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Does Cross-Age Contact Reduce the Cross-Age Deficit in Younger and Older Adult's Eyewitness Identification Performance?

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ABSTRACT

Age-related differences in identification performance between younger (18–35 years) and older adults (62–68 years), alongside the cross-age effect (CAE), where people recognise own-age faces better than other-age faces, were investigated. Self-reported levels of other-age contact and attitudes, participants' memory for the unbiased lineup instructions, and the confidence-accuracy (C-A) relationship were also examined. Participants ($N = 154$) viewed two filmed events: one with a young adult target and one with an older adult target. Older adults were less likely than younger adults to identify the perpetrator. Interestingly, the CAE, contact, attitudes, and choosing behaviours did not impact identification performance. Older adults experienced more difficulty remembering the pre-lineup instructions than younger adults, but only after the first lineup. Confidence was predictive of accuracy for both age groups, but this relationship was differently influenced by the CAE. The findings provide further insights into the factors that may impact younger and older adults' identification performance.

1 | Introduction

The population is getting older, in the UK it is expected that by 2050 one in four people will be aged 65 years and over, increasing to 26.2% in 2069 (Office of National Statistics 2021). Similarly, in the United States it is expected that by 2060 the older population (65 years and older) is projected to double in size (Vespa, Armstrong, and Medina 2018). Older adults may be especially at risk of crimes against them (e.g., neglect, fraud, abuse, theft, burglary; Serfaty et al. 2016), as such their testimony is likely to play a key role in legal proceedings, and with increased frequency (Bornstein 1995; Rothman, Dunlop, and Pamela Entzel 2004). Aging is however associated with memory changes which can lead to impairments in recall and recognition tasks (Craik and Rose 2012), which has implications for older adults as eyewitnesses. Face recognition, which is crucial for eyewitness identification, is also another cognitive ability that follows a lifespan trajectory and is influenced by a person's age (Germine, Duchaine, and Nakayama 2011). As the likelihood of older adults witnessing crime and being asked to identify criminals from police lineups is likely to increase, investigating how accurate older adults are at making identifications, including any factors that might influence accuracy, remains an important area of research.

A number of studies have compared older adult and younger adults' identification accuracy from lineups (please see Table 1). Some of this research has found that often older adults are less accurate at correctly identifying a previously seen perpetrator from a target present (TP) lineup (Badham et al. 2013; Colloff et al. 2017; Havard and Memon 2009; Holdstock et al. 2022; Memon et al. 2002; Pica and Pozzulo 2018; Rose,

TABLE 1 | Studies employing lineup paradigms comparing identification responses with older and younger adults.

Study	Age groups	TP responses	TA responses	CAE
Badham et al. (2013)	OD vs. YA	OA made fewer CIDs than YA	OA made fewer CR than YA	N/A
Colloff et al. (2017)	OA vs. MA vs. YA	Accuracy decreased with age	Accuracy decreased with age	N/A
Havard and Memon 2009	OD vs. YA	OA made fewer CIDs than YA	OA made fewer CR than YA	Only TA lineups for YA
Holdstock et al. (2022)	OD vs. YA	OA made fewer CIDs than YA	OA made fewer CR than YA	N/A
Memon and Gabbert (2003)	OD vs. YA	OA & YA make similar CIDs	OA made fewer CR than YA	N/A
Memon et al. (2002)	OD vs. YA	N/A	OA made fewer CR than YA	N/A
Nyman et al. (2019)	OD vs. YA	OA & YA make similar CIDs	OA made fewer CR than YA	N/A
Perfect and Harris (2003), Exp 3	OD vs. YA	Both groups more accurate with own age	OA made fewer CR than YA	Only TP lineups for OA
Pica and Pozzulo (2018)	OD vs. YA	OA made fewer CIDs than YA	OA made fewer CR than YA	N/A
Rose, Bull, and Vrij (2003)	OD vs. YA	OA made fewer CIDs than YA	OA made fewer CR than YA	No CAE
Rose, Bull, and Vrij (2005)	OD vs. YA	OA & YA make similar CIDs	OA made fewer CR than YA	Reverse CAE for YA
Searcy, Bartlett, and Memon (1999)	OD vs. YA	OA made fewer Correct IDs than YA	OA made fewer CR than YA	N/A
Searcy et al. (2001)	OD vs. YA	OA made fewer Correct IDs than YA	OA made fewer CR than YA	N/A
Wilcock and Bull (2010)	OD vs. YA	OA made fewer CIDs than YA	OA made fewer CR than YA	N/A
Wilcock, Bull, and Vrij (2007)	OD vs. YA	OA & YA make similar Correct IDs	OA made fewer CR than YA	No CAE
Wright and Stroud (2002)	MA vs. YA	Both groups more accurate with own age	N/A	Only TP lineups, both groups
Yarmey and Kent (1980)	OD vs. YA	OA & YA make similar Correct IDs	N/A	N/A

Abbreviations: CAE = cross age effect, CID = correct identifications, CR = correct rejections, MA = middle aged adult, OA = older adult, YA = young adult.

Bull, and Vrij 2005; Searcy, Bartlett, and Memon 1999; Searcy et al. 2001; Wilcock and Bull 2010) however other research has found that older adults can be as accurate as young adults when correctly identifying previously seen perpetrators (Memon and Gabbert 2003; Nyman et al. 2019; Rose, Bull, and Vrij 2005; Wilcock, Bull, and Vrij 2005; Yarmey and Kent 1980). When presented with target absent (TA) lineups, where the correct decision is to say the perpetrator is not there, older adults are more likely to choose someone, as compared to younger adults, and thereby make a false identification (Badham et al. 2013; Havard and Memon 2009; Memon and Gabbert 2003; Memon et al. 2002; Perfect and Harris 2003; Pica and Pozzulo 2018; Rose, Bull, and Vrij 2003, 2005; Searcy, Bartlett, and Memon 1999; Searcy et al. 2001; Wilcock and Bull 2010; Wilcock, Bull, and Vrij 2005). Meta-analyses have also confirmed that older adults are less accurate at making identifications, and much for more likely to falsely choose an innocent suspect, or make a misidentification as compared to younger adults (Erickson, Lampinen, and Moore 2016; Fitzgerald and Price 2015; Martschuk and Sporer 2018). Older adults performance on lineup identifications has often been compared to children's behaviour, as children also are more likely to incorrectly choose an innocent suspect (Havard 2014) or make a misidentification (Fitzgerald and Price 2015), however the mechanisms behind both groups lineup response behaviour may be different.

