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Challenges older adults face in detecting deceit:

The role of emotion recognition

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Abstract

Facial expressions of emotion are key cues to deceit (Frank & Ekman, 1997). Given that the aging literature has shown an age-related decline in decoding emotions, we investigated whether a) there are age differences in deceit detection and b) if so, whether they are related to impairments in emotion recognition. Young and older adults (N = 364) were presented with 20 interviews (crime and opinion topics) and asked to decide whether each man was lying or telling the truth. There were 3 presentation conditions: 1) visual, 2) audio, or 3) audio-visual. For crime interviews only, reduced emotion recognition was related to poor deceit detection for older adults in the visual condition.

Keywords: Aging, Deceit Detection, Emotion Recognition, Social Judgments

Challenges older adults face in detecting deceit: The role of emotion recognition

Deception is defined as a deliberate attempt to mislead others. Con artists, politicians, and poker players often rely on the assumption that people are generally not very good at catching lies. Research on the accuracy of deceit detection has largely supported this assumption, although the vast majority of deception research has been limited to a young and middle-aged population. Practically speaking, extending this research into older adulthood is particularly important because it may explain why older adults are susceptible to con artists. Accurate statistics on the incidence of fraud among the elderly are lacking because many cases go unreported (Tatara et al., 1998). Nevertheless, it has been estimated that 75 percent of all fraud incidents target persons over the age of 60 years (Mackin, 1994, April). Thus, a first overarching goal of this study was to examine whether older adults show a deficit in detecting deceit. The second overarching goal was to explore a mechanism for such age differences. From a pragmatic perspective, understanding the underlying causes for older adults' vulnerability to fraud may help older adults avoid such scams in the future. Furthermore, the deceit detection paradigm affords a theoretical examination of whether age-related changes in different domains of cognitive abilities relate to higher-order judgment processes such as deceit detection. Key findings from the deception literature and the emotion and aging literature raise some interesting predictions regarding the accuracy of older adults in detecting lies. Specifically, older adults may be worse than young adults at detecting deception when the ability to use facial expressions of emotion as a cue is necessary for accurate detection. The basis of this prediction is elaborated in the next section after a brief summary of the aging and deception literature.

We first turn to a pattern of results observed in the deception and aging literature. It appears that the conditions under which age differences emerge may depend upon the modality in which information is presented. Older adults were better than young adults at detecting deception when information was presented in audio format (Bond, Thompson, & Malloy, 2005) but late middle-aged adults performed poorly, in comparison to younger mid-life adults, when information was presented audio-visually (Ekman & O'Sullivan, 1991). Thus, expanding upon our first goal, we wanted to directly test the degree to which older adult's deceit detection ability depends upon the modality of presentation. To our knowledge, this is the first study to examine the effect of modality on age differences in deceit detection. In line with our second goal, if older adults are more accurate at detecting deceit in one modality than another, what is the underlying mechanism for this difference? In the deception literature, overall accuracy at detecting deceit is 54 percent, which is only slightly above chance accuracy of 50 percent (Bond & DePaulo, 2006). The literature highlights several explanations for people's poor deceit detection ability. Among these explanations, one in particular may have important implications for older adults. Older adults may be worse than young adults at detecting deceit because they are less able to recognize facial expressions of emotion which are key cues to deception. This possibility is discussed next.

Emotion Recognition

Modality differences observed in the deception literature suggest an age-related modality-specific deficit. Namely, older people appear to be at a disadvantage when they must rely exclusively on visual stimuli. One plausible explanation for this modality-specific deficit is that older adults may be worse than younger age groups at recognizing facial expressions of emotion (Sullivan & Ruffman, 2004). According to Frank and Ekman (1997, 2004), facial expressions of emotion provide accurate cues to deception that "leak out" unintentionally from the deceiver

(i.e., "leakage cues"). Liars betray their fear, guilt, and excitement in facial expressions, which are not available in audio only messages. In their *high stakes lies* paradigm, Frank and Ekman motivated liars and truthtellers with the opportunity to earn additional compensation if they could convince the interviewer they were telling the truth. When participants judged liars and truth-tellers in this paradigm, they reached an average level of 60 percent accuracy in detecting deceit. Important to the aims of this study, scores on a micro-expression test of emotion recognition, which measured the ability to recognize emotions displayed in very brief presentations of facial expressions, correlated with accuracy in deceit detection. This research indicates that when people are invested in the results of their lies, as in the Frank and Ekman (1997) paradigm, they inadvertently "leak" out emotional facial expressions of fear and shame, among other emotions. These emotional expressions can provide cues to deception and suggest that prior laboratory experiments on deceit detection may not be generalizable to what occurs in everyday life. The liars in prior deception research were not invested in the results of their lies, but instead were only acting. Because we expected older adults to perform even worse than young adults in some conditions, it was important that we use stimuli from the Frank and Ekman paradigm, rather than actors only pretending to lie, in order to present accurate cues to deception. This would insure above chance-level accuracy in both age groups and provide stimuli that more closely mimic those lies in everyday life.

