70$), who correctly identified eight or more of the famous footballers. The size of both samples is similar to previous research in the field (see Frowd, Hancock, et al., 2011; Frowd, Pitchford, et al., 2011; Martin et al., 2017).

2.2 | Materials

2.2.1 | Target faces

The stimuli were images of 10 famous, white male English footballers (i.e., Leighton Baines, Ross Barkley, Gary Cahill, Michael Carrick, Joe Hart, Jordan Henderson, Harry Kane, Adam Lallana, James Milner and Jack Wilshere). Images were colour full-faced frontal photographs, showing a neutral facial expression, without any distinguishing characteristics such as football team identifiers or hairstyles. Two sets of these 10 colour photographs, approximately 10 cm high by 10 cm wide, were printed on A4 paper. All 20 photographs were labelled at the back with a different number (randomly assigning numbers and, thus, participants to either the mindfulness instructions or standard condition) and were placed into one large envelope, for each

participant to randomly select a face to construct. Once a face was selected from the envelope, it was placed in a separate envelope to ensure the specific target image, randomly assigning participants in each condition, was not used again. Hence, two composites were created for each target; one composite was created by a participant in the mindfulness instructions condition and one composite was created by a participant in the standard condition.

Composites were constructed on a laptop computer using self-administered EvoFIT (v1.6.70) software. At the end of the study, two sets of images were collated to be used in naming of the composites. Each set comprised 20 images. First came 10 of the 20 composite images, which were collated by a third independent party; to ensure naming participants were exposed to composites made in both conditions, each image set included five composites constructed in the mindfulness instructions condition and five composites constructed in the control condition. Moreover, as each footballer image was used to create two composites—one in the mindfulness instructions condition and one in the control condition—each of these 10 composite sets included one of the composites made of each footballer identity. The purpose of this design was to ensure naming participants would consider each composite solely as a unique identity and not in comparison with the preceded composites. In each set, the composite images were followed by the 10 target footballer images.

2.2.2 | Personality measure

The five facet mindfulness questionnaire—Short form

The five facet mindfulness questionnaire—short form (FFMQ-SF) (Bohlmeijer et al., 2011) is a 24-item questionnaire measuring five facets of mindfulness, based on the original 39-item FFMQ (Baer et al., 2006). The five mindfulness facets are; *observing* (e.g., 'I pay attention to physical experiences, such as the wind in my hair or the sun on my face'); *describing* (e.g., 'When I feel something in my body, it's hard for me to find the right words to describe it'); *acting with awareness* (e.g., 'I rush through activities without being really attentive to them'); *non-judging* (e.g., 'I think some of my emotions are bad or inappropriate and I shouldn't feel them'); and *non-reacting* (e.g., 'When I have distressing thoughts or images, I just notice them and let them go'). All item responses range from 1 (*never or rarely true*) to 5 (*very often or always true*), with higher scores indicating higher levels of mindfulness. Bohlmeijer et al. (2011) reported good reliability for all facets; observing, $\alpha = .81$; describing, $\alpha = .87$; acting with awareness, $\alpha = .83$; non-judging, $\alpha = .83$; non-reacting, $\alpha = .75$. In the present experiment, Cronbach's α for total FFMQ-SF was $\alpha = .83$ and Cronbach's α for the five facets was: observing, $\alpha = .78$; describing, $\alpha = .71$; acting with awareness, $\alpha = .62$; non-judging, $\alpha = .73$; non-reacting, $\alpha = .77$.

2.3 | Procedure

We invited participants, who were not football fans, to attend two separate sessions over two consecutive days. On Day 1, we asked

participants to first complete the FFMQ-SF as a baseline measure of their trait mindfulness levels, to ensure any observed effects were not driven by participants' already elevated trait mindfulness levels. Then, we asked them to randomly select a face from the envelope including target pictures. If the target face was unfamiliar to them, we asked them to study the face for 30 s. If the face was familiar to them, they were asked to choose another, encoding the first unfamiliar face (in the present experiment, one participant was familiar with their first choice, however, the next randomly selected face was unfamiliar and, thus, encoded). Their random selection of the face determined if they were placed in the experimental or the control condition group. After face encoding, participants were informed that they would attempt construction of the face the following day.

Participants returned 24 hr later to construct a composite of the face from memory using self-administered EvoFIT. On Day 2, we first briefly introduced the EvoFIT process to participants. All participants were encouraged to take their time and pay attention to all the instructions and subsequent prompts. The researcher remained available to answer any questions relating to the procedure.

2.4 | EvoFIT construction stage

Fodarella et al. (2015) provide a detailed description of the standard EvoFIT face construction procedure, inclusive of CI and H-CI processes. In the present study, participants used a self-administered (standalone) EvoFIT protocol (e.g., Martin et al., 2017), which did not include the CI and H-CI procedures due to the standalone EvoFIT not requiring a forensic practitioner, who would apply these procedures.

Participants first viewed an instructional video briefly describing the process of creating a composite. In the standard condition, once the instructional video finished, participants were directed to the start of the face-composite construction process. In the standard condition, participants were presented with prompts throughout the process of face selection (prior to a screen of faces being shown), asking participants to simply visualise the face.

In the experimental condition, the video was followed by on-screen brief mindfulness instructions, discussing how the mind often wanders naturally and the process of returning the focus to the present moment and the process (see Mantzios & Giannou, 2018b). Participants were told to repeat this process of returning their focus to the process when distracted and when prompted to take a focused breath and visualise the face. The transcript of the mindfulness instructions added on EvoFIT was as follows:

So, to construct a composite, you will be asked to select faces from the screen and make other choices to allow you to create the best likeness possible.

You will also be asked to visualise the face, basically to see it in your mind. Each time you are prompted to

visualise the face, please close your eyes and direct your attention to the face you remember.

However, you might find that any noise heard inside or outside of the room distracts you, or that your mind wanders onto other things.

This happens to everyone and is of course absolutely fine. Our minds do that naturally.