There have been several suggestions as to why older adults might be more inclined to choose from a lineup as compared to younger adults. One explanation is the natural cognitive decline associated with aging, which often results in poorer memory function and could affect face recognition memory (for reviews see, Harada, Natelson Love, and Triebel 2013; Salthouse 2010). This decline may contribute to the reduced cognitive performance observed in older adults (Martschuk and Sporer 2018). Furthermore face recognition ability peaks at around 30 years of age and then gradually starts to decline (Germine, Duchaine, and Nakayama 2011). Therefore, studies often compare one group approaching their peak ability (young adults) with a group that passed their peak ability many years ago (older adults).

Other researchers have suggested that older adults are less likely to remember the unbiased instruction given before viewing a lineup highlighting the possibility that '*the perpetrator may or may not be present in the lineup*' and therefore assume the perpetrator is present and they need to choose someone (Wilcock, Bull, and Vrij 2005; Wilcock and Bull 2010). Several studies have found that older adults are less likely to remember the unbiased instructions compared to younger adults (Rose, Bull, and Vrij 2003, 2005; Wilcock, Bull, and Vrij 2005), and that failing to recall the instructions negatively affected lineup performance. The failure to recall the unbiased instructions, coupled with a strong expectation that the perpetrator will be present in the lineup (Havard and Memon 2009; Memon, Hope, and Bull 2003), could also be a factor in the high false identification rates for older adults.

Another factor that could contribute to older adults' poorer performance may be related to older adults being typically tasked with identifying a young adult target, and eyewitness researchers have explored the possibility that older adults' poorer performance may be accounted for (at least in part) by the cross-age effect (CAE). The CAE proposes that we are better at recognising similar-aged faces, relative to other-age faces (Anastasi and Rhodes 2005; Ebner and Johnson 2010; Lamont, Stewart-Williams, and Podd 2005; see Rhodes and Anastasi 2012, for a review). The CAE has been supported by data from a survey of just over 1000 police lineup decisions made by real witnesses in England, which found that as the age difference between a suspect and an eyewitness increased, suspects were less likely to be identified (Horry et al. 2012). Many face recognition studies have also found a clear CAE (Martschuk and Sporer 2018; Rhodes and Anastasi 2012; Wiese, Komes, and Schweinberger 2013). Although, face recognition research indicates CAE are present in both younger and older adults, there is some evidence the effect may be smaller in older adults (e.g., Rhodes and Anastasi 2012).

Furthermore, the few studies that have employed lineup paradigms with older and younger adults have often yielded inconsistent results (see Table 1). Some research has indicated that older adults were more accurate at identifying own-age targets in TP lineups, but not in TA lineups (Perfect and Harris 2003; Wright and Stroud 2002). In contrast, other studies have found that younger adults were more accurate in TA own-age lineups, with no CAE observed for older adults (Havard and Memon 2009). Additionally, some research has failed to find a CAE for either age group (Rose, Bull, and Vrij 2003; Wilcock, Bull, and Vrij 2007), while one study reported that young adults were more accurate when viewing a TA lineup of older-aged adults compared to a younger-aged adults (Rose, Bull, and Vrij 2005).

Many of the theories used to understand the CAE have been borrowed or adapted from the own-race bias (ORB) literature. One explanations involves perceptual expertise, suggesting that through frequent social contact with specific groups, we become experts at recognising faces from those groups (for reviews Meissner and Brigham 2001; Singh et al. 2022). Evidence regarding a contact-based explanation of the CAE with younger and older adults in face recognition studies has produced inconsistent findings (Ebner and Johnson 2009, 2010; He, Ebner, and Johnson 2011). He and colleagues (2011) in a face recognition study, demonstrated that self-reported contact with own and other age faces predicted the magnitude of the CAE in younger (18–30 years) and older adults (63–92 years). In contrast, Ebner and Johnson (2009) found higher levels of self-reported contact with older adults was associated with better recognition of older faces for younger adults (18–22 years), but the same effect was not observed for older adults (65–84 years). In addition, a meta-analysis by Rhodes and Anastasi (2012) examined an experience/contact-based explanation of the CAE and suggested that despite their experience with other age groups, older adults still had superior recognition for same-age faces. No empirical research to date, however, has examined if a contact-based explanation may account for the variability in age-related differences in younger and older adults' performance in eyewitness identification studies.

Other researchers have argued the contact-based (perceptual expertise) explanation of the CAE is incomplete and social-cognitive explanations should also be considered (He, Ebner, and Johnson 2011). Social-cognitive explanations argue that own group biases like the CAE, are associated with differences in the amount of attention and evaluations that are given to own compared to other group faces (Hugenberg et al. 2010). The categorisation individuation model (CIM, Hugenberg et al. 2010) integrates both perceptual expertise (contact-based) and social cognitive accounts of own-group biases, alongside a motivational component. The CIM model argues that we may lack the motivation to engage in more effortful processing (i.e., less likely to seek additional individuation information) of out-group relative to in-group members, which subsequently negatively impacts out-group member recognition performance. Thus, individuals with more positive attitudes may be more motivated to differentiate other-age faces, which in turn may enhance subsequent memory for other-age faces (as shown in the context of ORB, see Elliott, Chu, and Coleman 2017; Meissner and Brigham 2001). In addition, studies examining the effect of intergenerational contact generally find contact has a positive relationship with attitudes (e.g., Pettigrew and Tropp 2006).

Limited research, however, has examined how both motivation and contact may affect the CAE. In their face recognition study, He, Ebner, and Johnson (2011) found that older and younger adults reported higher levels of contact with individuals of their own age and exhibited more accurate

recognition of faces from their own age group. They also measured levels of positive age-related attitudes using the AGED Inventory (Knox, Gekoski, and Kelly 1995) and found younger target faces were rated more positively than older target faces. However, age-related attitudes did not influence face recognition or the CAE for either younger or older adults. To our knowledge, the impact of self-reported contact and/or attitudes toward other age-groups, and their potential contribution to explaining age-related differences in identification performance between younger and older adults, has not been systematically explored in eyewitness research.

Eyewitness confidence is another factor extensively studied in eyewitness research and is often a persuasive element in legal settings (for a review see, Slane and Dodson 2022). Recent research has indicated that confidence can reliably indicate identification accuracy (Wixted et al. 2015; Wixted, Read, and Lindsay 2016), but this relationship may be more reliable under specific lineup conditions (see Wixted et al. 2015; Wixted and Wells 2017). In general, older adults have been shown to be less confident in their lineup decisions than younger adults (Goodsell, Neuschatz, and Gronlund 2009; Memon et al. 2002; Wright and Stroud 2002). Their confidence judgements are also much less likely to reflect the accuracy of their lineup identification decisions (Adams-Price 1992; Erickson, Lampinen, and Moore 2016; Martschuk, Sporer, and Sauerland 2019; Memon et al. 2002; Wright and Stroud 2002). Yet, other research suggests that post-lineup confidence can be an indicator of accuracy for both younger and older adults (Colloff et al. 2017). Evidence, although limited, also suggests that confidence judgements may be influenced by the CAE (Memon et al. 2003; Wilcock, Bull, and Vrij 2007). Memon et al. (2003) found that confidence did not correlate with accuracy for older adults when viewing either a same-age or other-age lineup. However, for younger adults, confidence correlated with accuracy when viewing a same-age line-up but not when viewing an other-age lineup. Given these inconsistent findings, we also explored age-related differences in the confidence-accuracy relationship between younger and older adults, and examined whether the CAE influenced this relationship.