Interestingly, the emotion recognition abilities necessary to detect these leakage cues to deception (i.e., micro-expressions of shame and fear) show age-related changes in older adults. Compared to young and middle-aged adults, older adults perform worse a) at decoding facial expressions of discrete emotions (e.g, Phillips, MacLean, & Allen, 2002) and b) at identifying emotions in blends of emotional expressions (Heckman & Blanchard-Fields, 2004). Age-related

decrements are still found after controlling for individual differences in visual perception of faces, face processing, and fluid intelligence, indicating that it is face processing abilities tied to specific emotions which are affected by age, independent of many other age-related changes (Sullivan & Ruffman, 2004). Furthermore, age-related impairments were found in recognizing discrete emotions such as anger and sadness, but not fear (Phillips, MacLean, & Allen, 2002). These findings correspond with a growing literature demonstrating that older adults respond differentially to negative information. Both neurobiological and behavioral studies have shown that older adults have a tendency to avoid negative emotional facial expressions (e.g., Gunning-Dixon et al., 2003; Mather & Carstensen, 2003; Mather et al., 2004). Although it is yet to be determined whether this influences the processing of negative information involving visual stimuli, it reinforces and has interesting implications for the finding that older adults are worse than young adults at recognizing negative emotional expressions.

Given that the ability to recognize micro-expressions of emotion is an important component of deceit detection (Frank & Ekman, 1997, 2004) coupled with the age-related decrements in emotion recognition discussed above, older adults may be impaired at detecting deceit in face-to-face situations. In this case, older adults would be unable to recognize the emotional leakage cues in facial expressions which are valid cues to deceit. Therefore, in the present study, we examined whether the ability to recognize facial expressions of emotion accounts for age differences in deceit detection when such information is available.

Additionally, if age differences in deceit detection are primarily due to a deficit in the ability to recognize facial expressions of emotion, we would not expect to find age differences in deceit detection when only audio information is provided. This may appear counter to findings that older adults are worse than young adults at inhibiting high arousal emotion words in an

auditory emotional Stroop task (Wurm, Labouvie-Vief, Aycock, Rebucal, & Koch, 2004) and at recognizing sad and happy prosody in voices (Wong, Cronin-Golomb, & Neargarder, 2005, Experiment 4). However, in contrast to facial cues, recognizing discrete emotions in vocal tone is not consistently demonstrated as an effective deception cue (Vrij & Mann, 2004). Instead, other auditory components such as a higher pitched voice, more uncertainty, and more tension are valid cues to deception (Vrij & Mann, 2004). Age differences in the ability to pick up on these cues have not been documented.

The Present Study

The goals of the current study were to 1) explore age-related differences in the detection of deceit; 2) examine the role of emotion recognition differences in explaining age-related differences in deceit detection; 3) investigate age-related differences in deceit detection as a function of visual versus audio presentation; and 4) determine whether cognitive abilities contribute to differences in deceit detection. Young and older adults were presented with one of three modalities of stimuli: 1) visual, 2) audio, and 3) audio-visual. These conditions were designed to help determine whether visual information is a critical dimension in accounting for differences in deceit detection. We chose to manipulate this factor between subjects instead of within subjects in order to avoid a reactance effect. The deception interviews in all three modality conditions were identical, but the modality of these interviews was manipulated between subjects.

We expected young adults to outperform older adults in the two modality conditions with visual stimuli (the visual and audio-visual conditions). Older adults' reduced capacity to recognize facial expressions of emotion may put them at a greater disadvantage in detecting deceit when facial cues are present. For this reason, we expected the greatest age differences in

the visual only condition. Furthermore, given age-related differences in emotion recognition, we expected that the relationship between age and deceit detection would be mediated by emotion recognition ability. That is, we expected individual differences in the ability to recognize emotions in facial expressions to account for age differences in the ability to detect deceit.

Method

Participants

Young adult participants were recruited from a pool of undergraduate psychology students. Students received credit hours toward a psychology course. Older adult participants were recruited from our participant pool and received $30 for participation. A total of 394 participants (184 young adults and 209 older adults) completed this study. Of these participants, eight percent were excluded from data analyses (N = 13 young adults and 17 older adults). Participants were excluded for the following reasons: if their scores fell below cut-off criteria for the cognitive and perceptual ability measures and if they did not understand the tasks or did not follow directions.

The 364 participants remaining after exclusions (182 women and 182 men) were divided among the three conditions so that there were approximately 55 young adults (M_{age} = 20.60 years, SD = 1.55 years) and 55 older adults (M_{age} = 70.72 years, SD = 5.36 years) in each condition. On average, participants had more than 12 years of formal education, with older adults reporting significantly more years of education than young adults, $F(1, 362) = 20.89$, $p < .01$. The majority of participants were White (74%) or Black (12%).

The participants in this sample exhibited the typical pattern of age differences in perceptual and cognitive abilities. Specifically, young adults exhibited better visual acuity and facial discrimination skills when compared to older adults and outperformed older adults on our

measures of fluid intelligence and working memory, *p*s < .01. Older adults, however, scored significantly higher than young adults on the *Advanced Vocabulary Test*, $p < .01$ (Ekstrom, French, Harman, & Dermen, 1976; See Table 1 for full descriptives). On average, participants rated themselves as in fairly good health, $M = 3.79$, $SD = .89$ on a 5-point Likert-type scale (1 = *poor*, 5 = *excellent*). Young adults reported that they were in better health than older adults, $p < .01$.