What we ask is that, should such distractions arise, observe and label your thoughts as 'thoughts', or emotions as 'emotions', without judging or evaluating them any further. Simply say to yourself 'I just had a thought' and return your attention to the present and continue selecting faces from the screen, judging the best likeness, visualising the face, etc.

These instructions were an introduction to subsequently presented prompts, appearing throughout face selection (prior to a screen of faces being shown) and asking participants to direct their attention and visualise the face they remember. These prompts were:

Please take a focused breath and visualise the face. Remember that we all get distracted from time to time. If your attention shifts away from visualising or constructing the face, acknowledge the distraction and bring your attention back to the present.

Therefore, the mindfulness instructions were presented at the beginning of the process, with the mindfulness prompts, mimicking the existing standard prompts, being administered throughout the process of face selection but ceasing when the process progressed to holistic manipulation of the face and adding external characteristics (i.e., mirroring the appearance of the existing standard prompts).

Next, participants selected a specific pool of faces to work with, based on the age, race and gender of the face they remembered (e.g., white males, around 30 years of age). Based on the selected face database, randomly generated examples of faces (showing a face with only the internal characteristics—i.e., eyes, nose and mouth) were presented, asking participants to either proceed to face construction or return to the process of selecting a more suitable face database. Once confident the database was a good representation of the target face, participants were presented with six successive arrays, each showing 18 faces (showing only the internal characteristics), asking them to choose two faces from each array, focusing on the eye region and ignoring face width. The first three arrays of faces presented smooth textured faces (i.e., faces without any shading and showing the same skin tone), whereas the subsequent three arrays presented textured faces (i.e., faces with differences in shading around facial features and skin tone). Once participants selected six smooth and six textured faces (i.e., two faces from each array), they were asked to pick one smooth and one textured face best matching the face they remembered.

Following, participants viewed two arrays of 18 faces, which were a combination (i.e., morphed together) of participants' selected faces, and were asked to select one face from each array. These two faces were, then, separately shown to participants and they had to select the best face of the two. The next page showed participants all selected faces and asked for a choice of the best matching face, which participants were asked to rate on a 1-to-10 likeness scale (1 being 'very poor likeness' to 10 being 'faces are identical'). The exact process of selecting two faces from arrays of 18 faces was repeated with 'evolved' smooth faces and 'evolved' textures of faces (i.e., where characteristics of the selected faces were 'bred together' to 'evolve' a face), again asking participants to select the best matching 12 faces (six for evolved smooth faces and six for evolved face textures), leading them to select the best combination face.

At this point, participants were asked to either evolve the face again, if they were not confident that the evolved face resembled the face they remembered, or, if confident, to continue the face construction manipulating the face through holistic tools. Participants used the holistic tools to alter the face holistically, across 14 categories (e.g., face weight, age, health, skin tone, extraversion, honesty, face position, etc.), by moving a slider left or right. Then, participants could use feature scales to adjust the position and shape of features (e.g., eyes, eyebrows, mouth, beard, etc.). Participants could use the holistic and feature scales as many times as required until they were confident the 'changed' face was a better match than the 'original' face. Finally, participants were asked to select hair (e.g., length, fringe, style, etc.) and other external features (e.g., hats and hoods) databases as many times as required in order to construct the best matching image of the target identity.

Once the participants were confident the final face with added external characteristics was a close match to the face they remembered, the researcher saved the composite face and exited the EvoFIT system.

2.5 | Naming stage procedure

The naming procedure lasted for approximately 20 min per person. Participants were tested individually, where the researcher noted down responses. When, occasionally, two football fans attended a naming session together, each participant was randomly assigned a different set of composite and target images and was tested in isolation from the other participant, leading to individual responding to the naming task. Participants were informed that they would first see and attempt to name 10 composite faces of white English footballers who currently play or have in the past played internationally for the English national team. Next, participants were informed that they would see 10 famous footballer images to name, to ensure they were familiar with the targets. Composites and targets (see Figure 1 for examples of composites) were presented one at a time in a different random order for each person; no time limit was set for the naming process, with each composite and target remaining visible until a response was given (a correct name, explicit biographical information, or 'do not know').

3 | RESULTS

3.1 | Participant trait mindfulness levels

Table 1 presents mean values of participants' baseline mindfulness levels (before face-composite construction) in the two conditions.

An independent samples *t* test was conducted to compare mindfulness levels in the mindfulness and the standard conditions; there was no significant difference in mindfulness levels between the mindfulness and the standard conditions [FFMQ-SF; $t(19) = .230$, $p = .820$]. Mean values displayed for overall mindfulness score and subscales are comparable to those reported in previous research (e.g., Baer et al., 2006; Bohlmeijer et al., 2011; Moore et al., 2012).

3.2 | Composite identification

Responses on the composite naming task were scored as *accurate identifications* (i.e., when a composite or target picture had been correctly identified by a participant, either with the correct name of the footballer or with accurate biographical information), *incorrect identifications* (i.e., when a composite or target picture was incorrectly identified, providing an incorrect footballer name or incorrect biographical information) and '*Do not Know*' responses (i.e., when no response was given). Table 2 presents descriptive statistics of these composite and target naming responses by Condition (Type of EvoFIT used to create the face).

In the analyses, 'conditional' scores were calculated for naming responses based on the number of composites and the number of targets that had been correctly named. This was done as participants would most likely not be able to correctly name a composite if that identity was unfamiliar to them. For example, if two composites and

eight target images had been correctly named, the conditional naming score for this participant would be 2/8 or 0.25. Table 3 presents descriptive statistics of these accurate, inaccurate and '*Do not Know*' responses, by-participants.

Paired-sample *t* tests were conducted by-participants to compare conditional naming responses. Results revealed significantly higher correct naming for composites in the mindfulness instructions condition over the standard condition, $t(23) = 4.61$, $p < .001$, $d = 1.44$ (indicating a large effect size), and significantly more '*Do not Know*' responses for composites in the standard than the mindfulness instructions condition, $t(23) = 2.89$, $p = .008$, $d = 0.45$ (medium effect size). There was no significant difference for incorrect naming between the mindfulness and the standard condition, $t(23) = 0.84$, $p = .41$, $d = 0.13$ (small effect size).

