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Context, Cognition and Convictions: Examining Analytic Versus Holistic Thinking in Police Lineup Identifications

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Abstract

Eyewitnesses have a significant impact on decisions made by the criminal justice system, and incorrect identifications are a leading cause of unjust convictions. Although many studies have examined the effects of individuals' cognitive approaches (analytic versus holistic) on object recognition, little research has explored these effects in relation to facial recognition. Moreover, no research has explored this phenomenon within the context of police lineup procedures. The aim of this study was to address these gaps and investigate whether there are effects of holism and background condition on identification accuracy and confidence in police lineup procedures. Participants (N = 254) watched a short mock crime video, completed a stimulus triads task to measure holistic tendency, and were randomised into one of three background conditions (no background, different visual perspective of background, same background) before completing an online lineup procedure. ANOVAs found no significant main effects of background condition, holism group, or an interaction between both on identification accuracy. Additionally, there was no significant main effect of background condition on identification confidence. However, a simple linear regression demonstrated a significant negative linear relationship between holism scores and identification confidence. Despite only one of five hypotheses being accepted, this study addresses a neglected area in the current body of literature and suggests practical implications and applications. Strengths and limitations, in addition to suggestions for further research, are discussed.

Keywords: eyewitness, analytic, holistic, lineup, identification, accuracy, confidence.

Context, Cognition and Convictions: Examining Analytic Versus Holistic Thinking in Police Lineup Identifications

Eyewitnesses have a significant impact on decisions made by the criminal justice system (Nayak & Khajuria, 2019), providing important, and often the only, accessible evidence in court (Werner et al., 2013). Research demonstrates that the reliability of eyewitness testimony is typically overestimated by legal professionals (Puddifoot, 2020; Wise & Kehn, 2020). Whilst police lineups are regularly used, eyewitnesses frequently fail to correctly identify criminals or misidentify innocent suspects and lineup fillers (Albright, 2017; Gustafsson, 2019; Wells et al., 2020). Up to 50% of identification judgements may be incorrect, according to results from controlled eyewitness identification laboratory investigations highlighted within two meta-analyses (Steblay et al., 2003; Steblay et al., 2011). Brewer and Doyle (2021) argue that these misidentifications can have devastating consequences for innocent victims and their families, as well as those affected by guilty criminals avoiding apprehension. According to further research, incorrect identifications are a leading cause of unjust convictions (Rosenthal, 2020), with more than 70% of 375 wrongful convictions that were later overruled by DNA evidence having at least one incorrect eyewitness identification (Innocence Project, 2020). This discovery has sparked investigation into the reliability of eyewitness accounts and the factors that enhance the accuracy of witness identifications. This paper aims to explore the effects of holistic thinking style and lineup background condition on identification accuracy and confidence within police lineup procedures.

Effect of Background Context on Information Recall

Research conducted by founding members of cultural psychology led to a surge in literature concerning ecological, cultural and psychological differentiation (Berry & Annis, 1974). Early research suggested that, as individuals learn new content, they also encode

information about the learning environment (Tulving, 1974). This has led to the development of context-dependent memory that suggests that memory is enhanced when contextual cues about the environment are identical in both the encoding and retrieval stages (Godden & Baddeley, 1975). This study recruited divers who learnt a sequence of words either on land or underwater. Individuals then recalled the information in either the original environment or in the alternate one. Findings demonstrate that when the recall setting matched the learning environment, divers remembered words more effectively, providing further support for the notion of context-dependent memory. Despite these findings, the study lacks generalisability as the sample of divers means results cannot be applied to every instance of context cue dependency (Koens et al., 2003). Although this limitation has been identified, it should be acknowledged that the theory of context-dependent memory has been highly influential and is considered to be the precursor to later theoretical models (Nisbett & Miyamoto, 2005). Context-dependence has been particularly influential within policing as it demonstrates that taking witnesses back to the scene of the crime and providing environmental cues may improve accuracy of eyewitness testimony (Ginet & Py, 2001).

Effect of Cognitive Approach on Information Recall

According to psychologists, the significance that individuals place on contextual elements in cognition varies dependent on their thinking style (Monga & John, 2008). Early research indicates that basic category learning mechanisms were thought to be universal (Shepard, 1987). However, Nisbett et al. (2001) later established a theoretical model of analytic versus holistic thinking to account for differences in individuals' cognitive approaches. The analytical strategy is a rule-based, formal technique that focuses solely on the target item by detaching an object from its surroundings (Spencer-Rodgers et al., 2010). However, holistic thinking examines the field or context as a whole, seeing it as greater than the individual parts (Choi et al., 2003). However, it is important to consider that this holistic

technique is field-dependent since it considers both object-field and object-object relationships (Spencer-Rodgers & Peng, 2018). Field dependence refers to the cognitive tendency that enables individuals to distinguish between an item and the field in which it appears (Witkin et al., 1977). Providing further support for this notion, researchers state that individuals with analytical thinking styles often focus on one particular focal object whereas individuals with holistic thinking styles focus on the majority of objects and their surroundings (Yama & Zakaria, 2019). Furthermore, cultural differences between analytic and holistic thinkers should be acknowledged; East Asian cultures tend to adopt holistic thinking styles whilst Westerners adopt an analytical approach (de Oliveira & Nisbett, 2017; Norenzayan et al., 2002).

If East Asians are predisposed to focus on background information, we may anticipate that they would find it more challenging to distinguish an item from the field in which it appears and would thus have a negatively impacted field independence performance (Nisbett & Masuda, 2003). One method utilised to measure field dependence is the Rod and Frame Test (RFT; Witkin & Asch, 1948). This task requires participants to peer inside a rectangular box with a rod inside of it and report when they perceive the rod to be vertical. The extent to which decisions concerning the orientation of the rod are affected by the location of the frame is a sign of field dependency. Ji et al. (2000) analysed how East Asians and Americans performed on the RFT and demonstrated that East Asians performed worse on the task, supporting the idea that holistic thinkers are more field dependent. These findings suggest that holistic thinkers will have more accurate identifications in police lineups when provided with context reinstatement, which is supported by additional research (Emmett et al., 2003). Despite this, significant male advantages have been demonstrated on the RFT that have remained stable over time (Razzak et al., 2014) and therefore gender differences must be considered when interpreting findings from these studies.