Materials

Deceit Detection

The stimulus material for the deceit detection task was obtained from Frank and Ekman (1997, 2004). The material consists of two videos: a *crime interrogation* and a *social opinion interrogation*. Each video contains interviews with 10 different men, ages 18-28 years. Although financial fraud against older adults is severely underreported, the available statistics indicate that 78 percent of offenders are male and 38 percent are under the age of 30 years old (Klaus, 2000). Thus, we felt that the demographic characteristics of the liars in these stimuli, while limited, were nonetheless representative of many of the perpetrators of fraud against the elderly. The interrogation was either regarding a) whether the targets stole money from a briefcase prior to the interrogation (crime topic) or b) whether they were lying about their own opinion on capital punishment or banning smoking (opinion topic). The men in each scene were different, but the interviewer was the same person in all scenes and asked similar questions of each interviewee. Each interview was approximately one minute in length and the interrogator could be heard, but not seen, asking questions. The presentation order of the crime topic interviews and the social opinion topic interviews was counterbalanced between participants. There was no effect of

presentation order, $p > .10$, so this variable will not be included in further analyses. The videos were projected onto a large screen and all participants were equidistant from the screen.

To introduce the deceit detection task, participants were told that, "Anywhere from 1/4 to 3/4 of the people in these interviews are lying". Prior to the presentation of the deceit detection interviews, participants rated how good they are at knowing when someone else is lying on a 5-point Likert-type scale (1 = *very poor*, 5 = *very good*). Both young adults ($M = 3.29$, $SD = .62$) and older adults ($M = 3.26$, $SD = .67$) reported being about average at knowing when someone is lying. After each interrogation scene, participants circled either the word *truthful* or *lying* and rated their confidence for each judgment (1 = *not at all certain*, 7 = *extremely certain*). There were no age differences in the average confident judgment for either the crime or the opinion topic interviews, Fs < 1.0. Both young and older adults were significantly more confident, on average, for the opinion topic interviews than the crime topic interviews (young adults $t(165) = -3.63$, $p < .01$ and older adults $t(175) = -3.09$, $p < .01$).

Emotion Recognition

The faces for the test of emotion recognition were obtained from the *Montreal Set of Facial Displays of Emotion* (MSFDE; Beaupré, Cheung, & Hess, 2000). The MSFDE consists of facial expressions of emotion by men and women of European and African descent. Each expression was created using a directed facial action task and was FACS (Facial Action Coding System) coded to assure identical expressions across actors. The set contains expressions of anger, joy, shame, fear, and disgust, morphed into different levels of intensity. In the present study, we used the medium level of intensity for all emotions (i.e., 60 percent intensity). Although emotion recognition research with young adults typically uses stimuli depicting a high intensity of emotion (e.g., Frank & Ekman, 1997; Schweinberger, Baird, Blümer, Kaufmann, &

Mohr, 2003), we chose medium intensity emotions because we displayed the stimuli for a longer duration than most studies with young adults that typically use durations of less than 150 milliseconds (e.g., Frank & Ekman, 2007; Schweinberger et al., 2003). We used a longer duration because we wanted to ensure that we were measuring emotion recognition ability rather than speed of processing, which has been shown to decline with age (Salthouse, 1996). For the current study, the *E-prime* program was used to display the digital photographs on a computer screen. The order of faces was randomly presented to participants, each for 1500 milliseconds (1.5 seconds). Each emotion was presented a total of eight times during the task. Participants then responded by identifying which emotion was displayed. Response choices were continuously available on a card to the side of the display.

Cognitive Abilities

The *Advanced Vocabulary Test* (Ekstrom et al., 1976) was used to assess verbal ability. For each of the 36 items, participants circled the word from a list of four words that is closest in meaning to a target vocabulary word. Older adults scored better on the vocabulary test than young adults, $p < .01$ (See Table 1 for full descriptives). Fluid intelligence was measured using the Educational Testing Service *Letter Sets Test – I-1 (Rev.)* (Ekstrom et al., 1976). For each of the 30 items, participants were presented with five letter sets and had to deduce the rule which four of the letter sets follow. Young adults scored better on the letter sets test than older adults, $p < .01$ (See Table 1 for full descriptives). Working memory capacity was assessed using the *Audio Computation Span Task* (Salthouse & Babcock, 1991). Participants heard a series of arithmetic problems that they were required to solve while at the same time remembering the second digit from each problem. The number of arithmetic problems presented in each set increased from one to seven with three trials at each set level. Working memory span is designated as the highest

number of digits recalled correctly on at least two of the three trials with that set length. Young adults scored better on the working memory test than older adults, $p < .01$.

Perceptual Functioning

Participants were screened for vision using two tests. The first was a measure of visual acuity, using the *Snellen* chart (Snellen, 1862). Young adults had better visual acuity than older adults, $p < .01$ (See Table 1 for full descriptives). We used a second test to determine whether participants could correctly discriminate between human faces because we thought this perceptual ability would be more closely related to the ability to decode facial expressions of emotion. The *Benton Facial Discrimination Test Short Form* (Levin, Hamsher, & Benton, 1975) assesses the ability to identify and discriminate photographs of unfamiliar human faces. The internal consistency of the test is adequate, *Cronbach's* $\alpha = .69$. Participants were first presented with a target face on the first page. On the facing page, they had to identify the identical target face in an array of six faces. There were 27 targets to match and participants' scores were the number of target faces identified correctly. Young adults scored better on the facial discrimination test than older adults, $p < .01$. Although hearing ability was not formally assessed in this study, for the audio and audio-visual conditions, the speakers were adjusted so that each participant indicated that they could hear the stimuli adequately.