The Benjamini–Hochberg (1995) procedure was also applied, to minimise the possibility of Type I errors due to multiple comparisons (Abdi, 2010; Diz et al., 2011). The procedure offers a balance between false positives and false negatives, to increase the chances of finding true positives (Diz et al., 2011; Glickmann et al., 2014). Similar approaches have been applied in face recognition (Babaei et al., 2020) and mindfulness (Strohmaier, 2020; Strohmaier et al., 2020) research. Correcting for three comparisons using this procedure, the aforementioned tests remained significant (or not).

By-items analyses were also carried out to explore naming levels for each item (composite) across participants (see Table 4). Paired-sample *t* tests revealed a marginally significant difference in favour of correct naming in the mindfulness over the standard condition, $t(9) = 2.25$, $p = .05$, $d = 1.00$ (large effect size), but there was no significant difference for incorrect naming, $t(9) = 0.25$, $p = .81$, $d = 0.11$ (small effect size). Finally, a paired-sample *t* test showed significantly more '*Do not Know*' responses for composites in the standard than the mindfulness instructions condition, $t(9) = 2.43$, $p = .038$, $d = 1.17$



FIGURE 1 Composite examples of footballers James Milner (left), Harry Kane (centre) and Adam Lallana (right). The composites on the left were constructed in the mindfulness condition and the composites on the right were constructed in the standard condition

TABLE 1 Mean values of participants' mindfulness levels in the standard and mindfulness conditions

	FFMQ-SF Total M (SD)	Observe M (SD)	Describe M (SD)	ActAware M (SD)	NonJudge M (SD)	NonReact M (SD)
Standard	78.8 (9.5)	14.5 (2.2)	17.2 (2.6)	17.2 (2.8)	14.9 (4.4)	14.9 (3.6)
Mindfulness	77.7 (12.7)	13.6 (3.8)	17.8 (3.4)	17.0 (3.3)	15.5 (3.5)	13.8 (3.9)

Note: Facet scores typically range from 5 to 25 (except for the observe facet which ranges from 5 to 20).

Abbreviation: FFMQ-SF, five facet mindfulness questionnaire—short form.

(large effect size). Correcting for three comparisons using the Benjamini–Hochberg (1995) procedure, the aforementioned tests remained significant (or not).

As by-items analyses can be statistically weak, a unified by-participants and by-items analysis was conducted on the correct naming responses using Generalised Estimating Equations. This regression-type approach emerged significant for type of EvoFIT [$\chi^2(1) = 14.00, p < .001$],² confirming that the mindfulness condition gave rise to more identifiable composites than those produced from the normal procedure [$B = 1.47, SE(B) = 0.39, Exp(B) = 4.34, 95\%CI (2.01, 9.37)$; indicating a large effect size].

Overall, these results suggest that incorporating mindfulness instructions into self-administered EvoFIT helps constructors to create more identifiable composites.

TABLE 2 Descriptive statistics of composite and target naming responses by condition

	Mindfulness EvoFIT	Standard EvoFIT
Accurate identifications <i>M (SD)</i>	1.42 (0.93)	0.42 (0.58)
Inaccurate identifications <i>M (SD)</i>	1.42 (1.72)	1.50 (1.89)
'Do not know' responses <i>M (SD)</i>	2.17 (1.55)	3.04 (2.07)
Accurate target naming <i>M (SD)</i>	9.68 (0.69)	

TABLE 3 Descriptive statistics of composite naming rates

	Mindfulness EvoFIT	Standard EvoFIT
Accurate identifications <i>M (SD)</i>	0.15 (0.09)	0.04 (0.06)
Inaccurate identifications <i>M (SD)</i>	0.42 (0.47)	0.36 (0.41)
'Do not know' responses <i>M (SD)</i>	0.24 (0.17)	0.33 (0.23)

TABLE 4 Composite naming scores, across participants, by condition

Targets	Mindfulness EvoFIT			Standard EvoFIT		
	Correct	Incorrect	Do not know	Correct	Incorrect	Do not know
Joe Hart	3	6	3	0	4	8
Harry Kane	6	0	6	4	3	5
Jack Wilshere	4	2	6	1	3	8
James Milner	10	1	1	0	3	9
Adam Lallana	0	6	6	2	3	7
Gary Cahill	0	3	9	1	3	8
Michael Carrick	0	6	6	0	2	10
Jordan Henderson	4	4	4	0	5	7
Ross Barkley	2	4	6	1	4	7
Leighton Baines	5	2	5	1	6	5
<i>M (SD)</i>	3.40 (3.17)	3.40 (2.17)	5.20 (2.15)	1.00 (1.25)	3.60 (1.17)	7.40 (1.58)

4 | DISCUSSION

The present study explored the effectiveness of embedding mindfulness instructions in the face-composite construction process, to promote more identifiable composites. Findings demonstrated significantly higher levels of correct naming for composites constructed using EvoFIT with mindfulness instructions compared to using the standard, self-administered EvoFIT system. Such a difference in performance was not observed with the number of mistaken (incorrect) names given for composites, but more 'Do not Know' responses emerged for composites constructed in the standard condition.

The present findings show the potential for mindfulness instructions to be integrated in the face-composite construction process to assist with composite construction and enhance correct naming for face composites, supporting Martin et al.'s (2017) findings, who effectively incorporated a focused breathing exercise before the EvoFIT face-composite process, resulting in better naming of composites in the meditation condition. The present findings extend such research findings in acquiring the benefits of mindfulness through non-meditative practices (see also Adams et al., 2013; Mantzios & Giannou, 2018a), suggestive of an easier application of mindfulness in the face-composite process. The importance of the present mindfulness practice lies in the mindfulness prompts being task-congruent; in other words, the intervention was aligned to the task, prompting participants to close their eyes and recall the target face, while acknowledging distractions and bringing attention and awareness back to the task. Research has suggested eye-closure to facilitate free recall (e.g., Wagstaff et al., 2011) and improve memory for events (e.g., Vredeveltdt & Penrod, 2013) and mindful attention and awareness skills to relate to improved long delay free recall (e.g., Brown et al., 2016), better memory recall in eyewitness processes (e.g., Hammond et al., 2006), and resisting distractions and mind-wandering (e.g., Diaz, 2013; Mrazek et al., 2013). The present findings suggest that inducing these skills throughout the composite

construction process results in better composites and, thus, better composite identification.