The current study investigated several potential explanations for age-related differences in lineup identification performance between younger and older adults. These include levels of contact and attitudes that may influence the CAE, memory for unbiased instructions, and expectations regarding the presence of the perpetrator when viewing a lineup. We also examined whether age-related differences were present in the confidence-accuracy relationship and if this was influenced by the CAE. Based on the reviewed literature, we hypothesised that older adults would demonstrate poorer overall lineup performance (combined performance in TP & TA lineups) compared to younger adults (H1). Additionally, we predicted that older adults' poorer performance would be evident in both TP and TA lineups (H2). Due to inconsistent findings in the literature regarding the CAE in younger and older adults, we tentatively predicted that a CAE would predict identification performance for younger, but not for older adults (H3), and higher levels of self-reported contact with the other-age group would be associated with better identification performance (H4).

In contrast, as limited research has investigated the impact of attitudes towards other age groups on recognition performance, and the existing research primarily stemming from the face recognition literature, predictions regarding the influence of other-age attitudes on identification performance were exploratory. We also expected that older adults would be less likely to remember the pre-line instructions than younger adults (H5). Finally, due to mixed findings, we tentatively predicted that, confidence would be associated with line-up accuracy in younger but not older adults (H6) and that lineup identification decisions of same-age targets would be more predictive of accuracy that other-age target identifications (H7).

2 | Method

2.1 | Participants

An opportunity sample was recruited through a combination of different platforms, including social media, prolific and community organisations (e.g., the University of the Third Age). A total of 241 participants were recruited (94 younger adults and 147 older adults). A total of 14 younger adults and 55 older adults were removed for partial completion. A further 18 older adults were excluded for: failing the attention check ($N = 5$) not completing the Telephone adapted version of the Montreal Cognitive Assessment (T-MOCA, $N = 3$) and for scoring below 18 on the T-MOCA ($N = 10$).

The remaining sample consisted of 80 younger adults aged between 18 and 35 years ($M = 24.70$, SD = 4.70; 46.3% female, 53.8% Male; Years in education = 15.70 years, SD = 3.05) and 74 older adults aged between 62 and 68 years ($M = 72.23$, SD = 4.13; 70.3% female, 29.7%; Years in education = 16.11 years, SD = 4.47). Both the younger adult (98.8%) and older adult groups (98.6%) were predominantly white. There was no difference in years of education between younger and older adults ($t = -0.67$, $p = 0.51$). Similarly, younger adults ($M = 5.63$, SD = 1.15) and older adults ($M = 5.70$, SD = 1.11) did not differ in their overall health ratings ($t = -0.43$, $p = 0.67$). However, younger adults ($M = 5.12$, SD = 1.36) reported lower levels of overall physical wellbeing compared to older adults ($M = 5.61$, SD = 1.21; $t = -2.32$, $p = 0.02$). All participants provided online consent and received compensation for their participation. Ethical approval was obtained from the University's Research Ethics Committee at Edge Hill University.

2.2 | Design

A two-factor split plot experimental design was utilised; 2 (Target: younger vs. older) × 2 (Line-up type: TP vs. TA) were within-group factors and 2 (Age: young adult vs. older adult) was the between-group factor. The main dependent variable was lineup-identification response. Each participant saw two lineups; a younger target lineup and an older target lineup one of which was a TP lineup and the other a TA lineup. In TP lineups three responses were possible, a correct identification, a foil identification, or an incorrect rejection. In TA lineups, two responses were possible, a correct rejection or a foil identification. Additional dependent measures included mean scores for

the other-age contact and other-age attitude measures, and responses to the post-lineup identification questionnaire.

2.3 | Materials and Measures

2.3.1 | Filmed Events

Participants watched two short films (1 min 30 s in duration for each film) created by Havard and Memon (2009). In one film, the target was a younger adult (26 years of age) and the other an older adult (67 years of age), both targets were Caucasian. Each film begins with the target walking along a corridor trying office door handles to see if any were unlocked. Next, the target is shown entering an office, he then proceeds to pick up a wallet from one of the tables and a laptop from the nearby desk. The target then proceeds to rummage around in drawers, finding a mobile phone, which he also takes. The target takes one final look around the room before leaving, shutting the door behind him. The last scene shows the target walking back up the corridor with the laptop bag over his shoulder. Each film included face frontal and profile views of the targets and all target actions, sequences and camera profiles were identical.

2.3.2 | Lineups

Four 9-person, head and shoulder, colour, video line-ups created by Havard and Memon (2009) were used. A TP (i.e., a line-up that contains the target) and a TA (i.e., a line-up that does not contain the target) for the younger target and the older target. The lineups were constructed using the Video Identity Parade Electronic Recording (VIPER) system by an experienced VIPER operator and a researcher, following standard police procedures (see Police and Criminal Evidence Act (PACE) Code D 1984; Valentine, Darling, and Memon 2007). Individual video clips lasted 15 s and depicted the person moving in a 180° motion, from a full-face frontal profile to right profile pose, then left profile pose and returning to a full-face frontal pose. The background, focal distance and lighting conditions were held constant across video clips. The positions of the target and target replacement (TA line-up) appeared at position four. The same foils were used for the TP and TA line-ups, except the designated target replacement foil that was used in the TA lineups. Each lineup member's video clip had a corresponding number (i.e., 1, 2, 3, etc.) which appeared on the top left of each clip.

2.3.3 | Other-Age Group Contact

He, Ebner, and Johnson's (2011) social exposure scale was used to measure participants reported levels of exposure to individuals from the other age-groups. The 3-item measure comprised of questions relating to Media exposure: ('How often are you exposed to younger/older adults on television or other media?'), Personal exposure: ('How often do you have personal contact with younger/older adults?'), and other types of exposure: ('How often do you have other types of contact with younger/older adults?'). Participants responded on an 8-point scale ranging from 1 (less than once per year) to 8 (daily) to each question. A mean score was calculated for item responses for each participant, with higher scores reflecting greater levels of reported social exposure. In the present study, the reported social exposure scale reliability was $\alpha = 0.76$.