Procedure

Participants were tested in groups of one to four for approximately three hours. The order of tasks was as follows: Snellen eye chart, Benton Facial Discrimination Test, Deceit Detection, Audio-Computation Span, 5-minute break, Vocabulary Test, Letter Sets Test, Emotion Recognition task, and the Demographics Form, followed by debriefing and compensation.

Results

All analyses are reported using two-tailed tests of significance. Effect sizes for each *F* value comparing two means are reported as Cohen's *d* (*d*). Effect sizes comparing more than two means are reported as partial eta squared (η_p^2).

Age-Related Differences in Deceit Detection Accuracy

To address whether deceit detection accuracy differs as a function of gender, we conducted a two-way between-subjects analysis of variance (ANOVA) with Age, Gender, and the Age x Gender interaction term. This analysis was performed with three different dependent variables of deceit detection accuracy 1) collapsed across topic, 2) for the crime topic interviews, and 3) for the opinion topic interviews. The Age x Gender interaction did not reach significance in any of these analyses (*p*s > .10). Because there were no gender effects, gender is excluded from further analyses.

Next, in order to determine if, and under what conditions, age differences emerged in deceit detection, we tested the full model with a 2 (Age: young vs. old) x 3 (Modality: visual, audio, audio-visual) x 2 (Topic: crime vs. opinion) mixed-design ANOVA with age and modality as between-subjects variables and topic as a within-subject variable. There was a main effect of age with young adults (M = 5.85, SE = .08) performing better than older adults (M = 5.49, SE = .08) at detecting deceit ($F(1, 358) = 10.76$, $p < .01$, $d = .34$). There was also a main effect of modality, $F(2, 358) = 5.96$, $p < .01$, $\eta_p^2 = .03$. Fisher's least significant difference (LSD) test revealed that participants performed better in the audio-visual condition (M = 5.91, SE =.09) than in the visual (M = 5.44, SE = .10) condition, $p < .01$. There was not a main effect of topic, $p > .10$.

The main effect of modality was qualified by a Topic x Modality interaction, $F(2, 358) = 12.72$, $p < .01$, $\eta_p^2 = .07$. Pairwise comparisons revealed that for the crime topic, all three modality conditions significantly differed from each other. Participants in the audio-visual condition ($M = 6.25$, $SE = .13$) outperformed those in the audio condition ($M = 5.71$, $SE = .14$), who in turn were more accurate than participants in the visual condition ($M = 5.14$, $SE = .54$), ps $< .01$. For the opinion topic, however, none of the modality conditions differed from each other, ps $> .20$. Because the opinion topic showed no effect of modality, the remaining analyses for the opinion topic will be collapsed across modality condition. The Topic x Modality interaction was the only significant interaction. The main finding of these results is that young adults were more accurate than older adults at detecting deceit, collapsed across modality.

Age-Related Differences by Modality for the Crime Topic

Given our *a priori* hypothesis that the visual condition would show greater age differences than the other two modality conditions, we examined age differences by modality for the crime topic. Thus, the simple effect of age was computed at each level of the three modality conditions. Deceit detection accuracy in the visual condition showed significant age-related differences ($F(1, 115) = 6.31$, $p < .05$, $d = .49$) with young adults ($M = 5.52$, $SE = .21$) outperforming older adults ($M = 4.79$, $SE = .20$; see Figure 1). Young adults ($M = 6.55$, $SE = .20$) also outperformed older adults ($M = 6.03$, $SE = .17$) in the audio-visual condition for the crime topic accuracy ($F(1, 132) = 4.13$, $p < .05$, $d = .36$). Age differences were not significant in the audio condition, $p > .10$. In sum, for the crime topic interviews, young adults outperformed older adults in the visual and audio-visual conditions. Consistent with our prediction, the age differences in the visual condition are larger than the age differences in the audio-visual condition ($d = .49$ vs. $d = .36$).

Within-Age Condition Effects for the Crime Topic

Although the Age x Modality interaction was not significant, given our *a priori* hypotheses we examined the within-age modality effects to see if a different pattern of results emerged for the two age groups. We predicted a differential advantage when visual information was available (i.e., in the visual and audio-visual conditions) for young adults when compared with older adults. Thus, the mean deceit detection accuracy in each modality condition for the crime topic interviews was compared to the mean of each of the other modality conditions using independent sample *t*-tests separately for each age group.

Young adults. For the crime topic, young adults were significantly more accurate in the audio-visual condition ($M = 6.55$, $SE = .18$) than either the audio ($M = 5.70$, $SE = .20$, $t(113) = -3.18$, $p < .01$, $d = .59$) or visual ($M = 5.52$, $SE = .19$, $t(112) = -3.92$, $p < .001$, $d = .73$) conditions (see Figure 1). There was not a difference between deceit detection accuracy in the audio and visual conditions for the young adults, $p > .10$. It should also be noted that one-sample *t*-tests revealed that young adults were significantly better than chance (i.e., 5.00) at detecting deceit in all three modality conditions, *p*s < .01.