The present study was the first to test and validate the applicability of the standalone version of EvoFIT. Naming accuracy for composites constructed with this version of EvoFIT was low at 4%, indicating composites were not good enough to evoke recognition, while inaccurate naming was high at 36%. Such performance perhaps indicates that the present self-administered EvoFIT system is too intricate to be administered without the help of a forensic practitioner or additional instructions. Frowd (2021) discusses a less taxing self-administered EvoFIT version could show, for example, fewer face arrays, while the present study suggests adding focus and attention inducing instructions through the process to assist with composite construction and identification. Low naming scores for the composites in the standard condition also suggest the value of CI and H-CI techniques, lack of which meant less identifiable composites, compared to past research that utilised these procedures as part of the EvoFIT process (Frowd, 2011; Frowd et al., 2008). CI and H-CI processes are included to encourage witnesses to visualise the target face (Fisher & Geiselman, 2010) and make inferences about the character of the target face (Frowd et al., 2008), respectively. The present mindfulness instructions and prompts invited witnesses to move away from being on automatic pilot, to visualise and focus on the face and the process of face construction, probing participants to attend to the present moment, non-judgmentally. These instructions and prompts echo some of the outcomes of the CI processes and focused breathing, which have been found to enhance face construction using the EvoFIT system (Frowd et al., 2008; Martin et al., 2017), enabling promotion and maintenance of the effects of CI and mindfulness throughout the construction process, to enhance accuracy in face construction. In effect, accurate naming in the mindfulness condition was at 15%, comparable to Martin et al.'s (2017) naming at 19%, considering they utilised the typical EvoFIT process, inclusive of CI and H-CI processes, but also the focused breathing exercise. However, inaccurate naming of the composites in the mindfulness condition was at 42%, higher than in the standard condition at 36%. Such difference, although non-significant, and considering that more 'Do not Know' responses were given for composites in the standard condition, possibly indicates that the composites constructed in the mindfulness condition were better, inducing identification more often.

The present findings further support the potential for mindfulness to be developed through non-meditative techniques, to support cognitive processes such as face recall and face-composite construction. Previously, Hanley et al. (2015) showed how an everyday activity such as dishwashing can become an informal mindfulness practice, and Mantzios and Giannou (2018a) revamped colouring books into a mindfulness tool that reduced anxiety. Moreover, Adams et al. (2013) observed mindfulness instructions to induce a state of mindfulness and to protect from increases in negative affect and body satisfaction while female participants tried on a bathing suit. The present non-meditative exercise may have indeed

increased state mindfulness, but further research would need to employ a state mindfulness measure (along with the trait mindfulness measure employed in the present research to measure participants' trait mindfulness) pre- and post-face construction, in order to determine whether the mindful instructions increased state mindfulness or whether the standard face construction process decreased mindfulness. In the present study, mindfulness instructions and prompts enhanced the already existing EvoFIT prompts, which appear in the first half of the process, where face selection from face arrays occurs, therefore, state mindfulness levels at the end might not have been accurate representations of state mindfulness levels due to the mindfulness intervention not being applied throughout the process. Future research should embed mindfulness instructions throughout the process and measure state mindfulness before and after face-composite construction. Future research could also investigate the possibility of applying mindfulness in the composite naming process, drawing on recent findings proposing mindfulness to be effective in face recognition performance (Giannou et al., 2020).

The present findings should be interpreted with caution due to the size of our composite naming sample. Although similar sample sizes have been reported in previously published work (e.g., Frowd, Hancock, et al., 2011; Frowd, Pitchford, et al., 2011; Martin et al., 2017), future research should validate these effects further, by recruiting more naming participants but ensuring they are keen football fans. In the present study, naming participants, who did not meet our sampling criterion of correctly identifying more than eight target footballers, provided considerably more incorrect or 'Do not Know' responses; therefore, it appears that naming participants need to strictly be committed football fans in order to be able to correctly name the composites. Being a devoted football fan, regularly attending games, perhaps means more prior exposure to the footballers, enhancing familiarity (see Vallano et al., 2019). However, considering that a person attempting to name a composite might not be too familiar with a perpetrator, future research could investigate composite construction and identification of a face not overly familiar to both witness and naming participants.

Future research should also be conducted to offer insight into the potential mechanism by which mindfulness instructions resulted in better naming of composites. Research has related being attentive or mindful of an event to accurately recalling of information (e.g., Higgs & Donohoe, 2011), suggesting the potential of different attentional processes and practices to reinforce memory. Hence, future research could explore if the observed effects were a direct result of the intervention inducing the mindful cycle of acknowledging a distraction as a distraction and bringing awareness back to the present experience (e.g., Kabat-Zinn, 2003) or due to enhancing present moment attention to the process of face construction. Mindfulness literature has exemplified two distinct fields within attention. One field investigates what we would describe as sustained attention to the immediate present experience (e.g., Brown & Ryan, 2003). For Brown and Ryan (2003), mindfulness is openly experiencing the present moment that brings about

present awareness and attention. The second field describes the sustained attention in the immediate present experience, but with the addition of a non-judgmental attitude towards thoughts and feelings that may arise in the present moment (Kabat-Zinn, 2003). While both fields relate to models of attentional training and highlight the importance of maintaining attention in the present moment experience, the latter (applied to the present experiment) represents a model for the self-regulation of attention (Bishop et al., 2004) that results in overcoming mind-wandering and the consequences of thought suppression (paradoxically associated with an increased occurrence of thoughts; Abramowitz et al., 2001; Wegner, 1994) when non-judgement is present. The ability to adopt a non-judgmental, non-evaluative and accepting attitude enables the reiteration of attention to the present moment experience (e.g., Arch & Craske, 2006). Such a distinction between enhancing and sustaining attention and sustaining attention with the addition of self-regulating attention could be explored in the face-composite process, to identify the strongest approach to assist face composition and face recognition in general.