2.3.4 | Other-Age Group Attitudes

A modified (26-item) of the Age Group Evaluation and Description Inventory (AGED) was used to measure younger and older adults attitudes and stereotypical beliefs towards the other age groups (Knox, Gekoski, and Kelly 1995). The original scale is comprised of 28 adjectives grouped into four dimensions: the *goodness* (i.e., insensitive—sensitive) and *positiveness* (i.e., unsociable—sociable) dimensions form the *Evaluative* (attitudes) sub-scale, and the *vitality* (i.e., dependent—independent) and *maturity* (i.e., undignified—dignified) dimensions form the *Descriptive* sub-scale. In the present study one adjective pair was removed from the positiveness subscale (involved—apathetic) and one from the vitality subscale (sexy—sexless). A sliding scale ranging from one representing the most negative to seven the most positive, was used to rate each bipolar adjective pair. After reverse scoring ($N = 13$ pairs) the total score for each subscale was the mean of item responses, with higher scores indicating more positive attitudes. Knox and colleagues reported acceptable reliability for each sub-scale (Knox, Gekoski, and Kelly 1995). In the present study, internal consistency for the positiveness was $\alpha = 0.71$, for goodness $\alpha = 0.70$, for maturity $\alpha = 0.70$, and for vitality $\alpha = 0.61$. Although the reported reliability for vitality is less than 0.70, internal consistency values between 0.60 and 0.70 or greater are acceptable (Ursachi, Horodnic, and Zait 2015).

2.3.5 | Telephone Adapted Version of the Montreal Cognitive Assessment (T-MoCA)

The T-MoCA (Pendlebury et al. 2013) is a short, sensitive, and validated instrument for differentiating between individuals with and without cognitive impairment. The T-MoCA is an alternative to the 30-item MoCA (Nasreddine et al. 2005) and is used when in person testing is not possible (excludes items that require use of paper and pencil and visual items). The 22-items of the T-MoCA are divided into the domains of attention, language, memory, executive functioning, and orientation. Total scores ranged from 0 to 22, plus and additional point is awarded those with ≤ 12 years of education. The recommended cut-off score for mild cognitive impairment is 18 (Pendlebury et al. 2013).

2.3.6 | Post Lineup Questionnaire

A 4-item post-lineup questionnaire was completed following each lineup response. First, participants were asked the question '*How confident are you in the lineup decision you just made?*' and responded using an 11-point scale ranging from 0 (not at all confident) to 11 (very confident). Next, participants were asked questions about their lineup experiences: '*How much pressure did you feel to make a choice?*' (1 = not at all pressured to 11 = very pressured), their expectations: '*Did you expect to see the person that you saw committing the theft in the line-up?*' (*Yes, no, maybe*) and their memory for the pre-lineup instructions: '*Do*

you remember the instructions saying the person may or may not be there?' (Yes, no, maybe).

2.4 | Procedure

The experiment was hosted and administered online using the experiment builder platform Gorilla (Anwyl-Irvine et al. 2020). The experiment was set up, so participants were unable to go back and review previous experiment elements.

2.4.1 | Phase 1

After providing online consent participants were informed, they would be presented with two short films. Prior to viewing the films participants were instructed to watch them carefully as they would be asked some questions about what they had seen (they were not informed they would be subsequently asked to identify the individuals from the films). The first film commenced when participants pressed the 'Play' button on the screen. Before viewing the second film, participants were once again asked to watch the film carefully and to press the 'play' button when they were ready to proceed. Both films were presented full-screen and the presentation order of the films was counter-balanced so either the younger target or the older target was viewed first.

2.4.2 | Phase 2

After viewing the films participants completed the AGED Inventory questionnaire and the other age-group contact questionnaire. When responding to these questionnaires younger adults were asked to think about a 'typical older adult (65 years of age and older)' and older adults to think about a 'typical younger adult (18–30 years of age)'.

2.4.3 | Phase 3

Next, participants completed the identification tasks. Lineups were presented sequentially, and participants were informed each lineup would be presented twice (following UK police guidance, Police and Criminal Evidence Act (PACE) Code D 1984) before a lineup response was requested. Prior to viewing each lineup, participants were instructed, '*the person from the film may or may not be present in the lineup*'. Each participant saw two lineups and the presentation order was counterbalanced so the TP or TA lineup could appear first or second and this could either be of the younger adult target or the older adult target.

After reading the pre-lineup instructions, the first lineup began as soon as participants pressed the 'play' button. At the end of the first lineup sequence, participants were reminded they needed to view the lineup a second time and the lineup sequence commenced for a second time immediately after participants pressed the 'play' button. After viewing the lineup sequence a second time, participants immediately progressed to the identification response screen. Participants were instructed, '*if the person from the film was present in the lineup, please select the corresponding lineup number*'. Or '*if the person was not present in the lineup, please select not present*'. The identification responses options (numbers 1–9 and *a not present* option) were displayed in a 5×2 array and were presented in a 5×2 array beneath the post-lineup instructions.

Following their lineup identification response, participants completed the post-lineup questionnaire (see above) in which they rated their confidence in their decision and completed further post-lineup questions. This process (phase 3) was repeated when viewing the second lineup.

2.4.4 | Phase 4

Once participants had completed the lineup tasks, they answered some demographic questions (age, gender, ethnicity, total number of years in education) and were also asked, '*How would you rate your overall health at the present time?*' and, '*How would you rate your overall physical wellbeing at the present time?*' Participants responded to these questions on a 7-point Likert scale ranging from 1 (very poor) to 7 (excellent). Finally, participants were debriefed and thanked for their participation.

2.4.5 | Phase 5 (Older Adults Only)

Following the completion of the online study, a researcher contacted older adults to schedule a time for the T-MoCA completion. Two researchers who had completed online MoCA training and certification for using the T-MoCA for research, were responsible for administering the T-MoCA.

3 | Results

3.1 | Overall Performance

First, identification decisions were coded as either correct or incorrect. A target identification was coded as correct in TP lineups, and a correct rejection was coded as correct in TA lineup. All other identification decisions were coded as incorrect. Next, lineup responses from both lineups were combined to create a measure of overall lineup performance. Each participant was given a score of 0 (both line-ups incorrect), 1 (one line-up correct), or 2 (both line-ups correct). A Chi-square test was performed to examine if overall lineup performance varied as a function of age (H1). The expected age-related deficit in overall lineup performance for older adults was not observed, $X^2(2, 154) = 2.98$, $p = 0.225$, $V = 0.14$ (see Table 2).

Since an accurate identification decision requires a different response in TP and TA lineups and given the mixed pattern of age-related differences observed across these lineups, we examined performance in TP and TA lineups separately. To determine if identification performance was influenced by age (H2) and the CAE (H3) separate hierarchical loglinear (HILOG) analyses were performed on TP and TA identification responses. Post hoc analyses using a Bonferroni adjusted alpha for multiple comparisons were used to examine significant effects. Descriptive statistics are presented in Table 3.