Interaction Effect of Background Context and Cognitive Approach on Information Recall

Based on previous findings, Masuda and Nisbett (2001) conducted a study to examine the effects of cognitive approaches on information recall when backgrounds and environmental settings change in the encoding and retrieval stages. The study used a sample of Japanese and American participants, who were shown realistic animated representations of aquatic animals and were asked to describe what they had viewed; Americans' statements referred to focal objects, whilst Japanese participants' statements focused on background features. Moreover, Japanese participants made roughly 70% more remarks on environmental factors, although American and Japanese participants both cited specifics about the focal aquatic animals, supporting the notion that East Asian cultures tend to adopt holistic thinking styles whilst Westerners adopt an analytic approach (de Oliveira & Nisbett, 2017; Norenzayan et al., 2002). Furthermore, by presenting the focal animal with a novel background in a follow-up recognition exercise, Japanese performance was negatively impacted, demonstrating that the item had become "bound" (Chalfonte & Johnson, 1996) to the background on which it had originally been presented, supporting the theory of context-dependent memory (Godden & Baddeley, 1975). In contrast, the incorrect background had no impact on how Americans saw the object. These findings demonstrate that holistic thinkers are affected by a change in background and contextual elements at the retrieval or recall phase, highlighting important implications for police lineup procedures. Holistic thinkers may be more susceptible to eyewitness inaccuracies than analytic thinkers when the background at the identification stage does not match the environment of the crime itself, supported by research suggesting that police lineups should use plain coloured backgrounds (Wells et al., 2020). Despite this, the findings also demonstrate that holistic thinkers may have improved eyewitness identification accuracy when the background at the identification

stage is a match for the environment in which the crime took place, suggesting that plain backgrounds may not be necessary although backgrounds should be identical for all suspects, as has been argued within the literature (Havard et al., 2023).

Numerous researchers have attained similar findings regarding “binding” (Lyle et al., 2006; Park et al., 1999). Although, Lyle et al. (2006) highlighted that individual differences should be considered in addition to cultural differences; for older adults, features are less tightly bound and therefore older adults may be more susceptible to false memories. This has important implications for eyewitness identifications as older adults’ identifications may be more prone to inaccuracies. Furthermore, although previous literature has focused on a cross-cultural approach to studying differences in cognitive approaches, individual differences underlying analytic and holistic thinking styles have been neglected (Choi et al., 2007). Recently, this has led to the use of the theory of analytic versus holistic thinking in research within a single culture (Cheek & Norem, 2017; Monga & John, 2010; Xiaotian & Jingyu, 2017). Individual differences in numerous facets of behaviour and brain activity have been linked to analytic and holistic thinking styles (Bakhchina et al., 2021). Moreover, variations in cognitive performance between individuals with analytic and holistic tendencies have been highlighted across multiple tasks, including attention (Gutchess et al., 2020; Jurkat et al., 2021). Critics have also argued that gender differences should be taken into consideration; male techniques are focused on holistic stimulus elements, whereas female approaches are more analytic, focusing on stimulus specifics (Pletzer, 2014). This leads researchers to question whether these individual differences should be considered by criminal and legal professionals when receiving eyewitness testimonies to assess their accuracy (Russ et al., 2018).

Impacts on Facial Recognition

More recently, research has shifted its focus to the impacts of analytic and holistic thinking in specific relation to facial recognition. A plethora of methods have been put forward in recent years to address the challenging issues with facial recognition (Zhao et al., 2003). Our face is perhaps the most noticeable and unforgettable aspect of our body (Leopold & Rhodes, 2010) and we can recall a large number of distinct faces (Werner et al., 2013). We are more sensitive to subtle changes in facial features than we are to differences in any other category of objects, highlighting this as one of the factors that makes facial recognition so important for identifying a criminal (Lander et al., 2018). Expertise in this process differs to object recognition and relies heavily on the ability to observe all characteristics of a face at once as opposed to analysing individual components sequentially (Van Belle et al., 2010). This and subsequent research suggest that faces are processed holistically (Taubert et al., 2011; Tsao & Livingstone, 2008). The holistic perspective is founded on early observations of how individuals perceive faces and represents the notion that "a face is the sum of a multitude of small details, which are viewed in such rapid succession that we seem to perceive them all at a single glance" (Galton, 1873, p.3). Despite these outdated observations, research continues to support this idea (Wong et al., 2021) and one explanation for the prevalence of holistic facial processing is that every face is made up of the same components arranged in a similar way (e.g. eyes above nose and nose above mouth); it is thought that holistic processing enables individuals to distinguish between these seemingly identical facial components when combined as a whole (Richler & Gauthier, 2014).

Despite the belief that facial recognition is solely a holistic process, numerous researchers have hypothesised that the cognitive processing style applied during facial recognition has an impact on identification accuracy (Hills & Lewis, 2018; McCaffery et al., 2018; Peng et al., 2019). Whilst holistic processing of faces may be categorised as perceiving

separate features as a cohesive whole (Pascalis et al., 2011), analytic processing of faces is the perception, comparison, or analysis of certain facial features (Joseph et al., 2015). In comparison to analysing faces holistically, an analytical approach that focuses attention on certain facial components requires greater effort (Richler et al., 2009). Holistic judgements occur much more quickly and can result in a later improvement in the capacity to identify faces amid filler faces in a lineup (Bower & Karlin, 1974; Patterson & Baddeley, 1977). Despite these findings suggesting that holistic information may be important for facial recognition, this idea has been much debated by researchers (Richler et al., 2012; Tanaka & Simonyi, 2016) and there is conflicting empirical data to support such a notion (Tanaka & Farah, 1993). In particular there is a lack of clarity regarding the definition of holism when perceiving faces (Piepers & Robbins, 2012). In spite of these arguments, the findings suggest that holistic thinkers may provide more accurate identifications in police lineups, although the limited literature to support such a notion should be considered and further research is required to contribute to the existing body of literature.