In conclusion, the present findings indicate the potential for non-meditative mindfulness instructions to be embedded to the face-composite construction process, without subjecting participants to further tasks or cognitive demands, and without the explicit instigation that witnesses are practicing mindfulness. The subjective differences between knowing and being blind to the such interventions may form a more compelling argumentation in future research as to how standardising mindfulness in face-composite instructions may be more acceptable by the general public, but for now, we assume that there is merit to embedding mindfulness instructions within eyewitness techniques and research trials.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

ENDNOTES

- ¹ Although, note that some people find it uncomfortable to close their eyes, particularly in the presence of others (Nash et al., 2016).
- ² Scored participant responses were subjected to Generalised Estimating Equations (GEE). This analysis contained one predictor, type of EvoFIT (coded as 1 = Mindfulness, and 2 = Standard, which was the reference category). The response variable (DV) was accuracy of composite naming (coded as described above: 0 = incorrect and 1 = correct response). The 'link' function specified was binary logistic (logit) to model the nominal (binary) responses. An 'exchangeable' structure was specified for the Working Correlation Matrix. Once built, the resulting parameter values [B and SE(B)] were checked to be within sensible limits (not too high or low), which might otherwise indicate an issue with fitting of the final model.

DATA AVAILABILITY STATEMENT

Data available from Kyriaki Giannou.

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REFERENCES

- Abdi, H. (2010). Holm's sequential Bonferroni procedure. In N. Salkind (Ed.), *Encyclopedia of research design* (pp. 574–578). Sage.
- Abramowitz, J. S., Tolin, D. F., & Street, G. P. (2001). Paradoxical effects of thought suppression: A meta-analysis of controlled studies. *Clinical Psychology Review*, 21(5), 683–703. [https://doi.org/10.1016/S0272-7358\(00\)00057-X](https://doi.org/10.1016/S0272-7358(00)00057-X)
- Adams, C. E., Benitez, L., Kinsaul, J., Apperson McVay, M., Barbry, A., Thibodeaux, A., & Copeland, A. L. (2013). Effects of brief mindfulness instructions on reactions to body image stimuli among female smokers: An experimental study. *Nicotine & Tobacco Research*, 15(2), 376–384. <https://doi.org/10.1093/ntr/nts133>
- Alberts, H. J., Otgaar, H., & Kalagi, J. (2017). Minding the source: The impact of mindfulness on source monitoring. *Legal and Criminological Psychology*, 22(2), 302–313. <https://doi.org/10.1111/lcrp.12102>
- Alberts, H. J., & Thewissen, R. (2011). The effect of a brief mindfulness intervention on memory for positively and negatively valenced stimuli. *Mindfulness*, 2(2), 73–77. <https://doi.org/10.1007/s12671-011-0044-7>
- Arch, J. J., & Craske, M. G. (2006). Mechanisms of mindfulness: Emotion regulation following a focused breathing induction. *Behaviour Research and Therapy*, 44(12), 1849–1858. <https://doi.org/10.1016/j.brat.2005.12.007>
- Babaei, E., Srivastava, N., Newn, J., Zhou, Q., Dingler, T., & Velloso, E. (2020). Faces of focus: A study on the facial cues of attentional states. In *Proceedings of the 2020 CHI conference on human factors in computing systems* (pp. 1–13). <https://doi.org/10.1145/3313831.3376566>
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27–45. <https://doi.org/10.1177/1073191105283504>
- Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: A practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society. Series B (Methodological)*, 57(1), 289–300. Retrieved from. <http://www.jstor.org/stable/2346101>
- Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., ... Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical psychology: Science and Practice*, 11(3), 230–241. <https://doi.org/10.1093/clipsy.bph077>
- Bohlmeijer, E., ten Klooster, P. M., Fledderus, M., Veehof, M., & Baer, R. (2011). Psychometric properties of the five facet mindfulness questionnaire in depressed adults and development of a short form. *Assessment*, 18(3), 308–320. <https://doi.org/10.1177/1073191111408231>
- Bonamo, K. K., Legerski, J. P., & Thomas, K. B. (2015). The influence of a brief mindfulness exercise on encoding of novel words in female college students. *Mindfulness*, 6(3), 535–544. <https://doi.org/10.1007/s12671-014-0285-3>
- Bowen, S., & Marlatt, A. (2009). Surfing the urge: Brief mindfulness-based intervention for college student smokers. *Psychology of Addictive Behaviors*, 23(4), 666–671. <https://doi.org/10.1037/a0017127>
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, 84(4), 822–848. <https://doi.org/10.1037/0022-3514.84.4.822>
- Brown, K. W., Goodman, R. J., Ryan, R. M., & Anālayo, B. (2016). Mindfulness enhances episodic memory performance: Evidence from a multi-method investigation. *PLoS One*, 11(7), e0153309. <https://doi.org/10.1371/journal.pone.0153309>
- Calvillo, D. P., Flores, A. N., & Gonzales, L. C. (2018). A brief mindfulness induction after encoding decreases false recognition in the Deese-Roediger-McDermott paradigm. *Psychology of Consciousness: Theory, Research, and Practice*, 5(2), 131–139. <https://doi.org/10.1037/cns0000145>
- Campillo, E., Ricarte, J. J., Ros, L., Nieto, M., & Latorre, J. M. (2018). Effects of the visual and auditory components of a brief mindfulness