3.2 | Target-Present Lineups

A HILOG analysis with age-group (younger adults, older adults), target-age (younger, older), and identification response (correct ID, Foil ID, incorrect rejection) returned a saturated model, ($X^2(0) = 0.0$, $p = 1$), the three-way interaction (age-group × target age × identification response) was significant, $X^2(2) = 8.22$, $p = 0.016$. To examine this effect, follow-up Chi-square analyses were performed using a Bonferroni adjusted alpha ($p = 0.008$).

TABLE 2 | Proportions (frequencies) of overall lineup performance, choosing behaviour and target presence expectancy by age-group.

	Younger adults	Older adults
Overall performance		
Both line-ups correct	0.26 (21)	0.23 (17)
One line-up correct	0.48 (38)	0.38 (28)
Both line-ups incorrect	0.26 (21)	0.39 (29)
Choosing behaviour		
Chose no one	0.05 (4)	0.11 (8)
Chose younger target	0.14 (11)	0.30 (22)
Chose older target	0.36 (29)	0.22 (16)
Chose both	0.45 (36)	0.38 (28)
Expect target		
Yes	0.53 (42)	0.35 (26)
No	0.06 (5)	0.03 (2)
Maybe	0.41 (33)	0.62 (46)
Second lineup		
Yes	0.65 (52)	0.54 (40)
No	0.04 (3)	0.01 (1)
Maybe	0.31 (25)	0.45 (33)

As we predicted older adults would be less likely than younger adults to make a correct identification, a chi-square exploring the relationship between age-group and identification response, collapsed across target-age, was performed; the relationship was significant, $X^2(2) = 7.83$, $p = 0.020$, $V = 0.23$. Post hoc comparisons indicated that older adults were less likely than younger adults to correctly identify the target (35.1% vs. 57.5%, $p = 0.005$), but age-related differences in foil identifications (40.5% vs. 25%) and incorrect rejection rates (24.3% vs. 17.5%) were not observed.

Next, to examine whether younger and older adults' identification performance is influenced by the CAE (H3), post hoc Chi-square analyses were performed to determine if identification performance varied according to target age, separately for younger and older adults. This analysis revealed a significant association between target age and identification response, $X^2(2) = 13.83$, $p = 0.001$, $V = 0.42$. Younger adults exhibited a higher rate of incorrect lineup rejections when viewing the younger target (32.5%) compared to the older target (2.5%, $p < 0.001$). However, neither correct identifications nor foil identifications varied with target age for younger adults. In contrast, for older adults, identification responses did not vary according to target age, $X^2(2) = 0.17$, $p = 0.919$, $V = 0.05$.

An alternative way to examine the CAE is to split the data by target age. With this approach, no association between younger and older adults' identification responses were observed for either the younger target, $X^2(2) = 6.08$, $p = 0.048$, $V = 0.28$, or older target, $X^2(2) = 9.08$, $p = 0.011$, $V = 0.35$.

3.3 | Target-Absent Lineups

To determine whether older adults demonstrated poorer identification performance compared to younger adults, and to explore if this was associated with target age, we conducted a 2(age group; younger adults, older adults) × 2(target-age; younger,

TABLE 3 | Proportion (frequency) of identification responses for TP and TA lineups.

	Younger target		Older target	
	Younger participants	Older participants	Younger participants	Older participants
Target-present lineups				
Identification proportions				
Correct IDs	0.53 (21)	0.34 (13)	0.63 (25)	0.36 (13)
Foil IDs	0.15 (6)	0.39 (15)	0.35 (14)	0.42 (15)
Incorrect rejections	0.33 (13)	0.26 (10)	0.03 (1)	0.22 (8)
Target-absent lineups				
Identification proportions				
Correct rejection	0.50 (20)	0.39 (14)	0.35 (14)	0.58 (22)
Foil IDs	0.50 (20)	0.61 (22)	0.65 (26)	0.42 (16)

older)×2 (identification response; correct rejection; false ID) HILOG analysis. This analysis returned a saturated model, $X^2(0)=0.0$, $p=1$, the three-way interaction was significant, $X^2(1)=4.51$, $p=0.034$. To further explore these effects, a series of Chi-square analyses with an adjusted alpha level ($p=0.025$), were performed.

As we had predicted that older adults would be less likely to correctly reject the lineup than younger adults, a Chi-square exploring the relationship between age-group and identification response, collapsed across target-age, was performed; the relationship was not significant, $X^2(1)=0.59$, $p=0.444$, $V=0.06$.

Next, to examine for potential CAE, Chi-square analyses for target age and identification response were performed separately for younger and older adults. For younger adults, $X^2(1)=1.84$, $p=0.175$, $V=-0.15$, and older adults, $X^2(1)=2.67$, $p=0.102$, $V=0.19$, identification responses did not vary according to target age.

The data were also split across target age. Age-related differences in younger and older adults' identification performance were not observed when viewing either the younger, $X^2(1)=9.46$, $p=0.33$, $V=0.11$ target or older target, $X^2(1)=4.11$, $p=0.043$, $V=0.23$.

3.4 | Other-Age Group Contact Attitudes and Identification Performance

Next, we examined if other-age contact and other age attitudes influenced age-related deficits in identification performance and the CAE. First, a mean overall other-age contact score as well as a mean overall other-group attitude score were calculated for younger and older adults. Overall, younger adults reported significantly higher levels of contact with older adults ($M=5.72$, SD = 1.51), than older adults reported having with younger adults, ($M=4.97$, SD = 1.59), $t(152)=2.98$, $p=0.003$, $d=0.48$. Regarding other age attitudes, older adults reported more positive overall attitude scores towards younger people ($M=4.51$, SD = 0.44) than younger adults reported towards older people ($M=4.29$; SD = 0.58; $t(152)=-2.58$, $p=0.011$, $d=-0.15$).

Next, separate hierarchical logistic regressions were performed on TP and TA lineup data to examine the effect of age-group, target-age, other age contact (H4) and other age attitudes on identification performance (see Tables 3 and 4 for descriptive statistics). In TP lineups correct identifications coded as 1 and foil identifications and incorrect rejections coded as 0, and in TA lineups correct rejections were coded as 1 and incorrect rejections as 0. Age group and target age were entered on the first step, other age contact and other age attitudes on the second step, all two-way interactions on the third, all three-way interactions on the fourth and the four-way interaction on the fifth step. Significance thresholds were adjusted for multiple comparisons ($p=0.025$).

For TP lineups, the first step containing age-group and target age was significant, $X^2(2, N=154)=8.41$, $p=0.015$, R^2 (Nagelkerke) = 0.071, R^2 (Cox & Snell) = 0.053. Age group was the only significant predictor of identification performance in the model ($b=-0.92$, Wald = 7.56, $p=0.006$, OR = 0.40, 95% CI [0.208, 0.769]), indicating that older adults were significantly less likely to correctly identify the target than younger adults. When other age contact and other age attitudes (step 2) were added, the second step showed no significant improvement in the model, $X^2(2, N=154)=0.09$, $p=0.957$, R^2 (Nagelkerke) = 0.072, R^2 (Cox & Snell) = 0.054. Adding the interaction effects (steps 3–5) also did not show any improvements (all p's > 0.10).