The Present Study

Despite the extant literature within this area, the majority of research focusing on analytic versus holistic thinking has been cross-cultural (de Oliveira & Nisbett, 2017; Masuda & Nisbett, 2001; Norenzayan et al., 2002). Limited literature has considered the individual differences between analytic and holistic thinkers (Choi et al., 2007). It should also be considered that whilst many studies have explored the effects of cognitive approaches on object recognition (Masuda & Nisbett, 2001), there is little research exploring these effects on facial recognition, particularly within police lineups. Moreover, there is little to no research within the field exploring the effects of backgrounds in police lineups. Specifically, there is currently no literature examining the interaction effect between cognitive approaches and backgrounds on identification accuracy in police lineups. This study aims to address the

gaps in the current literature and examine whether there are effects of holism and background on identification accuracy and confidence in police lineup procedures.

Research Questions and Hypotheses

Research question 1: will there be an effect on the accuracy of eyewitness identifications in police lineups between individuals with high, medium, or low holistic tendencies?

Research question 2: will there be an interaction between holism and background condition, as indicated by either correct or incorrect eyewitness identifications in police lineups?

H_1*:* individuals with a high holistic cognitive approach will make significantly more accurate identifications in the lineup procedure as compared to those with medium holism and as compared to those with low holism. This is in line with previous research suggesting holistic judgements result in improved eyewitness recall (Bower & Karlin, 1974; Patterson & Baddeley, 1977)

H_2*:* there will be a significant impact of background condition on identification accuracy, as supported by previous literature regarding context-dependent memory, suggesting that recall is improved when contextual cues concerning the environment are identical in both the encoding and retrieval phases (Godden & Baddeley, 1975)

H_3*:* there will be a significant interaction effect between holism group and background condition on identification accuracy, as supported by previous research highlighting that an object becomes bound to the field in which it appears for holistic thinkers (Chalfonte & Johnson, 1996; Masuda & Nisbett, 2001)

H_4*:* there will be a significant impact of background condition on identification confidence, as supported by previous literature regarding context-dependent memory,

suggesting that recall is improved when contextual cues concerning the environment are identical in both the encoding and retrieval phases (Godden & Baddeley, 1975)

H_5: there will be a significant relationship between holism scores and identification confidence, as suggested in the existing body of literature (Bower & Karlin, 1974; Bruce, 1988; Patterson & Baddeley, 1977; Tanaka & Farah, 1993).

Method

Participants

G*Power 3.1.9.4 software (Erdfelder et al., 1996) was utilised to estimate required sample size by performing an a priori calculation (Faul et al., 2007). With a power of (1-β) .95 and an α of .05, 251 participants were required to detect a medium effect. Participants were recruited online through social media advertisements and the University of Chichester's Psychology Research Participation Scheme. Convenience sampling was employed to recruit participants, in addition to snowball sampling which was utilised by encouraging participants to share the online survey with friends and their social media following. Students recruited using the university's research scheme were awarded credit for their participation.

The survey obtained 360 responses, however due to partially completed and insufficient responses, only 254 responses were entered into data analysis. Of the remaining participants (N = 254), 77.1% (n = 196) were female, 19.3% (n = 49) were male, 2.0% (n = 5) were non-binary, and 1.6% (n = 4) preferred not to say. Respondents' ages ranged from 18 to 80 (M = 29.94, SD = 16.08). When considering ethnicity, the majority of participants were White British (n = 209 [82.3%]), whilst the remaining participants (n = 45 [17.7%]) were from other ethnic backgrounds. This current research project gained ethical approval from the University of Chichester's Research Ethics Committee.

Materials

An online survey was developed and distributed using Qualtrics (2023). The survey was pilot tested on a small sample of students prior to data collection to ensure appropriate question wording, smooth functionality, and to gauge estimated time for completion.

Mock Crime Video

A short 30-second clip of a mock crime was used to display to participants during the online survey. The video used within this study showed a robbery take place during a marriage proposal, in which the guilty suspect could be seen stealing the engagement ring before running off into the distance. The mock crime video used in this study is publicly available and can be accessed at https://www.youtube.com/watch?v=kDltqy2wgbU. The present study utilised a clip from this video spanning 1:15 to 1:41. This video is hosted on YouTube, a publicly accessible platform; the authors claim no ownership of or rights to this material, and its use within this research was solely for non-commercial, academic purposes.

Holism

Holism was measured using the stimulus triads task (Kimchi & Palmer, 1982). This task was comprised of 16 sets of figures. Each set contained one reference figure and two comparison figures. The reference figure was either a “square” comprised of smaller squares or triangles, or a “triangle” comprised of smaller triangles or squares. Participants were instructed to provide their initial and unprompted opinion of which of the two comparison figures most closely resembled the reference figure (see Appendix A). Between the two comparison figures, if the same-configuration stimulus (“triangle” comprised of triangles or “square” comprised of squares) was chosen, the response was scored as one. Otherwise, the response was scored as zero. Since each subject completed 16 stimulus triads, a score of 0-16 was assigned to each participant. A higher score indicated a greater holistic tendency.

Participants (N = 254) were then split into three groups: low (n = 78), medium (n = 83), and high (n = 93) holism.

Lineup Identification

Faces for the lineup fillers were acquired from the Amsterdam Dynamic Facial Expression Set (ADFES; van der Schalk et al., 2011) and the Faces and Motion Exeter Database (FAMED; Longmore & Tree, 2013). Faces and images were edited using Adobe Photoshop (Adobe Inc., 2019).