- intervention on mood state and on visual and auditory attention and memory task performance. *Current Psychology*, 37(1), 357–365. <https://doi.org/10.1007/s12144-016-9519-y>
- Carmody, J., & Baer R. A. (2009). How long does a mindfulness-based stress reduction program need to be? A review of class contact hours and effect sizes for psychological distress. *Journal of Clinical Psychology*, 65(6), 627–638. <https://doi.org/10.1002/jclp.20555>
- Chambers, R., Lo, B. C. Y., & Allen, N. B. (2008). The impact of intensive mindfulness training on attentional control, cognitive style, and affect. *Cognitive Therapy and Research*, 32(3), 303–322. <https://doi.org/10.1007/s10608-007-9119-0>
- Chiesa, A., Calati, R., & Serretti, A. (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Review*, 31(3), 449–464. <https://doi.org/10.1016/j.cpr.2010.11.003>
- Chiesa, A., & Serretti, A. (2009). Mindfulness-based stress reduction for stress management in healthy people: a review and meta-analysis. *The Journal of Alternative and Complementary Medicine*, 15(5), 593–600. <https://doi.org/10.1089/acm.2008.0495>
- Davies, G., & Valentine, T. (2007). Facial composites: Forensic utility and psychological research. In R. C. L. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *The handbook of eyewitness psychology* (Vol. II, pp. 73–98). Erlbaum.
- Davis, J. P., Thorniley, S., Gibson, S., & Solomon, C. (2016). Holistic facial composite construction and subsequent lineup identification accuracy: Comparing adults and children. *The Journal of Psychology*, 150(1), 102–118. <https://doi.org/10.1080/00223980.2015.1009867>
- Diaz, F. M. (2013). Mindfulness, attention, and flow during music listening: An empirical investigation. *Psychology of Music*, 41(1), 42–58. <https://doi.org/10.1177/0305735611415144>
- Diz, A. P., Carvajal-Rodríguez, A., & Skibinski, D. O. (2011). Multiple hypothesis testing in proteomics: A strategy for experimental work. *Molecular & Cellular Proteomics*, 10(3), M110.004374. <https://doi.org/10.1074/mcp.M110.004374>
- Fisher, R. P., & Geiselman, R. E. (1992). *Memory enhancing techniques for investigative interviewing: The cognitive interview*. Charles C. Thomas.
- Fisher, R. P., & Geiselman, R. E. (2010). The cognitive interview method of conducting police interviews: Eliciting extensive information and promoting therapeutic jurisprudence. *International Journal of Law and Psychiatry*, 33(5–6), 321–328. <https://doi.org/10.1016/j.ijlp.2010.09.004>
- Fodarella, C., Kuivaniemi-Smith, H., Gawrylowicz, J., & Frowd, C. D. (2015). Forensic procedures for facial-composite construction. *Journal of Forensic Practice*, 17(4), 259–270. <https://doi.org/10.1108/JFP-10-2014-0033>
- Frowd, C. D. (2011). Eyewitnesses and the use and application of cognitive theory. In G. Davey (Ed.), *Introduction to applied psychology* (pp. 267–289). Wiley-Blackwell.
- Frowd, C. D. (2015). Facial composites and techniques to improve image recognisability. In T. Valentine & J. P. Davis (Eds.), *Forensic facial identification: Theory and practice of identification from eyewitnesses, composites and CCTV* (pp. 43–70). Wiley-Blackwell.
- Frowd, C. D. (2021). Forensic facial composites. In A. M. Smith, M. P. Toglia, & J. M. Lampinen (Eds.), *Methods, measures and theories in eyewitness identification*. Taylor and Francis.
- Frowd, C. D., Bruce, V., Smith, A. J., & Hancock, P. J. (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-Surrett, D., Richardson, J., Baldwin, H., & Hancock, P. (2005). 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., Hancock, P. J., Bruce, V., Skelton, F. C., Atherton, C. J., & Nelson, L. (2011). Catching more offenders with EvoFIT facial composites: Lab research and police field trials. *Global Journal of Human-Social Science*, 11(3), 35–46. Retrieved from. <https://socialscienceresearch.org/index.php/GJHSS/article/view/165>
- Frowd, C. D., Hancock, P. J., & Carson, D. (2004). EvoFIT: A holistic, evolutionary facial imaging technique for creating composites. *ACM Transactions on Applied Perception (TAP)*, 1(1), 19–39. <https://doi.org/10.1145/1008722.1008725>
- Frowd, C. D., Nelson, L., Skelton, F., Noyce, R., Atkins, R., Heard, P., Morgan, D., Fields, S., Henry, J., McIntyre, A., & Hancock, P. J. (2012). Interviewing techniques for Darwinian facial-composite systems. *Applied Cognitive Psychology*, 26(4), 576–584. <https://doi.org/10.1002/acp.2829>
- Frowd, C. D., Pitchford, M., Bruce, V., Jackson, S., Hepton, G., Greenall, M., McIntyre, A. H., & Hancock, P. J. (2011). The psychology of face construction: Giving evolution a helping hand. *Applied Cognitive Psychology*, 25(2), 195–203. <https://doi.org/10.1002/acp.1662>
- Frowd, C. D., Portch, E., Killeen, A., Mullen, L., Martin, A. J., & Hancock, P. J. (2019). EvoFIT facial composite images: A detailed assessment of impact on forensic practitioners, police investigators, victims, witnesses, offenders and the media. In 2019 eighth international conference on emerging security technologies (EST) (pp. 1–7). IEEE - Institute of Electrical and Electronic Engineers. <https://doi.org/10.1109/EST.2019.8806211>
- Geiger, P. J., Boggero, I. A., Brake, C. A., Caldera, C. A., Combs, H. L., Peters, J. R., & Baer, R. A. (2016). Mindfulness-based interventions for older adults: A review of the effects on physical and emotional well-being. *Mindfulness*, 7(2), 296–307. <https://doi.org/10.1007/s12671-015-0444-1>
- Giannou, K., Taylor, J. R., & Lander, K. (2020). Exploring the relationship between mindfulness, compassion and unfamiliar face identification. *Journal of Cognitive Psychology*, 32(3), 298–322. <https://doi.org/10.1080/20445911.2020.1739693>
- Gilmartin, H. M. (2016). Use hand cleaning to prompt mindfulness in clinic. *BMJ*, 352, i13. <https://doi.org/10.1136/bmj.i13>
- Glickmann, M. E., Rao, S. R., & Schultz, M. R. (2014). False discovery rate control is a recommended alternative to Bonferroni-type adjustments in health studies. *Journal of Clinical Epidemiology*, 67, 850–857. <https://doi.org/10.1016/j.jclinepi.2014.03.012>
- Hammond, L., Wagstaff, G. F., & Cole, J. (2006). Facilitating eyewitness memory in adults and children with context reinstatement and focused meditation. *Journal of Investigative Psychology and Offender Profiling*, 3(2), 117–130. <https://doi.org/10.1002/jip.47>
- Hancock, P. J., Burke, K., & Frowd, C. D. (2011). Testing facial composite construction under witness stress. *International Journal of Bio-Science and Bio-Technology*, 3(3), 65–71.
- Hanley, A. W., Warner, A. R., Dehili, V. M., Canto, A. I., & Garland, E. L. (2015). Washing dishes to wash the dishes: Brief instruction in an informal mindfulness practice. *Mindfulness*, 6(5), 1095–1103. <https://doi.org/10.1007/s12671-014-0360-9>
- Higgs, S., & Donohoe, J. E. (2011). Focusing on food during lunch enhances lunch memory and decreases later snack intake. *Appetite*, 57(1), 202–206. <https://doi.org/10.1016/j.appet.2011.04.016>
- Hilton, L., Maher, A. R., Colaiacono, B., Apaydin, E., Sorbero, M. E., Booth, M., Shanman, R. M., & Hempel, S. (2017). Meditation for posttraumatic stress: Systematic review and meta-analysis. *Psychological Trauma: Theory, Research, Practice, and Policy*, 9(4), 453–460. <https://doi.org/10.1037/tra0000180>
- Hussein, M., Egan, H., & Mantzios, M. (2017). Mindful construal diaries: A less anxious, more mindful, and more self-compassionate method of eating. *SAGE Open*, 7(2). <https://doi.org/10.1177/2158244017704685>
- Kabat-Zinn, J. (1990). *Full catastrophe living: The program of the stress reduction clinic at the University of Massachusetts Medical Center*. Delta.
- Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice*, 10(2), 144–156. <https://doi.org/10.1093/clipsy.bpg016>