TABLE 4 | Mean scores (SD) for other-age attitude and pressure to choose.

	Younger participants	Older participants
Other age contact	5.72 (1.51)	4.97 (1.59)
Other age attitudes	4.29 (0.58)	4.51 (0.44)
Pressure to choose		
First lineup	4.94 (3.22)	4.69 (3.18)
Second lineup	4.88 (3.03)	4.15 (2.99)

For TA lineups, the first step with age group and target age was not significant, $X^2(2, N=154)=0.61$, $p=0.736$, R^2 (Nagelkerke) = 0.005, R^2 (Cox & Snell) = 0.004. Neither age group model ($b=0.43$, Wald = 1.50, $p=0.221$, OR = 1.54, 95% CI [0.772, 0.3.05]), or target age model ($b=-0.02$, Wald = 0.004, $p=0.951$, OR = 0.98, 95% CI [0.512, 0.1.87]), predicted identification performance. As such, none of the additional steps were explored.

Hence, contrary to predictions, neither other-age contact, nor other-age attitudes were found to influence identification performance in TP or TA lineups for either age group.

3.5 | Choosers Versus Non-Choosers

Next, we examined if age-related differences in identification performance were related to higher rates of choosing for older compared to younger adults and whether choosing bias was associated with target-age. Choosers were categorised as those who made a choice from a lineup (whether a correct ID or foil ID), and non-choosers were those who did not make a lineup choice. Overall lineup choosing was coded as; did not choose anyone, chose no one lineup, or chose on both lineups. For target-age related choosing, identification responses were coded as; did not choose anyone, chose on the younger target lineup, chose on the older target lineup, or chose on both lineups. Descriptive statistics are presented in Table 2. As these analyses were exploratory a Bonferroni adjusted alpha ($p=0.008$) was implemented. Overall choosing behaviour did not vary according to age group, $X^2(2, 154)=2.15$, $p=0.341$, $V=0.12$, or target age, $X^2(3, 154)=9.54$, $p=0.023$, $V=0.25$.

We also examined the possibility that age-related differences in identification performance may be related to older adults being less likely to recall the pre-lineup instructions (i.e., the

perpetrator may or may not be present in the lineup; H5). There was a significant association between age-group and memory for pre-lineup instructions following the first lineup response, $X^2(2, 154) = 7.51$, $p = 0.023$, $V = 0.22$. Post hoc analysis using standardised residuals and Bonferroni adjusted alpha ($p = 0.008$) indicated older adults (77.0%) were less likely to positively affirm ('*yes*' response) they remembered the pre-lineup instructions than were younger adults (92.5%, $p = 0.007$), but differences in younger and older adults '*no*' responses (5.0%, 12.2%, respectively) and '*unsure*' responses (2.5%, 10.8%, respectively), were not observed. Significant associations between age group and memory for pre-lineup instructions following the second lineup were not observed, $X^2(2, 154) = 2.65$, $p = 0.27$, $V = 0.13$.

Additionally, we were interested to see if younger and older adults differed in their expectations that the target would be present when shown a lineup, and in feeling a sense of pressure to make a positive identification. First, a mixed-model ANOVA on pressure to make an identification, with participant age (younger adults, older adults) as the between-participant factor and lineup presentation order (first or second) as the within-participants factor, revealed a significant main effect of lineup presentation order, $F(1, 152) = 4.24$, $p = 0.041$, $\eta^2 = 0.03$ (see Table 4 for descriptives). Specifically, participants felt more pressure to make a positive identification when viewing the first lineup ($M = 4.82$, SD = 3.19) than when viewing the second lineup ($M = 4.53$, SD = 3.03). No other effects were significant.

Further exploratory Chi-square analyses were performed separately for first lineup responses and second lineup responses to examine whether expectations that the target would be present in the lineup (yes, no, unsure) varied by age group (see Table 2 for descriptives). Again, as these analyses were exploratory a Bonferroni adjusted alpha ($p = 0.008$) was implemented. Variations in younger and older adults' beliefs that the target would be present in the presented lineup were not observed for first lineup, $X^2(2, 154) = 3.44$, $p = 0.179$, $V = 0.15$, or second lineup, $X^2(2, 154) = 6.97$, $p = 0.031$, $V = 0.21$, identification decisions.

3.6 | Identification Performance and Confidence

Confidence-accuracy characteristic (CAC) analyses (Mickes 2015) were performed to examine age-related differences and a potential of a CAE in younger and older adults' confidence-accuracy judgements (H6-7). First, the data were collapsed into three bins, low (1–4), medium (5–8), and high (9–11), because there were too few target responses at certain confidence levels. Overall, for younger and older adults, as confidence increased so did accuracy, although the increase was greater for older adults than younger adults (see Figure 1). Both younger (98%) and older (93%) adults were highly accurate when expressing high confidence judgements, with no difference between younger and older adults' confidence judgements at low, medium, or high confidence levels.

Next, we examined whether high-confidence identifications corresponded to high accuracy for the CAE. Figure 2 displays the CAC curves for the CAE for younger and older adults. For younger adults, identification accuracy was higher for the younger target compared to the older target across low (1–4) and mid (5–8) confidence levels, but accuracy tended to be equivalent for younger (98%) and older (98%) target identifications for the high confidence level. However, younger adults consistently expressed high confidence levels regardless of accuracy for the younger target, whereas for the older target, greater increases in confidence levels were associated with higher levels of accuracy, demonstrating a more reliable confidence accuracy relationship.

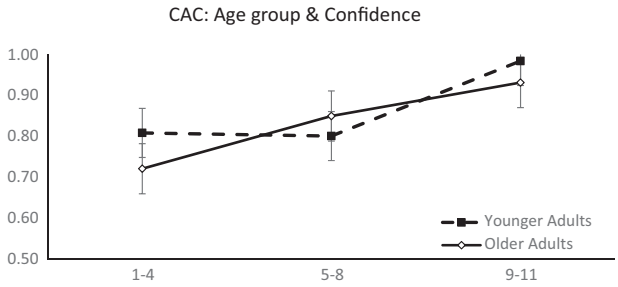

FIGURE 1 | CAC plots for younger and older adults. Error bars are standard error.

For older adults, confidence was a good indicator of identification accuracy when viewing both younger and older targets. Identification accuracy was higher for the younger target compared to the older target across low (1–4) and mid (5–8) confidence levels, but lower at the high confidence level. Additionally, increases in confidence were associated with increased accuracy for both the younger and older targets at each confidence level. However, the increase was much greater when viewing the older target than the younger target.