Study Design and Procedure

An experimental between subject design was employed. Participants (N = 254) were recruited online using either the University of Chichester's Psychology Research Participation Scheme (n = 165 [65%]) or through an advertisement poster (n = 89 [35%]), which displayed both a link and a QR code. The study advertisement was shared on social media sites, including Instagram, Facebook, and WhatsApp. Prior to taking part in the study, an information sheet outlining the main goals and ethical rights, such as anonymity, confidentiality, and right to withdraw, was provided to participants. Upon obtaining fully informed consent, all participants completed a short demographic questionnaire to gather information such as age, gender, and ethnicity. Participants were assessed via the demographic questions, ensuring they met the inclusion criteria; individuals under the age of 18 and those who did not consent to take part were excluded from the study.

Upon completing the demographic questions, participants were instructed to watch the short mock crime video and complete the stimulus triads task. Participants (N = 254) were then randomly allocated to one of three experimental conditions for the background condition of the lineup procedure: no background (n = 88), different visual perspective of the background (n = 83), same background (n = 83). Lineup faces in the no background condition were presented against a plain white background, the same background condition

used a background identical to the background in the mock crime video, whilst the different visual perspective condition used the same background from the mock crime video but from a different visual perspective and angle. Identification accuracy was measured by presenting individuals with a simultaneous lineup consisting of the guilty suspect and five innocent lineup fillers. Images were presented against one of the three backgrounds, depending on which condition participants were randomly allocated to (see Appendix B).

Participants were first instructed to look at the lineup and identify the suspect that they believed was guilty of committing the crime by selecting their image on the screen. To make the DV more sensitive, participants were then shown each of the six faces, one at a time using a sequential lineup, and asked to rate the likelihood that each of the suspects committed the crime. This was measured on a 5-point Likert scale, ranging from highly unlikely (1) to highly likely (5), and served as the measure of identification confidence for the purposes of this study. The procedure was conducted in this order, with the stimulus triads task placed in-between the mock crime video and lineup procedure, to account for the delays in eyewitness identifications that occur in realistic settings (Lin et al., 2019). Moreover, both simultaneous and sequential lineups were employed, in line with previous literature suggesting there is still uncertainty regarding which procedure is most effective (Kaesler et al., 2020). After completing the survey, a short debrief form outlining the full study aims and contact details for researchers was displayed to the participants. The study was open for participation from the 1/2/2023 to the 30/3/2023.

Statistical Data Analysis

Data was exported from Qualtrics (2023) and subsequent statistical analyses were completed in IBM SPSS Statistics [Version 28.0] (IBM Corp, 2021).

Assumptions screened include normality, assessed via skew and kurtosis z-scores and Shapiro-Wilk. Additionally, visual inspections of histograms, boxplots, P-P plots, and Q-Q

plots were conducted to assess normal distribution of residuals and eliminate significant outliers. Further assumption screening using Levene's test and scatterplot analysis was conducted to ensure homogeneity of variance, homoscedasticity, and a linear relationship between variables.

In order to test H_1, H_2 and H_3, a two-way between subject ANOVA was conducted to examine the effects of holism group (high/medium/low) and background condition (no background/different visual perspective of background/same background) on identification accuracy, in addition to exploring a potential interaction effect between holism group and background condition on identification accuracy. Identification accuracy was operationalised as a continuous percentage score, derived from five facial attributes inherent to the identification task: eyes/eyebrows, nose shape, facial shape, facial hair, and correct suspect selection. For each participant, the accuracy of their chosen suspect across these five attributes was assessed relative to the guilty suspect from the mock crime video, with each attribute scored as correct or incorrect. Scores were summed and converted to a percentage (out of 100), with higher scores indicating greater identification accuracy. To test H_4, a one-way between subject ANOVA was conducted to examine the impact of background condition on identification confidence. In order to test H_5, a simple linear regression was conducted to explore the relationship between holism scores and identification confidence. A p-value of less than .05 was considered to be statistically significant for all analyses (Grabowski, 2016). Partial eta squared (η_p^2) was utilised to measure effect size for ANOVA analyses (Lakens, 2013).

Following a preliminary regression analysis, a significant relationship between holism score and identification confidence resulted in exploratory analysis to explore the relationship between these variables split by background condition. A Pearson correlation coefficient was run to compare differences between background conditions.

Results

Effects of Holism Group and Background Condition on Identification Accuracy

To examine the impact of holism group (high/medium/low) and background condition (no background/different visual perspective of background/same background) on identification accuracy, a two-way between subject ANOVA was run. Residuals were analysed to ensure data met the assumptions for a two-way ANOVA. Residuals were approximately normally distributed as shown by skew z-scores within the +/- 1.96 range, although kurtosis z-scores were not within this range. Inspection of boxplots indicated no significant outliers in the data. Shapiro-Wilk demonstrated the assumption had been violated, although this may have been affected by the large sample size (Ghasemi & Zahediasl, 2012). Furthermore, Levene's test of equality of error variances indicated that the assumption of homogeneity of variance had been violated (F (8, 245) = 2.66, p = .008). Despite normality and assumptions being violated, the two-way ANOVA was run.