Older adults. For the crime topic interviews, older adults were better in the two conditions with an audio component, the audio condition ($M = 5.71$, $SE = .20$) and the audio-visual condition ($M = 6.03$, $SE = .18$), when compared to the visual condition ($M = 4.79$, $SE = .22$), *p*s < .01 (see Figure 1). There was not a difference between deceit detection accuracy in the audio-visual and audio conditions for the older adults, $p > .10$. It should be noted that for the crime topic interviews, older adults' performance was *not* significantly different from chance in the visual condition, $p > .10$. Older adults were better than chance, however, in the other two conditions (i.e., the audio and audio-visual conditions), *p*s < .01.

Interim Summary of Results

The above results indicate that young adults were better than older adults at detecting deceit in the crime topic interviews when a visual component was included (i.e., the visual and audio-visual conditions). Within age groups for the crime topic, young adults perform better when both audio and visual information is present than when either modality is presented alone and older adults perform better when the audio component is included (i.e., the audio and audio-visual conditions) than when visual information is presented alone. Interestingly, there was no effect of modality condition for the opinion topic interviews.

Emotion Recognition as Mediator

Our measure of medium intensity emotions showed good reliability, *Cronbach's* $\alpha = .83$. In order to determine whether there were age or gender differences in the ability to recognize emotions, we first conducted an Age x Gender ANOVA with emotion recognition as the dependent variable. The interaction was not significant, $p > .10$. There was, however, a main effect of age for emotion recognition with young adults ($M = 34.65$, $SE = .38$) outperforming older adults ($M = 28.80$, $SE = .36$), $F(1, 360) = 124.27$, $p < .01$, $d = 1.18$. Consistent with past work (Hampson, van Anders, & Mulin, 2006), there was also a main effect for gender ($F(1, 360) = 16.94$, $p < .01$, $d = .34$) with women ($M = 32.81$, $SE = .37$) outperforming men ($M = 30.65$, $SE = .37$).

Next, we tested whether emotion recognition mediated the age differences in deceit detection. Fear and shame have been identified in the deception literature as two emotions which leak out during deception (DePaulo et al., 2003; Frank & Ekman, 1997). Consistent with these findings, shame and fear were the only two emotions that were significantly related to deceit detection accuracy in the crime topic (ps $< .05$). For this reason, a new emotion recognition

variable was created for the mediated model by combining participants' scores on the fear and shame emotions. Because we found a Modality x Topic interaction, we first examined the point-biserial correlations between deceit detection accuracy, age, and emotion recognition (shame and fear combined) separately by topic and modality to determine which dependent variable(s) could be mediated by emotion recognition. (Intercorrelations for age, and perceptual, cognitive, social, and deception variables across modality conditions and separately by modality condition are presented in Tables 2 and 3). For the opinion topic interviews, deceit detection accuracy was not significantly correlated with emotion recognition, $p > .10$, so we focused on deceit detection accuracy in the crime topic interviews. The only condition in which emotion recognition was significantly correlated with deceit detection accuracy in the crime topic interviews was the visual condition. Therefore, accuracy scores for the crime topic interviews in the visual condition were used as the dependent variable in the mediation analysis. Using the Baron and Kenny (1986) steps for mediation, support was found for a fully mediated model in the visual condition. Age was negatively associated with crime deceit detection in the visual condition, $r = -.23$, $p < .05$, and age was also negatively associated with emotion recognition (combined fear and shame score), $r = -.53$, $p < .01$. When age and emotion recognition were added to a linear regression model as predictors of crime deceit detection, emotion recognition was positively associated with deceit detection, $\beta = .21$, $p < .05$. Also, in this same regression analysis, age was no longer a significant predictor of crime deceit detection, $p > .05$. The Sobel test confirmed these results, $z = 1.93$, $p = .05$ (Sobel, 1982).

In sum, the age-related differences in crime deceit detection can be accounted for by individual differences in emotion recognition such that participants who were better at recognizing fear and shame were better at crime topic deceit detection in the visual condition,

irrespective of age. When cognitive and perceptual abilities were added to these analyses, it did not change the model. (See Table 3 bottom diagonal for *Pearson's* correlation coefficients of emotion recognition with cognitive and perceptual abilities for the visual condition).

Working Memory as Mediator

Working memory was included in this study as a possible alternative mediator of the relationship between age and deceit detection. As reported above, and consistent with the aging literature, young adults (M = 5.08, SE = .10) scored better on our measure of working memory than older adults (M = 2.00, SE = .09), $F(1, 362) = 533.90$, $p < .001$, $d = 2.43$. Scores on the *Audio-Computation Span Task* are positively related to deceit detection accuracy collapsed across topic, $r = .17$, $p < .01$, and deceit detection separately by topic (crime topic interviews, $r = .13$, $p < .05$ and opinion topic interviews, $r = .11$, $p < .05$). The mediated model was tested to determine whether individual differences in working memory account for the age differences in deceit detection across topic or separately by topic (Baron & Kenny, 1986). The mediated model was not supported.