- Kieckhafer, J. M., Vallano, J. P., & Schreiber Compo, N. (2014). Examining the positive effects of rapport building: When and why does rapport building benefit adult eyewitness memory? *Memory*, 22(8), 1010–1023. <https://doi.org/10.1080/09658211.2013.864313>
- Levi, U., & Rosenstreich, E. (2019). Mindfulness and memory: A review of findings and a potential model. *Journal of Cognitive Enhancement*, 3(3), 302–314. <https://doi.org/10.1007/s41465-018-0099-7>
- Lloyd, M., Szani, A., Rubenstein, K., Colgary, C., & Pereira-Pasarin, L. (2016). A brief mindfulness exercise before retrieval reduces recognition memory false alarms. *Mindfulness*, 7(3), 606–613. <https://doi.org/10.1007/s12671-016-0495-y>
- Mantzios, M., & Giannou, K. (2018a). When did coloring books become mindful? Exploring the effectiveness of a novel method of mindfulness-guided instructions for coloring books to increase mindfulness and decrease anxiety. *Frontiers in Psychology*, 9, 56. <https://doi.org/10.3389/fpsyg.2018.00056>
- Mantzios, M., & Giannou, K. (2018b). A real-world application of short mindfulness-based practices: A review and reflection of the literature and a practical proposition for an effortless mindful lifestyle. *American Journal of Lifestyle Medicine*, 13(6), 520–525. <https://doi.org/10.1177/1559827618772036>
- Mantzios, M., & Wilson, J. C. (2013). Moderating the negative relationship between impulsivity and weight loss through self-compassion. *Appetite*, 71, 481. <https://doi.org/10.1016/j.appet.2013.06.043>
- Mantzios, M., & Wilson, J. C. (2014). Making concrete construals mindful: A novel approach for developing mindfulness and self-compassion to assist weight loss. *Psychology & Health*, 29, 422–441. <https://doi.org/10.1080/08870446.2013.863883>
- Mantzios, M., & Wilson, J. C. (2015). Mindfulness, eating behaviours, and obesity: A review and reflection on current findings. *Current Obesity Reports*, 4(1), 141–146. <https://doi.org/10.1007/s13679-014-0131-x>
- Martin, A. J., Hancock, P. J., & Frowd, C. D. (2017). Breathe, relax and remember: An investigation into how focused breathing can improve identification of EvoFIT facial composites. In *2017 Seventh International Conference on Emerging Security Technologies (EST)* (pp. 79–84). IEEE. <https://doi.org/10.1109/EST.2017.8090403>
- Moore, A. W., Gruber, T., Deroose, J., & Malinowski, P. (2012). Regular, brief mindfulness meditation practice improves electrophysiological markers of attentional control. *Frontiers in Human Neuroscience*, 6, 18. <https://doi.org/10.3389/fnhum.2012.00018>
- Morgan III, C. A., Hazlett, G., Doran, A., Garrett, S., Hoyt, G., Thomas, P., ... Southwick, S. M. (2004). Accuracy of eyewitness memory for persons encountered during exposure to highly intense stress. *International Journal of Law and Psychiatry*, 27(3), 265–279. <https://doi.org/10.1016/j.ijlp.2004.03.004>
- Mrazek, M. D., Franklin, M. S., Phillips, D. T., Baird, B., & Schooler, J. W. (2013). Mindfulness training improves working memory capacity and GRE performance while reducing mind wandering. *Psychological Science*, 24(5), 776–781. <https://doi.org/10.1177/0956797612459659>
- Mrazek, M. D., Smallwood, J., & Schooler, J. W. (2012). Mindfulness and mind-wandering: Finding convergence through opposing constructs. *Emotion*, 12(3), 442–448. <https://doi.org/10.1037/a0026678>
- Nash, R. A., Nash, A., Morris, A., & Smith, S. L. (2016). Does rapport-building boost the eyewitness eye closure effect in closed questioning? *Legal and Criminological Psychology*, 21(2), 305–318. <https://doi.org/10.1111/lcrp.12073>
- Perfect, T. J., Andrade, J., & Eagan, I. (2011). Eye closure reduces the cross-modal memory impairment caused by auditory distraction. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 37(4), 1008–1013. <https://doi.org/10.1037/a0022930>
- Perfect, T. J., Wagstaff, G. F., Moore, D., Andrews, B., Cleveland, V., Newcombe, S., Brisbane, K. A., & Brown, L. (2008). How can we help witnesses to remember more? It's an (eyes) open and shut case. *Law and Human Behavior*, 32(4), 314–324. <https://doi.org/10.1007/s10979-007-9109-5>
- Risan, P., Binder, P. E., & Milne, R. (2016). Regulating and coping with distress during police interviews of traumatized victims. *Psychological Trauma: Theory, Research, Practice, and Policy*, 8(6), 736–744. <https://doi.org/10.1037/tra0000119>