In summary, the CAC results suggest that for older adults, confidence is a better predictor of accuracy for own-age lineup identifications compared to other-age lineup identifications. Yet, for younger adults, confidence is a better predictor of accuracy for other-age faces than for own-age targets.

4 | Discussion

The purpose of this study was to investigate age-related differences in the younger and older adults' identification performance. Specifically, whether age-related differences were related to the CAE and whether factors including, other-age contact, other-age attitudes, memory for lineup instructions as well as expectation the target would be present in the lineup, could affect identification performance. Contrary to our prediction (H1) and previous research (Erickson, Lampinen, and Moore 2016; Fitzgerald and Price 2015; Sporer and Martschuk 2014), age-related differences in overall identification performance were not observed. Older adults demonstrated a similar level of overall identification performance to that of younger adults.

As predicted, however, age-related differences in identification performance were observed in TP lineups. Specifically, older adults were less likely to correctly identify the target in TP lineups compared to younger adults (Havard and Memon 2009; Memon and Gabbert 2003; Memon et al. 2002; Rose, Bull, and

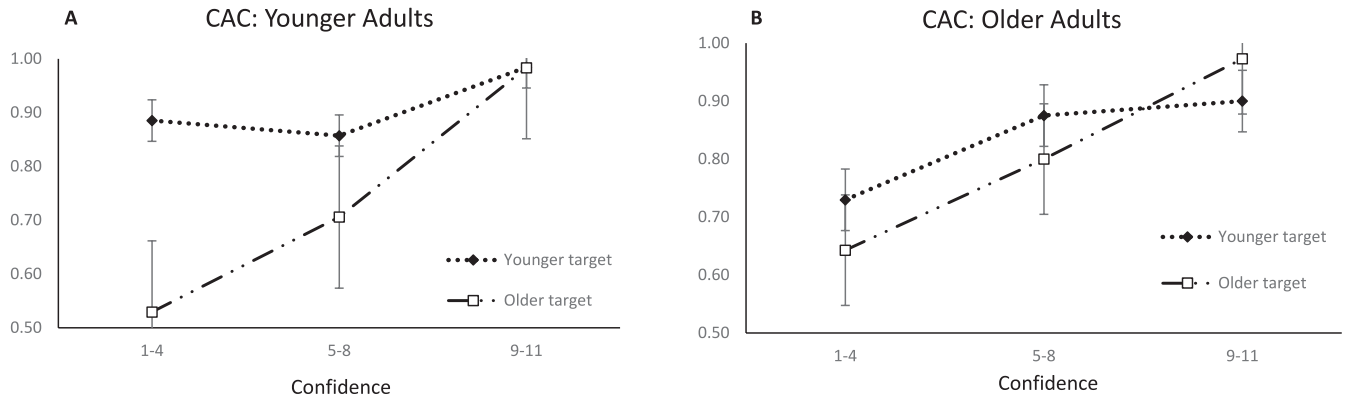

FIGURE 2 | CAC plots of the CAE for (A) younger adults and (B) older adults. Error bars are standard error.

Vrij 2003, 2005; Searcy et al. 2001; Wilcock, Bull, and Vrij 2005). However, contrary to our prediction, but consistent with the findings of Colloff et al. (2017) significant age-related differences between younger and older adults' overall identification performance in TA lineups were not observed. Therefore, our prediction that older adults would demonstrate poorer performance than younger adults in TP and TA lineups (H2), was only partially supported.

Both face recognition (Martschuk and Sporer 2018) and eyewitness identification research (Erickson, Lampinen, and Moore 2016) has suggested that age-related differences in younger and older adults' identification performance, may be due to older adults adopting a more liberal response criterion. In contrast to most previous research older adults were not more likely to choose someone from the lineups than were younger adults (Memon and Gabbert 2003; Memon et al. 2002; Rose, Bull, and Vrij 2003, 2005; Searcy et al. 2001; Wilcock, Bull, and Vrij 2005; Yarmey and Kent 1980). These findings do, however, replicate other research that also found no differences in overall choosing rates as a function of age (Havard and Memon 2009). A more liberal response criterion explanation, however, cannot account for the age-related differences in correct target identifications observed in the current study. Specifically, while younger and older adults had a similar overall choosing rate, older adults were still less likely to correctly identify the target than younger adults, while age-related differences in performance in TA lineups were not observed.

We also examined whether the CAE might account for age-related differences in identification performance. Given the limited and inconsistent findings in the eyewitness literature, we tentatively predicted that a CAE would be observed for younger adults but not for older adults (H3). Contrary to our prediction, significant differences associated with the CAE in younger adults' identification performance in TP or TA lineups were not observed. Specifically, younger adults' identification performance did not vary according to target age in TA lineups or for correct and foil identifications in TP lineups. Although younger adults' incorrect lineup rejections did vary according to target age in TP lineups. The direction of this effect was opposite to what the CAE would predict. Specifically, younger adults were more likely to incorrectly reject the TP lineup when viewing the younger target compared to the older target. For older adults, however, as expected significant CAE in TP and TA lineups were not observed.

These findings are consistent with Erickson, Lampinen, and Moore (2016) meta-analysis and other eyewitness research studies (Rose, Bull, and Vrij 2003, 2005; Wilcock, Bull, and Vrij 2005, 2007), which have found little evidence of a CAE in younger and older adults identification performance. Yet, inconsistent with other eyewitness research where CAE effects have been observed (Havard and Memon 2009; Perfect and Harris 2003; Wright and Stroud 2002). The pattern of findings is also inconsistent with the findings from Martschuk and Sporer's (2018) meta-analysis of face-recognition studies in which CAE's were observed for both younger and older adults. Thus, age-related differences in the ability to correctly recognise a target, when present in a lineup, did not appear to be due to differences in decision-criterion setting or the CAE, at least not in the present study. Future research should continue to investigate the potential impact of same-age and other-age target identifications on the identification performance of younger and older adults', as well as the situations in which lineup decision criterion setting may affect the CAE and identification performance.

Self-reported levels of other-age exposure other-age attitudes were also unable to account for the age-related differences in younger and older adults' identification performance in TP lineups. Contrary to predictions, contact with the other-age group, nor other-age attitudes, did not predict either younger or older adults' identification performance in TP or TA lineups. Therefore, a contact/attitude-based explanation for potential differences in CAE in younger and older adults' eyewitness performance, our fourth hypothesis, was not supported. These findings partially support Ebner and Johnson's (2009) findings whereby younger adults (18–22 years), but not older adults (65–84 years) recognition performance was influenced by other-age group contact levels. Yet, inconsistent with other face recognition research, higher levels of other age-group contact were associated with improved other-age recognition performance (He, Ebner, and Johnson 2011).