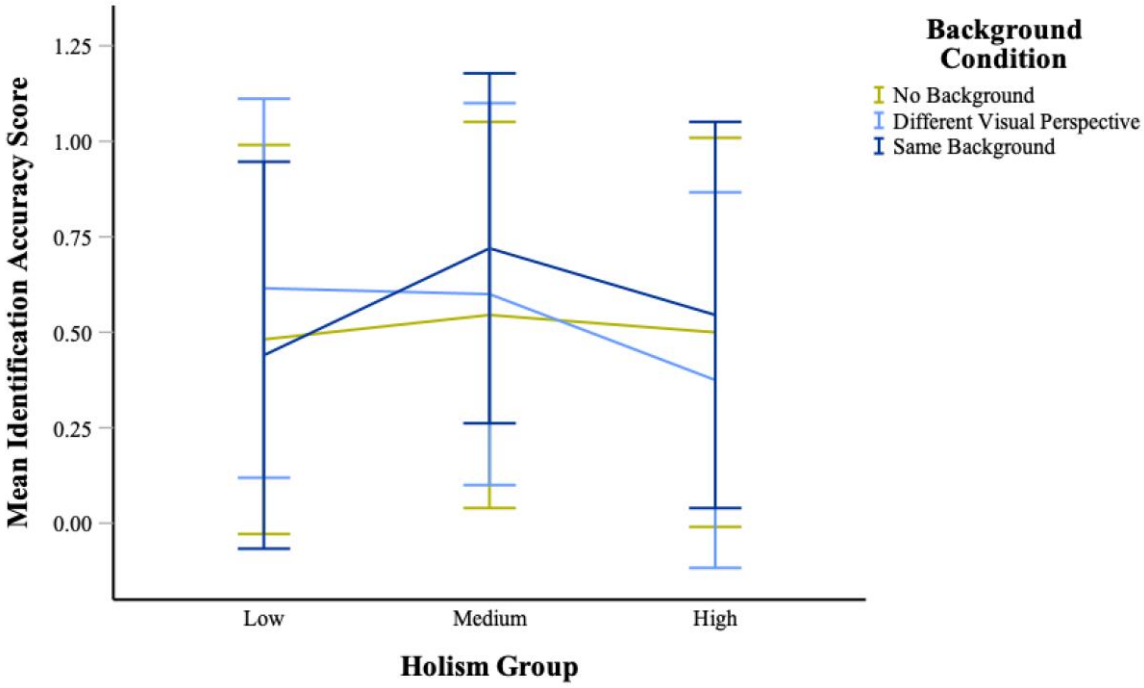
There was no significant interaction found between holism and background condition, (F (4, 245) = 1.18, p = .319, η_p^2 = .019). Overall, this indicates that the impact of holism on identification accuracy is unrelated to the level of the background condition participants belong to. As can be seen in Figure 1, main effects analysis showed that holism did not have a statistically significant effect on identification accuracy (F (2, 245) = 2.02, p = .135, η_p^2 = .016). Moreover, main effects analysis showed that background condition did not have a statistically significant effect on identification accuracy (F (2, 245) = .31, p = .736, η_p^2 = .002).

Because normality was violated, non-parametric alternatives were also run to examine the separate effects of holism group and background condition on identification accuracy. Two Kruskal-Wallis tests were run to examine these effects. The same pattern of results

emerged, demonstrating no significant effects on identification accuracy. Overall, results indicated that neither holism group nor background condition had a significant effect on identification accuracy. Moreover, results demonstrated that there was no significant interaction effect between holism and background on identification accuracy.

Figure 1:

Line Graph Displaying Mean Identification Accuracy Score Split by Holism Group and Background Condition (Error Bars: +/- 1 SD)



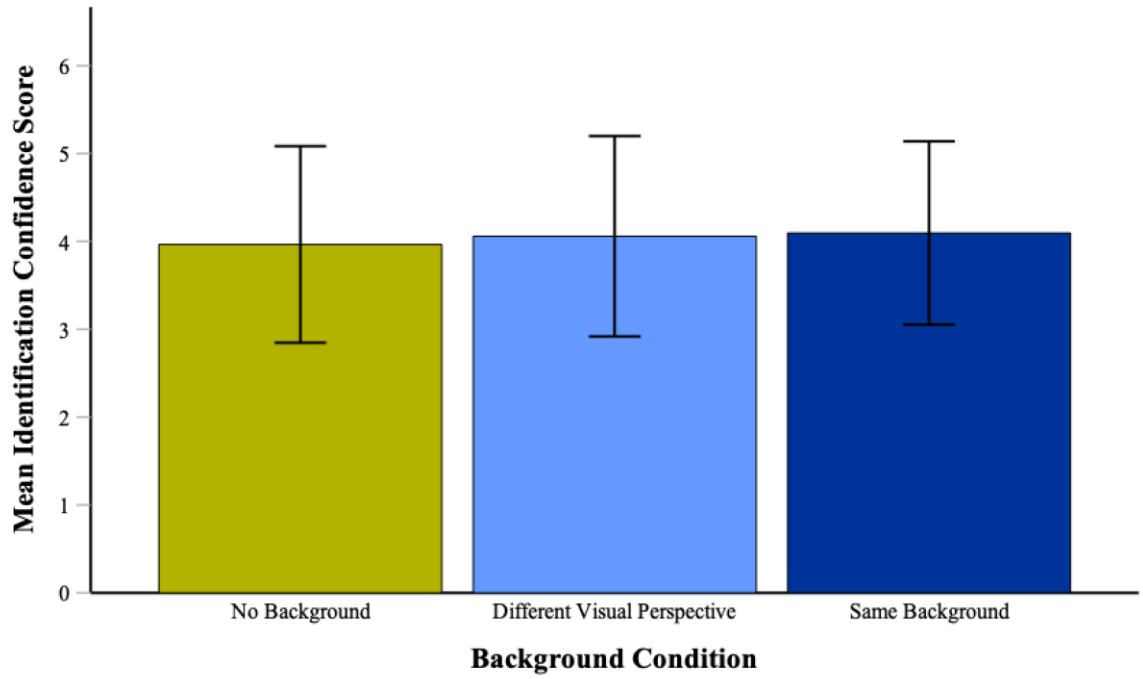
Effect of Background Condition on Identification Confidence

To examine whether the background condition (no background/different visual perspective of background/same background) explained a significant amount of variation in identification confidence, a one-way between subject ANOVA was run. Inspection of boxplots indicated that there were no significant outliers present in the data. The data were approximately normally distributed as indicated by kurtosis z-scores within the +/- 1.96

range, although the skew z-scores were not within this range. The Shapiro-Wilk test indicated that the assumption of normality had been violated ($p < .05$), although this may have been affected by the large sample size (Ghasemi & Zahediasl, 2012). Furthermore, Levene's test of equality of error variances indicated that the assumption of homogeneity of variance had been met (F (2, 251) = .01, p = .987). As can be seen in Figure 2, no significant main effect of background condition on identification confidence was found (F (2, 251) = .32, p = .725, η_p^2 = .003). Overall, results demonstrated that background condition has no significant effect on identification confidence.