Discussion

Overall, we found that older adults were worse at deceit detection than young adults. Specifically, in the crime topic interviews, we found that older adults did not benefit from visual information as much as young adults. Although individual difference measures of cognitive abilities did show age differences, they could not account for age differences in deceit detection. Instead, we found that for the crime topic interviews, the ability to recognize emotional expressions of shame and fear accounted for age differences in the visual condition (the condition with the largest age differences). Within age group, young adults performed better in the audio-visual condition than either the audio or visual conditions alone. This makes sense as

the audio-visual condition provided more information than either condition alone. Moreover, deception research suggests that a discrepancy in behavior between channels (e.g., between how a person says they feel and their facial expression) can be an accurate cue to deception (Zuckerman, Driver, & Koestner, 1982).

In contrast to young adults, older adults did not benefit from the increase in information in the audio-visual channel. We suggest that this is because older adults may not have been able to recognize the facial expressions of emotion that were leaked out unintentionally by the liars. Moreover, older adults showed equivalent levels of performance in the audio and audio-visual conditions, indicating that the additional visual information in the audio-visual condition may not have been useful for the older adults. In general, the integration of information across sensory channels appears to be preserved with age (Laurienti, Burdette, Maldjian, & Wallace, 2006), suggesting that this lack of enhanced performance in the audio-visual condition for the older adults is not due to an age-related decline in the ability to integrate auditory and visual information. Instead, older adults may not benefit from the visual information to the same extent as young adults, as indicated by the age differences in the visual condition.

Interestingly, there were no age differences in deceit detection accuracy in the audio condition for the crime topic. Processing deception cues such as emotion in the audio channel may be less complex than processing microexpressions of emotion in the visual channel. If so, older adults may be as adept as young adults at detecting these cues in the audio channel. Future research should investigate whether critical cues to deception are more easily processed in the audio channel than the visual channel.

Emotion Recognition: Influence on Deceit Detection Beyond Cognitive Abilities

Replicating past work in the aging literature (Phillips, MacLean, & Allen, 2002), we found that older adults performed more poorly at decoding facial expressions of emotion when compared to young adults. Accordingly, when age differences were found in the crime topic-visual condition, individual differences in the ability to recognize fear and shame accounted for more of the variance in deceit detection accuracy than age. These results align with previous research in the deception literature which highlights the ability to recognize facial expressions of emotion as a critical component for accurate veracity judgments (Frank & Ekman, 1997, 2004).

This finding, combined with the lack of support for cognitive abilities as a mediator for age differences in deceit detection, indicates that there is something uniquely important about emotion recognition for detecting deceit. The question remains as to what process is specific to emotion recognition abilities that is not tapped by our measures of working memory and fluid intelligence. One possible explanation is that differences in perceptual abilities, independent of cognitive processes, led to differences in emotion recognition performance. This is not likely given that our two measures of visual functioning did not account for the mediating effect of emotion recognition. Perhaps, however, a more fine-tuned measure of visual functioning is needed to capture the perceptual properties vital for emotion recognition.

To better understand the mediating effect of emotion recognition it may be important to consider the role of experience and exposure to emotions. Some emotions may not be experienced as prevalently in older adulthood as they are during young adulthood. For example, the literature has shown that older adults experience less anger in interpersonal problems than young and middle-aged adults (Birditt & Fingerman, 2003). Older adults may be avoiding negative emotions in their daily lives as an emotion regulation strategy (e.g., Blanchard-Fields,

Stein, & Watson, 2004; Carstensen, Pasupathi, Mayr, & Nesselroade, 2000). For example, eye-tracking data have shown that older adults exhibit an attentional preference away from angry faces (Isaacowitz, Wadlinger, Goren, & Wilson, 2006). If older adults avoid negative emotions, they may have less on-line exposure to these emotions, and in turn, are worse at identifying them (i.e., emotions such as anger, shame, and fear). The question is whether decreased exposure to negative emotions leads to poor recognition of these emotions. Future research could compare the emotion recognition abilities of older adults with varying degrees of exposure to negative emotions. Another possibility is that older adult's reluctance to attend to negative stimuli (Isaacowitz et al., 2006; Mather & Carstensen, 2003) did not give them enough processing time to identify the emotions in our task. To our knowledge, no one has related this tendency to avert attention away from negative stimuli to emotion recognition. Future research needs to address this issue to understand the online processing behaviors of young and older adults in reaction to facial expressions of emotion.

Differential Topic Effects

A question that arises from the above findings is why emotion recognition accounted for age differences in the crime topic interviews but not in the opinion topic interviews? Although young adults were better than older adults at detecting deceit in the opinion topic interviews, deceit detection accuracy in the opinion topic was not related to emotion recognition. Additionally, age-related differences in opinion deceit detection accuracy could not be accounted for by cognitive or perceptual abilities. Furthermore, while deceit detection in the crime topic differed by modality condition, there was no effect of modality condition in the opinion topic. It appears that factors influencing deceit detection judgments may differ by topic. There are several

possible factors that might contribute to differential topic effects which future research might address more directly.