The pattern of inconsistent effects surrounding the association between contact levels and face recognition performance are also analogous with the ORB literature, with some studies finding small but significant association between other-race contact levels and recognition performance (Hancock and Rhodes 2008; Walker and Hewstone 2006a, 2006b), and others finding no such relationship (Goodman et al. 2007; Ng and Lindsay 1994; Wong, Stephen, and Keeble 2020).

Methodological differences may account for these mixed findings, as the previous research has used more traditional face recognition experiments with many trials and target faces, whilst the current study used an eyewitness paradigm with only 2 targets and video lineups. Alternatively, an individual's motivation to process and remember other-aged faces may be more related to the quality rather than quantity of the experience with other age-groups (Brigham et al. 2007; He et al. 2011; Hugenberg et al. 2010; Young and Hugenberg 2010). This highlights the importance of using measures which evaluate both the quality and quantity of contact. Future research should employ a contact measure assessing both the quality and quantity of contact, to determine whether reductions CAE-related identification performance deficits are associated with the quality and/or quantity of contact with other-age groups (see, Tracy, Zomberg, and Young 2023).

Exploring alternative explanations for age-related differences in identification performance between younger and older adults, we found some support, in accordance with previous research (Rose, Bull, and Vrij 2003, 2005; Wilcock, Bull, and Vrij 2005, but see Havard and Memon 2009) suggesting that age-related identification performance deficits might be related to older adults' poorer memory for the unbiased pre-lineup instructions (H5). Specially, older adults (77.0%) were less likely than younger adults (92.5%) to report remembering the pre-lineup instructions, but only after viewing the first lineup. However, this age-related difference was not present after viewing the second lineup.

Consistent with previous research (Havard and Memon 2009), age-related differences in younger and older adults' expectations that the target would be present in the lineup did not emerge. The poorer memory for the pre-lineup instructions observed for older adults following the first lineup, however, does not account for the pattern of lineup identification responses in TP and TA lineups observed in the current study. If this was the case, age-related differences in identification performance would have been expected to emerge in TA lineups, such that older adults would demonstrate poorer lineup performance making more false identifications than younger adults. This pattern was not observed. Future research is needed to further understand how such line-up related factors may influence age-related differences in identification performance and to identify factors that could reduce these deficits.

Finally, turning to the confidence-accuracy relationship, as predicted, and consistent with previous research (Colloff et al. 2017), confidence was informative about accuracy for both younger and older adults. High-confidence responses associated with greater accuracy than low-confidence responses for both groups. However, in contrast to previous research, (Adams-Price 1992; Erickson, Lampinen, and Moore 2016; Martschuk, Sporer, and Sauerland 2019; Memon et al. 2002; Wright and Stroud 2002) confidence was a more reliable indicator of accuracy for older adults than for younger adults (see Figure 1). Regarding the CAE and the C-A relationship, confidence was again informative about accuracy for younger and older adults. Specifically, accurate responses were associated with higher confidence levels regardless of target age for both younger and older adults. However, for older adults the C-A relationship was more informative about accuracy when viewing a same-age than other-age target. Yet, and in the opposite direction of what the CAE would predict, for younger adults, confidence was more informative about accuracy for the other-aged target compared to the same-aged target (see Figure 2). However, the C-A pattern observed for the CAE in the current study, contradicts previous research (Memon et al. 2003) which showed that confidence correlated with accuracy for younger adults but not older adults, with this relationship observed in own-age lineups but not in other-age lineups. It is possible, the observed differences could be due the different statistical approaches implemented between the studies to investigate the C-A relationship.

A novel aspect of our study, however, is that we identified that the informativeness of the C-A relationship for younger *and* older adults', might depend upon whether a same-aged or other-aged target is being identified. These findings also provide further evidence that under certain circumstances, confidence may be an important indicator of accuracy (Wixted et al. 2015; Wixted and Wells 2017). Moreover, the results indicate that in certain circumstances, older adults can monitor their metacognitive abilities and employ strategies that can reduce age-related differences in memory (e.g., Siegel and Castel 2019). Thus, future research is needed to further investigate the C-A relationship and identify the conditions in which confidence is informative about accuracy.

The current research is not without limitations. First, we acknowledge the online methodology (due to the COVID-19 pandemic) may have increased the risk of a self-selection bias, particularly within the older adult population, and the sample may not be fully representative of the older adult population. Hence, there is the potential the results may be biased toward higher functioning older adults as well as those who are more computer literate. Although, more research comparing older adults' performance in online and in-person approaches is needed, evidence suggests that concerns surrounding potential performance differences may be unwarranted (e.g., Cyr, Romero, and Galin-Corini 2021; Chard, Cook, and Press 2022). Second, a single younger adult and older target stimulus was used. Using a single target increases the likelihood of distorting results due to stimulus-specific effects (Wells and Windschitl 1999). Thus, the findings may be limited to the specific targets used. Future research would certainly benefit from using multiple stimulus targets to overcome this constraint and enhance the generalisability of the findings. Third, and consistent with existing eyewitness research, targets were presented to participants via video-recordings and may lack ecological validity. Thus, future research should consider employing virtual reality to provide participants with a more immersive eyewitness stimulus experience (e.g., Kim, Park, and Lee 2014). Finally, the contact measure employed in the current study assessed the quantity rather than quality of contact and only in relation to other-age contact, but not own-age contact. As previously noted, differences in the CAE may be more associated with same-age contact levels rather than other-age contact levels (Ebner and Johnson 2009) and the quality of contact (He et al. 2011). Thus, future research should include contact measures that evaluate both own and other age group contact levels as well as the quality.

5 | Conclusion

Limitations aside, this study provides the first eyewitness identification study to examine the influence of self-reported levels of other-age contact and other-age attitudes on younger and older adults' identification performance of same-age and other-age faces. The current study replicated previous findings that older adults can be less accurate than younger adults when making an identification, but this affect was only observed for TP lineups as age-related differences in performance were not observed in TA lineups. Importantly, we found no evidence of a CAE on younger or older adults identification performance. None of the self-reported measures used for cross-age contact and attitudes were found to relate to identification accuracy, which suggests that there may be other factors involved in CAE such as motivation and quality of contact that need to be explored further. However, there was some evidence that older adults may have more difficulty remembering the pre-lineup instructions than younger adults, but only after the first lineup. This has real-world implications and suggests that the conditions that may aid (or hinder) older adults' memory for pre-lineup instructions warrants further investigation.

Author Contributions

Joyce E. Humphries: conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, supervision, validation, visualization, writing – original draft. **Catriona Havard:** conceptualization, data curation, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization, writing – original draft. **Emily Breese:** data curation, investigation, methodology, software.

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Ethics Statement

Ethical approval was obtained from the Faculty of Arts and Sciences Research Ethics Committee, Edge Hill University.

Consent

All participants provided informed consent before participating.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are openly available at: https://osf.io/w24q5/?view_only=c027039738324a5291431ec23d8ca246.

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