Figure 2:

Graph Displaying Mean Identification Confidence Scores Split Between Background Conditions (Error Bars: +/- 1 SD)



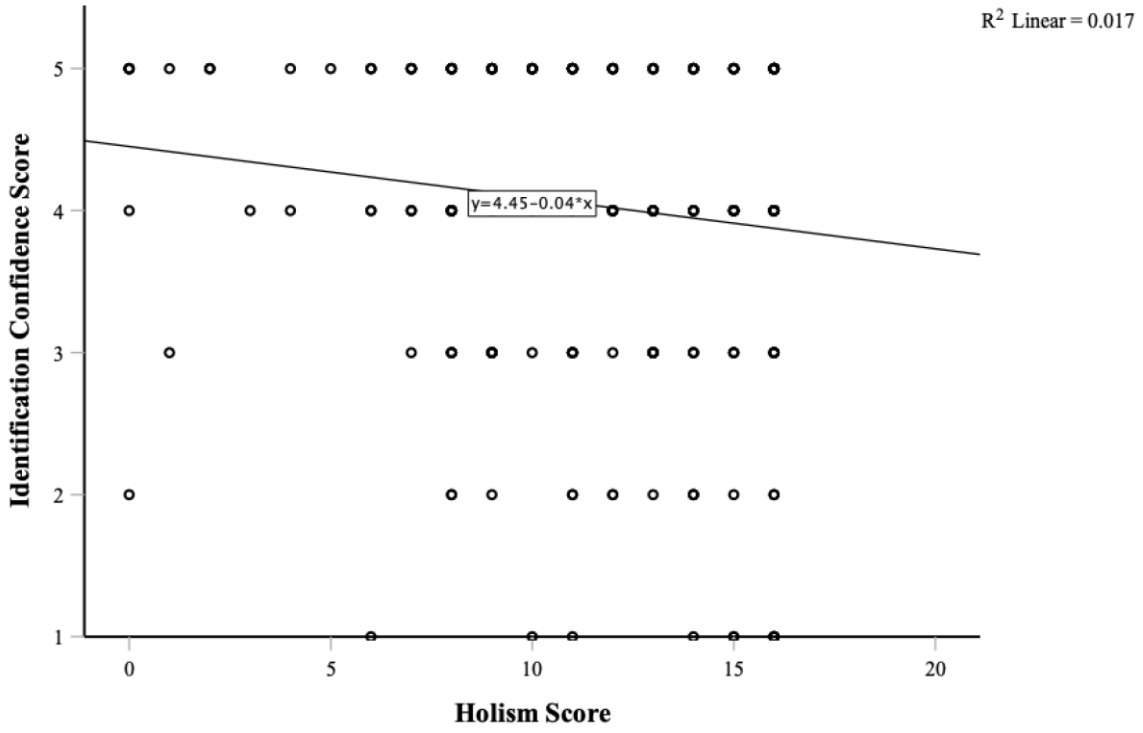
Relationship Between Holism Scores and Identification Confidence

To examine the relationship between holism scores and identification confidence, a simple linear regression was run. Normality checks were run to test statistical assumptions. Q-Q plots and P-P plots demonstrated that data met assumptions of normality and homoscedasticity. Visual inspection of scatterplots and boxplots demonstrated a linear relationship between variables and indicated that there were no significant outliers. Moreover, Levene's test of equality of error variances indicated that the assumption of homogeneity of variance had been met (F (14, 237) = 1.10, p = .358).

As can be seen in Figure 3, holism scores explained 1.7% of the variance in identification confidence and revealed a significant result (F (1, 252) = 4.27, p = .040). Holism scores (b = -.04, β = -.13) significantly predicted identification confidence, (t = -2.07, p = .040). The beta value indicates that as holism score increases by 1, identification confidence decreases by .04. Overall, the model demonstrates a significant negative linear relationship between holism scores and identification confidence, showing that participants with higher levels of holistic perception (or thinking) have lower levels of identification confidence.

Figure 3:

Scatterplot Displaying the Relationship Between Identification Confidence Score and Holism Score



Relationship Between Holism Scores and Identification Confidence Split by Background Condition

Following the significant regression, exploratory analysis was conducted with data split by background condition to further examine the relationship between holism scores and identification confidence. A Pearson correlation coefficient was run to analyse the linear relationship between holism scores and identification confidence. There was no significant correlation between the two variables in either the no background condition (r (86) = -.16, p = .144), the different visual perspective background condition (r (81) = .10, p = .391), or the same background condition (r (81) = -.14, p = .215). Overall, results demonstrated that the

relationship between holism scores and identification confidence was not significantly different between background conditions.

Discussion

Aims of the Study and Brief Interpretation of Findings

The present study aimed to investigate the main and interactive effects of holism group (high/medium/low) and background condition (no background/different visual perspective of background/same background) on identification accuracy. The study also examined the effect of background condition (no background/different visual perspective of background/same background) on identification confidence. Finally, the study explored the relationship between holism score and identification confidence. These variables were examined to explore the impacts of cognitive differences on eyewitness identifications and the subsequent consequences that may occur as a result of misidentifications. Unfortunately, all but one of the analyses revealed non-significant results. Thus, the hypotheses that there will be significant main effects or an interaction effect of holism group and background condition on identification accuracy will be rejected (H_1, H_2, H_3). Furthermore, the hypothesis that there will be a significant main effect of background condition on identification confidence will be rejected (H_4). However, support for H_5 was found; there was a significant negative linear relationship between holism score and identification confidence and therefore H_5 is accepted.

Effects of Holism Group and Background Condition on Identification Accuracy

Holism Group

There was no significant main effect of holism group on identification accuracy, as demonstrated by non-significant differences in identification accuracy between individuals in the low, medium, and high holism groups. These results contradict previous literature that suggests greater holistic judgements result in improved eyewitness recall (Bower & Karlin,

1974; Patterson & Baddeley, 1977). Future research may benefit from retaining holism as a continuous variable rather than dividing participants into groups, as this would preserve statistical power and reduce the risk of type II errors (Lazic, 2018; Serdar et al., 2021).