First, there appears to be a difference in the severity of the transgression for the two topics. The crime topic interviews deal with a moral issue: a theft. Thus, older adults may feel much more strongly about the importance of their veracity judgments in the crime topic interviews, in comparison to the opinion topic interviews. Thus the crime topic interviews may have activated more effortful and systematic processing than the opinion topic interviews. That is, older adults may be more motivated to process the available information to form a judgment in the crime topic interviews. Research on trait diagnosticity and impression formation is consistent with this possibility. In an impression formation and change task, older adults, but not young adults, exhibited greater change when given diagnostic information in the morality domain compared with the ability domain (Hess, Bolstad, Woodburn, & Auman, 1999). Similar to these findings older adults may have been motivated to process information effortfully in the crime topic given its moral content. However, processing the relevant information in this task requires the additional ability to decode emotional expressions, which impairs older adults' deceit detection accuracy in this condition regardless of the effort they have put forth.

In the social opinion topic interviews, older adults are not dealing with a hot moral issue like a crime. Thus, a second explanation may be that lying about a social opinion is less believable to older adults. As an illustration, in a thought listing response regarding the opinion interview, one older adult suggested that, "*Banning cigarette smoking doesn't seem like such a personal issue and not worth lying about. I didn't see a reason why he would lie."* Older adults may have a greater tendency than young adults to focus on their belief that people do not usually

lie about their opinion and thus they may believe the people in the opinion scenario are telling the truth.

In support of this possibility, personal beliefs have been shown to be an important factor that influences older adults' social judgments. For example, older adults have been shown to rely on a dispositional bias more so than young adults, but once plausible explanations for behavior are provided, older adults no longer exhibit this bias (Blanchard-Fields & Horhota, 2005). Moreover, personal beliefs have been shown to guide older adults' social judgments more so than young adults (Horhota & Blanchard-Fields, 2006). Perhaps in the social opinion topic, older adults who had strong beliefs on the issue may have relied more on well-known dispositional information as to how people behave in these situations. A final explanation for these differential topic effects may be inherent in the stimuli themselves: the actual targets may “leak” more emotional cues when being questioned in the crime topic interviews than in the opinion topic interviews due to the nature of the situation.

Limitations

One limitation of this research is the generalizability of our interviews to real-world emotion recognition. If our emotion recognition measure was dynamic instead of static it might better represent processes operating in the context of perceiving emotions in action. Like the deceit detection interviews in this study, lies in the real world occur in dynamic formats; our measure of emotion recognition was static faces on a computer screen. A measure of dynamic emotion recognition abilities might capture both processing speed and emotion recognition differences. Second, the targets in the stimuli were all young adults. Perhaps older adults would be more accurate at detecting deception in like-aged peers. Consistent with this possibility, past research has found a crossover interaction such that older women were better at decoding the

emotional facial expressions of other older women than the facial expressions of younger women (Malatesta, Izard, Culver, & Nicolich, 1987). Future research should test whether the age of the target matters when judging deception. Another limitation is that participants in this study judged targets in videotapes, rather than in live interactions. Judgment processes may operate differently in actual social interactions.

Conclusions

In this study we have been able to identify the conditions under which older adults may be vulnerable to judgment errors. Yet, despite evidence of an age-related decline in deceit detection, this study also carries a positive message in that a) older adults were not uniformly ineffective at detecting deceit, but only under certain conditions (e.g., when emotion recognition plays a major role) and b) knowledge of a deficit in certain situations can help to ameliorate older adults' vulnerability to deception. That is, older adults may be able to compensate for this loss. For example, older adults might protect themselves by avoiding financial decisions at initial face-to-face meetings.

Making a social judgment is a complex process that can vary not only between groups of people but also within the same person depending on the context. This study shows that isolated tests of social judgments may not be telling the whole story of what happens in daily life. Indeed, older adults may be relying on a sufficient strategy in many situations, as evidenced by their above chance performance in the opinion topic interviews. Finally, in this study, we moved beyond the documentation of age-related differences in emotion recognition abilities by examining the functional significance of these deficits (i.e., its impact on deceit detection). Future research in this area could contribute to our understanding of the impact of age-related deficits in emotion recognition on other judgment and decision-making domains.

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Table 1

Estimated Marginal Means, Standard Errors, and Analyses of Variance (ANOVAs) for Perceptual, Cognitive, Social, and Deception Variables

Variable Type	Variable	*Maximum Score*	Young Adults (*N* = 171)		Older Adults (*N* = 193)		ANOVA	
			Mean	*SE*	*Mean*	*SE*	*F*(1, 362)	*D*
Perceptual Variables	Visual Acuity (Higher scores = worse visual acuity)	--	17.92	.57	26.40	.53	119.10**	1.34
	Facial Discrimination	27	23.34	.18	21.46	.17	59.26**	.83
Cognitive Variables	Letter Sets Test	30	24.35	.34	14.83	.32	419.17**	2.26
	Working Memory	7	5.08	.10	2.00	.09	533.90**	2.43
	Vocabulary Test	36	19.06	.44	21.46	.41	15.92**	.44
Social Variable	Shame and Fear Emotion Recognition	16	14.45	.21	11.48	.20	105.67**	1.14
Deception Variables	Crime Deceit Detection	10	5.93	.12	5.54	.11	5.37*	.25
	Opinion Deceit Detection	10	5.78	.11	5.46	.11	4.38*	.22