- Rosenstreich, E. (2016). Mindfulness and false-memories: The impact of mindfulness practice on the DRM paradigm. *The Journal of Psychology*, 150(1), 58–71. <https://doi.org/10.1080/00223980.2015.1004298>
- Rosenstreich, E., & Ruderman, L. (2016). Not sensitive, yet less biased: A signal detection theory perspective on mindfulness, attention, and recognition memory. *Consciousness and Cognition*, 43(6), 48–56. <https://doi.org/10.1016/j.concog.2016.05.007>
- Semple, R. J. (2010). Does mindfulness meditation enhance attention? A randomized controlled trial. *Mindfulness*, 1(2), 121–130. <https://doi.org/10.1007/s12671-010-0017-2>
- Sprawson, I., Wood, J., & Mantzios, M. (2020). “And now close your eyes or lower your gaze”: Exploring novice meditators and their attentional processes during meditation. *Journal of Cognitive Enhancement*, 4, 369–378. <https://doi.org/10.1007/s41465-020-00175-3>
- Strohmaier, S. (2020). The relationship between doses of mindfulness-based programs and depression, anxiety, stress, and mindfulness: A dose-response meta-regression of randomized controlled trials. *Mindfulness*, 11, 1315–1335. <https://doi.org/10.1007/s12671-020-01319-4>
- Strohmaier, S., Jones, F. W., & Cane, J. E. (2020). Effects of length of mindfulness practice on mindfulness, depression, anxiety, and stress: A randomized controlled experiment. *Mindfulness Ahead of Print*, 12, 198–214. <https://doi.org/10.1007/s12671-020-01512-5>
- Tang, Y. Y., Ma, Y., Wang, J., Fan, Y., Feng, S., Lu, Q., Yu, Q., Sui, D., Rothbart, M. K., Fan, M., & Posner, M. I. (2007). Short-term meditation training improves attention and self-regulation. *Proceedings of the National Academy of Sciences*, 104(43), 17152–17156. <https://doi.org/10.1073/pnas.0707678104>
- Tredoux, C., Nunez, D., Oxtoby, O., & Prag, B. (2006). An evaluation of ID: An eigenface based construction system: Reviewed article. *South African Computer Journal*, 2006(37), 90–97. Retrieved from <https://hdl.handle.net/10520/EJC28017>
- Vallano, J. P., Slapinski, K. A., Steele, L. J., Briggs, A. P., & Pozzulo, J. D. (2019). Familiar eyewitness identifications: The current state of affairs. *Psychology, Public Policy, and Law*, 25(3), 128–146. <https://doi.org/10.1037/law0000204>
- Vredendeldt, A., Baddeley, A. D., & Hitch, G. J. (2010). Close your eyes and remember: The role of emotion in the eye-closure effect on eyewitness memory. In *Annual conference of the European association of psychology and law*. Gothenburg, Sweden.
- Vredendeldt, A., Hitch, G. J., & Baddeley, A. D. (2011). Eye closure helps memory by reducing cognitive load and enhancing visualisation. *Memory & Cognition*, 39(7), 1253–1263. <https://doi.org/10.3758/s13421-011-0098-8>
- Vredendeldt, A., & Penrod, S. D. (2013). Eye-closure improves memory for a witnessed event under naturalistic conditions. *Psychology, Crime & Law*, 19(10), 893–905. <https://doi.org/10.1080/1068316X.2012.700313>
- Wagstaff, G. F., Brunas-Wagstaff, J., Cole, J., Knapton, L., Winterbottom, J., Crean, V., & Wheatcroft, J. (2004). Facilitating memory with hypnosis, focused meditation, and eye closure. *International Journal of Clinical and Experimental Hypnosis*, 52(4), 434–455. <https://doi.org/10.1080/00207140490889062>
- Wagstaff, G. F., Wheatcroft, J. M., Caddick, A. M., Kirby, L. J., & Lamont, E. (2011). Enhancing witness memory with techniques derived from hypnotic investigative interviewing: Focused meditation, eye-closure, and context reinstatement. *International Journal of Clinical and Experimental Hypnosis*, 59(2), 146–164. <https://doi.org/10.1080/00207144.2011.546180>

- Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review*, 101(1), 34–52. <https://doi.org/10.1037/0033-295X.101.1.34>
- Wellings, N. (2015). *Why can't I meditate? How to get your mindfulness practice on track*. Piatkus.
- Wells, G. L., & Hasel, L. E. (2007). Facial composite production by eyewitnesses. *Current Directions in Psychological Science*, 16(1), 6–10. <https://doi.org/10.1111/j.1467-8721.2007.00465.x>
- Youngs, M. A., Lee, S. E., Mireku, M. O., Sharma, D., & Kramer, R. S. (2020). Mindfulness meditation improves visual short-term memory. *Psychological Reports*. <https://doi.org/10.1177/0033294120926670>

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