Background Condition

There was no significant main effect of background condition on identification accuracy, as demonstrated by non-significant differences in identification accuracy between individuals in the no background, different perspective background, and same background conditions. These results refute previous literature that supports context-dependent memory, suggesting that recall improves when contextual cues relating to the environment are prevalent in both the encoding and retrieval stages (Godden & Baddeley, 1975). Despite the assumptions not being met, an ANOVA was still conducted due to the robustness of F-tests (Blanca et al., 2017). Although, non-parametric alternatives were run; Kruskal-Wallis tests revealed the same pattern of results, suggesting that the non-significant ANOVA results were not due to assumptions being violated.

Interaction

There was no significant interaction effect of holism group and background condition on identification accuracy; the impact of holism group on identification accuracy was found to be unrelated to the background condition that each participant was randomly assigned to. This contradicts with previous findings that suggest that an object becomes bound to the field in which it appears for holistic thinkers (Chalfonte & Johnson, 1996; Masuda & Nisbett, 2001).

Effect of Background Condition on Identification Confidence

Findings indicated no significant effect of background condition on identification confidence, as indicated by non-significant differences in identification confidence scores between individuals in the no background, different perspective background, and same

background conditions. These results contradict previous findings that supports context-dependent memory, suggesting that recall improves when contextual cues relating to the environment are prevalent in both the encoding and retrieval stages (Godden & Baddeley, 1975).

Relationship Between Holism Scores and Identification Confidence

Findings demonstrated a significant negative linear relationship between holism scores and identification confidence, suggesting that individuals with greater holistic tendencies will have lower levels of identification confidence. This is in support of the existing body of literature that suggests there is a significant relationship between holism scores and identification confidence (Bower & Karlin, 1974; Bruce, 1988; Patterson & Baddeley, 1977; Tanaka & Farah, 1993). Further research is needed for clarification on the direction of this relationship, as the present study and the current body of literature continues to demonstrate contradictory findings (Richler et al., 2012; Tanaka & Simonyi, 2016).

Relationship Between Holism Scores and Identification Confidence Split by Background Condition

Results from a further exploratory analysis examining the relationship between holism scores and identification confidence split by background condition found no significant correlation between the two variables in either the no background, different perspective background, or the same background condition. This demonstrates that the relationship between holism scores and identification confidence did not significantly differ between each of the background conditions, suggesting that background has no effect on the relationship between these two variables. This contradicts existing literature that suggests that an object becomes bound to the field in which it belongs to for holistic thinkers (Chalfonte & Johnson, 1996; Masuda & Nisbett, 2001) and recall is improved when contextual cues (e.g. same background) are present in both the learning and retrieval environment (Godden &

Baddeley, 1975). Although, the chosen analysis of splitting the data file by background condition may not have been appropriate; further analysis would be beneficial, using a moderation analysis to examine whether the relationship between holism scores and identification confidence is moderated by background condition.

Limitations

Despite a relatively high attrition rate (29%), which may reduce reliability of findings (Brueton et al., 2011), the remaining sample of 254 participants ensured sufficient statistical power across the three conditions (Brysbaert, 2019; Uttley, 2019), as confirmed by the a priori power calculation. However, 65% of the sample were psychology students, raising concerns regarding demand characteristics and researcher effects (Mummolo & Peterson, 2017), and 82.3% identified as White British, limiting ecological validity and generalisability (Andrade, 2018). Whilst this is likely a consequence of convenience and snowball sampling, it is partially justified given the study's focus on individual rather than cultural differences within a single culture (Masuda & Nisbett, 2001). A notable methodological strength was the use of a task-based stimulus triads measure over a self-report measure, reducing self-report bias, introspective inaccuracy, and demand characteristics (Devaux & Sassi, 2016; Karpen, 2017; Malhotra, 2008; McCambridge et al., 2012; Safdar et al., 2016).

Nevertheless, the stimulus triads task has not been widely validated within the psychological literature, and its higher global salience of stimuli may have introduced a holistic bias, weakening the influence of individual differences (Chamberlain et al., 2017; Dale & Arnell, 2013). The online survey format, whilst increasing accessibility, anonymity, and data yield, reduced experimental control and ecological validity (Rumpf et al., 2019). Participants had no direct involvement in the mock crime and therefore may not have engaged as seriously as real-life eyewitnesses, potentially inflating accuracy scores and contributing to the non-significant findings. That said, the survey's brevity has been

associated with higher reliability (Kost & Correa da Rosa, 2018), and the deliberate delay between the mock crime video and lineup procedure partially accounted for the temporal gap experienced in real-life identifications (Lin et al., 2019).

Further Research, Theoretical and Practical Implications

Given the identified limitations, further research would benefit from employing both task-based and self-report measures of analytic and holistic thinking, correlating findings to establish whether both tap into the same underlying constructs (Abma et al., 2016; Dale & Arnell, 2013). Whilst self-report measures introduce bias (Devaux & Sassi, 2016; Safdar et al., 2016), the absence of clarity regarding the most appropriate measure warrants direct comparison, acknowledging that weak correlations may reflect methodological limitations rather than a lack of construct overlap (Snyder et al., 2020). Future research should also move beyond purely quantitative analysis; a mixed methods approach incorporating a researcher-led laboratory procedure would increase ecological validity (Patino & Ferreira, 2018; Rumpf et al., 2019), with post-identification interviews yielding rich qualitative data to contextualise eyewitness decision-making (Austin & Sutton, 2014). Additionally, eye tracking technology could be employed to examine whether individuals process faces analytically or holistically based on attentional focus during lineup procedures. As there is currently no literature examining the effects of cognitive approach within police lineups, future studies have significant scope to build upon the present findings with more controlled and ecologically valid methodologies.

Despite only finding one significant result and rejecting four of the five hypotheses, the present study examines an understudied area within the field and therefore little prior research is available. Limited previous literature within this field has had a primary focus on object recognition (Masuda & Nisbett, 2001) and the existing theories of context dependent memory (Godden & Baddeley, 1975) and binding (Chalfonte & Johnson, 1996) do not

consider the impacts on facial recognition. The findings from the present study highlight the necessity and urgency for theoretical development; further research should be conducted in order to expand psychological understanding of the processes underlying facial recognition, particularly between analytical and holistic thinkers.