Note. * $p < .05$; ** $p < .01$

Table 2

Intercorrelations for Age and Perceptual, Cognitive, Social and Deception Variables Across Modality Conditions and in the Audio-Visual Condition

Variable		1	2	3	4	5	6	7	8	9
1	Age Group	--	.50**	-.38**	-.73**	-.77**	.21**	-.48**	-.12*	-.11*
2	Visual Acuity	.48**	--	-.29**	-.42**	-.44**	.11*	-.31**	-.06	-.10
3	Facial Discrimination	-.31**	-.38**	--	.38**	.38**	.09	.28**	.07	-.01
4	Letter Sets	-.70**	-.51**	.31**	--	.74**	.16**	.52**	.09	.07
5	Working Memory	-.75**	-.51**	.39**	.70**	--	.05	.47**	.13*	.11*
6	Vocabulary	.15	-.06	.13	.19*	.17*	--	.17**	.03	.01
7	Emotion Recognition	-.42**	-.33**	.22*	.49**	.49**	.27**	--	.11*	.02
8	Crime Deceit Detection	-.17*	-.09	.14	.05	.08	.08	.06	--	-.01
9	Opinion Deceit Detection	-.12	-.12	-.01	.13	.12	.09	.03	-.08	--

Note. Intercorrelations across modality conditions (N = 364) are presented above the diagonal, and intercorrelations for participants in the audio-visual condition (n = 134) are presented below the diagonal. * Coefficient is significant at $p < .05$, two-tailed. ** Coefficient is significant at $p < .01$, two-tailed.

Table 3

Intercorrelations for Age and Perceptual, Cognitive, Social and Deception Variables in the Audio and Visual Conditions

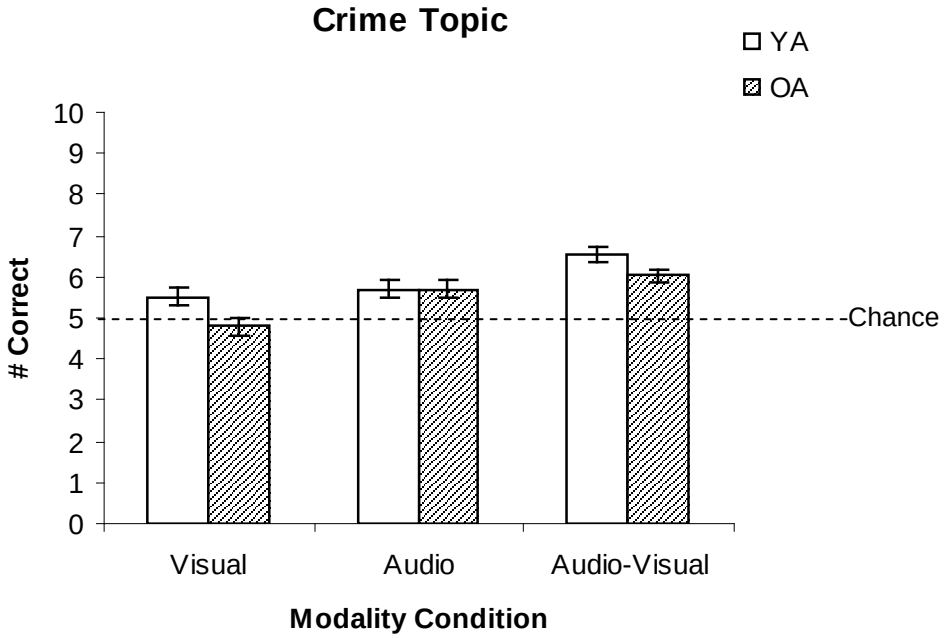
		1	2	3	4	5	6	7	8	9
1	Age Group	--	.49**	-.32**	-.78**	-.80**	.27**	-.48**	.00	-.20*
2	Visual Acuity	.55**	--	-.23*	-.35**	-.41**	.23*	-.29**	.03	-.16
3	Facial Discrimination	-.51**	-.26**	--	.38**	.33**	.00	.35**	.01	-.04
4	Letter Sets	-.73**	-.39**	.44**	--	.76**	.04	.54**	.03	.08
5	Working Memory	-.77**	-.40**	.40**	.77**	--	-.08	.44**	.02	.23*
6	Vocabulary	.23*	.21*	.12	.21*	.03	--	.09	.15	-.14
7	Emotion Recognition	-.53**	-.32**	.31**	.54**	.48**	.10	--	.05	-.06
8	Crime Deceit Detection	-.23*	-.14	.00	.15	.27**	-.16	.27**	--	.08
9	Opinion Deceit Detection	-.01	-.01	.02	.01	-.01	.06	.06	.05	--

Note. Intercorrelations for participants in the audio condition (n = 113) are presented above the diagonal, and intercorrelations for participants in the visual condition (n = 117) are presented below the diagonal. * Coefficient is significant at $p < .05$, two-tailed. ** Coefficient is significant at $p < .01$, two-tailed.

Figure Caption

Figure 1. Age and modality effects for the crime topic. Error bars are standard errors of the mean.

Figure 1


Crime Topic
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Correct
Chance
Visual
Audio
Audio-Visual
Modality Condition