More specifically, analytic versus holistic thinking in relation to facial recognition within police lineup procedures is understudied within the literature. As a result of the novel insight that this study provides, there are practical implications to consider. Results expand on the current body of literature, highlighting that there are individual differences that may impact the reliability of eyewitness testimony. Specifically, differences in holistic tendencies should be considered when obtaining eyewitness identifications. The findings from the present study imply that individuals with greater holistic tendencies will have lower levels of identification confidence, suggesting that changes should be implemented regarding the policies, procedures, and interventions within eyewitness lineups. One change that could be implemented is the measurement of an eyewitness' holistic tendency, prior to them taking part in a lineup procedure. Given that holistic thinkers are less confident in their identification accuracy and the reliability of eyewitness testimony is typically overestimated by criminal and legal professionals (Puddifoot, 2020; Wise & Kehn, 2020), it is imperative that these cognitive differences are measured prior to the lineup procedure, to prevent wrongful convictions. These suggestions can aid further development of police lineup procedures and the accuracy of eyewitness identifications, by ensuring that differences in cognitive approach are accounted for when eyewitness testimony is received.

Conclusion

The aim of the present study was to explore the impacts of holism and background on identification accuracy and confidence within police lineup identifications. Participants were required to watch a short mock crime video, complete a stimulus triads task to measure their

holistic tendency, and were then randomised into one of three background conditions for the lineup procedure: no background, different visual perspective of background, or same background. The study only presented one significant finding, and four of the five hypotheses were rejected. Despite this, the present study contributes to the limited literature within this area and highlights potential practical applications and interventions to improve the efficacy and reliability of police lineups. Strengths and limitations of the study have been acknowledged, alongside suggestions for further improvements to be implemented within future research. Gaining a more comprehensive understanding of the impacts of individuals' cognitive approaches on lineup identification accuracy is fundamental, given that eyewitnesses have a significant impact on decisions made by the criminal justice system.

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Appendices

Appendix A.

Figure Displaying Stimulus Triads Task (Kimchi & Palmer, 1982).

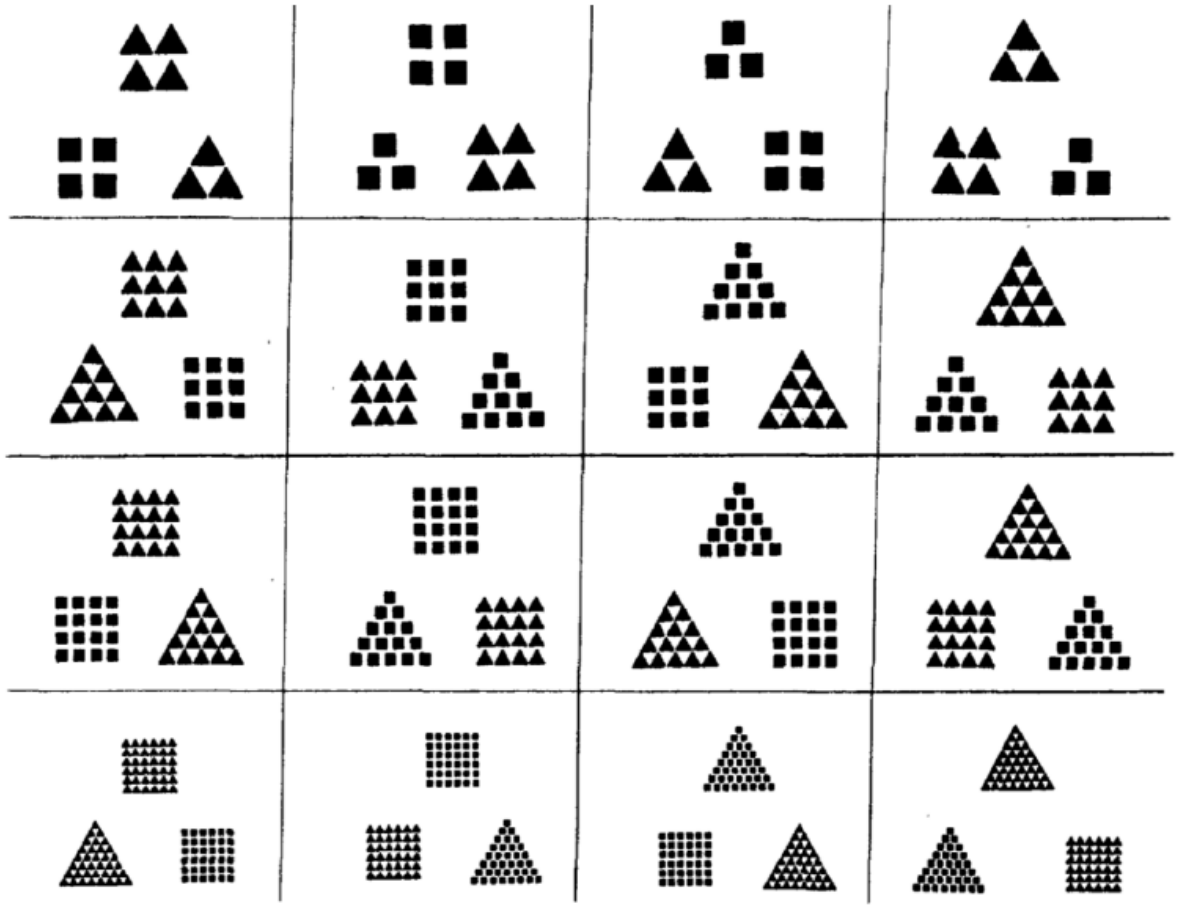


Figure 3. **The complete set of stimulus triads in Experiment 2.**

Appendix B.

Figure Displaying the Lineup Faces in the No Background Condition.



Figure Displaying the Lineup Faces in the Different Visual Perspective Background.



Figure Displaying the Lineup Faces in the Same Background Condition

